University of Bremen

EMAS

Environmental Statement 2022

Foreword

Dear members of the university, Dear interested readers,

COVID-19 was again the dominant topic at the university in 2021. Once more, everyone was called upon to keep good teaching and research programs running as well as possible. This left little room to do justice to environmental and climate protection in response to the catastrophic extent of climate change.

Despite all the restrictions, an energy-saving campaign was carried out with the support of the many employees. The campaign consisted of several elements: an online survey on climate and environmental protection, a personal letter to all employees including a thermometer to monitor room heating, vouchers for power strips that can be switched off, and a range of information material. The campaign was supplemented by an energy-saving competition between students, employees, and staff with digital assistance via an app.

The numerous positive responses to the energy-saving campaign demonstrate the considerable interest employees have in climate and environmental protection and the wish for an environmentally conscious university.

The commitment of many people at the university also gives good reason to be optimistic. In numerous organizations and committees, students are actively committed to the goals of “Students for Future”. The Academic Senate, a fundamental institution at universities, has also sent a clear signal with a Commission on Sustainability, Climate Protection, and Climate Justice. Important priorities that will be followed by numerous other measures.

The newly elected President, Prof. Jutta Günther, has made climate and sustainability the focus of her strategy for the university. Under the guiding theme of “Climate Change and Sustainability”, Prof. Günther plans to motivate the faculties to pursue even more interdisciplinary research and teaching and to make the university attractive to young, climate-conscious people well beyond the city and state borders. For the past two years, she has been a member of the Enquete Commission on “Climate Protection Strategy for the State of Bremen,” so she is very well connected thematically.

Climate protection and sustainability will therefore continue to be a central component of the university strategy in the future. However, our goal of a climate and environmentally friendly university will only be possible with the commitment of our employees. The challenge now is to ensure that everyone continues to do everything they can to protect the climate.

I would like to express my sincere thanks to every one of you!

Frauke Meyer
Director of Finance and Administration,
University of Bremen

Table of Contents

The University of Bremen – a Profile

The University of Bremen is a medium-sized German university with around 20,000 students. It offers a wide range of subjects for committed and talented students: over 100 master's and bachelor's programs as well as the state law examination. With research-based learning, the university has reinterpreted project-based learning, a special characteristic dating back to the time it was founded. As part of the European university network YUFE – Young Universities for the Future of Europe – it is developing a new model of European higher education together with nine other universities.

2330 researchers and scholars (42 % women), including 329 professors (30 % women), teach and conduct research in a broad range of subjects at the University of Bremen. In the field of natural sciences, engineering, social sciences, humanities, and teacher education, the university has long been focusing on interdisciplinary cooperation and excellent research. Between 2012–2019, Bremen was one of 11 universities to receive funding as a University of Excellence under the "Ambitious and Agile" Institutional Strategy.

The future questions of today's societies are addressed in five interdisciplinary high-profile areas: the oceans and the global climate, the future of industrial production, the social conflicts of modern welfare states, the interfaces of digital technology and humans, the logistics of global flows of goods, and justice in healthcare. Particularly prominent are the marine sciences, with their Cluster of Excellence, which has been continuously funded since 2006.

The university is committed to diversity and has always encouraged unusual ideas and the independence of its early-career researchers. Researchers at all career stages find a stimulating environment here. The university was successful in all rounds of the federal program for female professors as well as in the tenure-track program for the promotion of early-career researchers, and received the maximum possible funding for professorships in each case.

The University of Bremen has long maintained a close and trusting collaboration with the non-university research institutes on campus – 11 of which are jointly funded by the federal and state governments. Since 2016, the "U Bremen Research Alliance" has been living proof of the success of this academic cooperation. More than 50 cooperation professorships testify to the close cooperation and proximity.

The university takes its social responsibility seriously and cultivates its activities together with a large number of groups and institutions in Bremen. It likes to be the first to tackle new approaches: Founded as a reform university, we live and breathe change. Our vision: Bremen as a leading European research university and an inspiring place of learning. To achieve this, we rely on our strengths, on the potential of all members of the university, and on trusting collaboration with our partners.

University staff and students were involved in developing the university's vision, mission, and goals for the coming decade. On this basis, the Academic Senate of the University of Bremen then adopted the Strategy 2018 – 2028 in December 2017.

Key Figures

Number of students: 19,200
52 % female students

Students by faculty:
7,900 natural sciences and engineering
11,300 social sciences and humanities
15 % student teachers

Graduates: 3,100
1,500 bachelor
1,200 master
103 state law examinations
268 doctorates and habilitations

Personnel: 3,550
2,330 academic staff
(330 Professors)
1,220 administrative and technical staff

Budget (in million euros):
370 total
106 third-party funds

International affiliations:
2.800 foreign students
1.000 from Europe
1.100 from Asia
435 from Africa
200 from America

600 partner universities

Awards:
21 ERC Grants
1 Cluster of Excellence
7 Leibniz Prizes

The university in figures.
Figures taken from “Uni in Zahlen 2021” (rounded)

GreenMetric

More and more universities and colleges worldwide are committed to the sustainable use of natural resources. An international evaluation of the climate protection measures implemented once again confirms that the University of Bremen is one of the best.

For a long time, a direct comparison of strategies to reduce the ecological footprint was possible only with difficulty. The evaluation systems in many countries were too different. For example, the U.S. “College Sustainability Green Report Card” covers an impressive 300 institutions, but grades them only on a simple A-F school grade scale.

The “UI GreenMetric World University Ranking” was launched in 2010 with the aim of establishing a uniform evaluation system according to globally valid standards. A comprehensive, detailed catalog of criteria records a large number of parameters in the 6 categories Setting and Infrastructure, Energy and Climate Change, Waste, Water, Transportation, Education and Research, and evaluates them according to a standardized point system.

Participation in this annual ranking is voluntary and the results are published in the public domain on the Internet. In 2010, there were only 96 participants, but in 2020, 956 universities and colleges submitted their data. The University of Bremen has been participating in the “UI GreenMetric World University Ranking” since back in 2012 (https://greenmetric.ui.ac.id/).

Fig. 1: UI GreenMetric Certificate for the University of Bremen

In the European region, a total of 263 institutions participated in 2021, with **the University of Bremen achieving 13th place**. In the global comparison, Bremen is in an excellent position in the top group occupying 16th place, and even coming second in Germany!

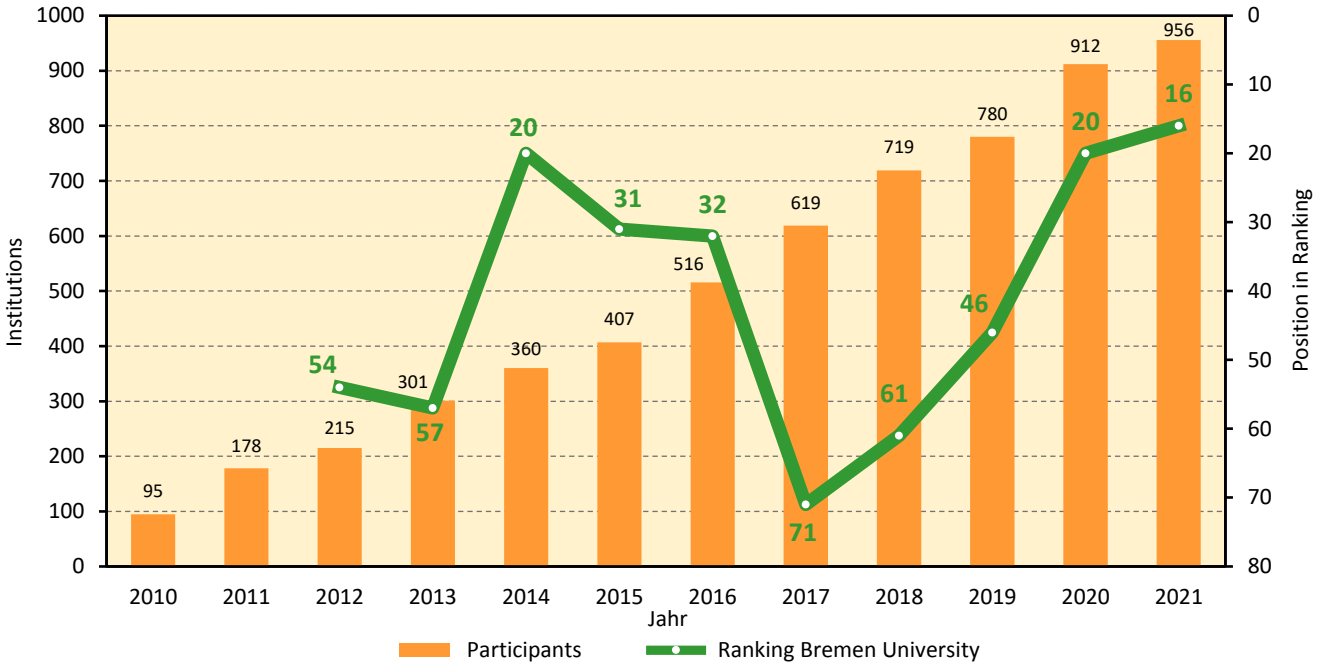

Fig. 2: World Rankings History for the University of Bremen (Own graph, data from https://greenmetric.ui.ac.id/)

Climate University

What makes a climate university – a brief explanation

A climate university wants to **understand climate change**, it analyzes its causes and consequences in all their facets. Researchers and scholars at the University of Bremen do this through their work. For many years, the university has maintained a high profile with the topics of climate and environmental sustainability. “Marine, Polar, and Climate Research” is an important focus with a high international reputation. Whether in a cluster of excellence, in university centers with a broad range of disciplines, or in Collaborative Research Centers, from the carbon cycle to the melting of the polar ice – climate research here takes place in an interdisciplinary network. The top-flight non-university research institutes in the State of Bremen are excellent partners with whom the university appoints outstanding researchers and coordinates research agendas. The university is involved in large consortia to share data for climate research or on biodiversity. Top-ranked international collaborations, advising decision-makers, very good ranking positions, major prizes and internationally received publications, and also substantial third-party funding are evidence of the recognition and international appeal of climate-related research at the University of Bremen.

A climate university searches for ways in which we can **confront climate change**, mitigate it, and adapt to its consequences. At the University of Bremen, these are not only questions of the natural sciences, but also of the social sciences, humanities, and engineering. Several research units contribute to making an impact at the interface of environment and society. Exemplary projects combine local perspectives and global challenges: from deforestation in the Sahara to material cycles in Germany to threatened livelihoods in the Arctic, for example.

A climate university wants to **shape the transformation** in society and very decidedly with industry as well; it has its finger on the pulse of these challenges in every respect.

The State of Bremen is home to the automotive industry, the aerospace industry, logistics and steel production, all of which are important and have a crucial impact on the climate. Bremen can be a demonstrator for the transformation of the economy and society toward climate neutrality – and the University of Bremen and other scientific institutions in the state are undertaking application-oriented and industry-related research and contributing to innovations.

A climate university assumes responsibility for **the next generation** and at the same time offers the chance for the current generation to get involved themselves. The University of Bremen therefore already stimulates interest and enthusiasm among school students and works with and for schools in a variety of educational formats. At the University of Bremen, German and international students can study climate-related issues in numerous study programs, courses forming part of the European exchange, and with digital learning resources. Last but not least, the junior researchers are shaping the future through their research. They receive excellent, interdisciplinary and, above all, international graduate training at the University of Bremen.

A climate university lives what its research results dictate and **embarks along the road to becoming a climate-neutral campus**. The University of Bremen has therefore committed itself to systemic climate protection. This is certified, implemented with concrete measures for climate neutrality, and continuously shaped in a collaborative process at the university. The **University of Bremen** will continuously expand its competencies in climate research and engage as a climate university in international and new national cooperations.

Understanding Climate Change

How has the climate changed over millions of years of Earth’s history, to what extent are human activities currently responsible for this change, and what role does the ocean play in the Earth system? These questions have been bundled together for more than two decades in Bremen’s interdisciplinary high-profile area “Marine, Polar, and Climate Research”. The scientists work in the leading global networks to investigate these issues and cooperate closely with top-flight research institutes in the State of Bremen.

Climate research in an interdisciplinary network

Excellent scientific research on understanding climate change takes place at MARUM – Center for Marine Environmental Sciences and at the Institute of Environmental Physics. The focus is strategically supported by the State of Bremen in terms of research policy and integrates a wide range of subjects.

A Cluster of Excellence explores the role of the ocean floor for the climate system. "The Ocean Floor – Unexplored Interface of the Earth" is a Cluster of Excellence which quantifies the exchange processes at this important interface. Geological, physical, chemical, and biological processes interact here and thus influence the climate system, the global carbon cycle, and the biological productivity of Earth's ocean. We still know too little about these processes to be able to include the ocean floor in global material balances.

A Collaborative Research Center is improving climate projections. Climate models exhibit energetic inconsistencies that lead to biases in climate projections. The "Energy Transfer" Transregional Collaborative Research Center is developing physically, mathematically, and numerically consistent models for both the atmosphere and the ocean.

A Collaborative Research Center is studying the melting of polar ice. The rise in temperature in the process of global climate change is much more pronounced at the poles than at other locations on Earth. The "Arctic Amplification" Transregional Collaborative Research Center is investigating which feedback processes are causing the Arctic ice, for example, to melt much faster than had been feared.

An institute is researching ocean acidification. The Bremen Marine Ecology Centre for Research and Education (BreMarE) deals with highly relevant topics of climate change, such as the biological effects of ocean acidification and the expanding oxygen minimum zones in the sea. BreMarE conducts research projects in the tropics as well as in the midlatitudes and the polar oceans, in coastal areas, and in the deep sea.

Environmental physics analyzes greenhouse gas emissions. The Institute of Environmental Physics (IUP) at the University of Bremen is one of the leading research institutes in the field of atmosphere, ocean, cryosphere, water, and soil research. It is particularly renowned for its remote sensing methods in atmospheric research to quantify the contribution of human activities and emissions to climate change. Important geophysical parameters are collected using microsatellites, satellite swarms, and novel sensors, which are also developed together with industrial partners. The topic of environmental sensors is being expanded together with microsystems technology, biophysics, and solid-state physics.

Climate research with excellent partners

Close partners in the climate research undertaken in Bremen are excellent institutes in the "U Bremen Research Alliance". The university and 11 non-university research institutes financed by the federal and state governments joined forces in this close cooperation in 2016. Establishing these institutes close to the university was one of Bremen's key science policy aims.

Joint strategic research planning. The most important players working together with the university to investigate climate change are the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), the Max Planck Institute for Marine Microbiology, and the Leibniz Centre for Tropical Marine Research (ZMT). They collaborate in the Ocean Floor Cluster of Excellence and on a regular basis in all major research projects, and strategically coordinate appointments — most recently the Heisenberg Professorship approved by the German Research Foundation (DFG) in 2021 to study the role of polysaccharides in the carbon cycle. Bremen is also a leading contributor to the German Alliance for Marine Research (DAM).

The international hotspot for Earth and environmental data. Data for the international scientific community are pooled in the PANGAEA – Data Publisher for Earth & Environmental Science world data center, operated jointly by the AWI and MARUM. PANGAEA has about 400,000 data sets from several hundred projects worldwide.

The location for all the data on biodiversity research. Bremen is a member of the National Research Data Infrastructure (NFDI) and represented by several consortia, in particular, the Biodiversity Data Consortium, which is an important institution for biodiversity data and coordinated at the University of Bremen.

Joint technology development with AI components. MARUM at the University of Bremen is continuously developing highly specialized technologies for climate and environmental research. Together with space scientists and in collaboration with the Alfred Wegener Institute in Bremerhaven, the German Aerospace Center (DLR) in Bremen, the German Research Center for Artificial Intelligence (DFKI), and

other universities and industrial partners, artificial intelligence methods are now being used to develop fully autonomous systems that can autonomously take samples in inaccessible places — whether in polar ice or on Mars.

Climate research with high recognition and international appeal

Climate research at the University of Bremen is carried out by excellent scientists who have time and again received individual awards for their work and have collectively established a high international reputation. 30 % of all publications at the University of Bremen from 2010 – 2019 relate to the United Nations Sustainable Development Goals.

The University of Bremen advises international decision makers. The University of Bremen is one of the founding members of the International Universities Climate Alliance (IUCA) network, established in 2020. It is the only member of the alliance from Germany so far. Through the IUCA network, research results are communicated more effectively in order to better respond to the challenges of climate change. The Climate Alliance is a unique alliance that supports government leaders, policymakers, and the business community in the fight against climate change. As an IUCA member, the university was eligible to put forward a proposal for the valuable "Earthshot Prize" and nominated the MOSAiC Arctic Expedition. Scientists from the University of Bremen also contribute as "coordinating lead authors" to the Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC).

The University of Bremen lives and breathes international research cooperation. Major international programs such as the International Ocean Drilling Program – with the Drill Core Repository in Bremen – create the framework for long-term cooperation. By being a significant participant in these programs, the University of Bremen is an internationally recognized partner in the field of environmental research. This can be seen, for example, in the publications: more than 75 % of those associated with MARUM are produced in collaboration with international partners.

Bremen is one of the most high-profile places in the world for earth and environmental sciences. In the current "Nature Index" ranking, the University of Bremen ranks high in the field of earth and environmental sciences. The Nature Index is based on publications of articles in renowned journals. In addition to national research organizations (such as Helmholtz, Max Planck, Leibniz), only one other German university besides the University of Bremen has made it into the German Top 5.

Climate researchers at the university awarded highly prestigious prizes. Four professors from the University of Bremen, some of whom also work at non-university institutes, have been awarded the Leibniz Prize, the German Research Foundation's most important research prize, in the field of environmental and climate research: Antje Boetius and Kai-Uwe Hinrichs for their work on microorganisms and their impact on global climate events, and Nicole Dubilier for her work on microbial symbioses; the most recent recipient of the prize was Veronika Eyring, who also heads the "Earth System Model Evaluation and Analysis" department at the DLR Oberpfaffenhofen. In 2018, marine biologist Antje Boetius (AWI and University of Bremen) also received the 26th German Environmental Award from the German Federal Environmental Foundation (DBU). It is the most valuable independent environmental award in Europe worth 500,000 euros. Researchers at the University of Bremen have already received the highly competitive ERC grants from the European Research Council seven times in the field of climate and environmental research, including one starting grant, two consolidator grants, and four advanced grants.

The University attracts third-party funding on a large scale in competitive procedures. The University of Bremen's outstanding position in climate research is demonstrated by the fact that it has ranked first in the DFG's funding rankings in the geosciences for many years.

Confronting Climate Change

How we can adapt to the unavoidable changes to our climate, how we can mitigate them, and how we can preserve the natural foundations of life is being investigated by researchers and scholars from the social sciences and humanities as well as engineering and the natural sciences. They do this permanently in dedicated academic units at the university and repeatedly participate in innovative projects that combine local and global perspectives.

Making an impact at the interfaces of environment and society

Analyses for a sustainability-oriented transformation of society. The artec Sustainability Research Center is the only university research center in

Germany with a clear orientation towards social-ecological research, oriented towards the Sustainable Development Goals (2030 Agenda, Sustainable Development Goals). Here, scholars from the social sciences, production technology, cultural studies, educational sciences, and human and health sciences seek to collaborate with interest groups and stakeholder groups outside academia as well.

Interdisciplinary research for sustainable technical processes. Scientists at the Center for Environmental Research and Sustainable Technologies (UFT) study the complex interactions between chemical substances and the living environment and develop sustainable processes ranging from wastewater treatment to the design of energy systems. Together, researchers from the fields of ecology, biology, and chemistry are working to reduce risks to humans and the environment and conserve natural resources.

Culture and social practices in the production of environmental knowledge. "NatureCultures" and "Maritime Anthropology" are two young fields at the University of Bremen committed to science and technology research. In the fields of environment, energy, resources, and medicine, extremely urgent issues – from climate change to combating global epidemics to ecologically responsible economic activity – are pursued from cultural and social science perspectives. Research on human-sea relations ranges from coastal societies to the transnational and local contexts of offshore wind power to investigating port infrastructures or plastic waste in the ocean.

Transnational Climate Change Law. The Research Unit for European Environmental Law (FEU) was founded back in 1994. It works on environmental, technical, and commercial administrative law and advises, among others, the Federal Environment Agency and the Federal Ministry for the Environment. Transnational climate protection law is a particularly important focus.

Linking local perspectives and global challenges

Regional ecology and global climate change. One focus of ecological research at the University of Bremen lies on the Sub-Saharan region. In a recent project, AI techniques from the field of deep learning were applied in an innovative way to high-resolution imagery. Researchers used it to map every tree on 1.3 million square kilometers in West Africa. This makes it possible to monitor deforestation processes and promote climate protection. The study by the Technology Center for Informatics and Information Technology (TZI) at the University of Bremen was published in "Nature" and highlighted as one of ten outstanding scientific results of 2020. In addition, the data was visualized by NASA. It might soon become possible to map tree populations worldwide.

Biodiversity and livelihoods of indigenous populations. Climate-related changes, such as global sea level rise and ocean acidification, are stressing Arctic ecosystems. This is compounded by fishing, tourism, and shipping in these regions. The University of Bremen is coordinating a project launched in 2020 with experts from the natural and social sciences from 14 institutions and eight nations. It involves indigenous people and other local stakeholders in the Arctic and investigates changes in biodiversity and the livelihoods of human inhabitants in Arctic coastal areas.

Optimized material cycles. Scientist Thorsten Kluß from the University of Bremen and his team have won the research category of the German Sustainability Award. During the production and processing of food, valuable substances are often thrown away. Instead, the "loopsai" software is designed to automatically arrange businesses in material cycles and make suggestions as to who can use other people's waste as raw material for themselves. With the help of the intelligent open-source software "loopsai – artificial intelligence naturally integrated", they want to make the concept available on the Internet.

Bee research as "Citizen Science". In the "Bee Observer" project, scientists are conducting research together with citizens. The Cognitive Neuroinformatics group provides beekeepers with sensor technology that they can use to monitor their bee colonies. In return, the hives provide data that the university hopes to use to track bee mortality.

Shaping the transformation

The industrial structure of the State of Bremen is dominated by sectors in which the likelihood of a carbon-neutral future is decided: automotive, aerospace, logistics, and steel production. Bremen is meeting this challenge. The Enquete Commission on "Climate Protection Strategies for the State of Bremen" of the Bremen Parliament is developing the practical measures needed to achieve the climate policy goals in the State of Bremen by October 2021. In addition to science and industry, the "Fridays for Future" movement in Bremen and Bremerhaven is also involved. The State of Bremen can be a laboratory and demonstrator for the necessary social and economic transformation by bringing together research, application, and innovation. The topic- and industry-related research at the

University of Bremen contributes to this as much as the work being undertaken at the other universities and research institutions in the State of Bremen.

Wind power: The State of Bremen and many companies in the State of Bremen were committed to the expansion of wind power at an early stage, particularly in the offshore sector. Scientists at the University of Bremen working in a range of fields from electrical engineering to marine engineering geology, are conducting research in this context on power electronics, sensors for early detection of damage to wind turbines, the development of power grids and smart grids, logistics, and the anchoring of wind turbines in the sea and the accompanying challenges for nature conservation.

Hydrogen: Under the name "Hydrogen Hanse", Bremen is placing enormous focus on the expansion of hydrogen as an energy carrier. The defossilization of Bremen's steel mills and the transformation of the city's industrial port are designed as European flagship projects. This work is accompanied by the massive development of basic and applied research on the topic of "green hydrogen" at the university and non-university institutes — for example, with the test field for electrolyzers at Fraunhofer-IWES.

Energy systems: The Bremen Research Centre for Energy Systems (BEST) is an association of professors from the university's technical, mathematical, natural science, economic, sociological, and legal disciplines. All members understand the energy transition as the transformation of a socio-technical system. BEST works closely with industry, the other universities, and the research institutions in the State of Bremen to link up the sustainability, security of supply, and competitiveness of energy systems.

Logistics and production: Bremen has the largest freight logistics center in Germany, and its seaport is the second largest in Germany and the fourth largest in Europe. Logistics research at the University of Bremen is closely related to practical industrial applications and is concentrated in the LogDynamics research network. By linking research approaches from business management, information technology, and production technology, LogDynamics plays its part in solving logistical problems. At the same time, it opens up opportunities for small and medium-sized enterprises to gain access to the research. Energy-efficient logistics and production is an important topic here, for example in the ongoing ecoKI project at the Bremen Institute for Production and Logistics (BIBA). The focus here is on supporting SMEs with the introduction of AI technologies for energy efficiency.

Mobility: Bremen is an important location for automotive manufacturing in Germany. At the same time, the city of Bremen is a suitable space for innovative transport concepts, for example with the very popular CarSharing. In a current project, researchers at the Center for Industrial Mathematics are simulating urban traffic using a so-called digital twin to make predictions about traffic flow and CO_2 emissions. They use a data-based hybrid model whose parameters are optimized using methods from the fields of Big Data and machine learning. In another project on autonomous driving, the focus is on automating recurring trips in familiar areas.

Aerospace: Bremen is an important location for European aerospace: the university cooperates with companies such as Airbus and OHB on research and development. It also works with non-university institutes on research into materials for lightweight construction in order to reduce the energy requirements and CO_2 emissions of aircraft. The university's MAPEX Center for Materials and Processes also investigates resource- and energy-efficient materials and manufacturing for other industrial processes as well. In supporting manned missions to other planets, MAPEX is taking on a task it knows will be difficult: since not everything can be transported to these planets, it must be possible to produce nutrients and materials locally in inhospitable environments with the least possible use of resources; the corresponding processes will also contribute to climate neutrality on Earth.

The next generation

For a university, taking a holistic view of climate protection always means living up to its educational mission: The University of Bremen offers its students and junior researchers, and school students as well, the space for their own exploration, design, and research. This decade will also see the University of Bremen develop into a European university of sustainability. Together with the other universities in the YUFE ("Young Universities for the Future of Europe") European university network, it has made sustainability one of four focal topics. Students from European countries will dedicate themselves to this topic on the campus in Bremen, and students from Bremen will learn about climate, environment, and sustainability in Europe. The university will benefit from the internationalization experiences of its European partners and other universities such as Jacobs University and the Hochschule Bremen City University of Applied Sciences.

Stimulating interest and enthusiasm

The next generation plays an important role for a climate-friendly future. Today's students get involved, they set the tone for our future society, they are the decision makers and researchers of tomorrow, whom the University of Bremen would like to inspire at this early stage.

The University of Bremen raises awareness for its own creative scope. In the MARUM school project "Climate – I'm changing!", both students and teachers at four collaborating schools will be accompanied over a period of two years as they undertake their scientifically based examination of climate protection. In the complex field of interaction between sustainable climate protection and the social and political framework conditions, they work together to develop possible actions for their own everyday life.

The university introduces students to climate research. The university teams up with schools to organize student laboratories in which research is conducted on current topics relating to environmental and climate protection. In 2018, a youth climate conference was held, organized by the university's environmental management team with the Bremen chapter of the German branch of Friends of the Earth Germany (BUND). Other events include the 2019 Physics Day on the production of greenhouse gases, Open Campus 2019 with student lab workshops on "The Oceans and the Climate", the Ocean Day organized by the Max Planck Institute for Marine Microbiology and the University, and the "Interdisciplinary Science Education" workshop on the topic of climate change, renewable energies, and Earth history.

The university invites people to join the climate debate. The series of events titled "Forum Science and School" is a cooperation between the University of Bremen and the House of Science in Bremen. Several times a year, representatives of scientific institutions give lectures and workshops. In 2019, four scientists reported from the perspective of their own research about means of counteracting climate change.

The university thinks from the end. Life cycle assessments are playing an ever more important role. In the "FreiEx – Free Experimentation of Chemistry Didactics" student lab, the endpoints "Virtual Water", "CO_2 Footprint", "Land Consumption" and "Life Cycle Assessment" are prepared using selected examples with a chemical-technical focus. Features, videos, and small series of experiments are suitable for school and also for university study. The online platform is being implemented with partners in Brazil and the USA.

Studying "climate" in a research-oriented way

The University of Bremen offers its students a wide range of teaching and learning opportunities on climate change in all its facets. In addition to subject-specific study programs, there are numerous easy-to-access courses that are taken by students in several disciplines and are often open to members of the public as well.

The University of Bremen makes teaching on climate change accessible. Courses relating to the United Nations' 17 Sustainable Development Goals are identified in the course catalog with a corresponding icon, making them more easily accessible across disciplinary and faculty boundaries.

The university attracts international students in climate science. With international, English-language master's programs in the natural sciences, the University of Bremen attracts international students to subjects related to climate change. In some cases, they take their knowledge back to their home countries, creating lasting networks.

The university puts teaching on climate change on the agenda throughout Europe. The University of Bremen is a member of the EU-funded university network YUFE ("Young Universities for the Future of Europe"), which connects young and innovative universities. "Sustainability" is one of the four focus areas. Since the winter semester 2020/21, students at the University of Bremen have been able to take part in courses at other YUFE universities and have them recognized for their studies – and vice versa. The range of courses on climate-related issues will be expanding in the coming years.

The University of Bremen provides easier access to climate knowledge. The unique program offered by the Virtual Academy of Sustainability (VAN) provides video-based courses for all German-speaking universities. The topic of climate protection and climate adaptation is treated separately in one module and is moreover a cross-cutting topic that links all modules together. The German Federal Ministry of Education and Research (BMBF) funded the VAN from 2016 to 2020. Currently, the VAN is being conceptually restructured, internationalized in the context of YUFE, and made available to a wide audience as an Open Educational Resource (OER).

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The university talks about climate-friendly. energy production In the winter semester 2020/21, the "Energy Systems of the Future" lecture series will focus on issues relating to energy efficiency and climate-friendly to climate-neutral energy. The lectures are open to all students, researchers, and the public and are characterized by the interdisciplinary approach to the discussion of future energy sources.

The university offers scope for experimentation. The Bremergy e.V. association was founded by students at the University of Bremen at the end of 2011. As "BreMo20", around 50 Bremen students from different disciplines developed a climate-friendly electric racing car in 2020, already the seventh model of the car in total. In addition to several partners at the university, the team is supported by almost 50 companies and foundations.

Shaping the future through research

Junior researchers play a special role in the challenges of climate change and climate protection. The university supports and trains young researchers in a variety of ways for the different facets of research on climate topics.

Recognition for climate research. The CAMPUS PRIZE – Research for a Sustainable Future from the Kellner-Stoll Foundation is awarded every year for outstanding and responsible research by junior researchers at the University of Bremen. The award winner is honored for a research project that contributes to the sustainable use of resources and the protection of the environment, the climate, and the oceans. The deciding factor is a research approach where all participants are equals as well as the involvement of local partners, companies, or civil society.

Promotion of early-career researchers. The GLOMAR – Global Change in the Marine Realm graduate school, supported by MARUM, organizes the interdisciplinary training of PhD students in marine sciences at the University of Bremen and for partner institutions in the U Bremen Research Alliance (UBRA). The principles are: scientific excellence, interdisciplinary and international networking. The doctoral students themselves come largely from abroad. The junior researchers thus receive excellent preparation for interdisciplinary collaborations in the climate sciences and the equally important science communication.

The path to a climate-neutral campus

The University of Bremen is aware of the responsibility it bears for society and sustainable global development. On its own campus, too, it strives to minimize the consumption of natural resources and avoid damaging effects on the environment and climate. Environmental management, a climate protection concept, and the Sustainability Forum all contribute to this. In an exchange between stakeholders from the university and the State of Bremen, the university creates awareness of climate change and agrees on concrete goals, which it pursues in numerous projects and measures.

Systemic climate protection

The University of Bremen is aware of its ecological footprint and its function as a role model. This is why climate protection plays a key role in environmental management.

The University of Bremen is successively reducing its CO_2 emissions. Since 2004, the university has had an environmental management system certified according to EMAS (Eco-Management Audit Scheme) and publishes an annual environmental statement. This regularly communicates measures and progress towards CO_2 reduction in a transparent manner.

The University of Bremen prioritizes energy efficiency and climate protection. In 2015, an integrated energy and climate protection concept was adopted as part of the BMU's (German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety) climate protection initiative. It contains a catalog of 30 measures that are currently being implemented. Since 2019, a climate protection manager has been responsible for coordinating the climate protection

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concept at the university and accompanying activities that have been initiated in this context.

Climate protection as a collaborative process

The climate-neutral campus is a university-wide goal that must be supported at all levels and by the political community. In a variety of formats, goals and approaches are discussed and agreed upon with the university public and the state government.

University and state make sustainability a cross-sectional task. The current target agreement between the university and the State of Bremen for 2019 to 2021 dedicates a separate chapter to the topic of sustainability as a cross-sectional task. The orientation toward sustainability is to be strengthened in order to contribute to the "Education for Sustainable Development" National Action Plan. Measures include energy efficiency and events on sustainability and climate change.

The university organizes participation in institutional climate protection. In 2018, the university's Sustainability Forum was established with the goal of implementing the 17 Sustainable Development Goals (SDGs) formulated by the United Nations, including climate protection, at the university. With the Sustainability Forum, the university has established a generator for intra-university discourse to identify areas of action in administration, research, and teaching, and to implement sustainable development in line with the 2030 Agenda.

Stakeholders at the university reflect on the development into a climate university. The topic of climate change is widely discussed throughout the university, for example in repeated debates in the Academic Senate, the university's parliament. A student initiative has helped to bring climate change in its many dimensions to the hub of the debate. In spring 2021, for example, the closed meeting of the Academic Senate addressed sustainability and climate neutrality.

Concrete measures to achieve climate neutrality

Selected measures illustrate the innovative and participation-oriented approach of the University of Bremen. Climate protection at the University of Bremen means implementing economically and institutionally sustainable measures that are self-supporting and enduring.

The University of Bremen produces its own climate-neutral electricity. Since as far back as 2011, the "UniBremenSOLAR eG" cooperative, which is supported by members of the university, has been producing electricity on the roofs of the university buildings. In 2020, 360,000 kWh of green electricity was provided by six photovoltaic systems with over 700 kWp. The UniBremenSOLAR eG is the first of its kind to be established at German universities.

The University of Bremen is increasing the energy efficiency of its server operations. For years, work has been underway to limit the increasing demand for energy caused by server operation. To this end,

the Green IT Housing Center, which is unique in the German university landscape, was established. It uses an innovative free-cooling system to reduce the energy consumption and costs of server operation. The university has computer workstations for all research institutions in the State of Bremen and saves 3.6 million kWh and 2,000 tons of CO_2 annually.

The University of Bremen promotes awareness for biodiversity With the "Campus Goes Biodiverse" crowd project, members of the university jointly explore the biodiversity on their campus. Relevant open spaces are no longer mowed. The initiative was founded jointly by students and academic and non-academic staff in 2020. Anyone can become part of the project and share observations of animals or plants via the iNaturalist app.

The Student Services Organization Bremen operates in a resource-saving way. The Student Services Organization is committed to the sustainable use of resources and the reduction of its ecological and CO_2 footprint. It is part of the Bremen Alliance for Reusable Food, invests in energy efficiency, sources regional products, reduces food waste, and uses renewable raw materials. It has joined forces with the International Office to support the Go Green project for the local cultivation of herbs and vegetables on campus by students living there.

The University of Bremen supports sustainable and climate-friendly mobility. The innovative corporate mobility management supports the use of local and long-distance public transport as well as cycling, thus contributing to a significant reduction in private car traffic and the associated CO_2 emissions.

Awards

The university's efforts to reduce CO_2 emissions have been honored nationally and internationally.

The "GreenMetric" climate protection ranking of the University of Indonesia in Jakarta certifies the University of Bremen an excellent 20th place among 912 participating universities worldwide. Within Germany, the university even achieved second place. The evaluation criteria included a wide range of environmental aspects. The University of Bremen received particularly good ratings in the category "Energy & Climate Change".

The university's innovative corporate mobility management system had already won an award in 2010 in the "Innovative Concepts in Mobility Management 2010" competition organized by the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) and Deutsche Energie-Agentur GmbH (dena).

The climate protection manager at the University of Bremen was awarded the Bremen Climate Protection Prize in 2014 — for her achievements at the University of Bremen and her general commitment to climate protection.

Environmental Management System of the University of Bremen

Environmental Management System

The environmental management system of the university was validated in May 2022 according to the EMAS III Regulation (Regulation (EC) No. 1221/2009), which came into force on January 11, 2010, for the University of Bremen at the Bibliothekstraße location in 28359 Bremen.

In the EMAS Regulation, particular emphasis is placed on information on the key areas of energy efficiency, material efficiency, water, waste, biodiversity, and emissions in the form of standardized indicators, provided that these fields correspond to the significant environmental aspects.

In 2019, Annex IV of the EMAS Regulation was amended: Regulation (EU) 2018/2026. The amendment is taken into account in this environmental statement when presenting the consumption values.

At the University of Bremen, energy efficiency, water, waste, and emissions were defined as key environmental aspects in a broad discussion in the environmental committee. At the beginning of 2016, after a detailed evaluation by the environmental committee, “biological diversity” was added as another important environmental aspect. All documents in the environmental management system are available via the platform https://www.uni-bremen.de/umweltmanagement. The environmental statements of the past can be viewed here, as can the current environmental manual with the procedural instructions for all relevant processes in environmental management. https://www.uni-bremen.de/umweltmanagement/redirection/umwelthandbuch. In addition, the legal directory is available here for all university employees and interested external parties.

The environmental management system of the University of Bremen covers the University of Bremen facilities across the whole of the campus with a total area of about 513,202 m², 57,428 m² of open space, and 158,468 m² of green space. The footprint includes minor roads, parking lots, green spaces, and the sports facilities. Public roads are not included.

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Aerial view of University of Bremen

The buildings of the University of Bremen have a ground floor area of 127,038 m² and a main useable floor area of approximately 197,915 m² in total.

Organizationally, the environmental management system covers all academic and non-academic institutions of the University of Bremen.

These particularly include the 12 faculties, the central units, the central academic facilities, and the administration with its administrative departments and administrative units.

Not included in the environmental management system are the external users on the site, i.e., the facilities and organizational areas that do not belong directly to the university (e.g., Student Services Organization with its Mensa cafeteria and student residence, the State and University Library Bremen, Bremer Bäder-Gesellschaft with its indoor swimming pool), as well as the affiliated institutes and companies (e.g., BIAS, Fiber Faserinstitut, BIBA, ZARM Drop Tower, Mikrofab). Although some of them are closely related to university institutions, they have their own management and leadership. The Fiber Institute at the University of Bremen has its own environmental management system certified according to ISO 14001.

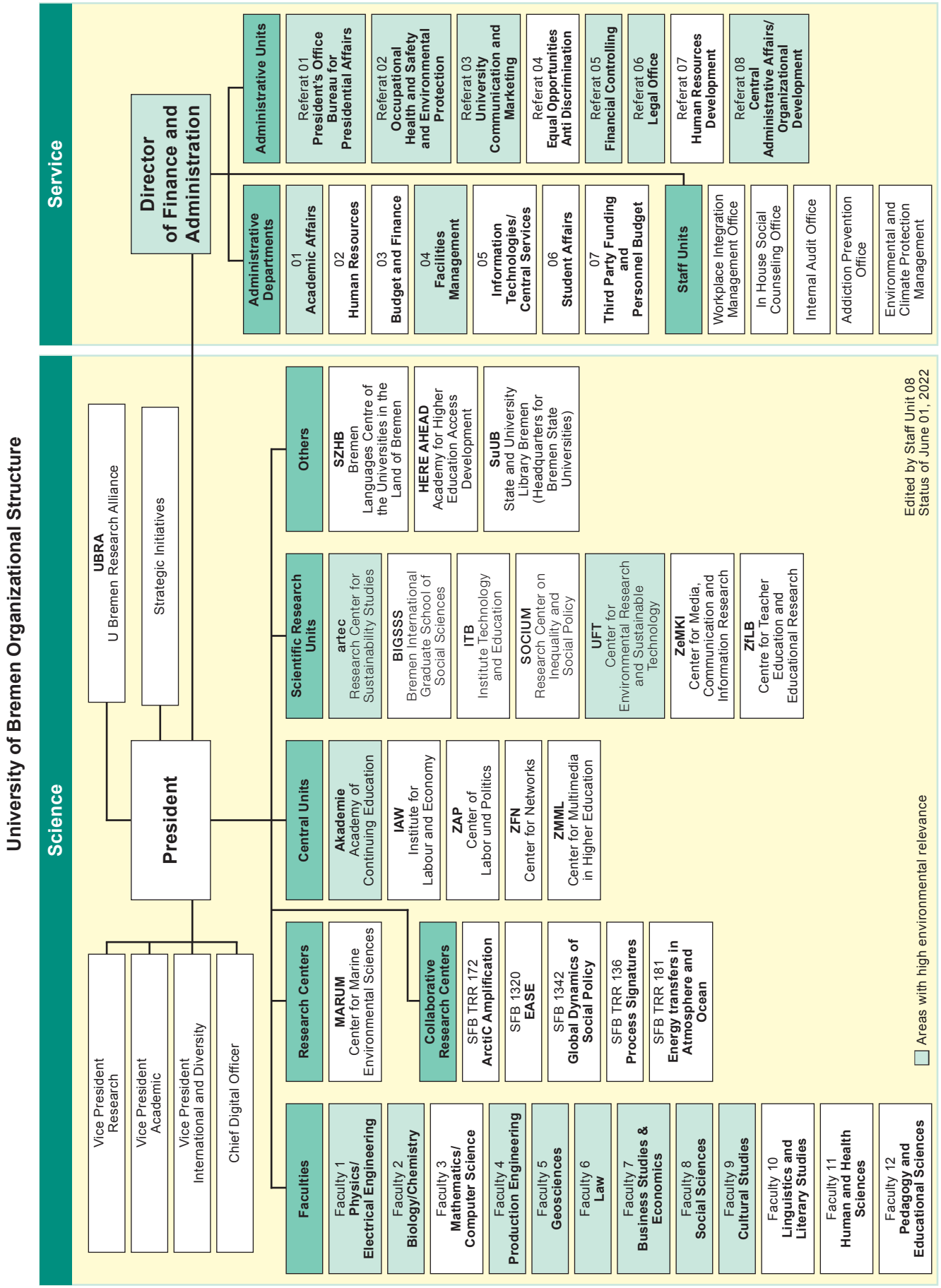

Fig. 3: Organizational chart of the University of Bremen

Context of the University of Bremen

The Amendment Regulation to the EMAS III Regulation (Amendment Regulation (EU) 2017/1505) requires the context of the organization to be presented. The consideration of external and internal context issues is part of every organizational strategy and therefore not fundamentally new for organizations. What is new is the systematic consideration of these issues within the environmental management system.

organization, (e.g., as public funding providers, business enterprises, potential clients, media).

With international networking and increasing complexity, the reputation of a university is also influenced by the direct and indirect actions of stakeholders. The relationships between the stakeholders are dynamic and reciprocal, i.e., in addition to the pure exchange of interests, there is also a mutual influence. A stakeholder analysis is therefore also an important prere-

Fig. 4: Stakeholders in the context of the University of Bremen

As an organization, the university is embedded in an extensive network of different interest groups, so-called “stakeholders”, who interact with the university in various ways. In simple terms, stakeholders can be divided into internal and external actors: Internal stakeholders are active within the organization, (e.g., as university management, staff, students, and teaching staff), external ones are primarily active outside the

quisite for the early recognition of potential risks and dangers, and also for the identification of opportunities and possibilities in order to enhance the appeal of the university.

Within the university, environmental management is a central stakeholder that interacts with all areas of the university. The diagram schematically illustrates the

interaction of the diverse stakeholders in the context of the university.

Sustainability Forum

For many years, the University of Bremen has had a successful organizational structure for implementing the EMAS environmental management system: formerly, the Environmental Officer to the Director of Finance and Administration and the Environmental Coordinator managed the process with the help of the Environmental Committee. This task remains and will continue to take up much of the Environmental Coordinator's working time. Since 2017, the Director of Finance and Administration has assumed the role of the Environmental Management Officer, supported by the Environmental Management Coordinator.

The university has just published its third sustainability report, demonstrating in the German university landscape that it is interested in the topic of sustainability and takes its social responsibility seriously. A significant demonstration of this, both internally and externally, are the sustainability guidelines that the Academic Senate adopted in 2010.

Standards for integrating sustainability into universities are gaining acceptance nationwide. Similar to EMAS, these standards include creating internal structures that monitor the issue of sustainability and make suggestions to the university management for appropriate goals and measures.

Therefore, in 2018, the University Executive Board established a Sustainability Forum with an inner circle comprised of a small number of members. In the inner circle, the process is coordinated by one representative from each of the following: research, teaching, operations, governance, transfer, and student initiative and engagement, as well as the environmental officer/coordinator. They consult on a case-by-case basis with other members of the university who are working on sustainability-related issues.

The Sustainability Forum is mandated by the University Executive Board to coordinate an intra-university discourse on the topic of a sustainable university, and to link this discourse with the nationwide networks for sustainability at universities. As a committee meeting on a regular basis, the Sustainability Forum has meanwhile been opened up to other interested parties. It is charged with making proposals to the University Executive Board for a more sustainable university and developing governance structures suitable for the University of Bremen.

Academic Senate Commission on Sustainability, Climate Justice, and Climate Neutrality

An important decision-making committee at universities is the Academic Senate. It is made up of members of the university faculty, staff, and students.

The Academic Senate is the central decision-making institution of the university. Its competences are regulated in § 80 para. 1 of the Bremen Higher Education Act (BremHG). The tasks of the Academic Senate include:

- Adoption of resolutions on the basic regulations and other statutes, unless other responsibilities are stipulated by law.
- Adoption of resolutions on the establishment, modification, and dissolution of study programs, faculties, departments, etc.
- Adoption of resolutions on the application for allocation of funds
- Election of the President
- Appointment of the Vice Presidents and the Director of Finance and Administration at the suggestion of the President
- Decision on the university development plan submitted by the University Executive Board
- Decision-making on the principles of resource management
- Statements on all self-administration tasks of fundamental importance
- Receiving and discussing the annual accountability report of the University Executive Board
- Appointment of the Gender Equality Officer according to § 6 BremHG.

The Academic Senate considers the goals of sustainability, climate neutrality, and climate justice to be a strategic priority of the University of Bremen. In 2020, the Academic Senate decided to establish a Standing Commission for Sustainability, Climate Neutrality, and Climate Justice. The commission prepares draft resolutions for the Academic Senate on the topics of sustainability, climate neutrality, and climate justice in the areas of teaching, research, administration, and operations. This is done in close cooperation with the

Study Commission, the Research Committee, and the Director of Finance and Administration.

The commission consists of:

- three university teachers, three research assistants, three students, and three members of the administrative and technical staff,
- and in an advisory capacity: Director of Finance and Administration, Chairperson of the Study Commission, Chairperson of the Research Committee, Environmental Management Coordinator, spokesperson of the Central Commission for Women's Issues (Gender Equality Officer),
- and one dean.

The Commission for Sustainability, Climate Neutrality, and Climate Justice is charged with developing a strategy for sustainability, climate neutrality, and climate justice. As an impetus for the commission's first meeting, Students for Future provided a catalog of possible actions. These measures are now being discussed and fine-tuned by the commission.

Environmental Policy

Sustainable action is one of the guiding principles of the University of Bremen and thus a central component of everything the university does, be it teaching, research, or administration. To implement this guiding principle, to stimulate a continuous improvement process, and to do more in the area of environmental protection than is required by the legal regulations, the University of Bremen has formulated the following Environmental Guidelines. In these guidelines, the University of Bremen also takes up the idea of sustainability and embeds it in research, teaching, and its operational activities.

Sustainability and Environmental Guidelines of the University of Bremen
Social responsibility and environmentally compatible actions are guiding goals of the University of Bremen and thus a central component of all university concerns from teaching, research, and administration. In order to put these goals into practice, to stimulate a continuous improvement process, and to live up to its exemplary function toward students and employees, the University of Bremen commits itself to the following sustainability and environmental guidelines:

Ensure efficiency
As an ambitious educational institution, the University sees its social task as creating and imparting knowledge and skills. The long-term efficiency of the University of Bremen requires its members to interact responsibly with each other and with the resources available. The university management is committed to this.

Energy efficiency and management of natural resources
At the center of the University of Bremen's sustainability and environmental activities are efforts to reduce the use of natural resources and to avoid operationally harmful effects on the environment and health. The university is taking up the challenge of climate neutrality and increasing energy efficiency.

Health protection and education of university employees
The University of Bremen regularly implements measures to ensure health-friendly work and study conditions and supports the health-conscious behavior of all university employees. It actively promotes health-related, social and cultural initiatives. Furthermore, the university enables its members to receive further education and training on issues of sustainable development.

Sustainability and environmental protection in research and teaching
Issues of sustainability and environmental protection are important subjects of research and teaching at the University of Bremen. These topics are taken up and dealt with in a large number of research projects and courses, thus providing important impulses for scientific, social, and political dialogue. All students have the opportunity to attend courses on education for sustainable development as part of the bachelor's and master's degree programs.

Participation and transfer in the context of sustainability
The University of Bremen is aware of its exemplary function. It also offers the public forums for the exchange of information and experience. With its scientific competence in research and teaching, it thus makes an active contribution to the protection of the natural environment and the dissemination of sustainable action.

Institutionalization of sustainability and environmental protection
For the practical implementation of the Sustainability and Environmental Guidelines, the committees and facilities of the University of Bremen support the work in research, teaching, and administration, as well as in the student initiatives. The University of Bremen provides a sustainability and environmental program which lists and discusses its goals and measures. This program serves as the foundation for the continuous improvement of the sustainability and environmental protection performance at the University of Bremen.

Environmental Goals and Environmental Program 2022

The following table shows not only the current environmental measures to improve environmental performance, achieve targets and objectives, and ensure compliance with legal obligations in the environmental field in accordance with Regulation (EU) 2018/2026 Annex Chapter B lit. e, but also the measures implemented in the last two years

Measures	Implementation period	Person(s) responsible	Status
Environmental goal: Further development of environmentally compatible and safe handling of hazardous substances (1)			
Planning of an Emergency Response Day	January 2023	Admin. Unit 02, Director of Finance and Administration	In planning
Planning of a Hazardous Materials Day 2023	February 2023	Robert Crueger	Schedule currently being planned
Environmental goal: Optimization of paper consumption (2)			
Conversion of towel dispensers in restrooms to paper-saving systems with EU-ECO label paper	December 2022	Admin. Dept. 04	Measure currently being implemented. Further buildings will be upgraded
Notice on economical paper consumption in the restrooms	December 2022	EMAS WG	EMAS flyers and stickers are being printed, the COVID-19 crisis led to delays
Environmental goal: Optimization of energy and water consumption (3)			
Evaluation of the use of smart control ventilation systems, taking into account long-term weather data, in selected buildings	February 2019	Admin. Dept. 04	Reviewed, currently not implementable
Replace lighting in all buildings with LEDs with the goal of 5 % energy savings overall in the respective buildings, starting from 2018	July 2021	Admin. Dept. 04, Technical Facility Management	Measure is currently being implemented. In the administration building, 26 % energy has already been saved, compared to 2012. Other buildings have been added
Planning and implementation of an energy-saving campaign with the target of 3 % energy savings on total consumption, starting from 2018	November 2021	EMAS WG, Climate Protection Manager	The campaign is scheduled to run until March 2022, with implementation starting on Oct. 1, 2021. The campaign was postponed due to the COVID-19 crisis
Application for a position for climate protection management to implement the climate protection concept	May 2022	Environmental management coordinator, Director of Finance and Administration, University	The position is established, environmental management coordinator acts as climate protection manager

Measures	Implementation period	Person(s) responsible	Status
Replacement of motors in the ventilation systems with the goal of 12 % energy savings for the building	December 2022	Admin. Dept. 04	Measure has been implemented, energy consumption data is currently being collected
Building energy analyses	December 2022	EMS Coordinator	Measure is in the planning phase. Buildings must be selected in cooperation with the “Technical Operations” department
Planning of a solar installation on the BIBA building	December 2022	Solar Cooperative, Admin. Dept. 04	The measure is in preparation
Environmental goal: Reduction in amount of staff-related waste (4)			
Workshops on the handling of waste	December 2019	Waste Management Officer	First training courses have taken place, measure has been extended
Development of a poster series on the careful, environmentally sound handling of waste	September 2022	EMS Coordinator	Deadline extended, posters and stickers are currently being printed
Environmental goal: Further development of emergency provisions and fire protection (5)			
Fire safety training, Training courses for - fire protection assistants - technical advisors - building contact persons - emergency call acceptance fire training (after technical conversion)	December 2022	Admin. Dept. 04, Fire protection north (experts)	In planning
Implementation of measures as part of the fire protection in the GW 1 building	December 2022	Admin. Dept 04	Measure started
Implementation of (partial) building evacuation exercises in the MARUM according to concept	July 2023	Admin. Dept 04, Fire protection north (experts)	Concept is completed
Environmental goal: Optimization of transport links to the campus (6)			
Survey of bicycle parking spaces on campus with the aim of improving the parking situation for bicycles	December 2019	EMS Coordinator, Staff of Senator for Education and Science	Measure completed
Planning and installation of a bicycle garage	August 2022	Admin. Dept 04; EMS Coordinator	Planning started
Development of a mobility concept for the technology park	December 2022	EMS Coordinator	Planning started, date postponed to December 2022
Environmental goal: Effective communication of occupational health, safety, and environmental protection (7)			
Planning and implementation of sustainability days with the motto “Festival of Actions”	May 2020	Sustainability Forum Virtuelle Akademie	Measure completed
Planning and implementation of an information day for building management	October 2022	Admin. Dept 04; EMS Coordinator	In planning, date postponed

Environmental Goals and Environmental Program 2022

Measures	Implementation period	Person(s) responsible	Status
Environmental goal: Optimization of environmental protection during the planning phase (8)			
Planning of the Marum3 building, considering energy aspects and the strict legal requirements of the State of Bremen (passive house)	Completion 2023	Admin. Dept 04; Senator for Education and Science	The building measure has been started. Completion is delayed
Planning of the energy-efficient renovation of the A-block NW2	December 2019	Admin. Dept 04	Planning has started
Pilot project for facade greening on selected buildings	December 2022	Admin. Dept 04	Measure in planning
Environmental goal: Broader integration of sustainability aspects in research and teaching (9)			
Sustainable Development Goals: Ambivalences of a Global Agenda - Lecture Series on the 17 Sustainable Development Goals (SDGs)	October 2020	artec – Sustainability Research Center	Measure implemented
- Climate-resilient city - Urban-rural cooperation - Regional innovations of energetic biomass use and governance (KlimaInnoGovernance)	August 2021	artec – Sustainability Research Center	Measure implemented
Establish a commission for sustainability, climate justice, and climate neutrality	April 2021	University Management, Academic Senate	First meeting has taken place. The commission now meets regularly
Energy Consumption of Private Households in the Context of the Energy Transition (Subproject of the ClimateInnoGovernance Research Network)	August 2021	artec – Sustainability Research Center	Research project has started
Project: Energy consumption at the University of Bremen – What is the climate's influence?	March 2023	Institute of Geography	Research project has begun; integration of this project into teaching will start in the summer semester of 2022
Environmental goal: Conservation and promotion of biodiversity (10)			
Organize a biodiversity day on campus	May 2019	NUB, Biodiversity Hub	Could only be held online due to the COVID-19 crisis
Impact of the new green space management on the species diversity of insects	July 2021	Institute of Ecology	The students have started with their master's or bachelor's theses
Creation of a bird registry on campus (BA)	December 2021	NUB, Biodiversity Hub	Measure implemented
Impact of vegetation structure on insect diversity and biomass development	April 2022	Institute of Ecology	The students have started their master's or bachelor's theses
Examine whether further areas on campus can be made available as "flowering areas"	May 2022	NUB, Biodiversity Hub	There are currently inquiries from various affiliated institutes

Direct Environmental Aspects and Core Indicators

The core indicators of the University of Bremen in the context of the university operations are regularly discussed and evaluated in the corresponding committees. The data are reviewed and made available by the “Technical Operations” department.

The following table shows the environmental aspects, their environmental impacts, and the core indicators derived therefrom for the environmental management system.

Environmental aspects	Environmental impact	Core indicator
Purchasing and supply	Materials and substance use Life cycle assessment of products and services purchased	Paper (t)
Wastewater	Possible environmental impact on water bodies	
Waste	Possible environmental impact on water, soil, and atmosphere through transport, recycling, and disposal	Residual waste (t) Waste paper (t)
Hazardous waste	Possible environmental impact on water, soil, and air pollution and harm to humans from hazardous waste	Solvents
Hazardous substances	Possible environmental impact on water, soil, and air pollution as well as harm to humans from hazardous substances	
Water	Resource consumption	Water (m^3)
Electricity	Resource consumption	Strom (MWh)
Wärme	Resource consumption	Heating (MWh) Heat for cooling (MWh)
Biodiversity	Effect on local flora and fauna through green management and biodiversity research	
Land consumption	Effect on microclimate and flora and fauna through sealed surfaces from construction projects, paths, squares and roads	Total area (m^2) Built-up area (m^2) Green area (m^2)
Emergency, operational failure	Possible emissions or accidents due to fires, explosions, or accidents involving water-polluting substances	

Consumption Data at a Glance

Energy

Electricity

The University of Bremen obtains 100 % of its electricity from renewable sources. The electricity consumption includes the consumption of the Student Services Organization and so-called affiliated institutes.

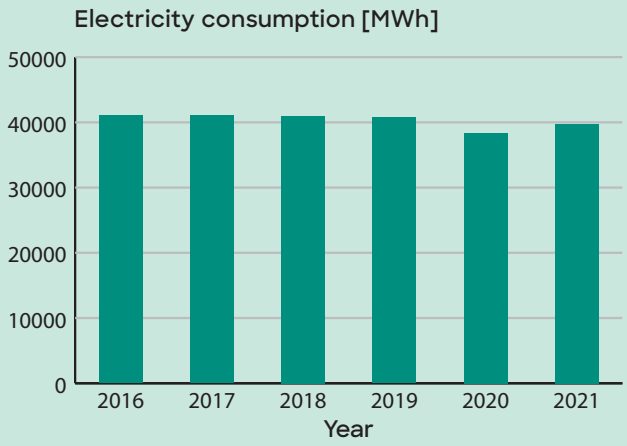

Fig. 5: Electricity consumption at the University of Bremen over time

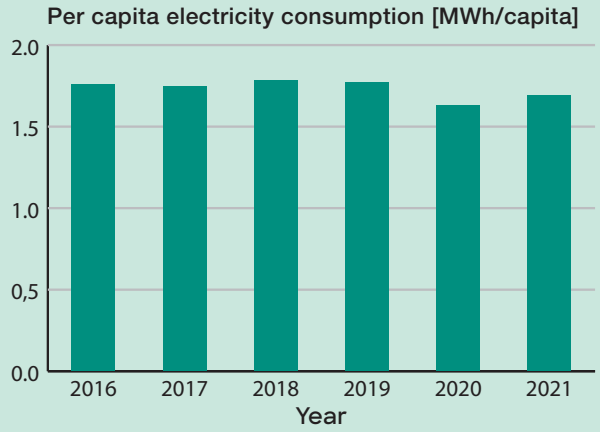

Fig. 6: Specific electricity consumption per capita at the university over time

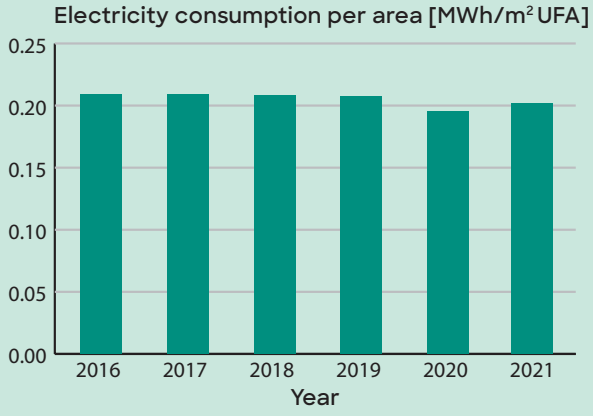

Fig. 7: Specific electricity consumption per main usable floor area (UFA)

Heat

District heating from the Bremen waste-to-energy plant is obtained from the steam after it has passed through the power turbines as part of the combined heat and power (CHP) system. The use of steam at the Bremen waste-to-energy plant results as a secondary process from the incineration of waste. The heat is used on the one hand for heating requirements, but also to a large extent for the generation of cooling.

All university buildings are included in the data on heat consumption. As with electricity consumption, this also includes buildings occupied by the Student Services Organization and the affiliated institutes.

In addition to heat for heating the various buildings, heat is used for cooling purposes. Comprising about one third of total consumption, this accounts for a considerable proportion of the total heat demand.

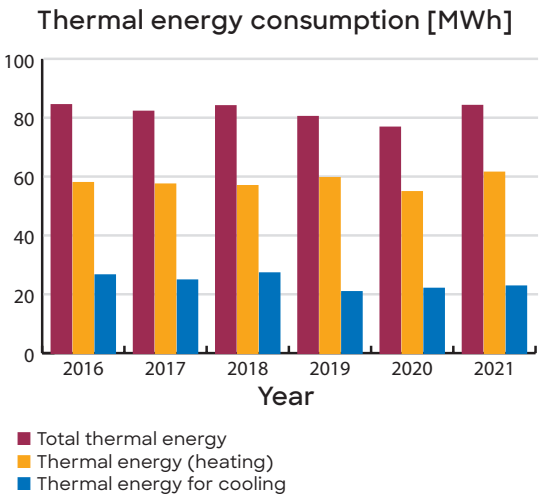

Fig. 8: Heat consumption and use

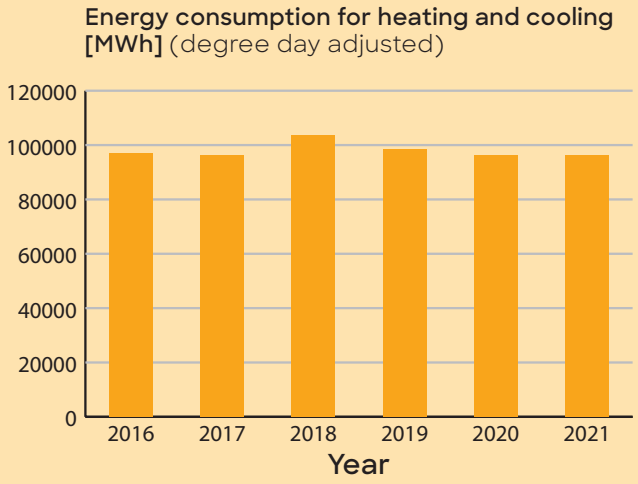

Fig. 9: Heat consumption of the university over time

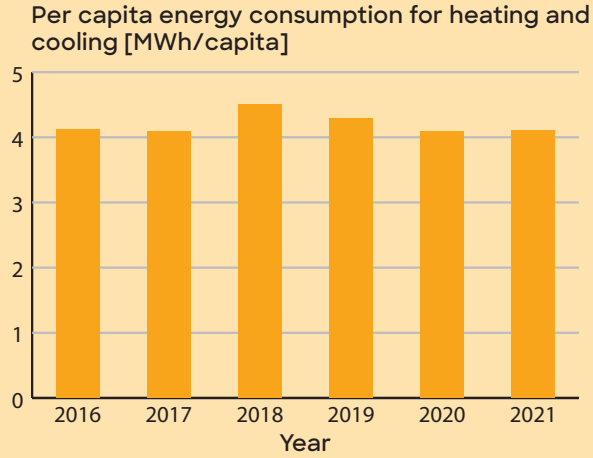

Fig. 10: Specific heat consumption per capita at the university over time (incl. heat for cooling production)

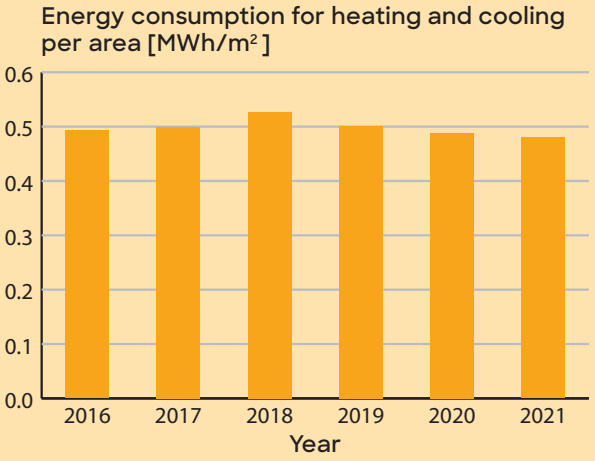

Fig. 11: Specific heat consumption per main usable floor area (UFA)

ÖKOSTROM ZERTIFIKAT

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Ökostrom von swb bezieht.

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Fig. 12: Green electricity certificate for the University of Bremen

Solar Energy on Campus

Since 2011, university members have operated a solar cooperative with solar panels on the roofs of the university. The cooperative could thus celebrate its 10th anniversary in 2021. The planning and also the operation of the installations are carried out by committed university staff and students. In the meantime, the cooperative has been able to expand its field of activity and has also participated in a wind farm in the vicinity. New PV installations are currently being planned on the roofs of the university. Initial bids have been received and construction will start shortly. The university management supports the process.

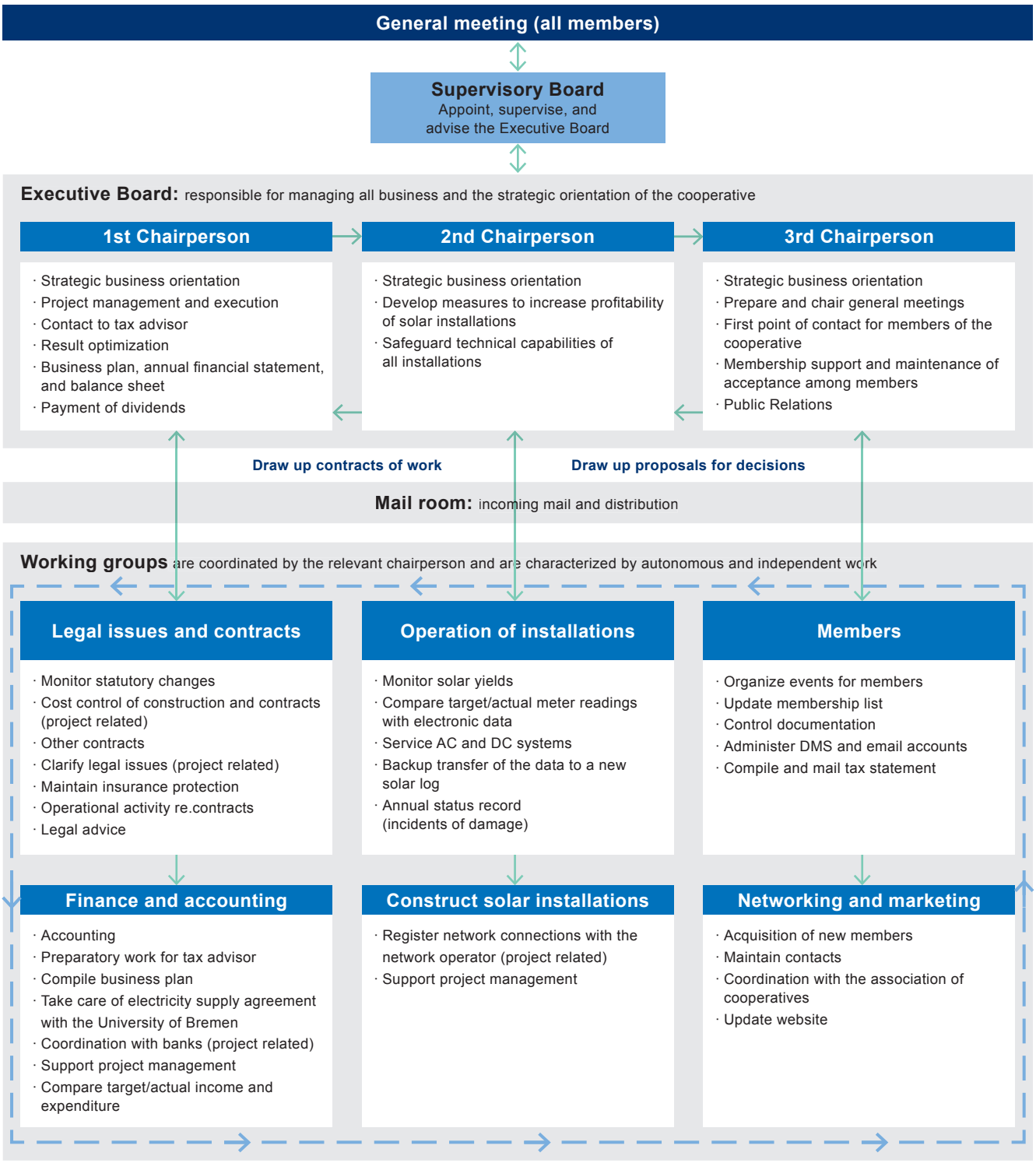

Fig. 13: Organizational structure of the solar cooperative at the university

The solar cooperative is now known nationwide and is a model for many universities. This is also reflected in an interview that the university's environmental and climate protection officer, as a founding member of the cooperative, gave to representatives of the University of Wuppertal in February 2022 (blickfeld, Die Campuszeitung für Wuppertal):

"No university in Germany has installed as much solar power on its roofs as the University of Bremen."

UniBremenSOLAR eG put its first photovoltaic installation into operation in 2011. The cooperative, which is supported by employees and students of the university, has since built five more installations. We spoke with Dr. Doris Sövegjarto-Wigbers, climate and environmental protection manager at Bremen University, about the history of the cooperative, its activities, and future plans.

blickfeld: "Dr. Sövegjarto-Wigbers, can you briefly introduce yourself to our readers?"

Dr. Sövegjarto-Wigbers: "I have been working at the University of Bremen since 1996 and am currently the environmental coordinator and climate protection manager. My first task was to introduce and establish environmental management at the university. The University of Bremen was one of the first universities to introduce the EU environmental management system EMAS. Since then, I have been in charge of the associated auditing procedures so that the EMAS certificate, which is valid for three years, can be regularly renewed. This certifies the university's environmental performance beyond the legal requirements."

blickfeld: "What does your day-to-day work look like?"

Dr. Sövegjarto-Wigbers: "I keep in touch with all the university's offices and institutions and identify potential for conserving resources and reducing CO_2, for example in energy consumption, lighting, or heating control. This involves both campaigns and continuing education programs to raise awareness of these issues among university employees, as well as technical solutions, such as converting to LED lighting or installing solar panels on campus."

"Many university employees were incredibly enthusiastic about the project, became members of the cooperative, and participated directly."

blickfeld: "The solar installations are operated by a cooperative. Can you tell us the story of how "UniBremenSOLAR" came about?"

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Dr. Doris Sövegjarto-Wigbers

Dr. Sövegjarto-Wigbers: "The establishment of a cooperative is the initiative of an environmental committee that has since been set up by the university and has developed various ideas to make the university more sustainable. This is where the commitment to erect solar panels on the roofs of the university buildings came about. The cooperative form of operation was quickly found, as there is, for instance, an example for our model in the "Volkswagen Belegschaftsgenossenschaft" for regenerative energies in Emden. The implementation took place "in a jiffy": In May 2011, the idea was formulated and only three months later — in August — the solar cooperative was founded. Many university members were incredibly enthusiastic about the project, became members of the cooperative, and participated directly."

blickfeld: "The setting up of the first PV installations also happened quickly — how did that work out?"

Dr. Sövegjarto-Wigbers: "One advantage is that the University of Bremen can manage its properties autonomously. Therefore, it can let the cooperative use the roof surfaces on favorable conditions. In addition, the university is embedded within a technology park, which goes hand in hand with its own local power grid. This means that electricity can easily be fed into the campus infrastructure and consumed directly by the university, generating revenue for us as a cooperative.

At the beginning of the planning, staff from the Administrative Department for Technical Operations and Building Affairs selected suitable university roofs. As a result, we were able to install and commission four installations, for example on the roof of the Mensa cafeteria, as early as 2011. Financing was provided on

the one hand by cooperative contributions and on the other by bank loans. In the meantime, the latter have been replaced by loans provided by the cooperative members, on which interest is paid accordingly. In principle, a dividend is also paid to all members of the cooperative, or rather for their shares, but this only takes place every two years. It is more important to our members to support a project and thus contribute to the energy transition."

blickfeld: "What has been the response from the university and the community?"

Dr. Sövegjarto-Wigbers: "The university is proud of the project, because it is a unique identifier for the location whose appeal radiates out to the city of Bremen and beyond. Many of the 128 members of the cooperative are committed and volunteer to help out, most recently with the cleaning of some of the PV installations. Transparency is also important to us: our electricity production and the resulting CO_2 savings can be viewed by the public."

"Last year, we were able to generate a total of 663,575 kWh of power."

blickfeld: "How much energy could be produced via the cooperative's PV installations and how much CO_2 could be avoided as a result?"

Dr. Sövegjarto-Wigbers: "Our solar panels have supplied a total of 5,034 MWh of solar power between the founding of "UniBremenSOLAR eG" and mid-2021.

Measured against the average electricity mix in the Federal Republic of Germany, this corresponds to a saving of approximately 1,973 t CO_2. Last year, we were able to generate a total of 663,575 kWh of power, significantly exceeding our planned figure of just under 600,000 kWh. No university in Germany has installed as much solar power on its roofs as the University of Bremen."

blickfeld: "What are the cooperative's further plans and goals?"

Dr. Sövegjarto-Wigbers: "We would like to further expand our commitment to the energy transition. For example, we recently participated in a citizen's energy cooperative and in a wind turbine it built. There are also plans to erect another PV installation on campus. With these steps, we want to set a good example and motivate society and those in the political arena to take their own initiatives."

The interview was conducted by Martin Wosnitza.

Energy-saving Campaign

In November 2021, the “Energy Saving Campaign 3.0” was launched at the University of Bremen. Under the motto “Climate Protection at the University”, a package of information was sent to all employees and students informing them of opportunities to participate in more climate protection at the university.

Various stickers were included in the package for employees to remind them to switch off various devices. A leaflet with tips on how to save energy at the university, vouchers for a power strip that can be switched off, a thermometer that displays the temperature in the office, and much more supplemented the comprehensive package of information. The material was placed on the Environmental Management website, where it will also be available for download by anyone interested, even after the campaign has finished.

An additional incentive to participate in the energy-saving campaign was provided by a CO_2-saving competition. Using an app specially set up for members of the university — the “Klimakarl” — participants were able to record their daily CO_2-saving measures and compare them with each other in direct competition. If certain targets were reached, the “Klimakarl” company made donations to non-profit environmental protection organizations.

The “Energy Saving Campaign 3.0” is accompanied scientifically by a two-part survey on attitudes and personal behavior in the area of climate and environmental protection. The initial evaluations show that there is not only general interest in the topic, but that the employees very much welcome the university’s climate protection initiatives. Numerous suggestions and proposals for improvements were made, but there was also general criticism of the slow progress being made in climate and environmental protection.

A university-wide modal split survey is planned for the fall of 2022. The survey is intended to collect important information about the mobility behavior of employees and students and thus support potential control measures by the university with regard to parking management, bicycle garages, university-issue electric bikes for staff, etc.

Fig.14: Sticker from the energy saving campaign on the subject of ventilation

Emissions / Renewable Energies

The emissions produced by the University of Bremen are mainly related to energy consumption. Since the University of Bremen obtains so-called “NaturStrom” electricity from the energy supplier swb and its heat comes from the nearby waste-to-energy plant, it does not generate any CO_2 emissions.

Water*

In 2021, a slight downward trend in water consumption can again be observed. This may be due to the COVID-19 crisis and the closure of the university. On the other hand, water-saving systems in all sanitary facilities were upgraded campus-wide.

*** Including water for drinking, cooling, soft water, and swimming pool operation. (The operating costs of the swimming pool are allocated to the university.)**

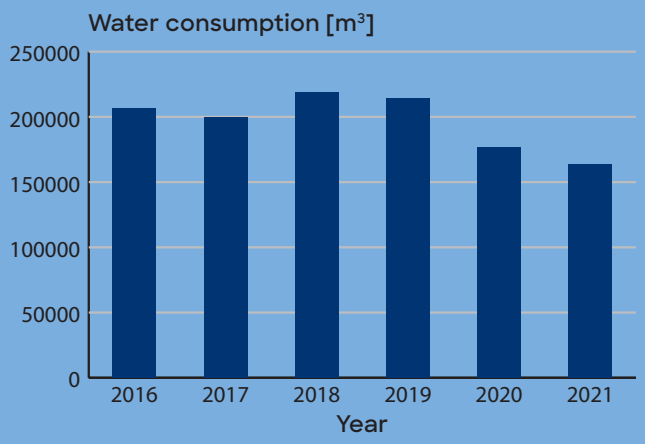

Fig. 15: Water consumption at the university over time

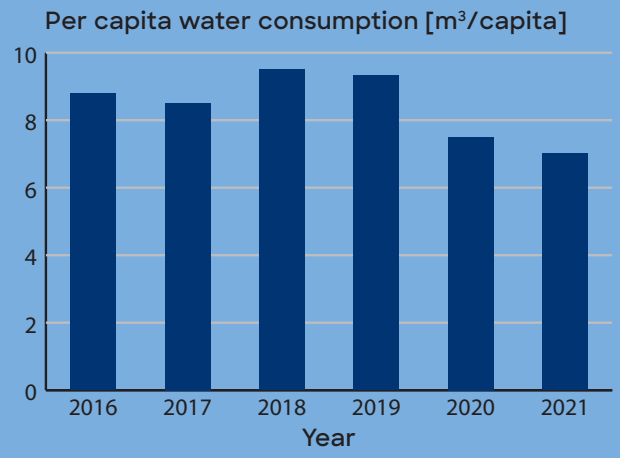

Fig. 16: Specific water consumption per capita at the university over time

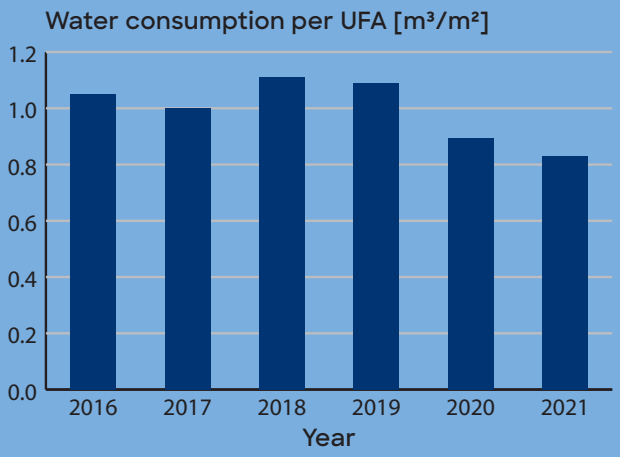

Fig. 17: Specific water consumption per main usable floor area at the university over time

Waste

The central responsibility for the collection, recycling, and disposal of recyclable materials and residual waste at the University of Bremen lies with the Waste Management Officer. He is also the head of the certified waste management company and is part of Administrative Unit 02 “Biological Safety, Hazardous Substances, Radiation Protection, and Waste Disposal”. Here, not only is hazardous waste from the university collected and sorted, but proper disposal is also offered for external facilities. For example, old chemicals are disposed of for all schools in the State of Bremen and the procurement of new chemicals is organized centrally. A specially equipped vehicle ensures proper transportation.

Recycling stations are distributed around the university campus in the vicinity of almost every building, where residual waste, waste paper, glass, “Green Dot”, and other recyclable and residual materials are collected separately, depending on the respective recycling situation and structure of the building.

The total quantities of waste disposed of at the university in 2021 were 348 t for residual waste and 305.9 t for waste paper. They are thus slightly down overall compared to previous years.

The central responsibility for the disposal of hazardous waste at the University of Bremen also lies with the Waste Management Officer and the Central Waste Disposal Unit. Approximately 50 different types of waste are currently managed. The Waste Management Officer is also responsible for the preparation of waste balances, waste management concepts, and compliance with legal regulations such as waste disposal certificates, etc.

The total amount of waste requiring special monitoring in 2021 was approximately 49 tonnes. Thus, the amount of hazardous waste has remained relatively constant in recent years with a slight downward trend.

The information on hazardous waste disposal at the University of Bremen is documented and prepared in detail on the website www.abfall.uni-bremen.de as well as in the “Guideline on the Handling, Collection, and Disposal of Waste at the University of Bremen”.

1. Name und Anschrift der Zertifizierungsorganisation

1.1 Name: bregau zert GmbH

1.2 Straße: Mary-Astell-Straße 10

1.3 Staat: DE Bundesland: HB

Postleitzahl: 28359

Ort: Bremen

ENTSORGUNGSFACHBETRIEB ZERTIFIZIERT bregau zert

3. Angaben zum Zertifikat

3.1 Nummer des Zertifikats (durch die Zertifizierungsorganisation frei zu vergeben): BREG2001-3/19

3.2 Erstmalige Zertifizierung ☐ oder Folgezertifizierung ☒

3.3 Vorgangsnummer (soweit von der Behörde erteilt): ZZDT001000946003

3.4 Das Zertifikat beinhaltet 3 Anlage(n).

3.5 ☐ Das Zertifikat wird nur für einen bestimmten Betriebsteil erteilt (siehe Anlage(n)

3.6 ☒ Das Zertifikat wird nur für bestimmte Abfallarten, Tätigkeiten oder Standorte erteilt (siehe Anlage(n) 1-3).

3.7 Das Zertifikat ist gültig bis zum 31.07.2022

4. Name und Anschrift des Entsorgungsfachbetriebes (Hauptsitz):

4.1 Name: **Universität Bremen – ZAE – Zentrale Abfallentsorgung**

4.2 Straße: Leobener Straße – NW 2 -

4.3 Staat: DE Bundesland: HB

Postleitzahl: 28359 Ort: Bremen

4.4 Eintrag in das Handels-, Vereins- oder Genossenschaftsregister (sofern ein Eintrag erfolgt ist):

Registernummer (HRA, HRB etc.): Nicht zutreffend Registergericht:

Fig. 18: Excerpt from the certificate for a waste management facility

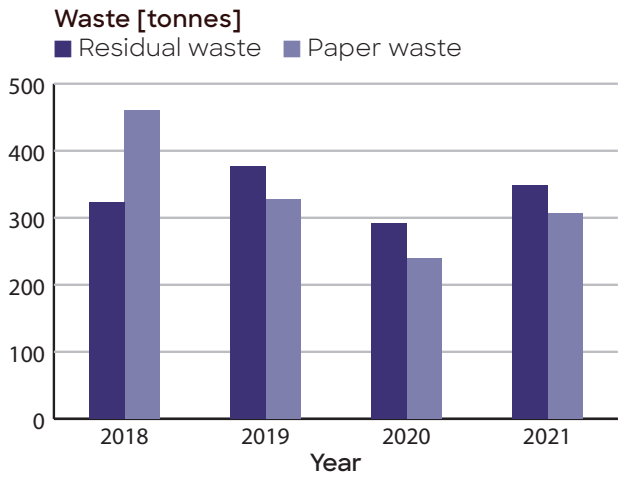

Fig. 19: Amount of residual waste and waste paper at the University of Bremen

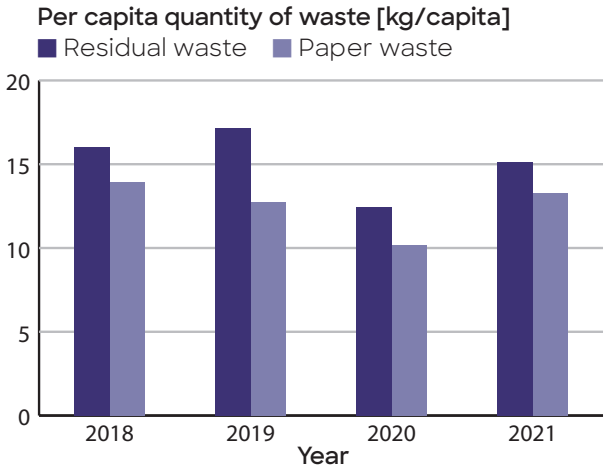

Fig. 20: Amount of residual waste and waste paper per capita (employees and students)

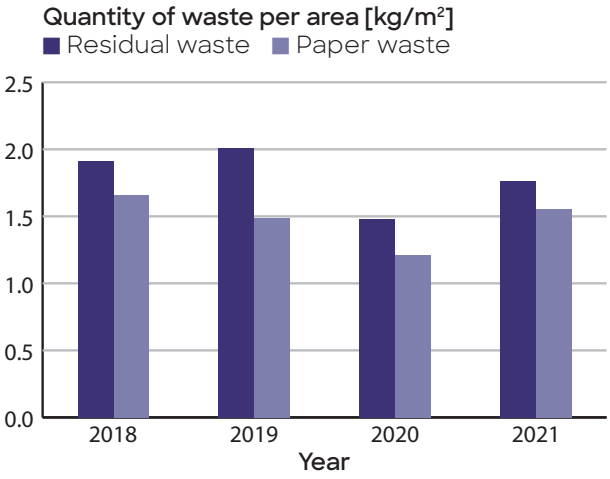

Fig. 21: Volume of hazardous waste over time

For solvent waste and hazardous waste, no data per capita or per area were reported, since only about 40 % of university employees have any contact with hazardous waste and/or solvents.

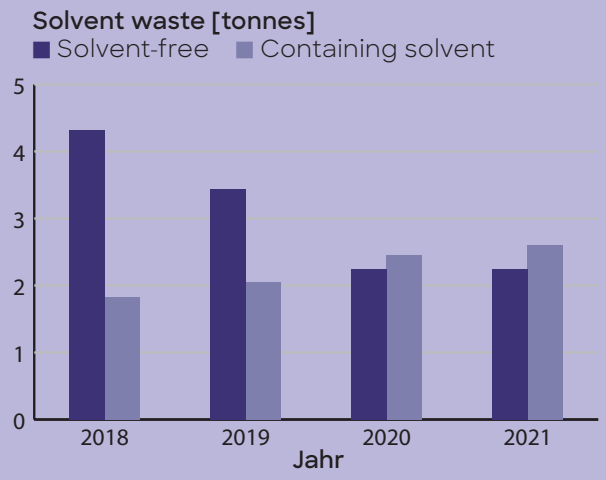

Fig. 22: Amount of solvent waste mixtures over time

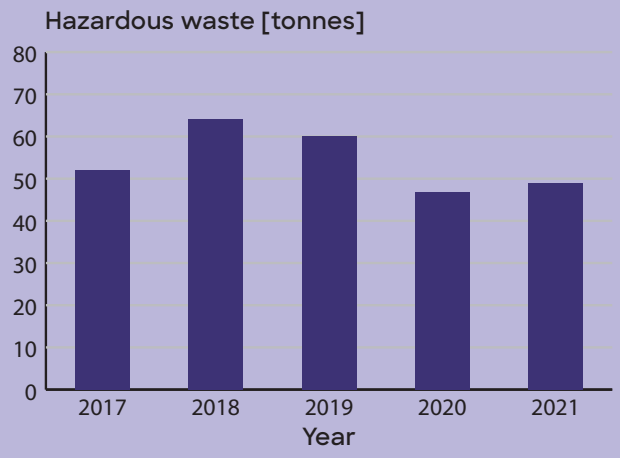

Fig. 23: Volume of hazardous waste over time

Material Efficiency

For several years, the University of Bremen has been strongly committed to improving material efficiency. Various projects are working on the goal of using material more efficiently. For example, since 2016 the University has been participating in the survey conducted by the “proRecyclingpapier” initiative on the use of recycled paper at universities.

In 2021, the University of Bremen used 100 percent recycled paper with the “Blauer Engel” (Blue Angel) label in its administration. With this recycled paper quota of 100 percent and 19 special points, the University of Bremen achieved first place in the evaluation and asserted itself as the “most recycled paper-friendly university” in 2021. Paper consumption has remained almost constant in recent years at 23 million sheets of paper per year.

In accordance with an official instruction, the university’s publications are predominantly printed on Blue Angel paper. The recycled paper used has a whiteness of ISO 80 or lower. The President takes the leading role in terms of best practice and uses only Blue Angel recycled paper for internal and external correspondence.

By using recycled paper, the University of Bremen has saved 1,168,088 liters of water and 240,556 kWh of energy compared to virgin fiber paper. The amount of water saved covers the daily drinking water needs of 9,653 people. The energy savings are equivalent to the annual energy consumption of 68 three-person households.

The in-house print shop also uses almost exclusively recycled products. The roll-ups frequently used at conferences and events are printed on recyclable cotton fabrics. In 2021, around 100 such roll-ups were printed. In the future, this may increase again if the COVID-19 restrictions are relaxed and more events can be held.

Another important aspect of paper consumption are the paper products used in the university’s sanitary facilities. Here, a conversion to more economical paper dispensers has taken place in recent years. Other materials, such as chemicals and consumables, cannot be listed at present because they are often bought in decentralized quantities.

Biodiversity

Biodiversity is a core indicator of the environmental management system at the University of Bremen. In April 2018, it was identified and defined as a key environmental aspect in the Environmental Committee. Initial measures in this regard were included in the environmental program. This was described in detail in the 2019 Environmental Statement. With the amendment of the EMAS III Regulation, in particular Annexes I – IV, further reference values have now been defined.

In recent years, the University of Bremen has undertaken some activities to improve biodiversity on campus. Biotopes have been created, nesting boxes have been distributed on campus, and insect hotels have been manufactured. 160 nesting boxes have meanwhile been installed, 30 insect hotels have been distributed, and more activities are being planned. In 2020, mowing of the grassy areas was limited and this will continue in 2021. The Biology Department will also scientifically monitor various measures in cooperation with the nature conservation group at the University of Bremen and garden maintenance.

Ground floor area:	127,038.73 m²
Green areas:	158,468.50 m²
Green areas:	197,915.44 m²
Open space:	57,428.00 m²
Total university area:	513,202.00 m²

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Legal Compliance

The University of Bremen can confirm that it has acted in accordance with the law and that no violations of the law are known. There have also been no known submissions from the senatorial authorities or other interested parties.

All environmentally relevant requirements are listed in a legal register that can be viewed by all university members on the Internet platform. The legal register is updated every three months.

https://www.uni-bremen.de/umweltmanagement/redirection/rechtsverzeichnis

Legal Regulations

This list contains important regulations for the University of Bremen for the individual environmental aspects

- Act on the Promotion of Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Disposal of Waste with the resulting ordinances and technical rules (Closed Substance Cycle Waste Management Act – KrWG).
- Law on the marketing, return, and environmentally friendly disposal of batteries and accumulators. The main emphasis of the law is the provision on the marketing, return, and environmentally friendly disposal of batteries and accumulators (BattG).
- Law for the Protection against Hazardous Substances with the resulting regulations and technical rules (Chemicals Act – ChemG).
- Law on the implementation of occupational health and safety measures to improve the safety and health of employees at work (ArbSchG).
- Ordinance on the National and International Transport of Dangerous Goods by Road and Rail (Dangerous Goods Ordinance for Road, Rail, and Inland Navigation (GGVSEB).
- Law on the Regulation of Water Resources with the resulting regulations and technical rules (Water Resources Act – WHG).
- Law for the protection against harmful effects on the environment caused by air pollution, noise, vibrations, and similar processes with the resulting ordinances and technical rules (Federal Immission Control Act – BImSchG).
- Technical rules for hazardous substances: Storage of hazardous substances in portable containers with the appendices contained (TRGS510).
- Ordinance on the return and disposal of used batteries and accumulators (Battery Ordinance – BattV).
- Bremen Implementation Act on the Avoidance and Disposal of Waste (BremAGAbfG).
- Energy Saving Ordinance (EnEV)
- Ordinance on Industrial Safety and Health, (BetrSichV).
- Ordinance on Installations for Handling Substances Hazardous to Water (AwSV).
- Regulation (EC) No. 1221/2009 of the European Parliament and of the Council of 25 November 2009 allowing voluntary participation by organizations in a community eco-management and audit scheme and repealing Regulation (EC) No. 761/2001, and Commission Decisions 2001/681/EC and 2006/193/EC.
- Bremen Local Law Amending the Local Law on the Disposal of Waste in the Municipality of Bremen (Local Law Amending Waste Disposal).
- Drainage Local Law (EOG)

DECLARATION OF THE ENVIRONMENTAL VERIFIER ON VERIFICATION AND VALIDATION ACTIVITIES

The undersigned, **Dr. Georg Sulzer**, EMAS environmental verifier with the registration number **DE-V-0041**, accredited or licensed for

the domains **85.42.1 und 72.2 (NACE-Code),**

confirms he has verified whether the entire organization, as described in the organization's updated environmental statement:

University of Bremen
Location: Leobener Straße, 28359 Bremen, Germany
with the registration number (DE-112-00022)

complies with all requirements of Regulation (EC) No. 1221/2009 of the European Parliament and of the Council of 25 November 2009 allowing voluntary participation by organizations in a community eco-management and audit scheme (EMAS), as amended by Regulations (EU) 2017/1505 and (EU) 2018/2026.

By signing this declaration it is confirmed that

- the verification and validation have been carried out in full compliance with the requirements of Regulation (EC) No 1221/2009), as amended by Regulations (EU) 2017/1505 and (EU) 2018/2026,
- the result of the assessment and validation confirms that there is no evidence of non-compliance with the applicable environmental legislation,
- 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 stated in the environmental statement.

This statement cannot be equated with EMAS registration. EMAS registration can only be carried out by a Competent Body in accordance with Regulation (EC) No 1221/2009, as amended by Regulations (EU) 2017/1505 and (EU) 2018/2026.

This declaration may not be used as a stand-alone basis for informing the public.

Altfraunhofen, May 2022

Dr. Georg Sulzer, Environmental Verifier (DE-V-0041)
Hangleite 2, 84169 Altfraunhofen, Germany

We will submit the next updated environmental statement in March 2023 and in March 2024.

The next consolidated environmental statement will be presented in March 2025.

Informations
www.uni-bremen.de
www.uni-bremen.de/umweltmanagement

Imprint

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