

UFZ site Leipzig / Photo: André Künzelmann (UFZ)

Consolidated **ENVIRONMENTAL STATEMENT 2022**

Helmholtz Centre for Environmental Research – UFZ for the locations in Leipzig, Halle, Magdeburg, Bad Lauchstädt and Falkenberg

Contents

FOREWORD	3
1 THE HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ AND ITS EMAS SITES	4
2 ENVIRONMENTAL MANAGEMENT AT THE UFZ	10
3 DEVELOPMENTS AND OBJECTIVES OF ENVIRONMENTAL MANAGEMENT	13
3.1 CLIMATE	14
3.2 ENERGY	17
3.3 MOBILITY	22
3.4 RESOURCES	26
3.5 BIODIVERSITY	31
3.6 INTERNAL COMMUNICATION, PARTICIPATION AND AWARENESS-RAISING	34
3.7 MULTIPLIER FUNCTION	37
4 ENVIRONMENTAL PERFORMANCE INDICATORS	42
4.1 CORE INDICATORS	42
4.2 ENVIRONMENTAL BALANCE	43
5 DECLARATION OF VALIDITY AND REGISTRATION CERTIFICATE	47

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FOREWORD

Tackling the diverse ecological, social and economic challenges of the future is a collective task. One of our guiding principles here is sustainability. Science plays a central role in the realization of sustainability. The UFZ makes important contributions: With our research, we show ways to reconcile a healthy environment with social development. As a Helmholtz Centre for Environmental Research (UFZ) in the field of integrative environmental research, we bear a particular responsibility for our negative environmental impacts. We try to keep these as low as possible. To monitor and continuously improve our environmental impact, the executive management decided back in 2002 to use the EMAS (Eco-Management and Audit Scheme) environmental management system. In this way, we are making a voluntary contribution to greater environmental protection than required by law. In 2005, the UFZ was successfully validated for the first time and since then EMAS has been used as an important tool to fulfill our ecological responsibility. The jointly developed environmental guidelines are to be understood as a self-commitment for our actions in order to achieve an ideal state. Our aim is to reconcile excellent research with the principle of sustainability and thus to conduct research for sustainability and at the same time to conduct sustainable research.

The years 2020 to 2022 were particularly challenging for us as a research center and also in terms of our environmental impact. The corona pandemic led to changes in the work environment that were unthinkable for many of us. However, the necessary reduction in our daily contacts and changes to work processes have clearly and noticeably advanced digitalization at the UFZ. Conferences, training courses and work meetings were increasingly held online, and most applications can now be submitted digitally. For many, near paperless working has gone from a vision to everyday life. In addition, the increased possibility of mobile working is probably the most noticeable difference in the „new“ digital culture at the UFZ for most employees. This cultural change is also visible in our environmental indicators and environmental impact. However, we are aware that many negative environmental impacts have been shifted to the private sector and can no longer be recorded by the UFZ. The year 2022 was also characterized by a sharp rise in energy costs and high inflation. This encourages us to continue saving energy and to expand the forms of renewable energy we generate ourselves. In particular, lowering the temperatures in the laboratory and office buildings to 19° Celsius from fall 2022 initially presented us and many employees



Photo: André Künzelmann/UFZ

with a major challenge. However, in addition to financial aspects, this necessary step represents an important contribution to greater sustainability at the UFZ.

On behalf of the executive management, I would like to thank all employees who are committed and dedicated to greater environmental protection and sustainability at the UFZ.

With this consolidated environmental statement, we show the concrete measures we have taken to achieve our goal of environmental sustainability and what we have already accomplished. It is also an incentive to keep making our processes more environmentally friendly and to continue on our path to a climate-neutral research center – a path that can only be taken together. In line with the 17th goal of Agenda 2020 („Partnerships for the global goals“), we would like to incorporate your suggestions and look forward to the dialog.

Yours sincerely

Dr. Sabine König | Administrative Director and Environmental Management Officer at the UFZ



1 THE HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ AND ITS EMAS SITES

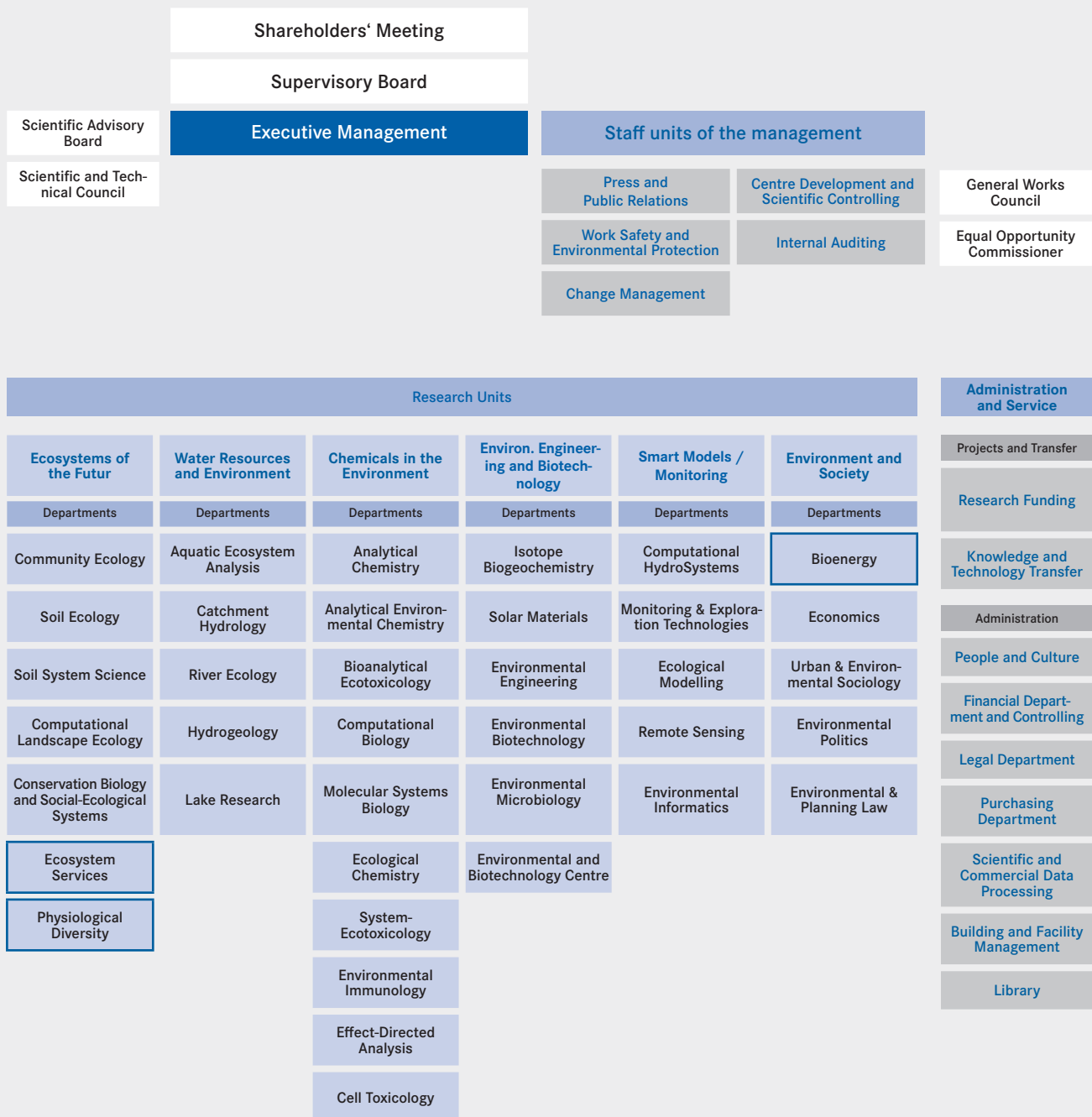
The Helmholtz Centre for Environmental Research GmbH - UFZ is a nationally and internationally recognized research center for environmental research. It employs 1,144 people (2021: 1,160, 2020: 1,199) at the Leipzig, Halle, Magdeburg and Bad Lauchstädt sites. The Falkenberg site is also part of the UFZ as a research station until June 30, 2023, but will then be closed and handed over to the state of Saxony-Anhalt.

Biodiversity, functioning ecosystems, clean water and intact soils are the natural basis of our existence. However, in view of climate and land use changes, demographic changes and the growing demand for energy and food, many of our livelihoods are being lost or are losing their quality. At the UFZ, we want to use excellent research to show ways of making it possible to reconcile a healthy environment with social development. Dealing with complex environmental problems makes it necessary to overcome boundaries between the natural, engineering and social sciences. The UFZ has extensive experience in integrated environmental research, possesses innovative scientific infrastructures and maintains important national and international cooperations. As a result, practice-oriented solution options are developed on a sound scientific basis. In terrestrial environmental research, the UFZ has a unique portfolio of topics that is oriented towards global trends and the United Nations Sustainable Development Goals (SDGs): Population growth and societal scarcity conditions, globalization, urbanization,

climate change and decarbonization, decline in biodiversity, growing quantity and diversity of chemicals with impacts on humans and the environment, new patterns in national and global governance. These closely interwoven global trends make it clear how complex and complicated the societal, ecological and social interrelationships are. This is one of the reasons why environmental research needs to conduct integrated research and develop data- and model-based syntheses on the current and future state of the environment. In order to live up to this integrative research and synthesis approach in environmental research, research at the UFZ is organized into **six strategic research units**, to which a total of **38 methodologically oriented departments** are assigned (see organizational chart on page 5).

The core processes of the scientists at the UFZ are supported by a central administration. There are also staff to support the executive management and various central processes and committees.

Organization chart / Status as of 31.12.2022



The **Department of Bioenergy** (research unit „Environment and Society“) and the **Departments of Ecosystem Services** and **Physiological Diversity** (research unit „Ecosystems of the Future“) are currently excluded from the scope of the EMAS certificate due to shared usage relationships. This is a joint use with the German Biomass Research Center (DBFZ) and the German Centre for Integrative Biodiversity Research (iDiv).

Nevertheless, the departments are still integrated into the UFZ's environmental management system. Reintegration into the EMAS certification is planned in the future.

An initial inventory in the form of an environmental audit was carried out for the Change Management staff unit of the executive management, which was founded on October 1, 2022, so that it was included in the scope of environmental management for the 2023 validation of the 2022 environmental statement.

THE EMAS SITES OF THE UFZ

The Helmholtz Centre for Environmental Research GmbH - UFZ is based in Leipzig. UFZ scientists also work at the Halle and Magdeburg sites and at the Bad Lauchstädt experimental station. Until June 30, 2023, also the lysimeter station in Falkenberg belongs to the UFZ.

LEIPZIG

The UFZ at the Leipzig site in Permoserstraße is part of the Leipzig Science Park. In recent years, this has developed into a lively and efficient research complex and is the second largest science location in Leipzig after Leipzig University. With a total campus area of 76,200 m², the UFZ site in Leipzig has 17 office and laboratory buildings as well as a new research building currently under construction. The streaming water experiment and a vehicle hall are also located on the UFZ site. A total of 916 employees (2021: 935; 2020: 971) and thus the majority of UFZ employees work at the UFZ site in Leipzig: in all research units and almost all administrative staff.

HALLE

The UFZ at the Halle site in Theodor-Lieser-Straße is located at the Weinberg Campus Technology Park, the innovation location for the life sciences and materials sciences industry in the region. Covering 134 hectares, the Weinberg Campus Technology Park is the largest in central Germany, of which the UFZ occupies around 16,000 m². 119 employees work at the UFZ site in Halle (2021: 120; 2020: 122). In the Research unit *Ecosystems of the Future*, the departments of *Community Ecology*, *Soil Ecology and Soil Systems Research* are located in Halle. In the Research unit Water Resources and Environment, scientists from the Department of Catchment Hydrology conduct research in Halle. The Halle site consists of a building with office and laboratory space.

MAGDEBURG

The UFZ at the Magdeburg site in Brückstraße is located on the eastern side of the Elbe and has a workforce of 86 (2020: 84; 2021: 83) employees. The Magdeburg site is approx. 15,500 m² in size. In addition to the UFZ, the Saxony-Anhalt State Archives and the Saxony-Anhalt Ministry of Social Affairs are also located on the site. The departments of *Aquatic Ecosystem Analysis*, *River Ecology and Lake Research of the Water Resources and Environment Research unit* are located at the Magdeburg site. It is a building with office and laboratory use.


BAD LAUCHSTÄDT

The [Bad Lauchstädt research station](#) is located around 30 km south of Halle. With an area of 446,200 m², the research complex is the largest site with regard to space. Nine employees work at the site (2020: 11; 2021: 8), who are assigned to the *research unit Ecosystems of the Future*. The infrastructure for investigating various scale-dependent ecological systems is provided in Bad Lauchstädt. They range from climate chamber, warm-house and cold-house experiments to manipulation experiments in the field. The site consists of two greenhouses, a warehouse with office space and two vehicle halls. The largest part of the site consists of arable land for field trials.





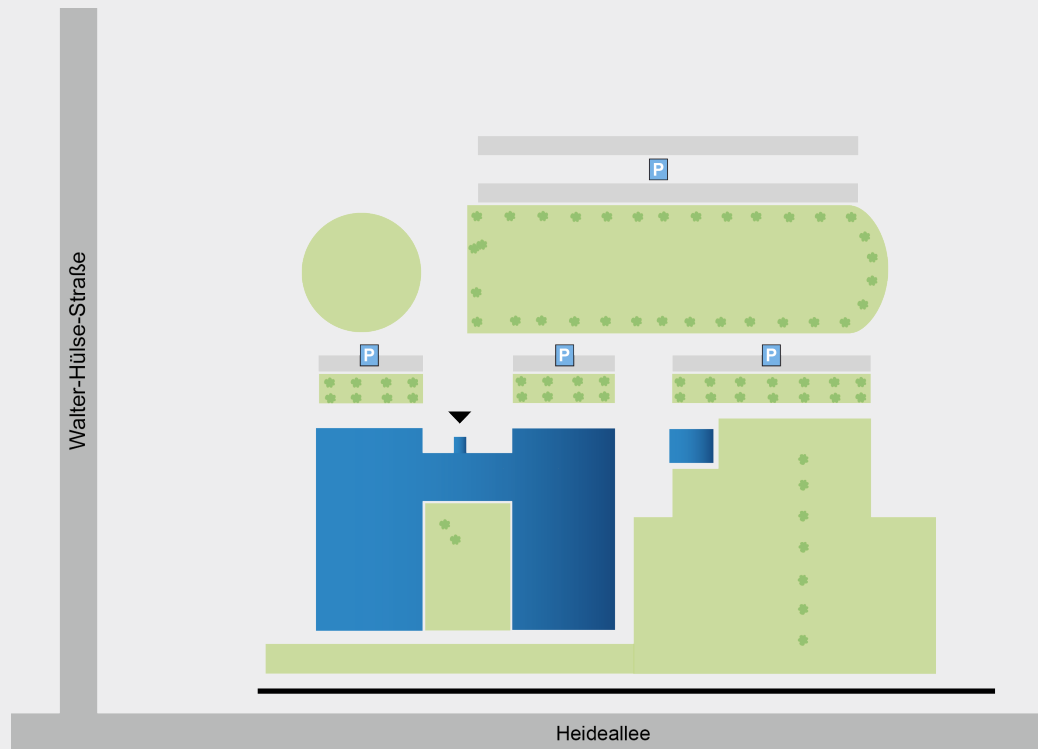
FALKENBERG

 The Falkenberg location is about 100 km north of Magdeburg in the Altmärkische Wische. The site has an area of approx. 6,800 m² and comprises a laboratory building with laboratory and workshop as well as a test station. The test station is a lysimeter facility, a research device for determining infiltration rates, evaporation and for sampling soil leachate. There are five employees at the site (2020: 5, 2021: 5). Due to the deconstruction and the return of the site to the federal state of Saxony-Anhalt in 2023, it will subsequently be removed from the EMAS validation.

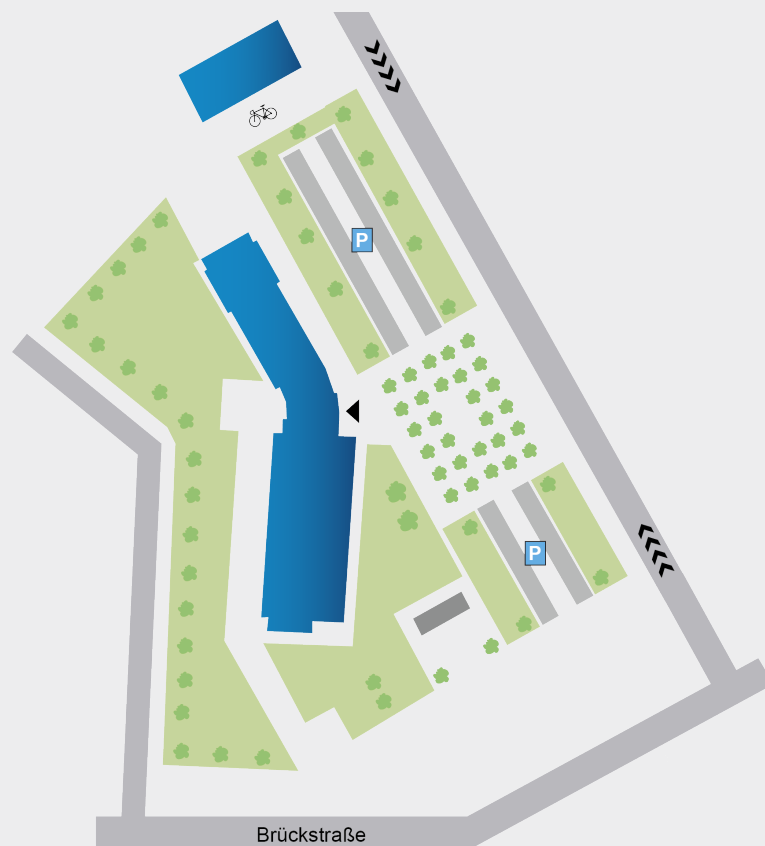
*The new UFZ research building
in Leipzig is scheduled to open in
spring 2024.*



Site plan UFZ location
Halle



Site plan UFZ location
Magdeburg



*Site plan UFZ location
Bad Lauchstädt*



*Site plan UFZ location
Falkenberg*



2 ENVIRONMENTAL MANAGEMENT AT THE UFZ

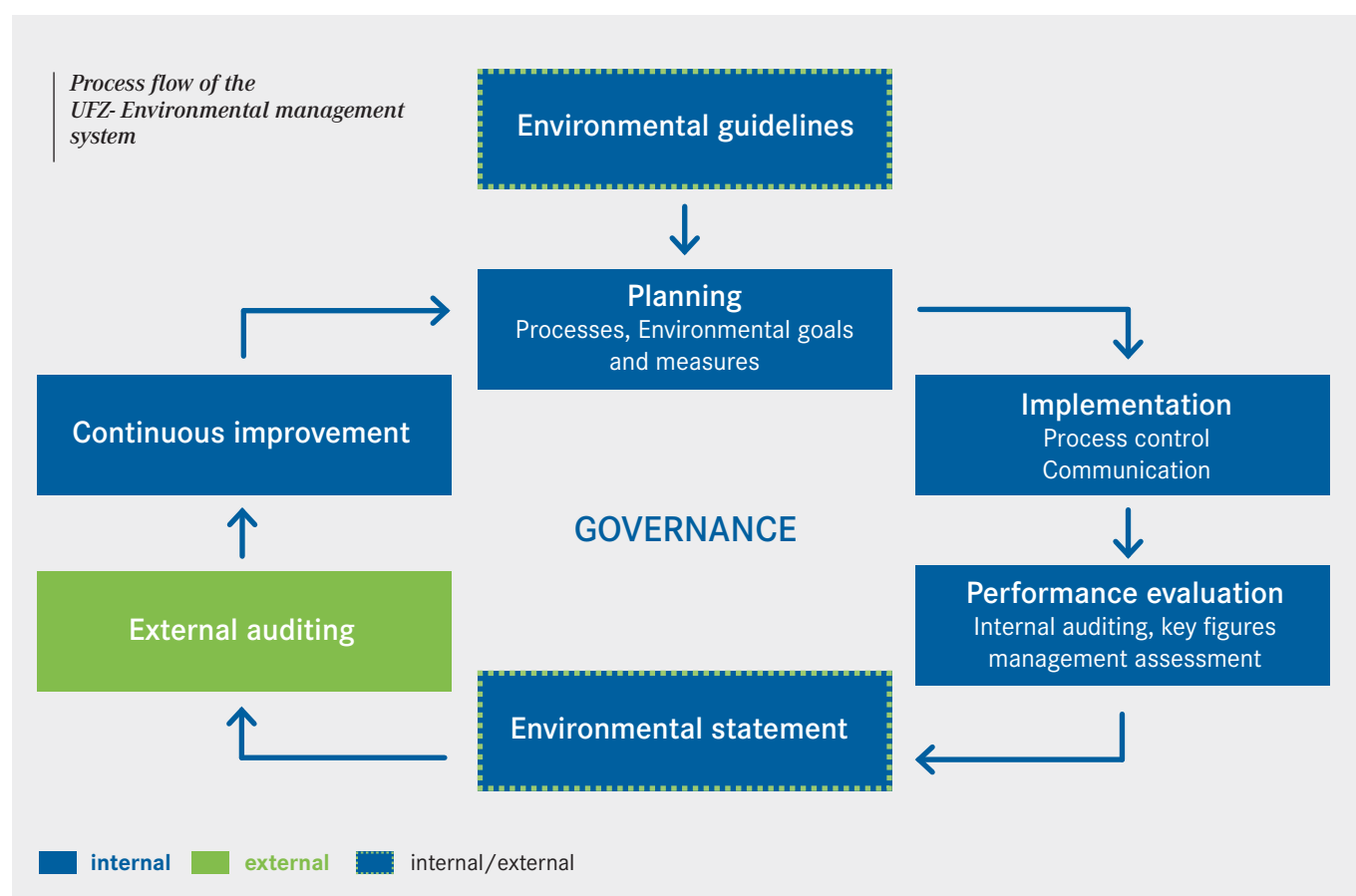
The Helmholtz Centre for Environmental Research - UFZ initiated the establishment of an environmental management system in 2002. This is audited in accordance with EC Regulation No. 1221/2009 (EMAS), EMAS Amendment Regulations (EU) 2017/1505 and 2018/2026 and DIN EN ISO 14001:2015 and was validated for the first time in 2005. Since then, the environmental management system has been audited annually by independent environmental auditors and revalidated every three years for the UFZ sites in Leipzig, Halle, Magdeburg, Bad Lauchstädt and, until 2021, Falkenberg. The primary aim of **EMAS (Eco-Management and Audit Scheme)** is to achieve continuous improvement in the company's environmental performance with the involvement of all employees.

RESPONSIBILITIES AND PROCESSES

The responsibilities, competencies and processes in environmental management are regulated in a digital environmental management manual that is accessible to all employees. It also contains information and documents that are important for environmental protection.

Significant environmental aspects and environmental impacts of the UFZ's activities were identified and evaluated in a comprehensive **environmental assessment**. It includes a context analysis, a stakeholder analysis and a risk and opportunity analysis. Appropriate adjustments are made in the event of changes. The UFZ has to comply with a number of provisions of environmental law in the areas of hazardous substances, biosafety (including genetically modified organisms), waste, radiation, water and water protection and energy.

The **environmental guidelines** are the central guideline for the UFZ's fundamental environmental behavior. They were adopted in 2004 and revised in a participatory process in 2017 and 2018. They represent the desired ideal state and should be seen as an impetus for the continuous improvement of the UFZ's environmental performance. These environmental guidelines form the basis for the environmental objectives and measures to achieve them (**environmental program**). In addition, the most significant environmental aspects and impacts, binding commitments, suitable key figures, the results of



OUR ENVIRONMENTAL GUIDELINES

Global environmental changes such as climate change, the decline in biodiversity, the scarcity of resources and the increasing pollution of the environment confront us with major challenges. As one of the world's leading research centers in the field of integrative environmental research, we assume our responsibility to contribute to the transformation towards a sustainable society - with our research and with our actions. We are guided by national and international sustainability goals, but also think beyond.

1. **With our research and the transfer of our knowledge to society, we want to initiate and actively shape the transition to a sustainable society.** We create knowledge, technologies, measures and management tools that help to enable and shape societal change. The transfer of our research results into society is of central importance to us.
2. **Beyond strictly complying with environmental legislation, we are committed to avoiding, reducing and, if necessary, compensating for negative environmental impacts and promoting positive environmental impacts.** It is our ambition to reconcile excellent research with the principle of sustainability:
 - We are striving to become a **climate-neutral company** and are committed to continuously reducing our greenhouse gas emissions.
 - We are committed to **using resources** such as energy, raw materials, water and land **efficiently**.
 - We want to ensure that both our **commute to work** and our **business trips** are as efficient and **environmentally friendly** as possible.
 - We prefer to **procure** products that are the **most environmentally friendly option** over their entire life cycle and **substitute hazardous** substances wherever possible.
- We **handle waste** responsibly and strive to reduce it.
3. **Environmentally aware and resource-conserving behavior is part of our self-conception as managers and employees of the UFZ.** We exemplify and promote environmental protection in our daily actions. We are actively using the possibilities of the environmental management system such as participating in the environmental committee and developing ideas and measures to continuously improve the environmental performance of the UFZ.
4. **We make our environmental management transparent both internally and externally in order to continuously improve through dialog.** In an open exchange within the center, with external partners and the public, we provide transparency about the performance of both our environmental research and our environmental management. We want to pass on our long-standing experience and expertise to other institutions, but also use external suggestions to continuously improve ourselves.

internal environmental audits and suggestions from UFZ employees are all incorporated.

A regular and systematic review of the implementation status of the environmental management system and the environmental guidelines is carried out by means of **internal audits** and robust key figures, among other things.

Compliance with the binding obligations, including the key legal obligations for us, was confirmed in the organizational units audited - corrective measures were initiated if deviations were identified. Finally, the ongoing suitability, appropriateness and effectiveness of the environmental management system is assessed by the executive management in the form of a **management review**

and opportunities for improvement are identified, which marks the start of the **annual process**.

Responsibility for the environmental management system at the UFZ has been in the hands of the Administrative Director Dr. Sabine König since March 2019. Peggy Kirsten has been responsible for the strategic development and coordination of the environmental management system as Environmental Management Coordinator since 2017. From March 2022 to June 2023, Manuel Rist assumed responsibility for this position. Environmental Management Coordination is part of the Staff Unit Center Development and Scientific Controlling.

The **Environmental Committee** is the central body for coordinating, informing and controlling the implementation of the environmental guidelines and for strengthening environmental protection at the UFZ. It consists of committed employees from scientific departments and administrative organizational units. The Environmental Committee is headed by the Environmental Management Coordinator and meets at least every six months and up to six times a year. There is a regular exchange of information between the committee meetings. In addition, the Environmental Committee has working groups for specific topics. Participation and involvement in these groups is open to all employees. There is at least one environment contact person in each of the organizational units. This person acts as a contact for the Environmental Management Coordinator, the Environmental Committee and, in particular, for the employees. In this way, operational environmental protection is firmly anchored in the organizational structures of the UFZ.

ENVIRONMENTAL ASPECTS

The environmental aspects of the UFZ, i.e. aspects of activities, products or services that may have an impact on the environment, are regularly recorded and reassessed. A basic distinction is made between direct and indirect environmental aspects.

Direct environmental aspects arise as an immediate consequence of activities at the UFZ and can be controlled by the UFZ. Examples are energy consumption, waste production and water consumption. The direct environmental aspects and their assessments are listed in Chapter 4 of the environmental statement.

Indirect environmental aspects arise indirectly from the activities of UFZ employees. The UFZ does not have complete control over indirect environmental aspects.

Examples include mobility and procurement. In contrast to direct environmental aspects, these are particularly noticeable in the upstream and downstream areas of the UFZ. The core activity of research has a large number of indirect positive environmental effects. Examples include the use of research results to strengthen environmentally friendly technologies, advising decision-makers, raising public awareness and positively influencing the environmental actions of employees and external partners.

It is not always possible to differentiate precisely between direct and indirect environmental aspects. The decisive factor is rather that all significant environmental aspects of the organization are recorded and evaluated. An environmental aspect is considered significant if the significance (quantity, predicted development and hazard potential) and the UFZ's ability to influence it are rated as high.

Environmental management currently **focuses** on the following areas:

- **climate,**
- **energy,**
- **mobility,**
- **resources and**
- **biodiversity.**

Particularly with regard to these environmental aspects, efforts are made to minimize the direct and indirect negative environmental impacts and to strengthen the positive ones. Other important areas for improving the environmental performance of the UFZ are:

- **internal communication, participation and awareness-raising as well as**
- **exercising a multiplier function.**

For each of these priorities, the UFZ formulates goals and concrete, verifiable measures. These are presented in the following chapter.



3 DEVELOPMENTS AND OBJECTIVES OF ENVIRONMENTAL MANAGEMENT

The consolidated environmental statement for the years 2020 to 2022 includes two years in environmental management that were significantly shaped by the **coronavirus pandemic** and one year that was defined by the energy crisis and the aftermath of the pandemic. These crises had an impact on work, communication and mobility behavior and necessitated adjustments to a wide range of processes. Both in the core area of research and in environmental management, the last three years have been exceptional years that continue to have an impact on the UFZ and its environmental performance indicators.

The years 2020 and 2021 were characterized by legal regulations and the need to reduce contacts, while most of the restrictions were lifted in spring 2022. Nevertheless, new ways of working became established that were probably unimaginable for many employees before the coronavirus pandemic. The possibility and, at times, necessity of mobile working has fundamentally changed the way employees communicate.

At times, video conferences had to be held instead of going on business trips. Working remotely meant that processes had to be increasingly digitized and the importance of digital data and document storage also increased. Even after the end of the coronavirus protective measures, it is clear that many employees are still happy to take advantage of the flexible working options and the use of video conferencing, which means that in addition to reduced travel activity, the presence of employees at the site is still below the pre-pandemic level. At the same time, the reduced presence of staff at the site in particular also means that many environmental impacts are no longer recorded by the UFZ and have shifted to employees' private rooms. A comparison of the environmental indicators with the period before the corona pandemic and also during the pandemic is therefore not entirely accurate. It is likely that it will take a few years before it will be possible to obtain robust environmental indicators that allow for a corresponding assessment and the identification of trends. This should be borne in mind for the coming chapters.

3.1 CLIMATE

OVERALL ENVIRONMENTAL OBJECTIVE: CO₂-eq^[1]-Prevention and minimization

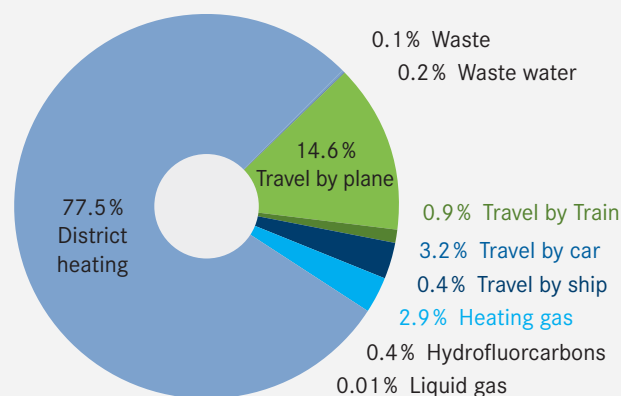
The UFZ has set itself the goal of becoming a climate-neutral research center. In the short to medium term, we want to achieve net climate neutrality by offsetting remaining CO₂-eq emissions in addition to the reduced emissions through our action programs. We have set ourselves the ambitious goal of achieving gross climate neutrality by 2040. This means that all reduction potential for avoiding and minimizing CO₂-eq emissions is to be exploited. This includes the areas of energy and mobility in particular (sections 3.2 and 3.3), but also has an impact on the areas of resources and raising employee awareness (sections 3.4 and 3.6).

DEVELOPMENT SINCE 2020

In 2022, the UFZ's **CO₂-eq emissions** fell by 37.0 percent compared to the previous year to 2,517.6 t CO₂-eq (or 39.4 percent compared to 2020); the per capita reduction was 38.0 percent compared to the previous year (or 38.2 percent compared to 2020). Per capita emissions fell from 3.8 t CO₂-eq in 2020 to 3.7 t CO₂-eq in 2021 and 2.1 t CO₂-eq in 2022. In 2022, the largest share of CO₂-eq emissions came from district heating generation with a total of 77.5 percent. The greatest savings compared to the previous year were achieved in 2022 by **returning to high-quality green electricity**. Despite the UFZ's desire for sustainable electricity, an electricity provider with a conventional electricity mix was selected for 2020 and 2021 through a tender by the Saxon Real Estate and Construction Management (SIB) as the responsible body for the entire science park in Leipzig. Thanks to successful negotiations and the express wish of the UFZ, high-quality green electricity could once again be purchased at the Leipzig site from 2022. This means that all sites are once again supplied with green electricity. Even without this special effect, the long-term trend thus shows a steady reduction in CO₂-eq emissions. The second biggest change in the sources of CO₂-eq emissions is the continued **reduction in business trips** resulting in a lower proportion of total emissions than before the pandemic. A comparison of the last three years nevertheless shows a large increase in CO₂-eq emissions from business trips for 2022, as traveling was possible again in large areas for the first time since the start of the pandemic in 2020. Emissions from air travel rose by 696.8 percent compared to the previous year (or 315.0 percent compared to 2020), while the other forms of mobility - rail travel (+172.7 percent or +100.4 percent compared to 2020), car travel (+19.3 percent or +14.3 percent compared to 2020) and boat travel (+16.1 percent or +77.6 percent compared to 2020) - saw smaller

increases. However, it is important to note that travel activity remains low compared to 2019 and has fallen by 31.2 percent. Despite the high increase in flights in 2022, these have fallen from 1,614 flights/year in 2019 to 987 flights/year in 2022 (-38.8 %). Emissions caused by district heating fell by 16.9% (or 2.8 % compared to 2020), which is mainly due to energy savings and reduced heating requirements. Emissions from waste and wastewater were included in the balance sheet for the first time in 2022. The aim is to gradually expand the carbon footprint.

Sources of CO₂-eq emissions of the UFZ in 2022



Note: Indirect CO₂-eq emissions along the value chain (Scope 3 emissions according to the Greenhouse Gas Protocol) are currently only partially recorded. An expansion of the greenhouse gas balance is planned.

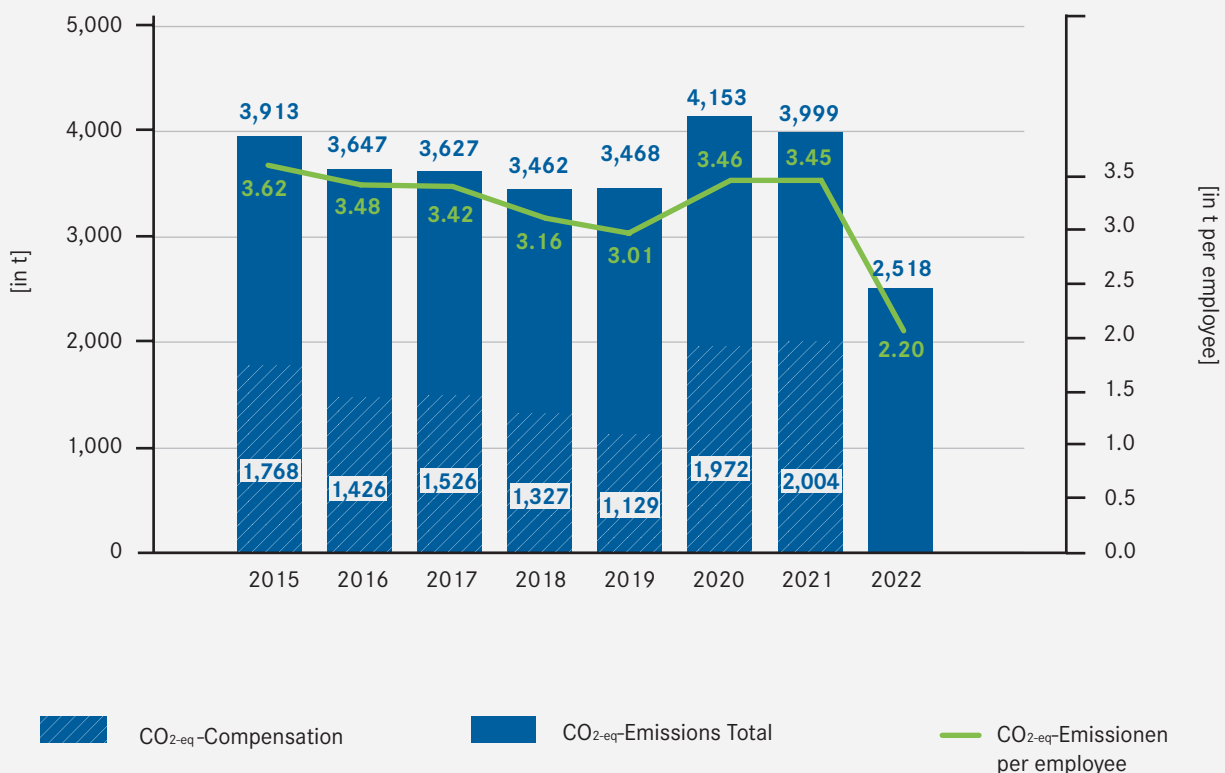
[1] The Global Warming Potential (GWP) is used as an indicator of the greenhouse gas emissions caused by human activities that contribute to global warming and climate change. Various greenhouse gas emissions (e.g. CO₂, CH₄, N₂O, HFCs, PFCs, NF₃ and SF₆) are converted into CO₂-eq for comparability.

The UFZ's efforts to become a **climate-neutral company** have been driven forward over the last three years. Within the near future, the UFZ is aiming for net climate neutrality within the existing system and accounting limits. This was planned retroactively for 2021 for the first time in 2022. Due to unexpectedly high compensation costs for the remaining CO₂-eq emissions, offsetting had to be postponed to 2023, so that net climate neutrality is planned retroactively for 2021 and 2022. With regard to the long-term and ambitious goal of gross climate neutrality by 2040, a **campus master plan** was adopted by the Supervisory Board in November 2021 and the climate neutrality of the UFZ was discussed further in detail at the 2021 Supervisory Board meeting. In cooperation with the users and owners of the Science Park, the Leipzig campus is to be transformed into a climate-neutral campus. To this end, a **CO₂-eq roadmap** was developed and commissioned in 2021, which outlines the steps for implementation. The measures and investments necessary to achieve the objectives were examined, taking into account the scientific requirements. Research work de-

veloped by UFZ researchers is to be implemented as pilot projects and will contribute to a water-sensitive, biodiversity-promoting and CO₂-eq-neutral campus.

Various avoidance and minimization measures have made it possible to achieve savings in CO₂ equivalents in recent years. The measures can be assigned in particular to the areas of energy (Chapter 3.2) and mobility (Chapter 3.3). Measures to conserve resources (section 3.4), biodiversity (section 3.5) and internal communication, participation and awareness-raising (section 3.6) also have a partial impact on CO₂-eq emissions. Some exemplary measures include the expansion of renewable energies, the promotion of bicycle mobility, the replacement of leaf blowers, the publication of guidelines for holding sustainable events and awareness-raising measures such as the transparency of CO₂-eq emissions of the organizational units through business trips with subsequent reflection on the volume of business trips, the provision of information on CO₂-eq consumption in the form of CO₂-eq thermometers for meals in the can-

Development of CO₂-eq emissions [in t] at the UFZ



teen in Leipzig and the voluntary commitment to avoid short-haul flights.

The **UFZ has been voluntarily compensating for CO₂-eq emissions** caused by air travel since 2010. In the years 2009 to 2022, a total of 22,315 t CO₂-eq were offset for air travel and individual events such as the UFZ Annual Reception 2019. Due to a switch to conventional electricity in 2020 and 2021, a switch that was not desired by the UFZ, the 2,820 t CO₂-eq arising in this context were also offset. Within the current system and balancing limits, 1,995.1 t CO₂-eq still need to be offset for 2021 in order to achieve net climate neutrality for 2021. This offsetting for 2021 is planned retroactively in the course of 2023. To neutralize CO₂-eq emissions, the UFZ uses compensation projects with the highest quality standard, the so-called Gold Standard, and the REDD standard for forest projects. These projects not only contribute to CO₂-eq avoidance, but also promote sustainable development in the project environment through ecological, social and economic aspects. The Environment Committee's CO₂-eq compensation working group also carries out a compre-

hensive assessment of the projects based on sustainability criteria. Due to the complex process of determining CO₂-eq emissions and evaluating potential compensation projects, compensation is provided each year for the previous year. The compensation projects are carried out in 4 categories: Forest, wind power/hydropower/water treatment, biogas/biomass and solar and energy efficiency.

In 2020, 1,129 t CO₂-eq for 2019 were offset in equal parts by reforestation in Kibale National Park in Uganda, a well project in Uganda, small-scale biogas plants in Nepal and energy-efficient cooking stoves in Rwanda. In 2021, 1,972 t CO₂-eq were offset in equal parts for 2020 through a forest conservation project with sustainable Brazil nut cultivation in Peru, a small hydropower plant in Honduras, small biogas plants in Nepal and energy-efficient cooking stoves in Rwanda. In 2022, 2,004 t CO₂-eq for 2021 were offset in equal parts by the rehabilitation of well systems in Eritrea and by generating electricity from poultry litter waste in India.

FROM CLIMATE RESEARCH

Natural carbon dioxide reduction can be implemented more quickly and is less risky than high-tech approaches

Scientists from the Helmholtz Climate Initiative, with the participation of UFZ researchers, have investigated the potential of various processes for capturing carbon dioxide (CO₂) from the air. This form of capture from the air is necessary in order to achieve the Paris climate targets. Thirteen options were identified that could be implemented in Germany. Both natural options, such as the reforestation of forests and the weathering of rocks, and high-tech methods such as bioenergy with CO₂ capture and storage (BECCS) or direct air capture of carbon (DACC) were investigated. Above all, natural carbon storage, such as the use of basalt as a natural carbon reservoir, has proven to be particularly promising. Artificial methods such as BECCS or DACC also have great potential, but require longer implementation times and involve risks such as the increased need for biomass transportation or the high energy requirements of DACC plants. The researchers emphasize that it is important to further develop and research various approaches so that CO₂ removal can be maximized. „The estimates for the necessary carbon dioxide removal in Germany range from 3 to 18 gigatons of CO₂ from today to the year 2100, depending on what we take as our historical responsibility, performance and contribution to global justice,“ explains UFZ scientist Dr. Malgorzata Borchers.

[See press release](#)



Photo: Ilham/Adobe.stock.com

FUTURE DEVELOPMENTS

We continue to pursue the principle of **avoidance before minimization of CO₂-eq emissions** on our way to achieving the ambitious goal of gross climate neutrality by 2040. The strategic embedding for this has already taken place and will be implemented in the coming years. We are aware that not all emissions can be reduced to zero by 2040. Instead, the goal is to reduce emissions as much as possible in all areas, particularly in the areas of energy, mobility and resources. In the area of energy in particular, there is an opportunity to reduce CO₂-eq emissions by means of energy-saving measures and the increased use of renewable energies. To this end, the measures of the Campus Masterplan 2020+ with a focus on Leipzig are to be successively implemented in Leipzig and similarly at the other locations as part of the planned climate protection strategy. Through the continuous further development of environmentally friendly mobility at the UFZ, we hope to further reduce our CO₂-eq emissions in this area too.

For 2023, we plan to record employee commuting emissions for the first time and identify further reduction measures through a mobility concept.

PLANNED MEASURES

- Achieve net climate neutrality retroactively from 2021 within the existing system and budget limits by 2023 (new deadline)
- Recording and balancing the CO₂-eq emissions of employees' commutes to work by 2023
- Gradual expansion of the greenhouse gas balance by 2030

3.2 ENERGY

OVERALL ENVIRONMENTAL OBJECTIVE: Energy efficiency and use of renewable energies

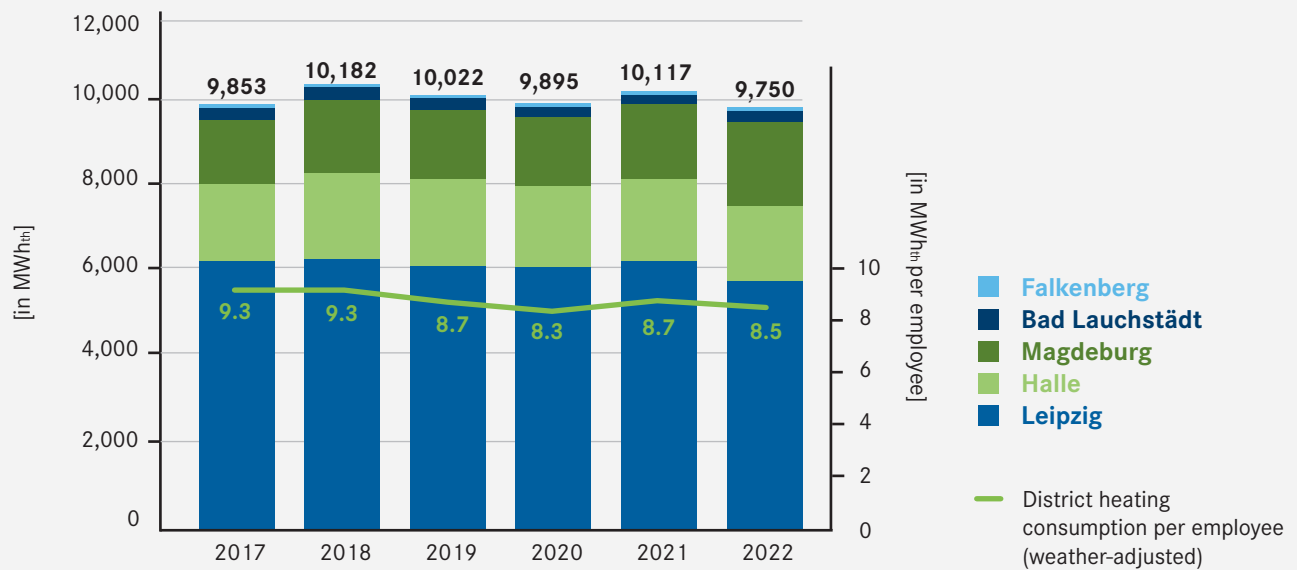
Energy is required for the research work and supporting administrative tasks of UFZ employees, as well as for the infrastructure in and with which they work. The UFZ implements measures to minimize energy consumption in everyday work and research. This helps to reduce the negative impact on the global climate caused by energy consumption and the emissions associated with it. At the same time, renewable energies are used and the in-house production of renewable forms of energy is further expanded.

DEVELOPMENT SINCE 2020

In 2022, the UFZ's weather-adjusted heat consumption fell by 3.6 percent compared to the previous year (or by 1.5 percent compared to 2020) and amounted to 9,750 MWh in 2022. This is the lowest weather-adjusted heat consumption since 2016. Without weather adjustment, heat consumption amounted to 8,368 MWh, which is also the lowest figure since 2016. Heat consumption per capita also fell by 2.3 % (or increased by 3.3 % compared to 2020), while the number of employees also fell. At the largest location, Leipzig, weather-adjusted heat consumption fell by 4.5 % compared to the previous year (or by 2.3 % compared to 2020), in Halle by 7.6 % compared to the previous year (or 6.1 % compared to 2020) and in Magdeburg consumption increased by 12.2 % compared to the previous year (or 22.0 % compared to 2020). In Bad Lauchstädt, consumption also

increased by 20.5 % (or 6.4 % compared to 2020) and in Falkenberg by 2.5 % (or a reduction of 11.7 % compared to 2020). The increase in Magdeburg is due to a technical defect in a heat recovery system. In Bad Lauchstädt, the increase is due to research work involving root washing with warm water. The savings in weather-adjusted heat consumption were achieved despite the heat energy required for the new research building in Leipzig. In 2021, 165.4 MWh and in 2022 already 321.8 MWh of weather-adjusted heat energy were required for the new research building (see diagram on page 18).

The **savings in heat consumption** in the year 2022 could be achieved thanks to the willingness of employees to get cooperate. In view of the drastic increase in energy costs in 2022 and the apprehended energy shortage, the UFZ had to intervene strongly in personal heating behavior. Since October 2022, the **ambient temperature in**

Heat consumption of the UFZ sites, weather-adjusted [in MWh_{th}]

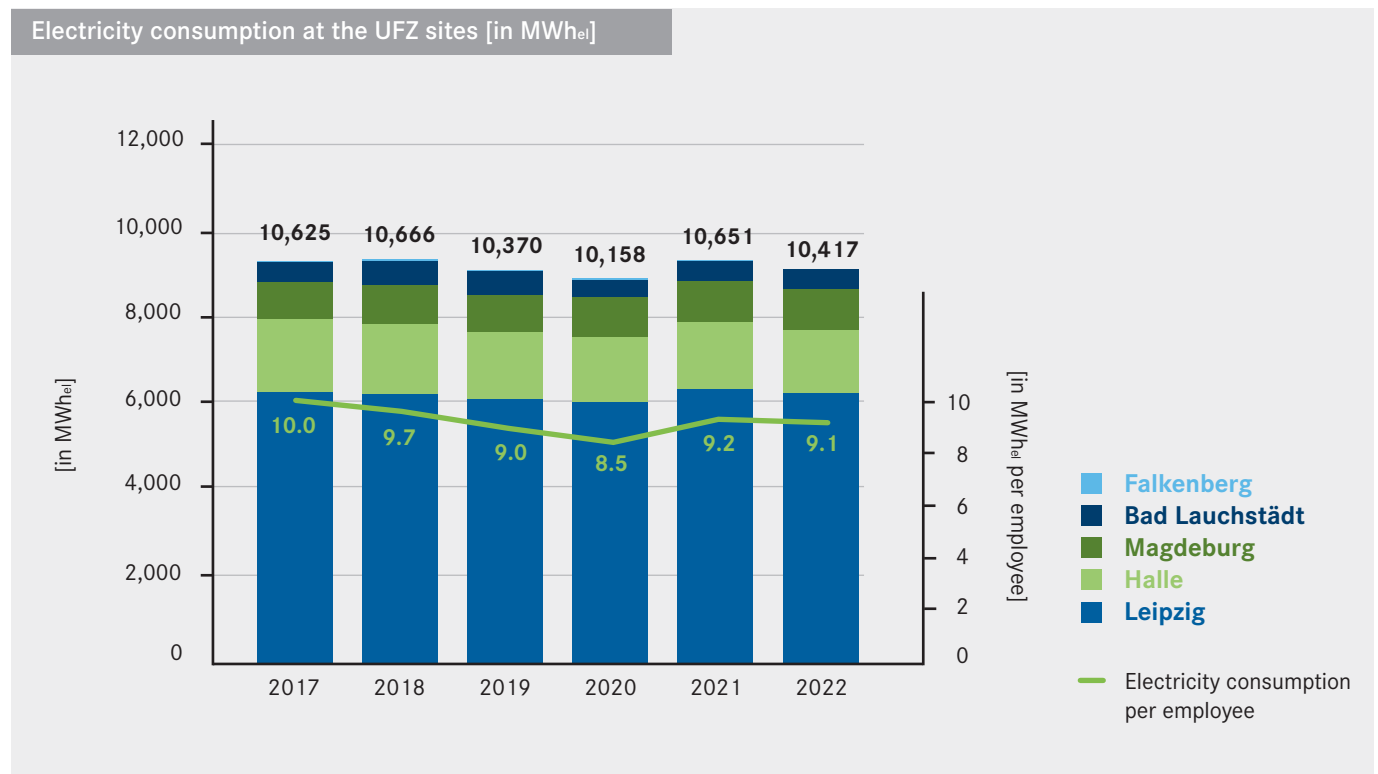
the office and laboratory buildings had been reduced to 19 °C. The heating systems in the corridors were even switched off completely. As the measures were only taken in October, the savings are expected to be reflected more clearly in the environmental figures for 2023. In addition, a **buffer tank** was removed from the central water treatment system at the Leipzig site and the **hot water boilers in the sanitary facilities** were taken out of operation at all locations where possible. These dismantling measures alone saved 12.4 MWh and 23 MWh in 2022. The extent to which the measures can be continued will be examined for 2023. In 2020, the building 1.0 building at the Leipzig site was also equipped with an **intelligent individual room control system** En:Key. In addition to presence detection, the system learns the presence behavior of the users and creates an individual heating profile. However, the predicted savings of 15 percent in test operation have not yet been achieved. This is due to the reduced and irregular attendance of employees since the corona pandemic and the increase in mobile working.

In 2022, the UFZ's **total electricity consumption** fell by 2.2 percent compared to the previous year to 10,418 MWh_{el}. Total electricity consumption rose by 2.6 percent compared to 2020. Per capita consumption fell by 0.8 percent compared to the previous year and increased by 7.5 percent compared to 2020. The indi-

vidual locations have shown large fluctuations over the last three years. Electricity consumption in Leipzig fell by 1.6 percent compared to the previous year (or increased by 3.3 percent compared to 2020), in Halle consumption fell by 5.0 percent (or by 1.9 percent compared to 2020), in Magdeburg consumption increased slightly by 0.7 percent (or by 1.2 percent compared to 2020), consumption at the Bad Lauchstädt site fell by 3.2 percent compared to the previous year (or increased by 14.8 percent compared to 2020) and consumption in Falkenberg also fell - by 52.7 percent compared to the previous year (or 45.3 percent compared to 2020).

The **changes in electricity consumption** are caused by many factors. In addition to the changing workload of employees at the site and electricity-intensive research activities, electricity consumption is also influenced by climate change. In order to maintain quality standards in the laboratories, more and more laboratories have to be cooled, especially in summer, which has an impact on electricity consumption.

Overall, the coronavirus pandemic has shown that electricity consumption is less dependent on employee capacity utilization than expected, but is determined by the basic load of the buildings. It should also be noted that although necessary measures such as digitalization lead to resource savings in other areas, they also increase



electricity consumption. The energy requirements of modeling and research data management are also constantly increasing. Furthermore, additional electricity is required for the new research building in Leipzig, which at 248.0 MWh accounted for 2.4 percent of total demand in 2022. By purchasing environmentally friendly green electricity (see section 3.1) and the planned expansion of photovoltaic systems, useful measures are being taken to reduce the negative environmental impact despite the almost constant overall electricity consumption.

The reduction in electricity consumption has been achieved through various **measures to save energy and improve energy efficiency**. Particular attention has been paid to the use of more energy-efficient technology. In the last three years, the following devices have been replaced with more efficient ones: At the Leipzig site, a **cooling unit** in building 6.0 was replaced in 2020. In 2021, one climate chamber each in Leipzig and Bad Lauchstädt was replaced with a new and more efficient model. Furthermore, two refrigeration systems in Magdeburg were replaced in 2022. A **plant growth chamber** in Halle was also retrofitted in 2022, saving 20.75 MWh per year. In addition to research-specific infrastructure, there is still great potential for traditional energy savings at the UFZ. Over the last three years, **the successive conver-**

sion to LED lighting has saved a total of 20.3 MWh of electricity per year in Leipzig, 33.4 MWh in Magdeburg and 76.3 MWh in Halle.

In addition, **motion detectors** were successively installed in the stairwells so that the lights are only switched on when employees are present. The **advertising** at the UFZ have also been unlit since October 2022. However, it is still unclear whether this measure will be continued. Progress has also been made in the area of digital research data and computer-aided analysis as a strategic core competence of the UFZ with regard to energy efficiency: To reduce the electricity required for cooling, the **ambient temperature of the data center** was increased to 28°C in 2021. This corresponds to a saving in cooling capacity of around 18-24 percent. The piloting of low-energy ARM (Advanced RISC Machines) technologies in the data center has been postponed until January 2023 due to supply bottlenecks. While the replacement of freezers and refrigerators was subsidized by the EMAS budget until 2020, the costs for this energy-saving measure have been covered by the organizational units themselves since 2021.

To identify further potential savings, additional measures were implemented in 2022. Initial preparations were

made to optimize the building management system by integrating it into a **CAFM-System**^[2]. Object-oriented energy monitoring was continued under the supervision of the University of Aachen: Data collection has been running since September 2021, with an initial evaluation planned for September 2023. Various options and also unconventional ideas were discussed as part of the energy crisis at the end of 2022. To this end, representatives from several departments met and discussed various short and medium-term energy-saving measures in a **steering committee**. A list of proposals was submitted to the executive management in December 2022. A carport with a **PV system and integrated e-charging** station was also planned for 2022. Due to legal obstacles and better economic efficiency, the electric charging station for cars and the PV systems are to be installed separately. Implementation has been delayed until 2023.

The UFZ has been generating **renewable energy** for its own use since 2003. In 2022, 23.5 MWh of electricity was generated in Leipzig by photovoltaic systems and 3.8 MWh of heat by means of thermal solar modules. In total, 27.3 MWh of renewable energy was produced by the UFZ, which represents 0.26 percent of total energy consumption. In-house production of renewable energy increased by 20.9 percent compared to the previous year (or decreased by 4.5 percent compared to 2020). The fluctuations in renewable energy in the last three years are due to the inconsistent duration and intensity of sunshine. The **planned expansion of the PV systems** on the new research building 7.3 with an expected yield of 50 MWh has been delayed until 2023 due to supply bottlenecks. The expansion of the PV systems on buildings 19.6 and 19.7 in Leipzig, at the Magdeburg site and in Bad Lauchstädt, with an expected total yield of 435 MWh, is proceeding according to plan. These planned expansions will increase the share of renewable energy by a factor of more than 15.

To enable the use of renewable energy even outside the sites, a solar cube was developed as part of the Sus-

tainability Challenge at the UFZ (see section 3.6). This prototype is intended to offer the possibility of charging mobile measuring stations via photovoltaics. The **solar cube** is to be completed by 2023.

FUTURE DEVELOPMENTS

In the future, the focus in the energy sector will continue to be on **improving energy efficiency**, as there is great potential for reducing energy consumption, particularly with regard to the building structure. The linchpin for optimization is a good data basis. It has shown that there is room for improvement here. For this reason, a metering and energy management concept for identifying, monitoring and reducing electricity, heat and other consumption will be developed by 2025. In addition, the extent to which **district heating can be used** at the Leipzig site will be examined. This conversion could save up to 40 percent of CO_{2-eq} emissions for heat at the site. However, it is not up to the UFZ to decide, but is the responsibility of third parties, over which the UFZ has only limited influence. A technical review will be carried out by the 2nd quarter of 2023. On the one hand, the impact of reducing the flow temperature on room temperatures will be examined, as lower flow temperatures require larger heating surfaces to achieve the same effects. On the other hand, a lower return temperature (preferably below 55°C) is to be achieved, which is necessary for an economically viable connection to the district heating network. To increase energy efficiency, a complete conversion to LED lighting in Leipzig, Magdeburg and Halle is also planned. Another important step is the expansion of renewable energy at the sites. A PV system is currently being installed on the new research building in Leipzig, which is expected to generate 50 MWh. With the provision of special funding from the BMBF, further PV systems with a total area of around 1,000 m² and a forecast electricity generation of 435 MWh are to be installed. These are to be set up in Leipzig, Magdeburg and Bad Lauchstädt.

[2] CAFM stands for Computer-Aided Facility Management and refers to the support of facility management through the use of special software solutions.

PLANNED MEASURES

- Raising the temperature of refrigerators for sample storage from -80 to -75 and -70 degrees to save energy at the Magdeburg site by the second quarter of 2023
- Reduction of the flow temperature in the local heating network to test a district heating connection at the Leipzig site by the 3rd quarter 2023
- Piloting of ARM architectures in the data center for energy optimization (until 2023 - new deadline)
- Construction of photovoltaic systems on buildings 19.6 and 19.7 at the Leipzig site, the Magdeburg site and the plant building at the Bad Lauchstädt site with an expected total yield of 435 MWh_{el} p.a. by 2023
- Construction of photovoltaic systems on the roof surfaces and facades of building 7.3 which is currently under construction at the Leipzig site with an estimated total yield of 50 MWh_{el} p.a. by 2023
- Development of a “solar cube” as a prototype for, among other things, the use of mobile measuring stations up to 2023
- Examination of measures to dismantle the central water treatment plant to save energy at the Leipzig site by 2024
- Replacement of a heat recovery system with increased energy efficiency at the Magdeburg site by the 2nd quarter 2024
- Complete conversion to LED lighting at the Leipzig, Halle and Magdeburg sites by 2025
- Optimization of the building management system through integration into a CAFM system up to 2025
- Creation of a metering and energy management concept for monitoring and saving heat and electrical energy and other consumption by 2025
- Object-oriented energy monitoring for the use of machine evaluation algorithms and augmented building and district operation: analysis and optimization of the interaction between the building management system and the individual trades through the development of algorithms with the support of the University of Aachen to 2026

Geothermal energy indispensable for an energy transition in heating

In a joint study, experts from the Helmholtz Association and the Fraunhofer-Gesellschaft show that geothermal energy is indispensable for a German energy transition in heating. The heating sector accounts for 56 percent of the national energy demand. Only 15 percent of heat is renewable. The German government's goal is for half of the heat generated by local authorities to come from climate-neutral sources by 2030. The researchers have developed a roadmap on how this goal can be achieved. It turns out that deep geothermal energy can play an important role in achieving this goal. The focus of the investigation is on hydrothermal reservoirs, i.e. thermal water-bearing rocks at depths of between 400 and 5,000 meters. Geothermal water can be extracted at temperatures between 15 and 180 °C from such deep wells. The advantage of deep geothermal energy is that it supplies energy continuously and independently of weather conditions or the time of day, with low land consumption. The researchers show that deep geothermal energy alone can cover more than a quarter of Germany's heating requirements. In order to exploit this potential, they recommend five points for action: 1) Clear development goals, 2) Risk compensation for companies and municipalities, 3) Investments in key technologies, 4) Training and further education of specialists and 5) Dialogue with citizens.

[See strategy paper](#)

3.3 MOBILITY

OVERALL ENVIRONMENTAL OBJECTIVE: Efficient and environmentally friendly operational mobility

One of the UFZ's goals is to promote efficient and environmentally friendly mobility for employees. This applies to both business trips and commuting. For the UFZ as an international research center, mobility - which also includes air travel - is indispensable for research and the dissemination of research results in the future. The aim is to weigh up the negative environmental impact of mobility against the positive indirect effects of research activities.

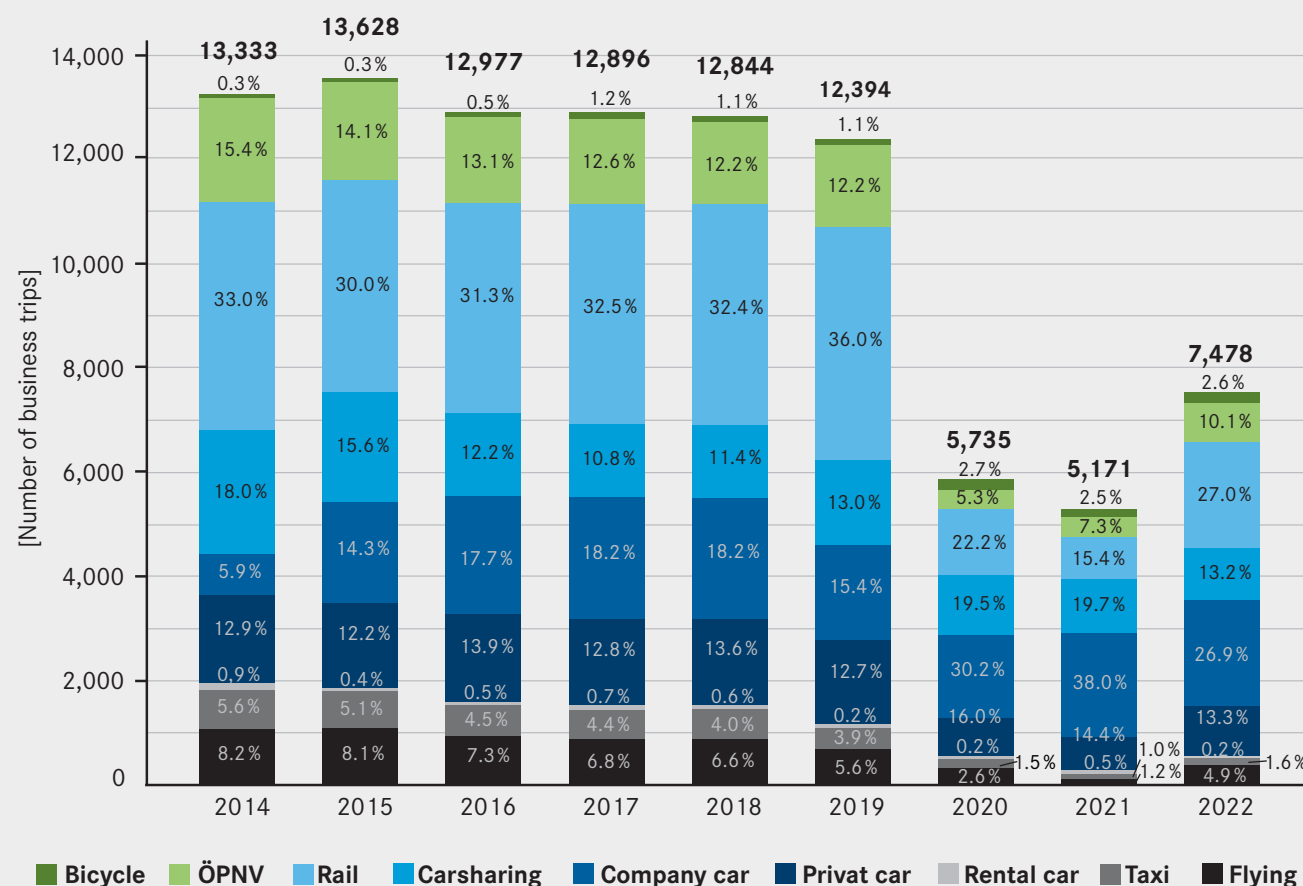
DEVELOPMENT SINCE 2020

Due to the pandemic and the associated travel restrictions, the number and distribution of **business trips** for 2020 and 2021 is hardly conclusive. Due to the coronavirus pandemic and the necessary contact reductions and legal travel restrictions, very few business trips were made in 2020 and 2021. Within the remaining mobility, more use was made of private transport in order to further reduce contacts. For 2022, the number of business trips was significantly lower than in previous years, even after the end of pandemic-related restrictions, but

there was still an increase compared to 2020 and 2021. For 2022, it is unclear whether this is also a temporary reduction compared to the long-term trend or whether travel activity will remain low in the long term after the pandemic.

The **number of business trips** increased by 38.5 percent in 2022 compared to the previous year (or by 27.9 percent compared to 2020). Per capita business trips increased from 4.8 in 2020 to 6.5 in 2022 (or decreased to 4.5 in 2021). Compared to 2019 (before the coronavirus pandemic), business trips fell by 31.6% last year. The de-

Development of the number of business trips and the share of use at the UFZ



cline in climate-damaging air travel should be highlighted as a positive aspect, especially in comparison to the long-term trend. While UFZ employees took an average of 805 flights between 2017 and 2019, this figure fell to just 370 in 2022.

This is also reflected in the **modal split**, i.e. the shares of the various forms of mobility. While air travel still accounted for 5.6 percent of business trips in 2019, it was only 4.9 percent in 2020. Another positive development can be seen in the increased number of business trips made by bicycle. In 2020, 155 business trips by bicycle were recorded; in 2022, the figure was 194, the highest ever recorded. The use of motor vehicles, i.e. company cars, private cars, rental cars and car sharing, has remained relatively constant over time, with a lower absolute number of business trips. While 3,775 business trips were made by car in 2020, there were a total of 4,013 in 2022, which corresponds to a relative increase of 6.3 percent. The modal split shows that since the beginning of the coronavirus pandemic, but also in 2022, these have accounted for a significantly larger share than before the pandemic. On average for the years 2017 to 2019, the proportion of business trips by car was 42.2%, while it rose to 65.8% and 72.6% in 2020 and 2021 respectively due to the coronavirus pandemic. With a share of 53.7%, the usage rate in 2022 is therefore slightly higher than the average from 2017 to 2019. This shift in usage rates is mainly at the expense of the use of public transport and rail. To what extent this trend will continue remains to be seen in the coming years.

Further measures have been implemented since 2020 to reduce the environmental impact of business trips. To raise employee awareness, all organizational units have been provided with information on their respective **CO₂-eq footprints** from their business trips every year since 2021. In addition to the amount and proportion of emissions from air, rail and car travel, the departments, divisions and staff units also receive data for comparison with other organizational units of the UFZ. Since December 2021, a **voluntary commitment to avoid short-haul flights** has been available on the intranet, which can be signed by all employees – by the end of 2022, 97 UFZ employees, including executive management and some sen-

ior managers, had signed this commitment (see section 3.6). In addition, since August 2021, reference has been made to the **principles of environmental protection** in the service regulations for the use of company cars. Employees are encouraged to reduce the use of motor vehicles to a minimum and to choose more environmentally friendly alternatives. If this is not possible, employees are encouraged to use environmentally friendly driving methods in order to minimize fuel consumption and tire wear and thus achieve the lowest possible environmental impact through vehicle operation. These awareness-raising measures are intended to initiate a process of reflection among employees in order to ultimately reduce the environmental impact of business travel. Starting with the coronavirus pandemic, a **concept for virtual and hybrid events** was developed. UFZ employees are thus supported in shifting face-to-face events to the digital world and thus also contributing to the reduction of business trips. However, it remains to be seen whether the various measures to raise awareness will actually contribute to a sustainable reduction in business trips or whether it is currently only a short-term reduction.

In addition to business trips, **commuting by employees** to the UFZ sites also causes CO₂-eq emissions as well as particulate matter and nitrogen oxides.^[3] As part of the necessary contact reductions at the sites, a **company agreement on mobile working** at the UFZ was adopted in August 2020. This enables more flexible working and a better work-life balance, while at the same time reducing employees' commuting emissions by reducing their presence at the site. During the pandemic, contacts had to be almost completely restricted at times. Even after the restrictions were lifted, it has become clear that many employees continue to enjoy the option of mobile working. In principle, it is possible to work remotely two days a week, provided this is compatible with the working environment. In theory, this can save up to 40 percent of commuting emissions for full-time employees. An evaluation and possible extension of the company agreement are planned for 2023. To promote environmentally friendly travel, a **job ticket** is also offered to employees and subsidized with 20 euros per month. As part of the 9-euro ticket, UFZ employees were able to use public transport free of charge.

[3] The environmental impact of employees' commutes has not yet been recorded in the UFZ's system of key figures.

*Manuel Rist demonstrates the new UFZ cargo bike.
Photo: UFZ*

The 'Deutschlandticket' is to be subsidized to the same extent in order to offer employees an attractive, cost-effective and environmentally friendly alternative to the car.

Bicycle mobility has also been further expanded since 2020. The long-standing commitment of the staff and in particular the bicycle coordinators at the UFZ was recognized in June 2022 by the *ADFC* with the silver level certificate of a **bicycle-friendly employer**. In 2019, the UFZ was the first major company in Saxony and Saxony-Anhalt to receive the bronze-level certificate. The level upgrade was achieved through long-term measures such as partially roofed bicycle parking spaces, lockable bicycle parking spaces at the Halle and Magdeburg sites, company bicycles, but also through smaller measures such as bicycle repair kits at all sites and a flat-rate allowance for business trips by private bicycle. Over the past three years, various measures have been implemented to further promote bicycle mobility: An additional **lockable bicycle parking space** with 24 new bicycle racks was built for employees in Magdeburg in October 2020. This means that more than half of the employees can store their bikes safely. To promote e-mobility for bicycles, an **e-charging box for bicycles** was set up at the Leipzig site in November 2020. Here, 12 employees can charge their batteries at the same time free of charge. **Bike Service Days** were held at the larger Leipzig, Halle and Magdeburg locations for the first time in August 2020 and again in September 2022 due to the coronavirus pandemic. While a mobile bike workshop was set up at the sites in Halle and Leipzig, employees in Magdeburg had the opportunity to hand in their bikes to a local workshop for people with disabilities. As part of the UFZ-funded campaign, employees can have their private bicycles serviced and registered free of charge. The UFZ also has various service and cargo bikes. Due to the high demand, another **e-cargo bike with a higher capacity** was purchased in 2021, which will also enable larger transports. A total of six cargo bikes are available at the UFZ. The cycling culture is also evident among employees in their private lives. As in previous years, many UFZ employees took part in **City Cycling**, a Germany-wide campaign by the Climate Alliance network to promote cycling, climate protection and quality of life. On average, over 70 employees have taken part in the campaigns in each of the last three years. Between 2020 and 2022, the UFZ



"Cycling for the environment" team covered 64,574 km during the campaign period. If this distance had been traveled by car, it would have caused 9.5 t CO₂-eq.

Guests of the UFZ are also given the opportunity to travel in an environmentally friendly way. Since July 2019, the UFZ has been funding a **bike rental station** from the provider Nextbike for visitors to the Leipzig site as well as for private and business use. Between 2020 and 2022, 8,026 bikes were rented and returned to the station. In 2022 alone, there were 2,999 bike movements. Despite the corona pandemic and the reduced presence of employees, the response was positive. An extension of this measure until mid-2026 is therefore being planned.

Further supportive measures in the area of operational mobility were implemented in 2021 with the purchase of an **e-caddy for environmentally friendly delivery** in purchasing, especially within and between locations, and the procurement of a **hydrogen-powered fuel cell vehicle** to replace a hybrid vehicle. Further vehicles in the fleet are to be successively replaced by environmentally friendly alternatives in accordance with the fleet concept.

FUTURE DEVELOPMENTS

Many measures have already been implemented in recent years, which are to be continued and expanded in the future. To promote cycling mobility, Bike Service Days are also to be held in the coming years and an extension of the *Nextbike* station at the Leipzig site is currently being planned. To further highlight the attractiveness of cycling, the Bicycle-Friendly Employer certificate is to be continued until 2025. The gradual replacement of vehicles with high NO_x/CO_{2-eq} emissions with environmentally friendly alternatives is still being planned where possible. In addition, to further promote e-mobility, an e-charging station for motor vehicles is to be built at the Leipzig site by 2023 so that both e-bikes and e-cars can be charged at the site. In order to encourage employees who cannot or do not want to commute to the UFZ by bike to use environmentally friendly mobility, the Deutschland-Job-Ticket is also to be subsidized. In addition, a mobility concept is to be drawn up in cooperation with other research centers at the Leipzig site by the end of 2023, taking into account the vehicle fleet concept. The additional employee mobility survey required here (see section 3.1) to analyze commuting routes will be incorporated into the concept.

PLANNED MEASURES

- Subsidizing the Germany Job Ticket for UFZ employees until the 2nd quarter of 2023
- Installation of e-charging stations for cars as an incentive for e-mobility by 2023
- Development of a mobility concept with specific measures to improve efficiency and minimize CO_{2-eq} by 2023
- Continuation of the “Bicycle-friendly employer” certificate at silver level to support environmentally friendly mobility for employees until at least the second quarter of 2025
- Implementation of Bike Service Days (maintenance and bike registration) until 2025
- Continuation of the bike rental station at the Leipzig site until mid-2026
- Gradual replacement of high- NO_x/CO_{2-eq} emitting vehicles in the fleet with environmentally friendly alternatives in accordance with the fleet concept by 2040

Radio wave technology used for pothole repair

RWInnoTec, a company founded in 2021 by UFZ and HTWK Leipzig, uses radio waves to heat asphalt quickly and in an environmentally friendly way. This technology is used to repair potholes and was awarded the IQ Innovation Prize Leipzig in July 2022. The mobile plant can be used to heat prefabricated asphalt slabs to the desired processing temperature of around 160 degrees Celsius in just a few minutes without impairing the quality of the asphalt and without releasing solvents. Further applications for radio wave technology are planned for the future, such as the drying of damp masonry or the chemical-free control of wood pests. The new technology can therefore make an important contribution to the environmentally friendly renovation of roads and thus also contribute to environmentally friendly mobility, which would not be possible without roads.

[See press release](#)



Mobile radio wave unit. Photo: HTWK

3.4 RESOURCES

OVERALL ENVIRONMENTAL GOAL: Conservation of resources and circular economy

As an environmental research center, we strive to use our limited resources responsibly. Renewable resources and waste materials should be used efficiently, environmentally harmful raw materials avoided and closed material cycles established.

DEVELOPMENT SINCE 2020

The UFZ has been donating used IT hardware to the non-profit organization *AfB gGmbH* since 2012. By refurbishing old PCs, notebooks, flat screens, mobile devices, servers and printers, the **life of the used IT hardware is extended** and some of it can be reused. Since the start of the collaboration, a total of 6,337 IT and mobile devices have been returned to the material cycle. In the last three years, more than 54 percent of the devices have been reused after refurbishment, while the remainder has been used to recover raw materials through recycling. In 2022, the UFZ thus helped to finance a job for people with disabilities and saved 23.1 t CO_{2-eq.} greenhouse gas emissions, 239,346 t 1,4-DB_{eq.} water ecotoxicity^[4], 160,299 l water and 90.5 MWh_{el} primary energy input^[5] as well as 8.1 t Fe_{eq.} raw materials^[6] and reduced human toxicity^[7] by 118 t 1,4-DB_{eq.}^[7] by 118 t 1,4-DB_{eq.}.

The UFZ also offers its employees the opportunity to return private cell phones for environmentally friendly recycling so that valuable resources can be recovered from private cell phones and harmful substances can be disposed of properly. **Cell phone boxes** are set up at all locations for this purpose, which are also returned to *AfB gGmbH* and processed or recycled. The proceeds from the cell phone collection campaign are currently donated to NABU and the [Cell Phones for Bumblebees, Bees and Co.](#) campaign. Since 2011, over 800 private cell phones have been returned to the raw material cycle through this offer. As a further initiative to conserve resources, the UFZ has been using **climate-neutral toner** in its multifunctional devices since 2013. The emissions from the entire life cycle are compensated by the manufacturer via Gold Standard certified climate protection projects. For the years 2019 to 2021, 143.82 t CO_{2-eq}

were offset in this way. Again since 2013, with the exception of 2021, dedicated employees have been collecting **pens and highlighters** and returning them to the raw material cycle. Styrofoam **filling material**, which is used for the delivery of consumables for the laboratories, has been reused since 2021. This process has also been extended to **shipping boxes** and **insulation material** since 2022, either by taking it back or recycling it. Smaller changes can also help to increase eco-sustainability. For example, the **standard search engine** for new devices has been replaced by *Ecosia* since 2020. Revenue generated by *Ecosia* is used to plant trees in regions particularly affected by climate change.

As a pilot project, the **Plastic Reduction Working Group** of the Environmental Committee launched a **collection campaign for gloves** from the KimTech company in 2021. **Cell culture bottles** can also be returned to the raw material cycle. In the first year, a large bag of cell culture bottles was reintroduced into the raw material cycle in this way. The working group encourages a more critical approach to plastic products and the use of plastic-free alternatives, especially in the laboratories, and raises awareness of the issue. In addition, the working group also advocates resource-saving plastic use beyond the UFZ. As part of the Sustainability Action Week at the *Fraunhofer Institute for Cell Therapy and Immunology (IZI)*, the working group shared its experiences in 2020. Since then, there has been a close exchange with other players thanks to the working group.

In order to evaluate the use of plastic in the laboratories, a **survey on plastic reduction in the laboratories** was conducted by the WG in 2022. Participants have the opportunity to receive plastic-free starter kits for the laboratories. The evaluation of the survey and distribution of

[4] The ecotoxicity of water refers to the effects on freshwater and seawater ecosystems, e.g. through heavy metals. It is expressed in 1,4-dichlorobenzene equivalents.

[5] Primary energy consumption reflects the demand for primary energy resources such as crude oil, hard coal, hydropower, etc. of a product over its entire life cycle from production to disposal. Primary energy is required for the provision of final energy such as electricity.

[6] By reusing used IT, fewer raw materials are mined for the production of new devices. As the globally available metal and mineral reserves such as palladium and iron vary greatly, the consumption of a metal is set in relation to its availability. This is shown in iron equivalents.

[7] Human toxicity measures the effects or damage to human health caused by environmental pollutants such as nitrogen oxides that are released into the air, soil and water. It is expressed in 1,4-dichlorobenzene equivalents.

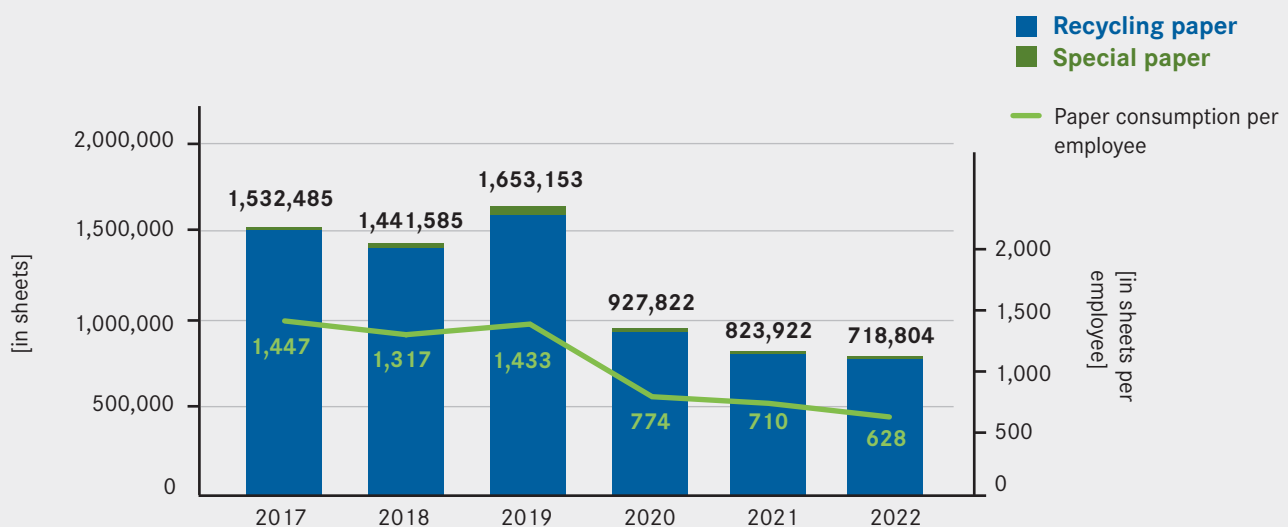
the kits is planned for 2023. In everyday laboratory work, however, plastic products often cannot be replaced due to a lack of alternatives. The Plastic Reduction Working Group is therefore also committed to a low-plastic UFZ outside of laboratories. At the suggestion of the working group, for example, a **returnable system** certified with the Blue Angel was introduced in the canteen at the Leipzig site in 2021. This can save on disposable products, as just one returnable cup can replace up to 1,000 disposable cups. The special feature of the chosen system is that the cups and bowls can be returned not only to the canteen in Leipzig, but also to all catering establishments that participate in the deposit system. This actively contributes to waste avoidance, even outside the company. A further improvement was achieved through the tender for the canteen operator in Leipzig. Among other things, an increased proportion of regional organic food of 20 percent has been offered since 2021. The **organic-food certification** of the canteen in Leipzig was initially planned for 2022, but has now been delayed until mid-2023.

In addition to awareness-raising measures and direct measures, two concepts were developed and implemented in 2021 that contribute to the sustainable use of resources. For large-scale research equipment, a concept for the **life-cycle management of large-scale scientific equipment and large-scale investments** was developed in cooperation with the research unit leaders back in October 2020. Implementing the concept ensures that environmental aspects are taken into account over the entire life cycle and that potential environmental impacts are identified and avoided or minimized as far as possible

at the planning stage. Sustainability has also been further promoted in procurement and purchasing over the past three years. In July 2021, the **sustainable procurement concept** was adopted at the UFZ. The aim of the concept is to establish a procurement system that offers the best possible environmental, social and economic characteristics throughout the entire supply chain. Purchasing advises the requisitioners on which sustainable criteria can be used and queried in procurement and also provides support with possible trade-offs and conflicting objectives between the three dimensions of sustainability. To inform and raise awareness among employees, a specific **intranet page on sustainable procurement** was set up in 2022. It provides clear information on sustainability certification marks and quality labels as well as best practice examples from the UFZ. Where possible, procurement is based on ecological and social criteria. This is to be continued in the future.

Paper consumption continued to decline in 2022. It fell by 12.8 percent compared to the previous year (or 22.5 percent compared to 2020). The UFZ consumed an average of 628 sheets per capita. This corresponds to a reduction of 11.5 percent compared to the previous year (or 18.8 percent less than in 2020). This is the lowest paper consumption, both in absolute terms and per capita, since monitoring began. This drastic reduction and the continuing trend is partly due to the low attendance due to the corona pandemic, but also in particular to the **constant digitalization** at the UFZ. The **digital personnel file**, which was originally planned for 2025, was already implemented in 2022. All active personnel files were scanned for this purpose and are now available in

Paper consumption [in sheets] at



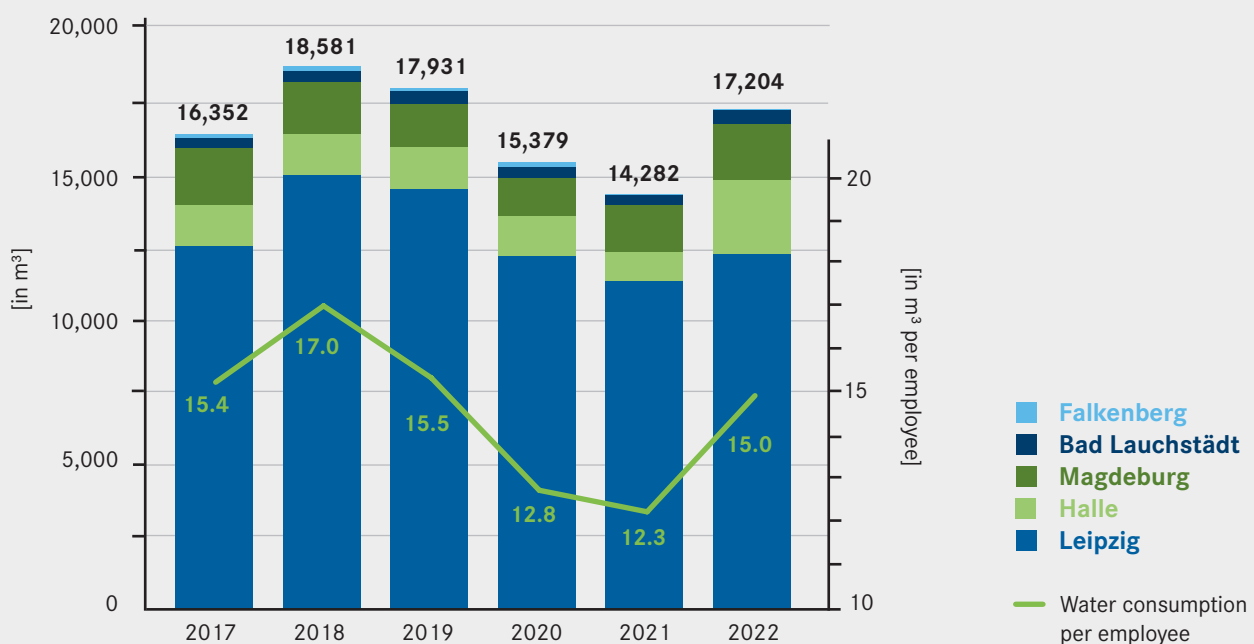
digital form. Smaller processes and workflows in the internal process are also being successively converted so that all forms, applications and recruitment documents can be processed digitally in future. Printing has already been reduced to a minimum. However, there are still processes that require printouts, such as employment contracts. In Purchasing, all **purchasing processes and documents were already digitized** in 2021, meaning that all procurement procedures have only been conducted digitally since then. All delivery bills are also to be used in digital form by 2025. This conversion has been delayed due to a software change in the purchasing system. However, analog delivery bills have been scanned since February 2021. **Digital elections** - where feasible - have also been held since 2021, such as the election of employee representatives. However, the legal boundaries here are often narrowly defined.

Even without the introduction of digital workflows, paper could also be saved thanks to the **digital signature** in 2021 and a legally compliant extension of the digital signature for external processes at the start of 2022. All employees can sign internal documents using a PDF certificate and do not have to print them out and sign them by hand. As part of this process, it became apparent that this type of signature was sometimes not sufficient for external processes. A second extended digital signature was therefore introduced, which is only required by the management and a few other executives for external pro-

cesses with high security standards. Thanks to the digitalization of processes, paperless working at the UFZ is now largely possible. To further reduce paper consumption, increased transparency in the form of a **printing statistic** published at the Center has been encouraged for reflection since 2021 (section 3.6).

Water consumption increased by 20.5 percent in 2022 compared to the previous year (or by 11.9 percent compared to 2020). Per capita water consumption has also increased with the number of employees falling slightly. Compared to the previous year by 22.1 percent, compared to 2020 by 17.3 percent. Contrary to the downward trend of previous years, 2022 therefore represents a reverse trend. Compared to 2019, however, there is still a reduction of 4.1 percent or 3.2 percent per capita. The largest increase in water consumption was recorded in Halle. At 1,563 cubic meters and an increase of 159.2 percent compared to the previous year, water consumption in Halle has risen to its highest level since 2014. This increase is due to the need to flush the drainage system for renovation purposes. The increases at the Bad Lauchstädt (+33.5 percent on the previous year or 12.2 percent on 2020), Magdeburg (+19.4 percent on the previous year or 48.7 percent on 2020) and Leipzig (+8.2 percent on the previous year or 11.9 percent on 2020) sites are due to necessary hygiene flushing to protect drinking water during the coronavirus pandemic, in-

Water consumption at the UFZ sites [in m³]



creased employee attendance and water-intensive research projects. Hygiene flushing will be reduced from April 2023, so that a future reduction in consumption is expected. There was also a significant leak in Leipzig, which contributed to the increase.

The core business of the UFZ - the research process - inevitably leads to the generation of (hazardous) waste.

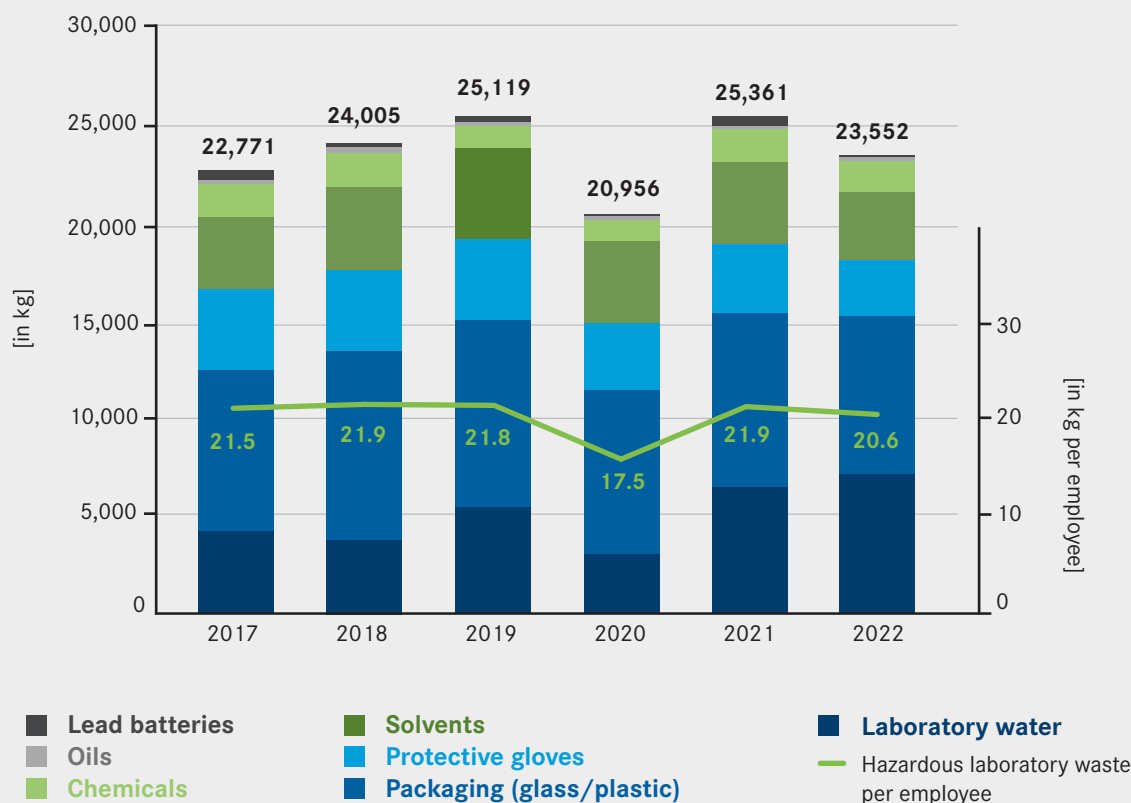
Hazardous laboratory waste at the UFZ consists of laboratory waste water, protective gloves, packaging, solvents, chemicals, oils and batteries. It should be noted that the generation of laboratory waste is heavily dependent on the research processes. The total volume of laboratory waste decreased by 7.1 percent compared to the previous year (or increased by 12.4 percent compared to 2020). Per capita, the volume decreased by 5.8 percent compared to the previous year (or increased by 17.8 percent compared to 2020). The largest increase (9.8 percent compared to the previous year and 151.3 percent compared to 2020) was in the amount of wastewater generated. This is due to research activities. The largest percentage reduction in laboratory waste compared to the previous year can be seen at the Halle site (57 percent). At the Magdeburg (-2 percent) and Leipzig (-4.6 percent) sites, this is significantly lower. The fluctuations at the

respective locations are mainly due to different disposal intervals. In addition, annual audits are carried out by the Occupational Safety and Environmental Protection staff unit to check whether the contracted waste management companies hold the appropriate professional licenses.

FUTURE DEVELOPMENTS

The established measures to conserve resources will be continued in the future. Where possible, the UFZ will continue to take eco-social criteria and labels into account in its procurement. This will be done both by advising and informing the purchasing department and by raising employee awareness. Furthermore, a market analysis is planned to examine a switch to green office supplies. Among other things, advertising materials will be further reduced from 2023 and only advertising materials from sustainable production will be procured. The Plastic Reduction Working Group will also continue to encourage a critical approach to plastic products in the laboratory and beyond. The recycling options at the UFZ will be maintained and, if possible, expanded in the future. To improve the reusability of raw materials, a separate organic waste collection system will be successively introduced at all sites from 2023.

Development and composition of hazardous laboratory waste at the UFZ [in kg]



The use of digital applications and solutions, which has also been driven forward by the corona pandemic in the last three years, is intended to further reduce the environmental impact in the coming years, enabling almost paperless work in the future, particularly in administration. A digital certificate manager and paperless applications for appointments, for example, are expected to save even more paper by 2023. The integration of digital delivery bills by 2025 is another small component that minimizes additional resources. However, it will still take some time to fully digitalize all processes without switching the system.



*PAN-Biotech collection and retrieval campaign.
Photo: Stephan Schreiber/UFZ*

PLANNED MEASURES

- Distribution of environmentally friendly starter kits to reduce plastic in everyday laboratory work by 2023
- Carrying out a market analysis to examine a switch to green office supplies using the existing framework agreements by 2023
- Introduction of paperless applications for appointments via the e-recruitment system by 2023
- Introduction of separate organic waste collection and -disposal at the Leipzig site in the second quarter of 2023 (new deadline) and at the Magdeburg and Halle sites in 2024
- Reduction in paper consumption by switching to digital delivery bills by 2025
- Reduction of UFZ advertising materials while taking ecological and social criteria into account by 2025

FROM WATER RESEARCH

Reservoirs and dammed areas identified as sink for microplastics

The research team of the joint project MikroPlaTaS has investigated the occurrence and behavior of microplastics in three industrial water reservoirs in Saxony and three dammed river areas in North Rhine-Westphalia. The results show that these water systems serve as sinks for microplastics, as the particles combine with natural substances, sink to the bottom and are permanently bound in the sediments. It was found that the plastic particles found were mainly polyethylene and polypropylene, which is not surprising given the use of these substances for disposable and packaging materials.

However, the long-term effects of these plastic sinks on ecosystems are not yet known. The researchers are therefore discussing possible measures to limit the entry of microplastics into other bodies of water and ultimately into the sea. They want to develop recommendations for action and make them available to political decision-makers and other stakeholders. It is still unknown to what extent such effects of microplastics occur in nature, as the exact distribution of small microplastics and their combination with natural substances in ecosystems have not yet been sufficiently researched and the detection methods available are complex and costly.

[See press release](#)



Photo: UFZ

3.5 BIODIVERSITY

OVERALL ENVIRONMENTAL OBJECTIVE: Promoting biodiversity at the UFZ sites

While the demand for natural resources continues to grow, biodiversity is declining worldwide. The most important direct drivers of biodiversity loss include habitat alteration and destruction, climate change, invasive species, over-exploitation and pollution. Biodiversity loss leads to the destabilization of ecosystems and the reduction of nature's services for humans (ecosystem services). It increases the probability of ecological disasters and their direct and indirect consequences for humans, such as pandemics. The UFZ also aims to counteract these effects with measures to promote biodiversity at its sites.

DEVELOPMENT SINCE 2020

At all UFZ sites, some of the areas are designated as **ecological meadows**. This means that former lawns are mowed less frequently and can develop into natural meadows with a higher diversity of species and flowers in the long term. In addition, there are **insect nesting aids, bird nesting aids** and, in Leipzig and Magdeburg, **beehives** as well as a **meadow orchard with old fruit tree cultivars** at the Bad Lauchstädt site. In Magdeburg, four new fruit trees were planted in 2021 to compensate for necessary felling. The selected varieties are rare tree species from the Saxony-Anhalt region. Fruit trees were chosen at the request of the employees, as they can be used by the employees and also serve as a source of food for insects and birds. To prevent the valuable areas from being destroyed by mechanical leaf removal, leaf blowers have no longer been used at all locations since May 2021. Instead, environmentally friendly and biodiversity-protecting **manual methods are used to remove leaves**. In Leipzig, leaf removal is carried out by an inclusive company, so that socio-ecological requirements could also be implemented here.

In June 2020, the idea of introducing **wild and honey bees** to Magdeburg was realized with the aim of increasing pollination performance and, in particular, biodiversity at the site. This idea had its origins among employees at Magdeburg Day in the fall of 2018. For the implementation of the project, a bee working group was founded. Co-operating with the "[Leipzig summt und brummt](#)" school project, the honey yield, humidity and temperature in the beehive and outside the beehive are measured, as well as the rainfall, wind speed and direction. In this way, the project shows the pupils how environmental influences have an impact on the bees' performance. As

the presence of wild bees is more important for biodiversity than honey bees, two insect nesting aids were also set up in 2020. In 2021, another environmental education project was created, which focuses on the living tubes of a wild beehive in Magdeburg. However, due to the coronavirus pandemic, the additional environmental education project with removable living tubes had to be postponed and has been further delayed until 2023.

In 2020, the Works Council set up five **raised beds** for employees in Halle for urban gardening. Teams from the workforce can apply for raised bed sponsorships every year. In 2022, the measures were further supported by the EMAS budget by subsidizing the purchase of organic seeds of old cultivars and thus increasing the ecological quality of the raised beds. As the campaign was so well received by the employees, a similar concept is planned for Leipzig.

Equally in 2020, a distribution station was set up for the Leipzig-based **community-supported agriculture** [KoLa Leipzig](#). UFZ employees can pick up high-quality organic vegetables directly at their workplace and take them home without any further detours. Solidarity farming is a counter-model to conventional agriculture. The com-



Control of bee colonies at the UFZ. Photo: UFZ



*Research green roof at the Leipzig site.
Photo: André Künzelmann (UFZ)*

munity-run farm can supply up to 1,500 households in Leipzig with fresh, regional, organic and fairly produced vegetables. Priority is given to protecting soil and water bodies. Since September 2021, employees of the UFZ in Leipzig have also been able to purchase potatoes, onions and flour from regional, certified organic cultivation from a mobile supplier. The provider is the municipal company [Wassergut Canitz GmbH](#). A special feature of this company is that, among other things, species-rich groups of trees have been planted in the fields. These serve as breeding grounds and habitats for birds and predatory insects, which in turn provide pest control. In addition to increasing biodiversity, this can also reduce ground-water pollution. Both measures contribute indirectly to an increase in biodiversity through the employees' consumption.

The [research green roof](#) at the Leipzig site shows how increasing the biodiversity of the site can be combined with research work. The first **research green roof** was erected on Building 7.1 in 2019 and another one was installed on a carport next to Building 7.1 in June 2020. This is a standard carport with hydrogeological sensors and a lysimeter. The aim is to record the water balance of a carport in order to calibrate software models and optimize decentralized rainwater management. In addition, a **surface water-free campus** for the science park in Leipzig is currently being modeled as part of a master's thesis. Precipitation volumes and the sealed area have already been determined. The modeling is still pending and is to be completed by the end of 2023. For rainwater utilization, a green roof was also installed on the new research building 7.3 in Leipzig in the **green roof for rainwater harvesting** was installed on the new research building in Leipzig in the 1st quarter of 2022.

Due to outstanding permits for the necessary felling of trees, the near-natural conversion of the "Soldier's Forest" in Halle continues to be delayed. Another delay has occurred regarding the creation of a concept for ecologically valuable land as part of the expansion of the UFZ site in Bad Lauchstädt. Due to climate change and the severe drought in Bad Lauchstädt, areas that were once considered valuable have now been destroyed from a biodiversity perspective. Accordingly, the initial concept ideas had to be discarded. The concept is to be redrafted as soon as the expansion of the site has been confirmed.

FUTURE DEVELOPMENTS

In the coming years, the measures to promote biodiversity at the UFZ sites will be further expanded. An after-work garden with urban gardening will be set up at the Leipzig site both to attract employees and to increase biodiversity. In cooperation with the Leibniz Institute for Tropospheric Research e. V. (TROPOS), which is located in the Science Park in Leipzig, it is planned to increase the number of nesting boxes, with technical support from NABU. Measures that have already been implemented, such as the nesting facilities for insects at the Halle site, will be refurbished in 2023. A species conservation tower proposed as part of the Sustainability Challenge (section 3.6) to increase biodiversity in Bad Lauchstädt is planned for 2025. Furthermore, a concept for ecologically valuable areas is being developed as part of the expansion of the UFZ site there, which will also contribute to increasing biodiversity. The delayed near-natural conversion of the "Soldier's Forest" in Halle is planned for 2024. Overall, biodiversity enhancement is visible in many areas and will continue even though many measures have already been implemented.

PLANNED MEASURES

- Modeling of a surface water runoff-free UFZ campus at the Leipzig site by 2023
- Construction of an after-work garden with urban gardening at the Leipzig site by 2023
- Maintenance of the nesting aids for insects at the Halle site by 2023
- Increasing the number of nesting boxes in the Science Park at the Leipzig site in cooperation with TROPOS by 2023

- Near-natural transformation of the “Soldier’s Forest” at the Halle site by 2024
- Construction of a species protection tower to increase biodiversity at the Bad Lauchstädt site by 2025
- Expansion of the eco-meadow area at the Magdeburg site by 2025
- Creation of a concept for ecologically valuable areas as part of the expansion of the UFZ site in Bad Lauchstädt by 2028

FROM BIODIVERSITY RESEARCH

Ecological imbalance: How plant diversity in Germany has changed over the last 100 years hat

Biodiversity is shrinking at an alarming rate worldwide, but at a local level many studies have found no major loss of flora and fauna. A study by the UFZ, MLU and iDiv shows that there are many losers but also winners. In order to find out how widespread the trend of declining biodiversity is in Germany, the team analyzed data from over 7,700 areas whose plant populations were recorded several times between 1927 and 2020. This study covers a wide range of habitats and provides information on a total of almost 1,800 plant species. A negative population trend was identified for 1,011 of the species examined and a positive trend for 719. Surprisingly, according to the researchers, the losses were evenly distributed, while the gains were concentrated on a few species. It is not yet clear to what extent this can be transferred to other regions. The team advocates collecting and analyzing similar data from all over the world in order to draw attention to changes in biodiversity at an early stage and counteract the extinction of species.

[See Nature article](#)



Cornflowers / Photo: UFZ

3.6 INTERNAL COMMUNICATION, PARTICIPATION AND AWARENESS-RAISING

OVERALL ENVIRONMENTAL OBJECTIVE: Promote environmentally relevant behavior among employees

Continuous improvement of environmental performance cannot be achieved by one person or committee alone - it is much more a task for all employees. Participation requires communication, awareness-raising and action. In this way, a sustainable and environmentally friendly corporate culture can be established.

DEVELOPMENT SINCE 2020

Environmental protection and the promotion of sustainability is a collective task. In EMAS environmental management, this is achieved on the one hand through environmentally conscious and resource-conserving behavior in everyday life. On the other hand, structures have been created that make it easier for **employees to participate** in environmental management:

- The opportunity to use an ideas form to submit suggestions, the feasibility of which is discussed by the Environmental Committee.
- Working groups of the Environmental Committee open to all employees.
- Acting as an environmental contact person in the respective organizational units (see Chap. 2)

Since the introduction of **ideas management** in 2012, a total of 101 ideas for improvement have been submitted and implemented where possible. Some of the people who submitted ideas have helped to implement them. Suggestions are also increasingly being submitted by the environmental contact persons as partners for the environmental management coordinator, the environmental committee and the employees in the respective organizational units as well as in the internal audits. In summer 2022, employees were also asked to submit ideas for increasing sustainability at the UFZ sites. The additional

collection of ideas ran under the “**Sustainability Challenge**” competition. The proposals had to be quickly implementable and highly visible. The executive management provided a budget of up to 5,000 euros each for the best three proposals. These were awarded prizes and presented at the company meeting in September 2022, including:

1. A pilot project in which small solar systems are used for specific tasks, e.g. at monitoring stations,
2. the distribution of plastic-free starter kits for laboratory consumables,
3. the establishment of a species conservation tower at the Bad Lauchstädt site to increase biodiversity.

In addition, further activities relating to **participation, communication and transparency** were carried out, such as:

- Information relevant to environmental management is regularly disseminated via various committees and formats such as the works meeting or the new *UFZdirect* town hall format introduced in 2022
- Regular updates on operational environmental protection provided to the environmental contact persons
- Regular “*Environmental News*” articles on the intranet - 131 articles have been published since the start in 2013, with 16 of them in 2022
- Presentation of environmental management in the Secretaries’ Network in 2020 as additional multipliers in the organizational units
- The internal series of articles “Sustainability in everyday life”, which arose from an employee’s initiative and has been published in the UFZ “Telegraf” since 2020. It provides practical tips and suggestions on how to reduce your personal ecological footprint.
- Participatory evaluation of the employee survey on the topic of environmental protection 2022





Since 2020, the organizational units have been provided with information about their **CO₂-eq footprint through business trips**. Since 2021, **printing statistics for the respective organizational units** have also been compiled by the environmental management coordinator and discussed in the internal audits. In both statistics, the respective values are presented in comparison to other departments or units of an area, so that all units receive benchmarks in anonymized form. The transparency is intended to stimulate a process of reflection in the respective units and encourage sustainable behavior with regard to business travel and resource consumption. However, both processes were initiated during a period in which fewer business trips were possible and there was less printing due to reduced staff presence. Together with a **voluntary commitment to refrain from short-haul flights**, which employees can voluntarily sign publicly at the UFZ, a good timeframe could be chosen for all three issues despite the restrictions imposed by the pandemic, so that the sensitization should have a long-term effect on reducing the volume of printing and flying even after the pandemic. For events - most of which have been canceled during the coronavirus pandemic - a **guideline for the sustainable implementation of events** has been provided. Awareness is also raised among employees with regard to nutrition: A **CO₂-eq traffic light** was introduced on the menu in the canteen at the Leipzig site in 2021, which shows the emission level of the respective dishes and gives employees the opportunity to choose a meal that is as climate-friendly as possible.

In addition to the various awareness-raising measures a number of individual **events on the topic of sustainability** were held at the UFZ, such as a purchasing information event in 2021, at which the newly created sustainable procurement concept was presented. Among other things, the concept outlines possible alternatives, the procurement law framework and sustainable quali-

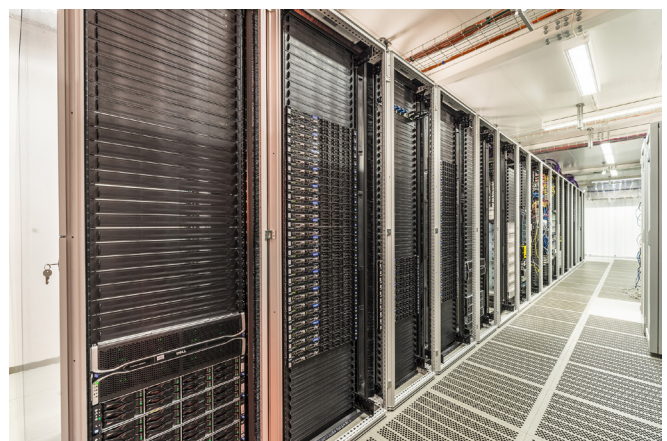
ty labels and seals. In 2022, this and other information on sustainable procurement at the UFZ, including best practice examples from the UFZ, was published on the intranet. This allows requisitioners to find out which sustainability criteria and seals can be included in the specifications. At the Magdeburg Day, the regular employee day in Magdeburg, the focus in autumn 2022 was on energy savings. Together with the Construction and Facility Management department and the executive management, employees identified ways and solutions for the site to further reduce its electricity and heating energy consumption.

A new **website on sustainability and the UFZ's corporate responsibility** was published in August 2022, both to raise awareness internally and to make the UFZ's own understanding of sustainability publicly visible. The website www.ufz.de/sustainability serves as an overview and is not limited to environmental sustainability, which is covered in particular by the EMAS environmental management system, but also shows the building blocks of social responsibility such as diversity and inclusion.

FUTURE DEVELOPMENTS

In the coming years, established measures such as the environmental news in the internal news format Telegraph, the involvement of environmental contact persons, the ideas form and the introduction of environmentally related topics in relevant committees will be continued. Flight and printing statistics will continue to be an important transparency measure, which will be made available to the organizational units and should encourage further reflection and improvement. From 2023, requests to use the computing capacities of the [High Performance Computing \(HPC\)-Clusters](#) will

High Performance Computing-Cluster / Photo: UFZ



have the option to provide users with a rough estimate of electricity consumption and CO_{2-eq} emissions. Particularly in the case of digital applications, the environmental impact is often difficult for users to grasp. The environmental management pages on the intranet are being further revised to provide better information and to make it even easier to help protect the environment. As a further training offer and to ensure that all employees, and in particular new employees, are informed about the EMAS environmental management system, a software-supported training course was developed in 2022, which will be mandatory for all employees from January 2023 and must be repeated every four years.

PLANNED MEASURES

- Transparency and reflection on the organizational unit-related printing volume in all organizational units by 2023
- Updating the intranet page for operational environmental management to lower the threshold for employee awareness by the first quarter of 2023
- Transparency regarding the electricity and CO_{2-eq} consumption of the HPC cluster, including an estimate of personal consumption for requests to use computing capacity by 2023
- Presentation and discussion of opportunities for participation and action as well as project brainstorming in the internal technician network (Tech-VerNetz) by 2024
- Revision of information on opportunities for participation and action at the quarterly Welcome Day by 2025

INTERNAL AND EXTERNAL AWARENESS

Helmholtz Environmental Lecture (HEL) - Towards a sustainable future: Why we need to rethink our world.

In the public guest lecture by political economist and *Spiegel* bestseller Prof. Dr. Maja Göpel at the UFZ, the question was raised as to how our society must be transformed in order to achieve a way of life that reconciles the well-being of people with the well-being of the planet. Global crises such as climate change, the loss of biodiversity and the coronavirus pandemic are becoming increasingly visible and are being exacerbated by

Russia's war of aggression. However, these crises no longer represent a new era or a state of emergency, but are already a new reality. There will be no return to the "old" normality. In view of these crises, the political and social question arises anew as to the scope for action that is possible in the fight against climate change and species extinction in view of an emerging arms race and changed economic and energy policy conditions. Can our world really be designed in a new and different way, more sustainably and in harmony with nature, more peacefully and rule-based, instead of relying on the right of the strongest? "Carrying on as before is not an option. The Western model of prosperity comes at a price," says Maja Göpel

[See interview with Maja Göpel](#)



Prof. Dr. Maja Göpel / Photo: André Künzelmann (UFZ)

3.7 MULTIPLIER FUNCTION

OVERALL ENVIRONMENTAL OBJECTIVE: Influence on indirect environmental aspects through research results - dialog with politics, industry, research sponsors and civil society

Tackling the diverse ecological, social and economic challenges of the future is a collective task. Science plays a central role in the realization of sustainability. The UFZ makes important contributions: With our research, we show ways to reconcile a healthy environment with social development. We communicate these in dialog with politics, business, research sponsors and civil society and thereby indirectly bring about environmental improvements.

DEVELOPMENT SINCE 2020

Strategic advisory bodies and knowledge transfer at the interface between business and politics are an important way of communicating the knowledge and research results gathered at the UFZ and contributing to sustainable development. In the years 2020 to 2022, UFZ scientists were also active in an advisory role as members of political bodies at regional, national, European and international level: examples include the German Advisory Council on the Environment and the Bioeconomy Council, two bodies advising the German government and at international level, the IPCC - Intergovernmental Panel on Climate Change, IPBES - Intergovernmental Platform on Diversity and Ecosystem Services and the ETC-ICM - European Topic Centre on Inland, Coastal and Marine waters. In addition, researchers contributed their expertise to various national and international bodies, committees and scientific advisory boards of universities, colleges, organizations, societies, associations and federations, consolidating these positions and further expanding their activities: Examples include PEER - the network of environmental research centers in Europe, BonaRes - the soil research center in Germany and the BfR Commission for Plant Protection Products and Biocidal Products. UFZ researchers have also contributed their expert knowledge to hearings, inquiries and dialogues with federal ministries, state parliaments and parliamentary groups on various environmental issues – for example

- on improving the federal government's sustainability strategy (Federal Chancellery, 2020)
- on the "Reform of approval procedures for pesticides" (hearing in the Committee on Food and Agriculture, 2020)
- on the water strategy and drought management (Bündnis90/DIE GRÜNEN Environment Committee, 2020),
- on problems and solutions for the near-natural and landscape-compatible expansion of renewable energies and infrastructure (Environment Committee of the German Bundestag, 2021)
- on the Insect Protection Act and planned amendments to the Federal Nature Conservation Act (Environment Committee of the German Bundestag, 2021)
- on climate change and biodiversity (DKK discussion with members of the Bundestag, 2021)
- at the Federal Agency for Nature Conservation (BfN) on ways to (target) areas for wind energy that are compatible with nature and the landscape (2021) and
- on European agricultural policy (EU, 2020, 2021).

In addition, a **cooperation agreement** was concluded in 2022 with the Thuringian Ministry for the Environment, Energy and Nature Conservation on the topic of water scarcity/low water. The aim of the cooperation, which will initially run for four years, is to jointly develop water-related precautionary measures in the area of climate adaptation and to limit the damage potential of extreme climatic events. The advantages and necessity of integrative environmental research are also demonstrated by **contract research** for the Federal Environment Agency. In 2022, economists from the Department of Economics and the University of Leipzig investigated how green economic stimulus programs can be sensibly implemented and designed. Green economic stimulus programs are intended to stabilize the economy in times of economic crisis and at the same time contribute to ecological development. In 2022, the Department of Computational Hydrosystems developed the "High resolution sub-seasonal hydrological (HS2S) forecasting system", a new forecasting tool for dealing with extreme weather conditions. It complements UFZ drought monitoring and supports the adaptation and manage-

ment of real-time risks by public authorities. The work is part of the work program of the Helmholtz Association's climate initiative for adaptation to extreme events. Together with the *GFZ German Research Centre for Geosciences*, the instrument, which is not yet available, is to be developed into a freely accessible, centralized, experimental early warning system for floods and will thus contribute to the improvement of existing flood forecasting systems.

In addition to consulting and scientific research, **technologies and concepts** are also put into practice with the involvement of the UFZ: In cooperation with the company *ChiroBlock GmbH* from Bitterfeld-Wolfen and the Institute of Non-Classical Chemistry, two new, complementary processes for the production of isocitric acid have been developed. The cooperation was funded by the Ministry of Education and Research. A yeast-based bioprocess for the production of the acid was developed within just two years. Isocitric acid was previously only available as a fine chemical in the gram range and can now be produced in the multi-kilogram range using the new process - and much more cheaply than is usual on the market. Among other things, the acid can be used as an anticoagulant. UFZ scientists Andreas Aurich and Steffi Hunger received the UFZ Technology Transfer Award 2022 for their contribution to the development of the bioprocess..

In addition, knowledge generated at the UFZ was disseminated and discussed via **public events** and other **science communication** formats as part of the press and public relations work of the UFZ and partners. Despite the pandemic, a wide variety of formats - some digital, some hybrid, some in person - were organized in the years 2020 to 2022. For example, the UFZ took part in the *Long Nights of Science* at the Leipzig, Magdeburg and Halle sites, the *Girls' & Boys' Days* at the Leipzig, Magdeburg and Halle sites, the *Circus of Science* event series, in which UFZ research is presented in an entertaining and informative way, as well as the *Green Children's Day* in June 2021 and the *Week of the Environment* in the park of Bellevue Palace, also in June 2021. In June 2022, a scientific conference on "Experiments for Ecosystem Research" was held at the UFZ Leipzig with an excursion to the Bad Lauchstädt site, where static fertilizer research has been carried out for over 125 years now.

In 2021 and 2022, topics relating to citizen science projects, smart bioenergy and plastics in the environment were discussed at the „[Leipziger Umweltstammtisch](#)“ which was co-organized by the UFZ. The „*Umweltstammtisch*“ is a dialog format for interested parties and

stakeholders in the environmental sector and takes place alternately at different locations with various experts. In a hybrid event organized by the Helmholtz Sustainability Talks on the topic of „[Hydrogen as an energy source – is there a best way?](#)“ in April 2021, UFZ scientist Katja Bühler discussed sustainable methods of producing and using hydrogen with representatives from science, politics, business and Greenpeace. Due to the pandemic restrictions, a virtual research walk was produced for both 2020 and 2021 instead of an annual reception. In 2020, a film was made on the topic of „[Climate - protecting and adapting](#)“, and in 2022 the feature „[Biodiversity - use, protect, value](#)“ was published in 2022. The Helmholtz Environmental Lecture - HEL took place in June 2022 for the first time since the start of the corona pandemic in 2020. The event was held in presence and broadcast as a livestream (see info box in chapter 3.6). Particularly popular UFZ topics in the media were climate-induced drought in Germany and the [UFZ drought monitor](#), national and international water shortages, extreme weather events caused by climate change, COVID-19 wastewater monitoring, contributions on negative emissions, fish mortality in the Oder in summer 2022, COP 28 in November 2022, the international climate negotiations in Sharm el-Sheikh, Egypt, which were observed on site by Prof. Dr. Reimund Schwarze and evaluated in numerous media reports, as well as the COP 15 World Conference on Nature in Montreal, Canada, at the beginning of December, where three UFZ researchers answered numerous questions from the media on site. A publicly accessible [UFZ expert database](#) was published in July 2022, especially for media representatives, but also for the public and authorities. It contains brief portraits of more than 70 scientists and their respective expertise in a clearly structured form. This expert database is constantly being expanded and updated. The film portraits created since 2020 are also integrated into this database. In the meantime, 51 video portraits have been published on the UFZ's YouTube channel, eight of them in 2022.



*Girls' & Boys in Leipzig.
Photo: Sebastian Wiedling (UFZ)*

Citizen science research enables citizens to participate in scientific projects. This exchange promotes new perspectives, information and findings in research. Citizen science research projects are very diverse and range from the ecological monitoring of running waters in the [FLOW project](#) and the [Butterfly monitoring](#) established in 2005 to the [Soil expedition](#), in which the soil is researched using tea bags. In 2020, the [UmweltTracker](#) project was launched in cooperation between the UFZ and Leipzig University. Volunteer cyclists and pedestrians were equipped with sensors to measure their personal environmental impact. The [CityC-LIM project](#) was launched in 2021 with UFZ participation. The aim of the project is to provide urban climate services using modern weather models and new data sources, such as data generated by citizen science monitoring. Feedback from citizens and city administrations is directly incorporated. Pets can also be included in citizen science research. The [IGAMon-Dog project](#) is looking for dog owners from Saxony-Anhalt, Berlin and Saxony to be trained as species detection dogs. The aim of the project is to detect alien invasive plant species with the help of dogs, monitor them and, if necessary, prevent their spread.

Environmental education for young people has also been further promoted over the past three years. At Girls' & Boys' Day, for example, pupils were given the opportunity to learn how environmental science contributes to preserving the natural basis of life for future generations and what the tasks of scientists are in this regard. The citizen science projects "Expedition Earth" and "Ecological monitoring of watercourses" are also aimed at children and schoolchildren. In the UFZ teaching lab, the UFZ offers school classes the opportunity to carry out exciting experiments in the school subjects of biology, chemistry and physics. In addition, educationally proven game and learning software is offered, which playfully explains environmental topics and thus strengthens the environmental competence of the pupils.

The "[Leipzig summt und brummt](#)" project provides an interdisciplinary offer for all schools on the subject of biodiversity using the example of bees. By using various measuring instruments and monitoring several beehives, pupils can independently explore the influence



of environmental conditions on bee colonies. Both the beehive in Magdeburg and in Leipzig are connected to the monitoring system. The UFZ has also been a partner of the Junior Engineer Academy joint project in Leipzig since 2019, which is to be continued in the coming years. Since 2012, the joint project of Leipzig's Werner-Heisenberg-Gymnasium, Immanuel-Kant-Gymnasium and Neue Nikolaischule has been supporting talented pupils with an interest in science and technology. The aim is to raise and encourage their interest in technical professions and (engineering) scientific careers at an early age.

FUTURE DEVELOPMENT

The communication and dissemination of scientific findings to society is essential for a research center. In the coming years, dialog formats ranging from policy advice to environmental education will continue to be offered and further developed - with the aim of disseminating research results and options for tackling environmental and climate challenges to politics, business and civil society in a targeted manner. Established formats such as the Environmental Roundtable, the Circus of Science event series, the Long Night of Science and the Helmholtz Environmental Lecture (HEL) will be continued in the years to come. Press work and media dissemination will also continue to be of great importance to the UFZ.

Building on the success of the Drought Monitor, further interactive platforms are to be developed. As an example, the UFZ is developing a [Renewable Energy Monitor](#) in cooperation with the German Biomass Research Center, which will show both the performance and the development of renewable energies in Germany by region. The Forest Condition Monitor is also due to go online in 2023. In addition to the presentation of selected

research achievements, EMAS environmental management will also be exhibited in urban society at Leipzig's 1st Future Day in 2023. This will show that the UFZ not only stands for research for sustainability, but also for sustainable research.

HELMHOLTZ ENVIRONMENTAL LECTURE

PLANNED MEASURES

- Participation in the "1st Leipzig Future Day" with a contribution to EMAS at the UFZ in April 2023
- Environmental education for schoolchildren using removable living tubes in wild bee hotels by 2023
- Publication of four film portraits of UFZ scientists on the UFZ YouTube channel in German and English in 2023
- Organization of the following events and/or participation of scientists in them:
 - Helmholtz Environmental Lectures (HEL) in the years 2023–2025

- Leipzig Environmental Roundtables in the years 2023–2025
- Long Nights of Science at the Magdeburg, Leipzig and Halle sites in the years 2023–2025
- Circus of Science event series in the years 2023–2025

FROM CITIZEN SCIENCE

Valid data in citizen science

Citizen science projects are increasingly proving to be an important pillar of environmental research. They provide data, open up science to society and give interested parties the opportunity to commit themselves to the benefit of the environment, to name just a few advantages. However,

there are also reservations, such as regarding data quality. A team of researchers led by the Helmholtz Centre for Environmental Research (UFZ) and the German Centre for Integrative Biodiversity Research (iDiv) used the status assessment of small water bodies to ascertain that citizen science data is indeed suitable for further use in science and administration. To this end, they examined data from around 300 volunteers at 28 streams in the citizen science Flow project and compared these with the results from the UFZ research project "Small water monitoring", in which the streams were sampled by scientists. This provided evidence that volunteers can collect very good data for stream assessment if they are trained beforehand and their efforts are well coordinated.

[See nature article](#)

[See Flow project](#)



ENVIRONMENTAL PERFORMANCE INDICATORS

4 ENVIRONMENTAL PERFORMANCE INDICATORS

4.1 CORE INDICATORS

CORE INDICATOR	UNIT	2017	2018	2019	2020	2021	2022
Emissions	CO ₂ -eq (t/EE)	3.42	3.16	3.01	3.46	3.45	2.20
Energy efficiency	Share of renewable energy (%)	0.30	0.17	0.18	0.16	0.11	0.15
Energy	Energy consumption (MWh/EE)	18.5	17.6	16.4	15.4	17.5	16.4
Leipzig	Energy consumption (MWh/EE)	15.1	14.0	13.0	12.3	14.1	13.1
Halle	Energy consumption (MWh/EE)	31.2	29.6	27.5	27.4	30.0	26.9
Magdeburg	Energy consumption (MWh/EE)	32.5	33.4	31.5	28.2	32.1	31.4
Bad Lauchstädt	Energy consumption (MWh/EE)	81.9	88.5	78.2	61.7	94.8	84.3
Falkenberg	Energy consumption (MWh/EE)	20.4	24.6	21.0	23.6	22.5	14.9
Water	Water consumption (m ³ /EE)	15.4	17.0	15.5	12.8	12.3	15.0
Leipzig	Water consumption (m ³ /EE)	14.7	16.9	15.5	12.5	12.1	13.3
Halle	Water consumption (m ³ /EE)	12.5	11.0	11.5	11.3	8.2	21.4
Magdeburg	Water consumption (m ³ /EE)	28.0	24.7	20.0	15.6	19.6	22.6
Bad Lauchstädt	Water consumption (m ³ /EE)	35.6	37.5	41.8	37.7	42.6	50.5
Falkenberg	Water consumption (m ³ /EE)	21.4	42.8	23.0	32.0	9.8	11.0
Non-hazardous waste	Residual waste (kg/EE)	31.0	34.1	34.0	28.2	29.2	28.7
Leipzig	Residual waste (kg/EE)	17.6	18.8	19.6	13.2	13.8	12.9
Halle	Residual waste (kg/EE)	100.1	95.9	90.3	94.2	95.3	96.1
Magdeburg	Residual waste (kg/EE)	80.6	117.9	115.6	102.4	103.4	99.8
Bad Lauchstädt	Residual waste (kg/EE)	67.4	73.0	79.3	84.0	116.6	103.3
Falkenberg	Residual waste (kg/EE)	7.7	8.9	15.2	8.4	9.6	9.6
Hazardous waste	Laboratory waste (kg/EE)	21.5	21.9	21.8	17.5	21.9	20.6
Leipzig	Laboratory waste (kg/EE)	23.9	22.8	24.0	17.1	23.8	23.2
Halle	Laboratory waste (kg/EE)	8.4	17.1	7.2	15.0	11.2	4.8
Magdeburg	Laboratory waste (kg/EE)	21.5	26.1	24.6	29.7	21.5	20.3
Land consumption in relation to biodiversity							
Total land consumption	Area (m ² /EE)	N/A	N/A	495.7	477.0	493.0	499.9
Sealed surface	Area (m ² /EE)	N/A	N/A	82.0	78.9	81.5	82.7
Partially sealed surface	Area (m ² /EE)	N/A	N/A	5.5	5.3	5.5	5.5
Near-natural area at the site	Area (m ² /EE)	N/A	N/A	408.2	392.8	406.0	411.7
Near-natural area away from the site	Area (m ² /EE)	N/A	N/A	N/A	0	0	0

4.2 ENVIRONMENTAL BALANCE

ENVIRONMENTAL DATA OF THE UFZ FOR THE YEARS 2017 – 2022: INPUT

KEY FIGURE	RATING	UNIT	2017	2018	2019	2020	2021	2022
Water								
Water UFZ total	CIII	m³	16,352	18,581	17,931	15,379	14,282	17,204
Water Leipzig	CIII	m³	12,467	14,909	14,435	12,148	11,285	12,209
Water Halle	CIII	m³	1,426	1,309	1,452	1,369	982	2,545
Water Magdeburg	CIII	m³	1,987	1,796	1,486	1,304	1,625	1,940
Water Bad Lauchstädt	CIII	m³	338	375	449	406	341	455
Water Falkenberg	CIII	m³	134	192	109	152	49	55
Energy								
Electricity UFZ total	BII	MWh	10,625	10,666	10,370	10,158	10,650	10,402
Electricity Leipzig	BII	MWh	7,178	7,117	6,994	6,908	7,252	7,135
Electricity Halle	BII	MWh	1,909	1,848	1,751	1,716	1,772	1,684
Electricity Magdeburg	BII	MWh	980	1,018	989	1,054	1,059	1,067
Electricity Bad Lauchstädt	BII	MWh	522	647	608	450	533	516
Electricity Falkenberg	BII	MWh	35	35	29	29	33	16
Heating UFZ total	BII	MWh	8,988	8,653	8,551	8,302	9,704	8,368
District heating Leipzig	BII	MWh	5,659	5,248	5,156	5,080	5,962	4,895
District heating Halle	BII	MWh	1,652	1,678	1,740	1,619	1,829	1,520
District heating Magdeburg	BII	MWh	1,330	1,413	1,352	1,308	1,609	1,637
Heating gas Bad Lauchstädt	BII	MWh	256	238	233	213	225	242
Heating gas Falkenberg	BII	MWh	92	75	71	83	79	75
Regenerative energy heating	CII	MWh	34	5	9	5	1	4
Regenerative energy electricity	CII	MWh	26	27	26	24	22	24
Diesel	CII	l	41,813	43,890	44,082	38,122	38,349	35,217
Petrol	CII	l	567	789	433	609	366	389
Vehicle fleet								
Company vehicles	CII	pcs.	33	32	34	33	35	32
Lamps								
Energy-inefficient lamps	CI	pcs.	1,113	657	230	206	346	549
Energy-efficient lamps (LEDs)	BI	pcs.	212	122	108	32	118	204
IT equipment								
Servers	BIII	pcs.	223	212	248	226	209	211
Notebooks/Laptops	CII	pcs.	1,722	1,802	2,042	2,243	2,337	2,465
Mini-PCs	BII	pcs.	893	959	935	902	858	831
Terminals	BII	pcs.	409	377	436	392	385	382
Monitors	AI	pcs.	2,764	2,825	3,011	3,125	3,140	2,509
Printers	CI	pcs.	302	254	232	213	205	197
Multifunctional devices	CI	pcs.	76	77	78	77	77	78

KEY FIGURE	RATING	UNIT	2017	2018	2019	2020	2021	2022
Office supplies								
Toner cartridges	CII	pcs.	331	446	468	144	132	114
Ink cartridges	CII	pcs.	84	86	56	81	53	43
CD and DVD blanks	CII	pcs.	170	50	10	5	20	0
Recycling paper	BI	sheet	1,512,500	1,412,500	1,600,000	900,000	800,000	700,000
Special paper	CII	sheet	19,985	29,085	53,153	27,822	23,922	18,804

ENVIRONMENTAL DATA OF THE UFZ FOR THE YEARS 2017 – 2022: OUTPUT

KEY FIGURE	RATING	UNIT	2017	2018	2019	2020	2021	2022
Water								
Waste water UFZ total	CIII	m³	16,352	18,581	17,931	15,379	14,282	17,204
Waste water Leipzig	CIII	m³	12,467	14,909	14,435	12,148	11,285	12,209
Waste water Halle	CIII	m³	1,426	1,309	1,452	1,369	982	2,545
Waste water Magdeburg	CIII	m³	1,987	1,796	1,486	1,304	1,625	1,940
Waste water Bad Lauchstädt	CIII	m³	338	375	449	406	341	455
Waste water Falkenberg	CIII	m³	134	192	109	152	49	55
Emissions								
CO₂-eq-Emissions total	BII	t CO ₂ -eq	3,627	3,462	3,468	4,153	3,999	2,518
Electricity	BII	t CO ₂ -eq	0	0	0	1,889	1,443	0
District heating	BII	t CO ₂ -eq	2,201	2,078	2,055	2,007	2,348	1,951
Liquid gas ^[8]	BII	t CO ₂ -eq	0.4	0.4	0.4	0.4	0.3	0.3
Heating gas	BII	t CO ₂ -eq	79.3	71.4	69.3	67.5	69.3	72.3
Air travel	BII	t CO ₂ -eq	1,176	1,106	1,129	88	46	367
Rail travel	BII	t CO ₂ -eq	52.8	49.5	52.0	10.8	8.0	21.7
Car travel	BII	t CO ₂ -eq	101.2	126.7	125.5	70.8	67.8	80.9
Boat trips	BII	t CO ₂ -eq	1.1	2.4	3.0	5.0	7.7	8.9
Hydrofluorocarbonates Air condition	BII	t CO ₂ -eq	15.2	27.5	33.3	13.7	8.9	9.9
Waste	BII	t CO ₂ -eq	N/A	N/A	N/A	N/A	N/A	1.4
Waste water	BII	t CO ₂ -eq	N/A	N/A	N/A	N/A	N/A	4.7
NO _x -emissions vehicle fleet	BII	kg	595	620	515	477	418	349
Printed matter								
Printed matter chlorine-free	CI	kg	234	80	1	0	92	13
Printed matter recycled	BI	kg	2,571	2,215	2,345	982	667	602

^[8] 2022: Adjustment of emission factor

KEY FIGURE	RATING	UNIT	2017	2018	2019	2020	2021	2022
Waste								
Residual waste UFZ total^[9]	CII	t	33	37	39	34	34	33
Residual waste Leipzig	CII	t	15	17	18	13	13	12
Residual waste Halle	CII	t	11	11	11	11	11	11
Residual waste Magdeburg	CII	t	6	9	9	9	9	9
Residual waste Bad Lauchstädt	CII	t	0.6	0.7	0.9	0.9	0.9	0.9
Residual waste Falkenberg	CII	t	0.05	0.04	0.07	0.04	0.05	0.05
Paper/cardboard total^[10]	CII	t	43	42	44	36	31	31
Paper/cardboard Leipzig	CII	t	24	22	24	16	12	12
Paper/cardboard Halle	CII	t	9	9	9	9	9	9
Paper/cardboard Magdeburg	CII	t	9	9	9	9	9	9
Paper/cardboard Bad Lauchstädt	CII	t	2.0	2.1	2.1	2.1	2.1	2.1
Paper/cardboard Falkenberg	CII	t	0.4	0.4	0.4	0.2	0.2	0.2
Organic waste UFZ total^[11]	CII	t	N/A	N/A	N/A	N/A	N/A	0.1
Organic waste Falkenberg	CII	t	N/A	N/A	N/A	N/A	N/A	0.1
Hazardous laboratory waste total	AIII	t	23	24	25	21	25	24
Laboratory waste Leipzig	AIII	t	20	20	22	17	22	21
Laboratory waste Halle	AIII	t	1.0	2.0	0.9	1.8	1.3	0.6
Laboratory waste Magdeburg	AIII	t	1.5	1.9	1.8	2.5	1.8	1.8
Dienstreisen								
Business trips total	BI	Number of	12,896	12,844	12,394	5,735	5,171	7,478
Bicycle	BI	Number of	157	139	133	155	131	194
Public transport	BI	Number of	1,629	1,568	1,508	302	375	756
Railroad	BI	Number of	4,189	4,159	4,457	1,272	797	2,022
Car sharing	BI	Number of	1,397	1,467	1,614	1,116	1,020	987
Company car	BI	Number of	2,341	2,338	1,912	1,730	1,964	2,015
Private car	BI	Number of	1,646	1,747	1,569	916	745	997
Rental car	BI	Number of	85	72	28	13	25	14
Taxi Cab	BI	Number of	570	509	484	84	54	123
Air travel	BI	Number of	882	845	689	147	60	370
Land consumption in relation to biodiversity								
Total land consumption	AI	Area (m²)	N/A	N/A	571,877	571,877	571,877	571,877
Sealed surface	AI	Area (m²)	N/A	N/A	94,583	94,583	94,583	94,583
Partially sealed surface	AI	Area (m²)	N/A	N/A	6,316	6,316	6,340	6,340
Near-natural area at the site	AI	Area (m²)	N/A	N/A	470,977	470,977	470,977	470,977
Near-natural area away from the site	AI	Area (m²)	N/A	N/A	N/A	N/A	N/A	N/A

[9] Conversion according to the European Waste Catalog (EAK, 20 03 01 01): 0,1

[10] Conversion according to the European Waste Catalog (EAK, 15 01 01): 0,15

[11] Conversion according to the European Waste Catalog (EAK, 20 03 01 04): 0,1

CALCULATION BASIS EMISSIONS

Electricity:

2022: 0 kg/kWh (Drewag - Stadtwerke Dresden GmbH),

2021: 0.199 kg/kWh Leipzig (DREWAG - Stadtwerke Dresden GmbH);

2020: 0.274 kg/kWh (DREWAG - Stadtwerke Dresden GmbH);

2017-2019: 0 kg/kWh (Stadtwerke Leipzig)

2022: 0.0 kg/kWh Halle, Magdeburg, Bad Lauchstädt (enercity AG);

2019-2021: 0.0 kg/kWh Halle, Magdeburg, Bad Lauchstädt (Stadtwerke Halle - EVH GmbH);

2017-2018: 0.0 kg/kWh Halle, Magdeburg, Bad Lauchstädt (LSW Energie GmbH & Co. KG)

0.0 kg/kWh Falkenberg (E.ON Energie Deutschland GmbH)

District heating:

2022: 0.323 kg/kWh Leipzig (TCM), 0.175 kg/kWh Halle (EVH GmbH), 0.063 kg/kWh (SW Magdeburg);

2017-2019: 0.139 kg/kWh (ENBW)

Propellant gas:

2022: 3.554 kg/kg (LfU-Rechner (2021)); 2017-2021: 3.07 kg/kg (BMW)

Heating gas:

0.228 kg/kWh Bad Lauchstädt (MITGAS)

0.228 kg/kWh Falkenberg (EON)

Waste water:

2022: 0.272 kg/m³ (DEFRA, 2022)

Residual, paper and organic waste:

2022: 21.280 kg/t for combustion (DEFRA, 2022)

ASSESSMENT OF THE ENVIRONMENTAL ASPECTS

Significance of the environmental aspect (quantity, predicted development and hazard potential)

A = Environmental aspect with high significance and relevance for action

B = Environmental aspect with average significance and relevance for action

C = Environmental aspect with low significance and relevance for action

Possibility of influence by the UFZ

I Relatively high control potential for environmental aspects even in the short term.

II The environmental aspect can be managed sustainably, but only in the medium to long term.

III There are either no control options for this environmental aspect or only in the very long term or only depending on decisions by third parties.

5 DECLARATION OF VALIDITY AND REGISTRATION CERTIFICATE

Declaration of the environmental auditor on the assessment and validation activities

The undersigned, Dr. Reiner Huba, EMAS environmental auditor with registration number DE-V-0251, accredited or licensed for the areas 72.1 research and development in the field of natural sciences, engineering, agricultural sciences and medicine, confirms that he has audited whether the sites or the entire organization, as stated in the updated environmental statement of the organization HELMHOLTZ-ZENTRUM FÜR UMWELTFORSCHUNG GMBH – UFZ with the registration number DE-159-00047 for the sites

1. Leipzig, Permoserstr. 15
2. Halle, Theodor-Lieser-Str. 4
3. Magdeburg, Brückstr. 3a
4. Bad Lauchstädt, Hallesche Str. 44
5. Falkenberg, Dorfstr. 55

meet all requirements of Regulation (EC) No. 1221/2009

in conjunction with Regulations (EU) 2017/1505 and (EU) 2018/2026 on the voluntary participation by or-

ganizations in a community eco-management and audit scheme (EMAS).

By signing this declaration, it is confirmed that

- the assessment and validation were carried out in full compliance with the requirements of Regulation (EC) No. 1221/2009 in conjunction with Regulations (EU) No. 017/1505 and (EU) 2018/2026
- the result of the assessment and validation confirms that there is no evidence of non-compliance with the applicable environmental regulations,
- the data and information in the organization's updated environmental statement give a reliable, credible and true picture of all the organization's activities within the scope specified in the environmental statement.

This declaration cannot be equated with an EMAS registration. EMAS registration can only be carried out by a competent body in accordance with Regulation (EC) No. 1221/2009. This declaration may not be used as an independent basis for informing the public.

Kirchheimbolanden, den 30.08. 2023

R. Huba

Dr. Reiner Huba
Umweltgutachter DE-V-0251



Please note: This is a translation of the German version of the above-mentioned declaration and is intended solely as a convenience to the non-German readers. Any deviations from the original German declaration are not binding and have no legal effect for compliance or enforcement purposes.

URKUNDE



Helmholtz-Zentrum für
Umweltforschung GmbH - UFZ

- Permoserstr. 15, 04318 Leipzig
- Theodor-Lieser-Str. 4, 06120 Halle
- Brückstr. 3 a, 39114 Magdeburg
- Hallesche Str. 44, 06246 Bad Lauchstädt
- Dorfstr. 55, 39615 Altmärkische Wische

Register-Nr.: DE-159-00047

Erstregistrierung am: 04.04.2005

Urkunde gültig bis: 31.07.2026

Diese Organisation wendet zur kontinuierlichen Verbesserung der Umwelleistung ein Umweltmanagementsystem nach der Verordnung (EG) Nr. 1221/2009 und EN ISO 14001:2015 Abschnitte 4 bis 10 an, veröffentlicht regelmäßig eine Umwelterklärung, lässt das Umweltmanagementsystem und die Umwelterklärung von einem zugelassenen, unabhängigen Umweltgutachter begutachten, ist eingetragen im EMAS-Register (www.emas-register.de) und deshalb berechtigt das EMAS-Logo zu verwenden.



Industrie- und Handelskammer
Dresden

Dresden, den 18.09.2023
Registerführende Stelle der sächsischen IHKs

Lukas Rohleder
Hauptgeschäftsführer





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