Forschung
in Sachsen.
Weißbuch.

Research success for the future

White Paper for research in public scientific institutions in the Free State of Saxony

STAATSMINISTERIUM
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Content

Interview with Sebastian Gemkow, Minister of Science

Science and research are subject to various ongoing transformation processes. The dialogue around this White Paper has revealed what favourable basic conditions for Saxony's research landscape have to look like.

Minister, what are the White Paper's goals and why is it so important?

Global events of recent years have made it very clear how big a role research plays in solving acute problems and overcoming long-term challenges.

We have to ask questions such as these: What can science contribute to sustainable development and to maintaining our prosperity? What can research do in crisis situations? What basic conditions do we need to create in Saxony in order to build on what we have and to establish new research structures in promising future fields?

Sebastian Gemkow

Answers to these and other general but also very concrete questions take centre stage in the White Paper process that was initiated by the Saxon State Ministry for Science, Culture and Tourism (SMWK).

To respond effectively to current as well as future challenges in Saxony as a scientific site, research policy guidelines need to be established at the core of the White Paper and consistently pursued. In doing so, we intend to make the successful, high-performing and transformable research ecosystem in the Free State even stronger.

How can good answers to the aforementioned exemplary questions and others be obtained?

Constructive processes begin with an honest analysis of one's own strengths and weaknesses. We examined Saxony's science landscape from this perspective, evaluated the state of affairs, and investigated the potential as well as the risks.

A broad-based dialogue with Saxony's science community as well as stakeholders from industry and politics was and remains indispensable in this process. Answering questions regarding future research policy and generating added value that not only benefits the State of Saxony requires the integration of complex knowledge and a wide variety of experiences.

Central research policy questions were worked out and possible solutions were debated in a variety of participation formats, including open discussion events, interviews and online surveys. This included exchanges with a commission of high-ranking experts that accompanied the entire process from a non-Saxon perspective and provided valuable support.

Through this extensive participative process, we have gained a lot of insights and generated ideas that are reflected in the guidelines. Now the joint implementation and further development of the guidelines are the next steps. ▶

"The White Paper is only the beginning. We have to keep communicating and must shape the future together."

You mentioned the commission of experts. Why is this external perspective important to you?

We all know the risk of organisational blindness. Members of an established system are often unaware, or no longer aware, of the own weaknesses and strengths. Critical questions that are essential to initiate change processes may no longer be asked.

So I'm very thankful that we had the support of the commission with high-ranking members in this process. Their technical expertise and great commitment, especially also the time they dedicated to this, made a major contribution to the preparation of this White Paper.

What impact will the White Paper have on research in Saxony?

The White Paper outlines the principles that will serve as the basis for the organisation of research and innovation. Since we cannot predict future technologies and methodological approaches, or only to a limited extent, it does not define a rigid catalogue of measures. It establishes the framework for a flexible scope of action that encompasses the unknown and unforeseeable. To be attractive for bright minds in competition with other research sites, we need to be agile and versatile. This is essential to successfully master the pending transformation processes.

We want to build on the strengths of our various research institutions. In particular, we want to support cooperation between the institutions – and with industry – because innovations are often created precisely at these touch points. Cooperation is of special importance because Saxony's economic structures differ from those of other federal states. Research in the public sector plays a special role here as a driving force. As recently shown again by the European Innovation Scoreboard, Saxony is an innovation leader in the comparison of European regions. This leading position has to be communicated, utilised and strengthened. The White Paper will be an important tool in this regard as well.

However, research in Saxony is not an island: The White Paper is closely interrelated with EU, federal and state strategies. Among other things, there are numerous touch points with Saxony's digital, innovation and skilled worker strategies. The White Paper offers orientation for future research policy decisions in this context. It also serves as a reliable standard for strategic processes and initiatives in the scientific community itself.

Initial position of research in Saxony – a strong foundation

In examining the future of research in Saxony and developing an outlook, the current position of Saxony's research landscape needs to be clear. What strengths can we build on? What challenges need to be overcome going forward? **Analysis** in the course of the White Paper process provides answers to these questions and lays the foundation for the development of research policy principles and guidelines.

Saxony's research ecosystem is well established...

Around 90 publicly financed scientific institutions make up Saxony's research ecosystem. Aside from university institutions, numerous non-university research institutions and other stakeholders enhance the research site, creating an excellent basis for scientific work.

1 German Centre for Rail Traffic Research

1 German Centre for Integrative Biodiversity Research

5 German Centres for Health Research and the National Centre for Tumour Diseases

21 Fraunhofer Institutes, branch institutes or facilities

8 Leibniz Institutes

1 interdisciplinary centre

2 sites of the Senckenberg Association, part of the Leibniz Association

6 Max Planck Institutes

5 colleges (including arts and administration)

5 universities of applied sciences

3 private or church-sponsored colleges (under the legal supervision of the SMWK)

2 new major research institutions under construction

7 state study academies

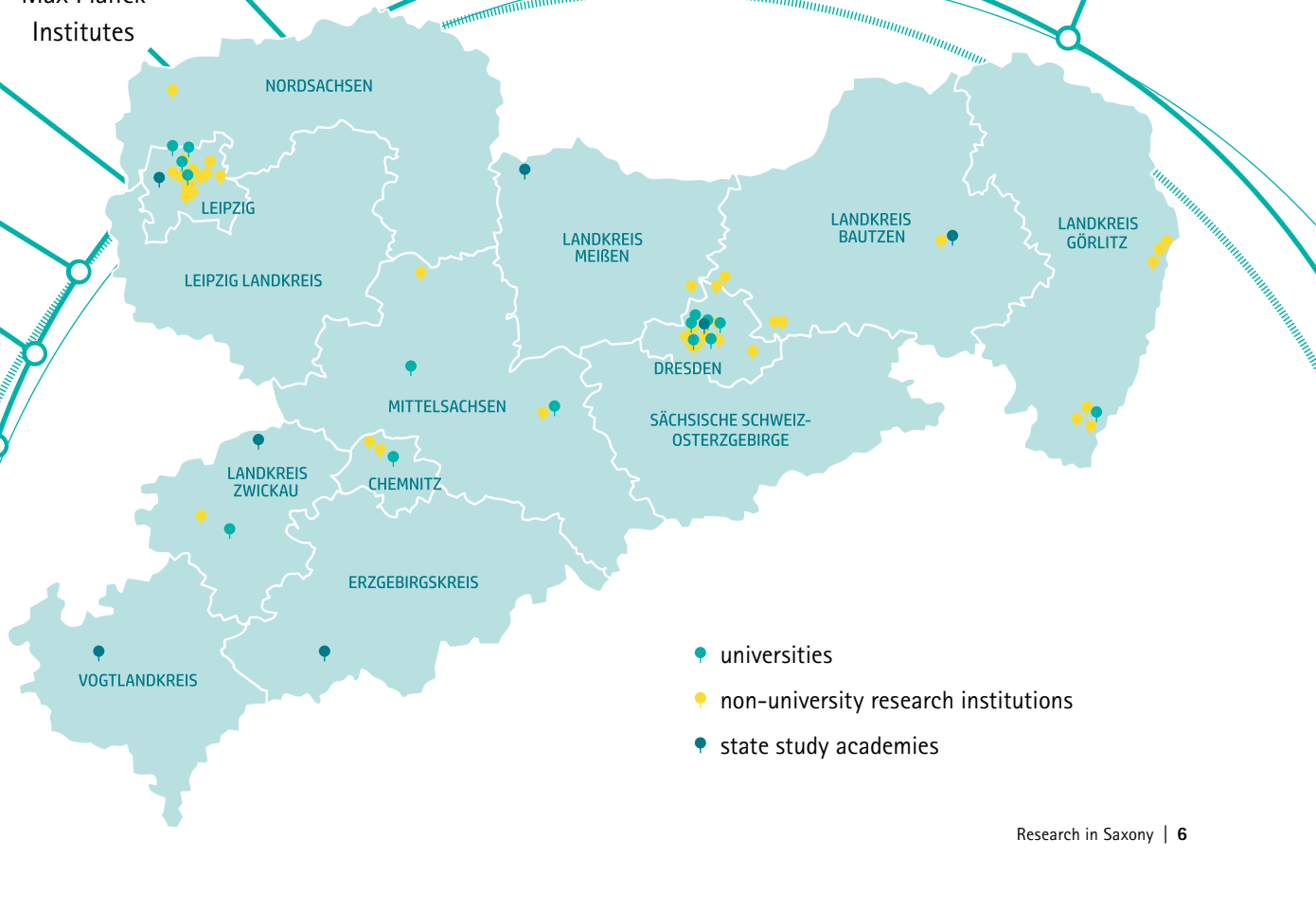
4 universities

1 Helmholtz field office

2 Helmholtz centres

2 Helmholtz Institutes

8 state-financed institutes and numerous additional stakeholders



...and will be expanded with two new major research institutions going forward.

The German Centre for Astrophysics (DZA) and the Centre for the Transformation of Chemistry (CTC) emerged as winners of the idea contest "Knowledge creates prospects for the region!" of the Federal Ministry of Education and Research (BMBF). Founding the two major research institutions in Lusatia and the central German coal mining district creates new prospects for research in Saxony and considerably expands the research site's range of topics and capabilities. With the establishment of multiple sites in Saxony's Lusatia region and the central German coal mining district over the coming years, the major research institutions will grow to become a driving force for progress rooted in the Bautzen, Görlitz and Nordsachsen administrative districts.

German Centre for Astrophysics

Astrophysics is high-tech science with great innovativeness. Varifocal eyeglasses, key components of mobile phones and navigation devices would be unthinkable without astronomic research. With the German Centre for Astrophysics, a major research institution is being established with a forward-looking scientific programme, a centre for digitalisation to converge data flows of astronomic observatories around the globe, and a centre for leading technologies in close cooperation with industry and existing technology centres in Saxony and worldwide. Saxony harbours great potential in the optical technologies field and semiconductor technology, and offers numerous points of contact for the German Centre for Astrophysics.

DZA

www.deutscheszentrumastrophysik.de

Centre for the Transformation of Chemistry

Chemistry is behind virtually all everyday products – fertiliser, paint, plastics, construction materials and medications. This makes the chemicals industry essential for numerous other economic sectors. However, it consumes a great deal of energy, is dependent on natural gas and petroleum, and emits large amounts of greenhouse gases. Thus there is an urgent need to rethink precursors, processes and products. What has been a linear chemicals industry to date needs to be transformed into a resilient circular economy over the long term, based on renewable resources and recycling – with the highest environmental and occupational health and safety standards as well as short transportation routes. The CTC aims to promote this sustainable circular economy scientifically and realise it in cooperation with industry. A new top-level research site is thus being established, attracting skilled workers, offering great potential for the establishment of new companies and supporting the structural transformation.

Center for the Transformation of Chemistry

www.transforming-chemistry.org

Saxony has an excellent, diverse and high-performing research community

The impressive range of scientific institutions in Saxony covers a full range of topics – diversity in this form is unique! Unique and excellent! This is not only true in terms of scientific fields. Third-party funds and research intensity also speak for Saxony as a research site and for its productivity!

Research excellence in Saxony

3 Clusters of Excellence currently define Saxony as a research site and are supported under the Excellence Strategy of the Federal Government to strengthen top-level academic research. Since 2012, TUD Dresden University of Technology has been one of Germany's **Universities of Excellence**, currently comprising ten universities nationwide and one university consortium.

Diversity on the one hand, specific strengths on the other

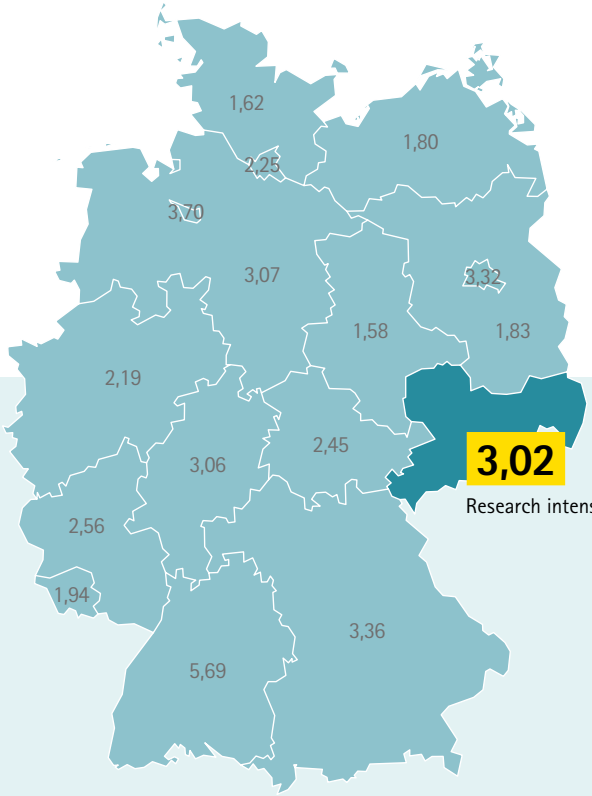
Thanks to the diversity of scientific institutions in the Free State, Saxony's researchers are fundamentally active in all scientific fields and successfully obtain third-party funds. A look at the main topics (starting on page 13) reveals the interplay with the Free State's economic strengths. For example, Saxony is one of Europe's largest and leading microtechnology and nanotechnology sites. Intensive research in this field bolsters industrial development and, as in numerous other fields, drives a wide range of innovations and helps make Saxony's industry more competitive.

3 Clusters of Excellence

- Physics of Life
  www.physics-of-life.tu-dresden.de
- Complexity and Topology in Quantum Matter
  www.ctqmat.de
- Centre for Tactile Internet
  www.ceti.one

Outstanding capacity of Saxony's scientific institutions

Third-party funding is strong in Saxony. At 37.6 %, the proportion of third-party funds out of the total proceeds of Saxony's universities in 2019 was significantly higher than the value for Germany as a whole (28.4 %).



Research and development spending
Saxony with a share of 3.02 % is a midfield leader in terms of research intensity, that is, total spending as a proportion of the nominal gross domestic product (GDP).

Strong commitment to European research partnerships

Saxony realises part of its project-specific research funding through participation in European research partnerships. The Saxon State Ministry for Science, Culture and Tourism (SMWK) is a member of four partnerships in the fields of material sciences/battery research, clean energy, personalised medicine and radiation protection. In addition, the Saxon State Ministry for Economic Affairs, Labour and Transport (SMWA) is engaged in a partnership for digital key technologies.

M-era.Net

European research network for material research, material technologies and battery research

- Term: 2021–2026
- 49 partners from 35 states

www.m-era.net

ERAPerMed

ERA PerMed
European research network in the field of personalised medicine

- Term: 2019–2023
- 31 partners from 23 states

www.erapermed.isciii.es

Participation in a new partnership on the topic of personalised medicine is slated to begin in 2024.

PIANOFORTE
EUROPEAN PARTNERSHIP FOR RADIATION PROTECTION RESEARCH

European Partnership for Radiation Protection Research (PIANOFORTE)

- European partnership to conduct radiation protection research
- Term: 2022–2027
- 58 partners from 22 states

www.pianoforte-partnership.eu

cet Partnership

Clean Energy Transition Partnership (CET Partnership)

European partnership to research the transition to clean energy of the future

- Term: 2022–2028
- 65 partners from 32 states

www.cetpartnership.eu

Numerous European and international research funding organisations and institutions are working together in these partnerships to jointly support coordinated transnational research projects in fields that are important for Europe. Through its participation in these partnerships, Saxony contributes to improving the excellence and international competitiveness of Saxony's science landscape. Its European visibility and networking are strengthened and improved at the same time.

Overview of European research partnerships

Funding instruments of the Free State of Saxony for research in any field along the innovation chain

Directive of the Saxon State Ministry for Science, Culture and Tourism (SMWK) for the granting of research project funding (RL TG 70):

Fundamental research

The objective of funding that is available for any scientific field is to strengthen the position of Saxony as a research, development and innovation site in national and international competition by working continuously to raise awareness of scientific institutions, in particular through fundamental and application-oriented research projects. This funding is in line with the topic-oriented project funding in the course of participation in EU partnerships under the EuProNet Directive. An overview of currently approved projects is available on the website of the Saxon State Ministry for Science, Culture and Tourism (SMWK).

Directive of the Saxon State Ministry for Science, Culture and Tourism (SMWK) on the granting of funding within the framework of competitive EU funding programmes for research and innovation (EuProNet):

Fundamental research

The funding objective is to support the participation of Saxon universities and research institutions in competitive European research programmes. In addition to EuProNet start-up funding to support participation in EU research funding, this includes Saxony's participation in EU partnerships under the Horizon Europe funding programme. Funding for Saxon participants in EU partnership projects therefore complements the funding under TG 70 with international and application-oriented joint projects in select fields.

Directive of the Saxon State Ministry for Science, Culture and Tourism (SMWK) on the granting of funding co-financed by the European Regional Development Fund/Just Transition Fund for research infrastructures, projects and networks in the field of application-oriented public research (EFRE/JTF RL Forschung InfraProNet 2021 – 2027):

Application-oriented research

The objective of this funding is to strengthen application-oriented research in any field at universities and non-university institutions in the Free State of Saxony and at the Saxony University of Cooperative Education. The funding is intended to contribute to the development of the regional innovation strategy RIS3 of the Free State of Saxony as well as further research and development (R&D) potentials in the field of public research, or to better exploit them, in order to improve the basic conditions for a successful transfer of innovation to the economy and subsequently to increase the actual technology transfer services. Another objective is the further development of the scientific information infrastructure. JTF funding provides support in the districts of Görlitz, Bautzen, North Saxony and Leipzig as well as in the cities of Leipzig and Chemnitz, JTF funding supports the management of the social, employment-specific, economic and ecological impacts of the transition to the Union's energy and climate policy targets for 2030 and to a climate-neutral economy in the Union by 2050 based on the Paris Agreement. Against this background, the JTF is funding application-oriented research projects in JTF regions with a technology maturity level (TRL) that at least allows validation under relevant conditions of use.

Directive of the Saxon State Ministry for Economic Affairs, Labour and Transport (SMWA) on the funding of projects co-financed by the Regional Development Fund (ERDF) in the funding period 2021 to 2027 for the validation of research results (RL Validierungsförderung EFRE 2021 – 2027):

Application-oriented research

The objective of the open-topic funding is to accelerate the introduction and dissemination of modern technologies in any field in the economy and society. The funds provided are to be used to qualify research results and inventions from science for commercial use. To this end, validation is to be used to reduce the discrepancies between the results typically provided on the research side and the information required on the business side for a risk assessment for the use of these results.

Sächsische Aufbaubank – Förderbank (business development bank)

Research in Saxony – did you know?

Several billion euros are to be invested in Saxony as a research site by 2030. This will safeguard and strengthen the leading position in research. Saxony also scores points as a research site with numerous other special features.

Around 25,1 million euros

Out of approximately 800 non-university research institutions in Germany, the Helmholtz-Zentrum Dresden-Rossendorf is Saxony's most successful single funding recipient in obtaining EU funding with around 25.1 million euros, and thus holds 13th place nationwide in this category.

Most modern higher education act

Saxony has one of Germany's most modern education acts, providing the best possible legal framework for the further development of the scientific and higher education landscape. The act boosts the national and international competitiveness of Saxony's universities in both research and teaching, and not only focuses on the gain but also the transfer of knowledge. It simultaneously supports first-class qualifications for our students, who are of great importance for Saxony's labour market as skilled workers with an outstanding education.

Nobel Prize for Medicine

Svante Pääbo of Sweden, Director at the Max Planck Institute for Evolutionary Anthropology in Leipzig, was the first researcher from Saxony to receive the Nobel Prize for Medicine for his findings on human evolution. He was the first to sequence the Neanderthal genome and discovered the Denisova hominin. He also contributes his outstanding scientific performance to large international consortiums that, for example, investigate genetic risk factors for COVID-19.

Universities with strong third-party funding

The German Research Foundation's Funding Atlas lists the TUD Dresden University of Technology in 5th place among the 40 universities with the strongest third-party funding (in reference to German Research Foundation funding accumulated in the years 2014 through 2019).

One of the largest Fraunhofer sites

Dresden is home to one of the largest Fraunhofer sites. Approximately 2500 people in eleven institutes are working on innovation projects in the fields of ceramic technologies, future nanoelectronics, laser systems, industrial 3D printers, networked agriculture, quantum telephones and many other core areas.

So-called "small subjects"

More than half of what are known as the "small subjects" are represented at Saxony's universities. They represent a special thematic facet of Saxony's knowledge landscape.

Around 294 million euros

With third-party funds of around 294 million euros in 2021, the TUD Dresden University of Technology was in 3rd place behind the Technical University of Munich (397 million euros) and RWTH Aachen University (387 million euros).

Third-party funds per professorship

In terms of third-party funds per professorship, TU Bergakademie Freiberg and TUD Dresden University of Technology took 4th and 5th place respectively in the 2019 nationwide ranking.

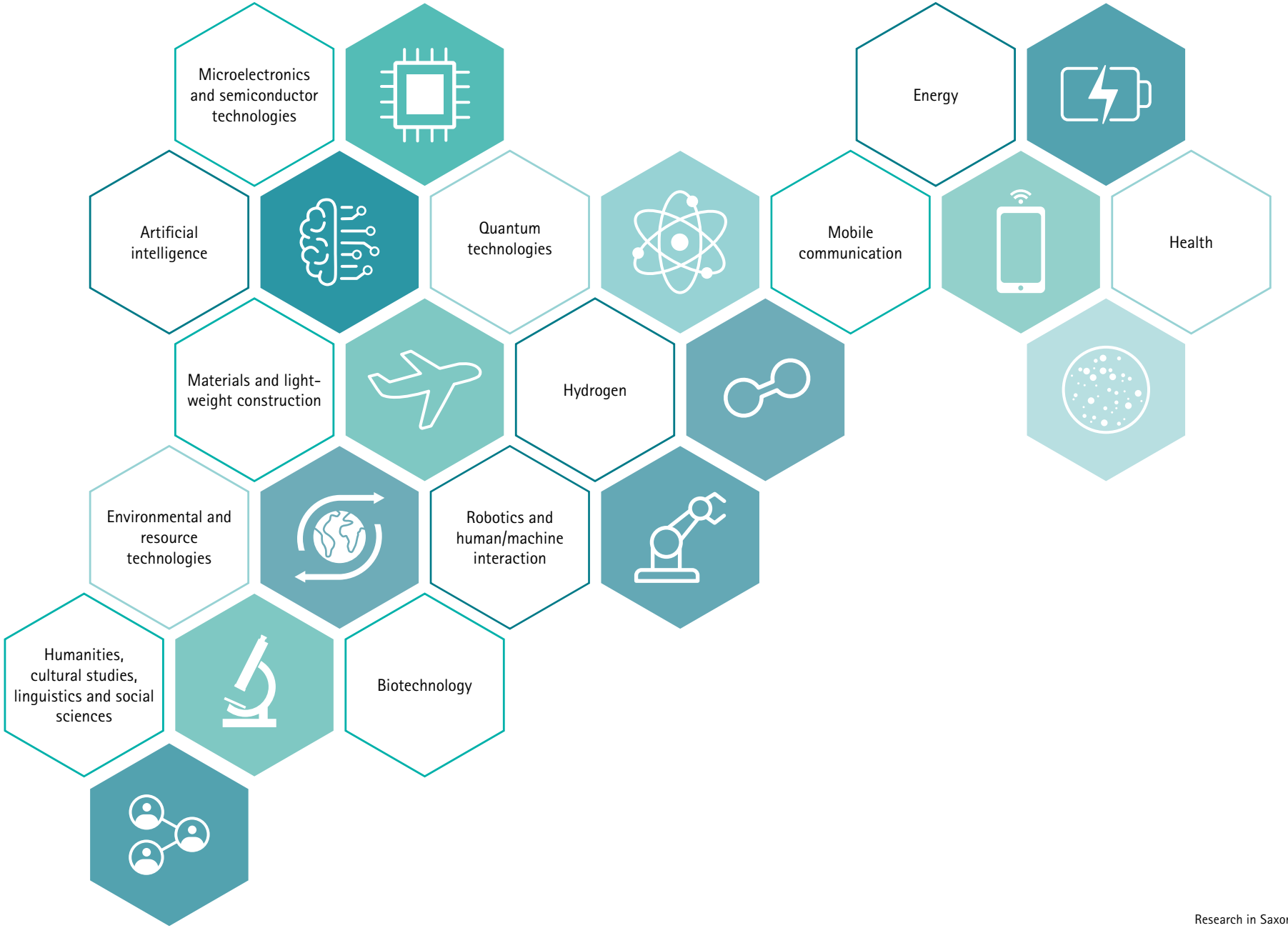
Around 100 million euros

The TUD Dresden University of Technology obtained around 100 million euros in EU funding from 2014 to 2019. This puts it in 5th place in Germany.

University of cooperative education

The Berufsakademie Sachsen with its seven study academies is a constant in Saxony's scientific community and growing into a university of cooperative education. This step means considerably greater visibility in the future, an image gain and the elimination of disadvantages in competing with other educational institutions, not only in Saxony.

Topics of special strategic importance for Saxony



Microelectronics and semiconductor technologies research

Saxony is a leading microelectronics site in Europe. Dresden is considered the European semiconductor manufacturing centre. "Silicon Saxony" is Europe's largest microelectronics cluster and the fifth largest in the world.

The success story of microelectronics in Saxony's science and research landscape is inextricably linked to Saxony's universities of technology and the engagement of the Fraunhofer-Gesellschaft as a leading global organisation for applied research. In the context of microelectronics companies such as Infineon, Globalfoundries, Bosch and X-Fab, high-performance research capacities of the Fraunhofer-Gesellschaft have been developed in the areas of design, materials, systems and technologies, prospectively enriched by the establishment of TSMC. They play an important role in Germany's microelectronics research complex and are continuously expanded. Institutes of the Leibniz Association and the state along with the Helmholtz-Zentrum Dresden-Rossendorf lend additional weight to non-university microelectronics research in the Free State.

The European dimension, resulting from the leadership role or claim to leadership of Saxony as a research and industrial site in this technological sector and alliances with Europe's two other leading research sites (IMEC, Leuven; CEA-Leti, Grenoble), deserves special mention. New requirements for the quantitative and qualitative compatibility of research structures and industry investments are associated with the implementation of the Important Project of Common European Interest (IPCEI) in the field of micro/nanoelectronics. The European Chips Act establishes the prerequisites for a major expansion of semiconductor production in Saxony and across Europe, attracting investments, promoting research and innovation, and preparing Europe for future chip supply crises. Pilot plants for the initiation of innovative production methods are of special research policy interest here.

The special importance of microelectronics for Saxony is reflected by the Free State's relevant strategies. First among these is the innovation strategy that assigns a key role to microelectronics to boost the industry's innovativeness.

Silicon Saxony e. V.

Innovation strategy

Artificial intelligence (AI) research

Saxony with its specific research and industry structures is among a handful of federal states with excellent potential in the areas of software/algorithms, hardware/system development as well as their applications (mobility, energy and environment, industry, health etc.), and stands to reap above-average benefits from the development of AI.

Strategic objectives, measures and spheres of activity have been defined in the Free State's AI strategy. Research in conjunction with industry plays a crucial role in the implementation of Saxony's AI strategy. AI is increasingly gaining importance in research, both as a research subject and as a tool in natural and engineering sciences, life sciences, humanities and social sciences, for instance in the context of systems research.

New cooperation-based institutions, such as the Centre for Scalable Data Analytics and Artificial Intelligence (ScaDS.AI) with sites in Leipzig and Dresden, play an important role in the research and transfer of AI. ScaDS.AI as one of five German AI competence centres permanently funded jointly by the federation and states is a key component for the implementation of the federal AI strategy. The centre aims to make significant contributions to Germany's technological excellence and sovereignty in the data analytics/big data field.

Saxony's pertinent strengths in semiconductor systems design and technology harbour great potential for AI in the Free State. They support the development of AI system architectures with tremendous application potential, for example, in next generation computing and edge computing.

AI strategy for the Free State of Saxony

ScaDS.AI

Quantum technologies research

Saxony with its specific technology-oriented structures in research and industry offers a wide range of opportunities and economic prospects in the field of quantum technologies. Promising initiatives have been launched, especially in the areas of quantum computing and quantum communication, to study technology developments and a wide range of application scenarios.

The technologies include solid-state systems with numerous potential applications, also in quantum sensing. Algorithms and applications, especially in industry, are the focus of activities at the Competence Centre Quantum Applications Saxony QAPPS. With a focus on the design of scalable electronic systems for quantum communication, Saxony is driving the development of high-security communication technologies. The Free State's strengths in material research are reflected by studies of the complexity and topology in quantum materials.

State Centre of Competence QAPPS

Robotics and human/machine interaction research

Saxony is increasingly becoming a stronghold of robotics in Germany with a growing robotics ecosystem comprising research, industry and start-ups. Thanks to its unique combination of competences in the fields of microelectronics, mechanical engineering and software, the Free State is positioned to produce important robot technology innovations and to develop into one of Europe's leading robotics clusters.

Established midsize technology enterprises contribute to this alongside university spin-offs and young start-ups in the robotics field. Research institutions of the Fraunhofer-Gesellschaft and the universities of technology are significant sources of innovative power.

Human/machine interaction research is closely related to robotics. Activities in this area focus on the development of technologies enabling machines to interact and communicate with humans. Researchers in Saxony are engaged in exciting activities in this field, such as the design and research of socio-technical systems and the investigation of research questions in the context of the further development of automated and networked driving.

Mobile communication research

Mobile communication is a cross-sectional technology with a great influence on the possible innovations of the digital age. It is therefore of great relevance to be optimally prepared for the use of sixth-generation (6G) mobile communication. 6G is expected to result in significant innovation leaps regarding intelligent, environment-adaptable communication, sustainability, and the availability and security of critical infrastructure.

Security is a key requirement for the future acceptance of IoT systems (Internet of Things). Scientists from around the world are therefore developing novel technologies in Dresden with the aim of improving the reliability of IoT systems. This includes ensuring availability, integrity and confidentiality. ▶

Future communication networks for human/machine collaboration are being researched at the TUD Dresden University of Technology in cooperation with the Technical University of Munich in the forward-looking project "6G-life". More than 150 scientists are not only working on new hardware and software but on future network architectures and methods. Their stated goal is to incorporate the research results into the worldwide standardisation of 6G in subsequent joint projects with technology companies and network operators.

Material research and lightweight construction

Saxony is one of Germany's leading research sites of international importance in the areas of new materials, (basic) materials and smart materials. The same goes for research in the field of nanotechnology. Saxony is the European leader in the production of nanolayers and nanoparticles, and also has outstanding expertise in nanoanalytics. Materialforschungsverbund Dresden e. V., a materials research association, is one example of the numerous activities in this area. Established in 1993, it brings together around 20 academic, non-university and industry research institutions, mainly in the materials technology and materials research fields.

Leichtbau-Allianz Sachsen, the Saxony lightweight construction alliance, bundles Saxony's scientific expertise in the lightweight construction field – from academic to non-university institutions. The initiative aims to support the positive development of Saxony as a business location by promoting Saxony's outstanding research landscape in the lightweight construction field and by working more closely with industry in Saxony and beyond state borders, for example, with the neighbouring countries of Poland and the Czech Republic.

Saxony has also been involved in M-ERA-Net, the European funding partnership for material and battery research, since 2021 and is networked with 50 funding organisations in 36 countries. Universities, research institutions and companies in Saxony participate in the annual calls for research projects with extraordinary success.

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Materialforschungsverbund Dresden e. V.

Leichtbau-Allianz Sachsen

Energy research

The transition to a climate-neutral society and an economy that is free of greenhouse gases with the greatest possible independence from energy imports demands a rapid, forward-looking and innovative conversion of our energy system. The energy transition needs to be consistently advanced through the development of corresponding technologies and methods. Key future trends in this area include energy storage technologies, new synthetic fuels, the digitalisation of the energy industry, sector coupling and the consistent further development of renewable energy technologies. Against the background of demographic trends and a changed market, fresh ideas are also needed urgently in the areas of standardisation, modularisation and automation.

Saxony has ideal conditions for this. According to the federal report on energy research, the Free State is consistently among the top four in the nationwide comparison. Broad-based energy research covers the focal points of electromobility in Chemnitz, synthetic fuels and gases in Freiberg, heat generation, delivery, storage and distribution in Zittau, non-fossil basic chemicals in Leipzig, and materials for the energy transition, aviation and aerospace, automotive engineering, electrical engineering and energy storage technologies in Dresden.

Saxony also has outstanding expertise in the fields of new materials and high-performance radiation sources. This supports the development of innovative energy generation technologies, for example, in laser-based fusion research and the associated development of new energy sources.

As a networking element and central point of contact, the Energy Research in Saxony competence centre of the Saxon Energy Agency – SAENA serves as a neutral interface between politics, administration, science and industry, in particular to support the transfer of research results to industry.

Saxony has been a participant of the European Clean Energy Transition Partnership (CETP) since 2022 and

publishes tender offers annually with its funding partners from 30 countries. Saxony's universities, research institutions and companies take part with great success and realise excellent research projects from fundamental research to the application stage.

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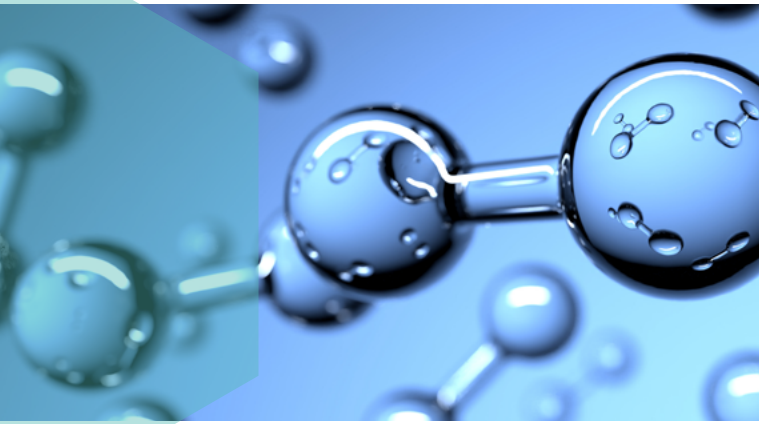
Hydrogen research

With its diversity of players in the hydrogen segment, Saxony offers an ideal basis for a successful ramp-up of the hydrogen economy along the entire value chain and thus an important prerequisite for the implementation of Saxony's hydrogen strategy.

Research activities have various regional focal points.

Topics such as electrolysis, fuel cells, storage and the transportation of liquid hydrogen are researched in Dresden.



Scaling industrial fuel cell production and the development of scenarios for mobility-based hydrogen applications take centre stage in Chemnitz. The establishment of the Hydrogen and Innovation Centre (HIC) as the site of the federal Hydrogen Innovation and Technology Centre (ITZ) will set new standards.

Freiberg stands out with its pyrolysis process using organic and plastic waste.

Fundamental research of algae-based biological hydrogen production is conducted in the Leipzig region along with research and development work on the production of hydrogen from biogas, the storage and transportation of hydrogen and its use as a substituent in the chemicals industry.

Hydrogen Lab Görlitz (HLG) is being established in Görlitz as a research platform for hydrogen applications, ranging from green hydrogen production to electrolysis, storage and use to project development for subsequent applications in municipalities and companies on the Görlitz Innovation Campus of Siemens. Hydrogen-based forms of automated mobility for rural areas are also being developed. ▶

Saxony's hydrogen strategy

Hydrogen and Innovation Center (HIC)

Hydrogen Lab Görlitz (HLG)

Saxon Competence Centre for Hydrogen (KH2)

Environmental and resource technologies research

With the Saxon Competence Centre for Hydrogen (KH2), the Saxon Hydrogen Union of Saxony's universities of technology and the associations HZwo e. V., Energy Saxony e. V. and HYPOS e. V. based in Saxony that operate both nationally and internationally, Saxony has the necessary hydrogen networks with numerous science and industry partners.

HZwo e. V.

Energy Saxony e. V.

HYPOS e. V.

Access to raw materials is a fundamental requirement for many industrial enterprises in Saxony. With global supply chains and changing geopolitical conditions, this however is not always assured. At the same time, the extraction and further processing of raw materials need to be sustainable and environmentally friendly. Technologies for the realisation of a circular economy are a key component of these efforts. The Free State has extensive research expertise and continues to expand this as a pillar of industrial innovativeness.

With its research excellence, the Helmholtz Centre for Environmental Research (UFZ) identifies new ways to support the sustainable use of natural resources to benefit humanity and the environment. Employees contribute their extensive experience with integrated environmental research and have access to innovative scientific infrastructures as well as important national and international partnerships.

The Deutsches Biomasseforschungszentrum (DBFZ) gGmbH, a departmental biomass research institute of the Federal Ministry of Food and Agriculture, is based in Leipzig. Here it works with partners from industry and research, agriculture and forestry to develop innovative solutions for a largely biomass-based economy.

Internationally highly renowned research institutions for the development of new circular economy technologies operate at the Freiberg site.

With CircEcon that is currently being founded, Saxony's universities of technology and the Zittau/Görlitz University of Applied Sciences intend to establish and operate a research campus for recycling complex fibre composite materials (from wind power plants, for example). ▶

CircEcon

A rural site for the research and development of self-contained value creation cycles for the production of carbon fibres from renewable raw materials is being created with the establishment of the Inno-CarbEnergy Boxberg research campus.

Saxony is very successful beyond its borders and networked worldwide in the field of raw materials research. EIT KIC RawMaterials, a European knowledge and innovation community, has been created in this field and the Regional Centre Freiberg – EIT RawMaterials was established at TU Bergakademie Freiberg. Thus Saxony is actively involved in global top-level research in the raw materials field.

InnoCarbEnergy

Regional Center Freiberg – EIT RawMaterials

Biotechnology research

In the course of a few years, Saxony has made a name for itself nationally and internationally as a biotechnology site with significant future potential and has grown into one of Europe's most dynamic biotechnology regions. This rapid development is owed in large part to Saxony's consistent Biotechnology Offensive launched in the year 2000. The cluster biosaxony e. V. also supports scientific institutions and companies in the biotechnology and medical technology fields.

Examples of topics include the use of microorganisms for the production of antibiotics or as catalysts for environmentally friendly processes, the genetic enhancement of plants to improve agricultural productivity and the use of stem cells to repair damaged tissue.

For example, the way cells organise to form tissue is being studied in Dresden. Scientists are researching a broad range of different complexity levels, ranging from molecular networks to cell organelles, cells and tissue to organs and complete organisms.

Health research

Special solutions at the interface of medicine, life sciences and engineering sciences are being researched and developed in Leipzig.

Saxony has globally networked and promoted research in this field since 2007 through its participation in relevant European funding partnerships (ERA IB – Industrial Biotechnology, ERA CoBioTech) and enabled innovations.

biosaxony e.V.

The number of people suffering from or contracting widespread diseases such as cancer and cardiovascular, infectious, lung or neurodegenerative diseases remains high. In Saxony's research landscape, Dresden and Leipzig offer outstanding science and clinical research potential.

Cancer research is a special strength in Saxony's research landscape with multidisciplinarity at a very high level. It comprises the study of molecular and cellular mechanisms that lead to the onset and progression of cancer, the development of diagnostic methods, therapies and prevention strategies, and research into the psychosocial aspects of cancer. Cancer research aims to reduce cancer prevalence, morbidity and mortality and to improve the quality of life of cancer patients.

The German Cancer Research Centre (DKFZ) with the support of the Free State of Saxony is establishing its first field office in Germany for new, intelligent technologies to combat cancer in Dresden.

The National Centre for Tumour Diseases (NCT) cluster is dedicated to individualised cancer medicine in theory and practice. It combines interdisciplinary patient care with cancer research excellence. It also incorporates the activities (in the field of precision radiation therapy, among others) of ONCORay, the National Centre for Radiation Research in Oncology. Furthermore, scientific institutions in Dresden are part of the German Consortium for Translational Cancer Research (DKTK) and cooperate with researchers at seven other sites in Germany. The goal is to transfer promising approaches in cancer research to clinical practice more quickly.

The Helmholtz Institute for Metabolic, Obesity and Vascular Research (HI-MAG) is dedicated to diseases of civilisation. It researches morbid obesity and its secondary diseases with the aim of improving diagnosis, therapy and prevention. Three existing sites of the German Centres for Health Research (DZG) dedicated to the major widespread diseases of cancer, neurodegeneration and diabetes in Dresden are further proof

of Saxony's relevance in health research. Another site in the field of child and youth health (DZKJ) is being established in Leipzig/Dresden in the coming years. The German Centres for Health Research (DZG) aim to improve the transfer of research results from the laboratory to general medical care, bundle competences across Germany and speed up processes.

Saxony also entered into a European funding partnership in the field of personalised medicine (EP PerMed) in 2023. As a continuation of previous initiatives of the Saxon State Ministry for Science, Culture and Tourism (SMWK) such as ERA PerMed and Regions-4PerMed, it is supporting research in this area until 2033. In addition, Saxony has been heavily involved in PIANOFORTE, the European radiation protection funding partnership, since 2022.

see page 9

National Centre for Tumour Diseases (NCT)

ONCORay – National Centre for Radiation Research in Oncology

Helmholtz Institute for Metabolic, Obesity and Vascular Research (HI-MAG)

German Cancer Research Centre

German Centre for Neurodegenerative Diseases

German Centre for Diabetes Research

Humanities, cultural studies, linguistics and social sciences research

The humanities, cultural studies, linguistics and social sciences are of special importance for Saxony as a research site. Research in these areas, for instance regarding cultural, political and social developments in our society, makes an invaluable contribution to understanding social processes, both regionally and globally.

The Free State is home to numerous excellent humanities and social sciences research institutions. All of them are closely networked with Saxony's universities and other national and international cooperation partners. The Free State provides important support, opening up fields of research that are unique in Germany with regard to expertise and singularity.

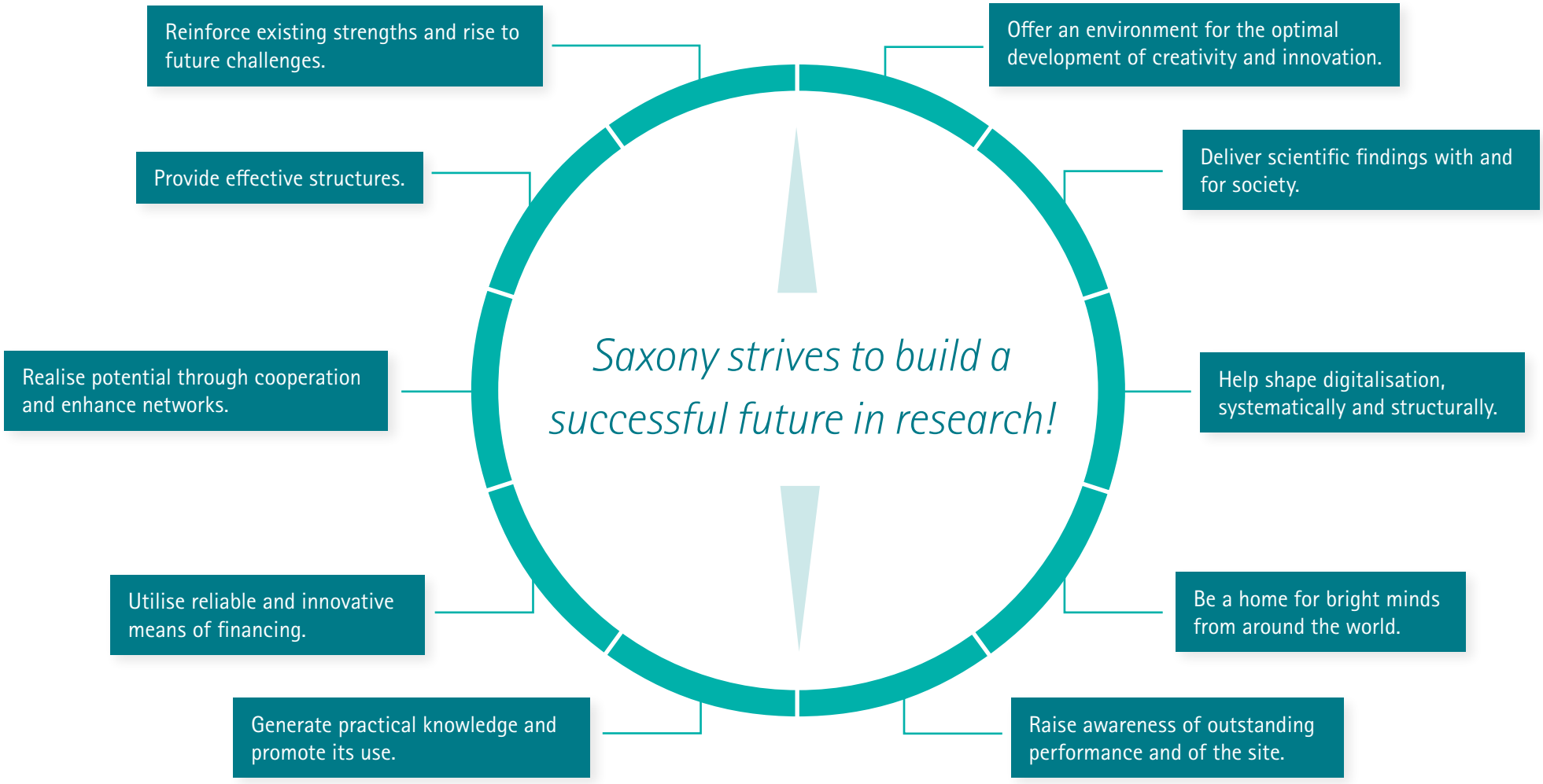
An interdisciplinary approach makes important contributions to a better understanding of social, cultural and political transformation processes in Germany and Eastern Europe. Research findings regarding political, social and cultural development during the Nazi regime and the GDR also provide a basis for comparative perspectives of other systems, enabling a critical examination of political extremism in the past and present. Research results in the area of regional history and regional particularities of the Free State, such as the language, history and culture of the Sorbs in Upper and Lower Lusatia, are another facet of this topic in Saxony.

Thus Saxony's scientific institutions make a crucial contribution to the design of sustainable and regionally balanced development concepts. Cultural heritage preservation is another important task of humanities institutes. The Saxon Academy of Sciences and Humanities in Leipzig, for example, is dedicated to this task.

Research policy principles and guidelines

The White Paper process showed it clearly that reliable, long-term guidance is essential for research policy action in the interest of ambitious, forward-looking research in the Free State of Saxony. Therefore, a key part of the process was dedicated to the development of corresponding principles and guidelines to provide this guidance. These principles and guidelines represent a self-concept of research in Saxony and are relevant for decision-making processes in politics and administration. They transparently describe for industry and society how research in Saxony is to be implemented successfully and for the benefit of all.

Research policy principles and guidelines – compass and standard for Saxony's research policy



With regard to research Saxony strives to ...

Reinforce existing strengths and rise to future challenges.

Saxony's research ecosystem has great scientific strengths (see page 5–24). **Diversity and openness** to topics in research as well as politics facilitated the development of these strengths. We intend to build on this foundation and to remain flexible going forward, continuing to identify and discuss research topics and content in a dialogue with the community. In doing so, we value input from Saxony's stakeholders as well as external input. All of this enables us to not only respond to new developments and new challenges – for example, in the context of climate change, resource scarcity or geopolitical crises – but to also anticipate and help shape them. We want to identify promising future topics in a timely manner, thereby accelerating the development of innovative solutions. We intend to seize unique strategic opportunities offered, for example, by the establishment of the two new major research institutions – the German Centre for Astrophysics (DZA) and the Centre for the Transformation of Chemistry (CTC) – and utilise them to open up new, long-term prospects for research and its transfer in Saxony.

To surmount the challenges of the future for society as a whole, we are supporting innovations in all fields. We believe that the **innovation chain** and its performance – from the idea to fundamental research, applied research and development to the transfer of results – is only as strong as the individual links. Focusing on just one area – fundamental research or applied research – does not agree with our scientific understanding and aspirations. Instead, we focus on linking both areas up to the transfer of research results.

We maintain **close ties with industry** in application-oriented research. By involving economic actors in the discussion and implementation of research, we want to facilitate a transfer-relevant orientation and align research projects with new strategic challenges in the development of technology. In application-oriented, technology-related academic research in particular, we view the universities of technology and universities of applied sciences as key players.

Industry research institutions in the Free State represent an important element of the research ecosystem in this context. At the interface between research and industry, they make a significant contribution to the transfer of research results. We believe that exchanges between these institutions and publicly financed scientific institutions harbour great potential. For example, their strategic effect for the site can be enhanced when they strive for affiliated institute status.

The research problems of the future are not exclusively determined by technology development needs. They are increasingly being defined by new questions in the **humanities and social sciences**. These scientific disciplines play a key role for us in understanding processes in society and in researching current and future ethical, social, cultural or political phenomena. We are committed to greater permeability at the borders of scientific disciplines and see great potential in new forms of co-creation. We believe that shaping the future and surmounting the challenges we are facing demands collaboration between all scientific disciplines.

"Saxony has long since convincingly demonstrated the capacity to combine fundamental research, applied research and actual applications, leading to the development of innovative products. This vision in fundamental research and the attentiveness in companies with regard to new fundamental research results are particularly pronounced in Saxony. The guidelines further reinforce the central elements of this attitude."

Prof. Dr. Dr. Andreas Barner,
Chairman of the University Council at the University of Freiburg,
Member of the Expert Commission

KompetenzwerkD – a strong association with an innovative orientation: Thanks to innovative digital humanities methods, the transformation of humanities research in recent decades has been particularly impressive. Digital humanities is bringing up entirely new research questions and simultaneously creating the opportunity to significantly expand our understanding of history, culture and society, preserve cultural heritage, promote citizen involvement and revolutionise research methods. The efficient processing and analysis of large volumes of data is a key prerequisite here. KompetenzwerkD rises to the associated new challenges. With it, Saxony has a research centre (workshop) and a competence and service network for digital humanities and digital cultural heritage. The network bundles the expertise of non-university humanities research institutions in Saxony in the digital humanities field and pursues their systematic strategic development across institutions.

With regard to research Saxony strives to ...

Provide effective structures.

We want research in Saxony to be based on resilient organisational structures with access to a **strong infrastructure** and **modern facilities**. Both in universities and non-university research institutions, we intend to maintain and further improve the high level, measurable using international standards, that has already been reached in the research structures. In doing so, we will ensure that the Free State is among the leading research sites, not only in Germany but also in Europe and worldwide.

Wherever possible, we intend to combine our activities in the expansion of research infrastructure and facilities with programmes and initiatives of the federal government and/or the European Union for maximum effectiveness. We utilise experience from relevant fields, such as microelectronics, for a coordinated strategic approach. With the expansion of infrastructure and facilities, safeguarding the effective and lasting operation of institutions is indispensable for us from the outset.

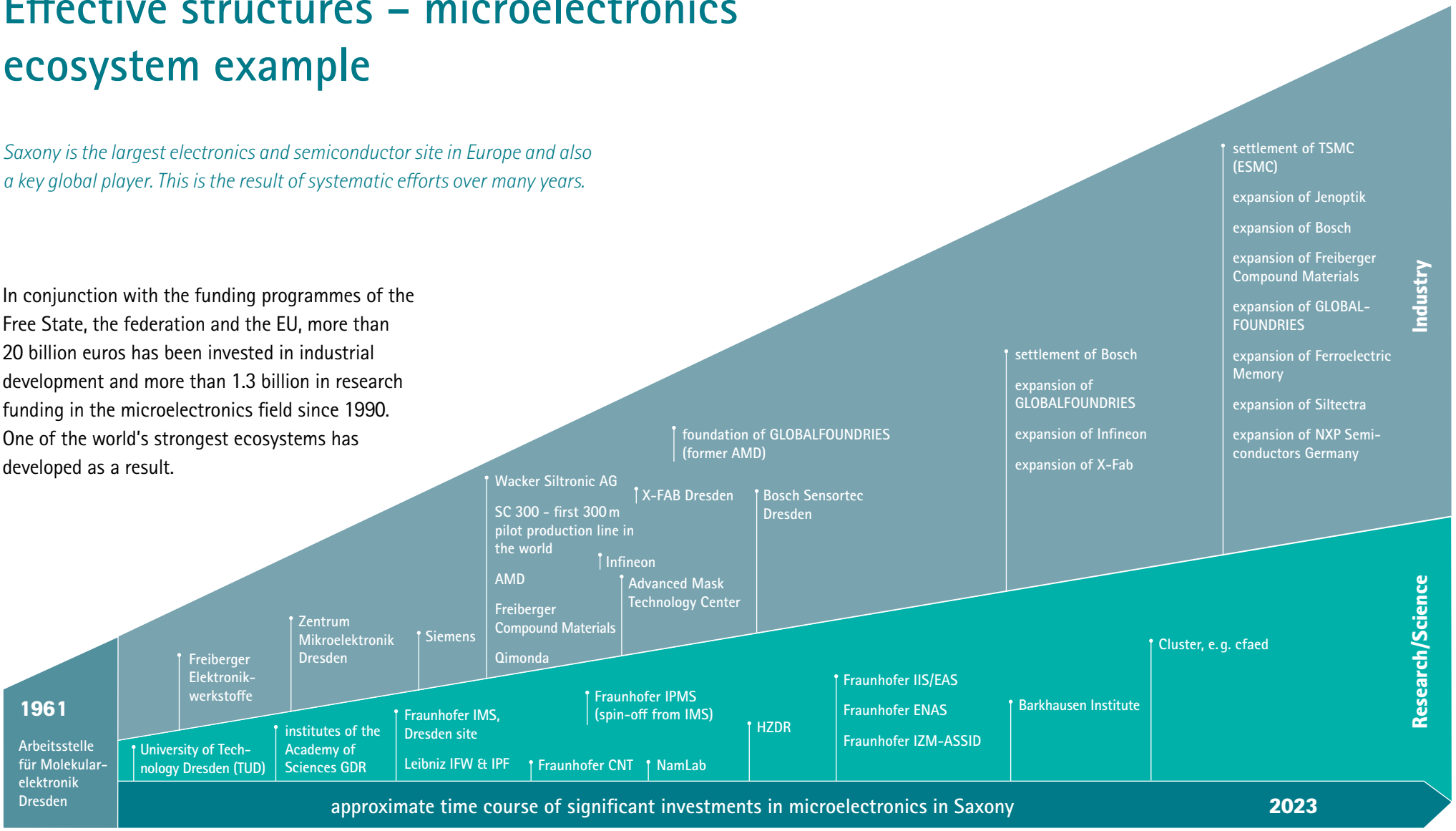
We believe that high-performance research is and continues to be assured by the capability of the research ecosystem's individual elements. Further development of research structures in Saxony with regard to their **effectiveness** is important to us. University development planning, internal development strategies, evaluation results, scientific council recommendations and appraisals by external scientists not only represent important tools to us for the strategic direction of research activities in the respective institutions and for their national and international fit. In our efforts, they also serve as an essential basis for the evaluation of effectiveness and for the improvement of **quality** and **competitiveness**. We intend to examine the issue of dismantling structures and discontinuing research topics exclusively from the factual perspective and in terms of content, not based on fiscal considerations. For us, innovation-oriented research includes the ongoing review of projects and undertakings regarding their prospects of success, scrutinising and in some cases also ending them. We do not view failure as a disappointment but as an integral part of the scientific process, since failure can be informative and help lay the foundation for future success.

We consider **funding instruments** extending from fundamental research to the transfer of research results decisive for the expansion and further development of research structures. Here we place great emphasis on the corresponding definition so that both concrete projects and systemic investments – application-oriented and with high relevance for business development – can be supported. We will fully utilise the definition options offered by the ERDF and JTF structural funds of the European Union in the research field. In particular, the multi-year financing framework associated with the structural funds gives us the opportunity to advance strategic research projects. We intend to make use of this and further enhance the visibility and vigour of research in Saxony – in particular also in the international context. Internationality is not an end in itself, but an important element of **excellence** and **top-level research**.

Effective structures – microelectronics ecosystem example

Saxony is the largest electronics and semiconductor site in Europe and also a key global player. This is the result of systematic efforts over many years.

In conjunction with the funding programmes of the Free State, the federation and the EU, more than 20 billion euros has been invested in industrial development and more than 1.3 billion in research funding in the microelectronics field since 1990. One of the world's strongest ecosystems has developed as a result.



With regard to research Saxony strives to ...

Realise potential through cooperation and enhance networks.

Exchange, networking and cooperation play a central role for us in research and innovation. Cooperation between universities and non-university research institutions as well as within networks, with external partners or clusters is of growing significance in overcoming the ever more complex challenges in research. Against the background of an increasingly globalised knowledge society, we are also thinking in European and international dimensions.

Interdisciplinary work is already an established practice in research in Saxony today. We want to build on that and, going forward, intensify our efforts in working towards a more lively dialogue between fundamental research and applied research, promoting **mutual cooperation**.

The existing, tight network of relationships between universities and non-university research institutions, which expresses itself in various **forms**, plays a central role for us in the expansion of cooperation. Examples include:

- Joint research topics, applications and projects
- Joint use of research infrastructure and/ or material/human resources
- Joint appointments
- Joint transfer activities
- Joint representation of interests

We also count on strong Saxon institutions, strong scientific alliances and participation with regard to the **Clusters of Excellence** and **Universities of Excellence** funded by the federation and states under the Excellence Strategy. Saxony has achieved significant successes here in recent rounds of competition and we want to build on that going forward. We see outstanding, site-specific potential for the further development of future research fields and the associated interdisciplinary cooperation and international networking, especially in joint applications of Saxon universities and the inclusion of non-university research institutions in clusters of excellence.

Joint applications and participation in programmes of the **German Research Foundation (DFG)** are key focal points for us. Saxon universities already cooperate with non-university research institutions in nearly all special fields of research today. We intend to build on that.

Going forward, we will place even greater emphasis on **research associations**, that is, on networks of scientists in a wide range of disciplines who jointly work on a complex problem. We see great potential here, especially in the fields of medicine and material or environmental research, to boost topics of future relevance.

With our participation in **European funding programmes**, including support for Saxon stakeholders in competitive programmes, we intend to further contribute to enhancing the excellence and international competitiveness of Saxony's scientific institutions. We want to promote the formation of effective research cooperation structures for emerging topics by supporting **research networks** within the ERDF framework, thereby contributing to promising developments.

For us, cooperation between scientific institutions and **industry** is an important driving force for the scientific system. We value a timely connection between research and practice because a living ecosystem that enables collaboration between various stakeholders guarantees the success of research and innovation in Saxony.

"Successful cooperation in research associations is already being practised in Saxony. This is impressively illustrated by the accounts in the White Paper. The diverse research landscape provides an excellent basis for even closer cooperation between scientists in various fields on the one hand and various institutions on the other hand. Joint projects have numerous advantages. They attract excellent researchers and their reach extends beyond the site since they are visible for the region's industry and also internationally."
Dr. Annette Schmidtmann, German Research Foundation (DFG), Head of Scientific Affairs, Member of the Expert Commission

DRESDEN-concept is a Dresden-based scientific alliance established in 2010. It now has 36 partners including the TUD Dresden University of Technology and local institutions of the Max Planck Society, Leibniz Association, Helmholtz Association and Fraunhofer-Gesellschaft as well as renowned cultural institutions engaged in research. DRESDEN-concept's mission is to intensify cooperation between the partner institutes and to not only identify but also utilise synergies in research and teaching as well as infrastructure and administration. Through networking across institutions and disciplines, DRESDEN-concept provides researchers with an ideal venue for science and innovation. Proximity between the partners, the effective use of infrastructures within the alliance and the establishment of joint research focal points account for the success of DRESDEN-concept and made a major contribution to the winning and successful defence of the title of excellence by the TUD Dresden University of Technology – as the sole university in eastern Germany – in the federal and state competitions for excellence.

HZDR/Helmholtz Institute Freiberg for Resource Technology (HIF) and TU Bergakademie Freiberg with their European and international partners successfully participated in the tender offer for a **KIC European Institute of Innovation and Technology (EIT) RawMaterials** in 2014. Thus Saxony succeeded in bringing 115 research institutions, universities and companies from 22 states together in the largest European research association for raw materials. The Saxon State Ministry for Science, Culture and Tourism (SMWK) supports the KIC EIT RawMaterials with funding for the **Regional Centre Freiberg**, which officially opened at TU Bergakademie Freiberg on 20 October 2016.

With regard to research Saxony strives to ...

Utilise reliable and innovative means of financing.

We plan to continue the **public financing** of research in Saxony, i. e.

- institutional funding (funding of research infrastructures or a research organisation/institution as a whole) and
- project funding (funding of individual and joint projects for a limited time)

on a stable foundation.

With the budgets established in a subsidy agreement, we intend to ensure adequate financing for universities over the long term.

For the contribution of the Free State to the funding of the Fraunhofer-Gesellschaft, the centres of the Max Planck Society, the centres of the Leibniz Association and the Helmholtz Association, we view the agreements between the federation and states in the course of the Joint Science Conference as the necessary long-term, stable framework. Funding for the state-financed research institutions is provided entirely by the Free State of Saxony. Where the opportunity arises, we pursue the transition of state-financed research institutions to new organisational structures financed, for example, by the federation and states to open up new development prospects for them.

To ensure long-term financing and planning reliability for non-university research institutions, we continue to advocate at the federal/state level for a 3 % increase for the jointly financed research institutions under the Pact for Research and Innovation (PFI). For state-financed research institutions, we have implemented the percentage increase according to the PFI since 2019 in the current legislative period and are striving for an ongoing link to the PFI. This ongoing financial growth, which is stipulated by scientific target agreements and backed by shared political will, is a unique feature of Saxony's science policy. We have every intent of utilising this as an opportunity and site advantage.

In addition to institutional funding for scientific institutions in Saxony, project-specific research funding is a central element of research financing. This is comprised of the optimal mix of funds from the Free State of Saxony, the federation and the European Union.

Project funding from the state is provided to enable scientific institutions to successfully participate in federal and EU programmes. This provides leverage for institutions to access additional sources of financing over the medium or longer term.

To systematically support research fields with an urgent need for funds, we will focus on **private engagement** in addition to stable, strong public financing. We are convinced that close cooperation between the public and private sectors, including companies and foundations, is indispensable to accelerate transfer and implementation processes in future research fields or to realise them in the first place. Here the private sector can contribute practical implementation knowledge and experience in addition to financial resources. In some cases, this cooperation is essential to close the research/application gap. We believe that foundations can get actively involved in specific fields of research or in response to social challenges, and support projects that may not be the focus of public funding. To support this financing option – for example, also for the career path of young scientists – we intend to compile relevant information going forward and to provide this to the research community.

We see opportunities in accessing private sector financing and encourage scientific institutions in Saxony to train researchers, making them aware of the full range of financing options. Proactively considering alternative options to public financing in day-to-day research is important in order to obtain a high level of funding. In this regard, we also advocate for the elimination of fiscal and bureaucratic hurdles.

The past has shown numerous times that unforeseeable events, such as the COVID-19 pandemic or the 2022 energy crisis, demand fast and uncomplicated action. Boldness in the design and development of financing instruments to support the **flexible use of funds in research** is important to us. Innovative approaches such as the SPRIND Freedom Act can offer orientation here. We want to be even more flexible in responding to changing conditions and requirements in the future.

Germany was home to about 25,000 foundations with legal capacity under civil law in 2022. Fewer than 10 % of them are based in eastern Germany. The Free State of Saxony assumes a leading position among the states of eastern Germany with 636 foundations under civil law. Researchers will find an overview of foundations in Germany at **www.stiftungssuche.de**.

"I am convinced that scientific progress benefits society. Promoting this is a task shared to a significant extent by numerous private foundations. They can be a source of great support for researchers regarding topics with future potential when speed, flexibility and readiness to assume risk are needed. As Secretary General of the Volkswagen Foundation, Germany's largest private non-profit science supporter, I am proud that we have funded more than 300 projects with Saxon participation since 2004. I gladly encourage researchers in Saxony to continue taking part in our funding initiatives with courage and commitment."
Dr. Georg Schütte, Secretary General of the Volkswagen Foundation, Member of the Expert Commission

With regard to research Saxony strives to ...

Generate practical knowledge and promote its use.

Only the effective transfer of results makes research an important source of impulses and ideas for industry, society and politics. The more effectively this **transfer** is realised, the more innovative, resilient and ready for the future our society will be. Science and research stakeholders have a great social responsibility in this respect.

The transfer of ideas and knowledge as innovation drivers is a multilayered process defined by high complexity and multidirectionality. It is subject to numerous influences and dependencies.

We therefore understand the transfer concept in both the narrower and the broader sense and pursue various **paths for the transfer** of scientific findings. These include in particular transfers through

- partnerships,
- contract and collaborative research,
- proprietary rights and intellectual property,
- science spin-offs and start-ups,
- training and continuing education,
- personnel exchange (minds),
- infrastructure services,
- standardisation and norms and
- scientific communication.

All of these are relevant to us for the success of research in Saxony, and are therefore considered in research policy decisions and in the development of instruments. Taking differences in the profiles of universities and non-university research institutions into account in the transfer of knowledge and technology is important to us.

Our steering instruments are intended to support successful transfers and promote the sustainability of structures.

With a uniform set of key indicators for all publicly financed scientific institutions, we intend to establish a reliable foundation for the ongoing analysis of developments and trends.

We believe that the full transfer potential can only be realised when **transfer activities** are considered starting in the project initiation phase, tailored to target groups and understood as a recursive bidirectional or multidirectional exchange process. In order to achieve this, we want Saxony's researchers to make even greater use of the well developed transfer structures in Saxony. This works especially well when the transfer is not understood as a one-sided offer of science for industry, but when companies actively seek and ask for the transfer of results from the research community.

Existing **transfer structures** such as start-up initiatives, transfer offices and technology transfer institutions at universities, the subsidiary structures of research institutions, transfer associations and initiatives, affiliated institutes and clusters, future-SAX – the Free State's innovation platform with the Saxony transfer network of around 70 institutions (research institutions, universities, chambers, business developers) – and the office of the Federal Agency for Disruptive Innovation (SPRIND) in Leipzig provide outstanding conditions for us to further boost the transfer of research results in Saxony.

We are committed to the permanent establishment of positively evaluated and effective transfer structures that can do their job on a stable foundation and with lasting success.

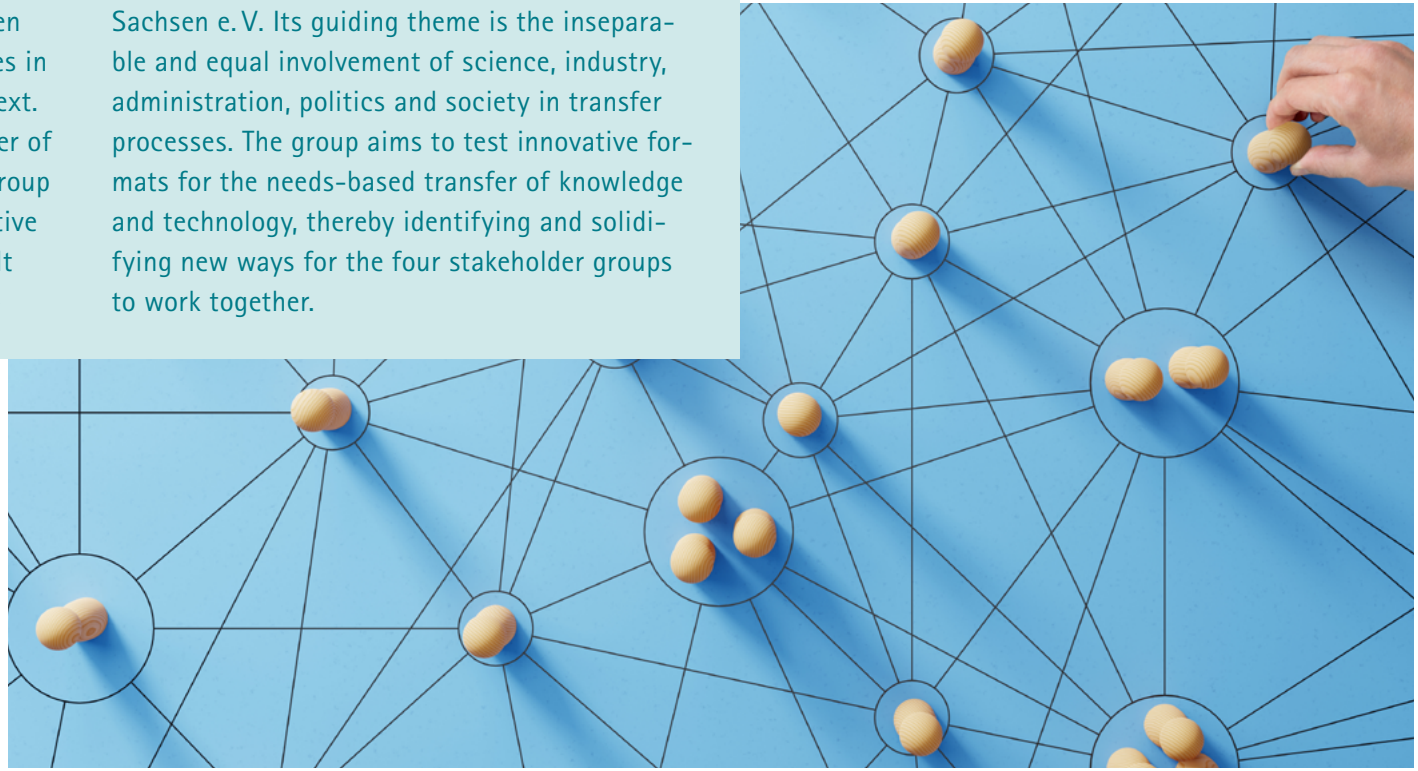
In addition to the transfer infrastructure, we believe that researcher **expertise** and knowledge are of crucial importance. We want scalability to be considered in day-to-day research and awareness of synergies to be continuously sharpened. It is important to us for successful career paths from research to start-ups – or vice versa – to become more visible in order to encourage imitation.

We only consider the transfer of results to be successful when all stakeholders relevant for the transfer are included. We want to make the transfer process even more efficient and effective through coordinated activities. To this end, we will increase our efforts to ensure that performance and success in the transfer of knowledge and technology are externally communicated and thus made transparent. This will serve as a source of inspiration for researchers.

futureSAX is the central point of contact in Saxony's start-up, transfer and innovation ecosystem. Connecting with the right contacts in the futureSAX network, a broad and inspiring exchange of experiences, the ongoing transfer of knowledge and technology and the improvement of innovation processes across industries and technologies take centre stage. futureSAX serves as a platform for innovative ideas, processes and products in the Free State and strengthens Saxony's innovation culture through numerous measures, such as networking founders, companies, investors, transfer stakeholders and the young generation.

"The successful transfer of research results is the key to an innovative society that is ready for the future. This requires a variety of approaches, cooperation and a clear understanding of synergies between research and industry. We are committed to making this transfer process transparent and inspiring for everyone involved. This works especially well in Saxony thanks to a well developed infrastructure, strong research institutions, dedicated researchers and a collaborative culture that promotes the exchange of knowledge."
Christin Eisenschmid, Managing Director Intel Germany, Vice President European Ecosystem Strategy, Member of the Expert Commission

Universities of applied sciences (UAS) in Saxony play a special role in transfer from research to industry, society and politics and back. The **transfer group Saxony5** established between Saxony's five universities of applied sciences in 2018 deserves special mention in this context. Its aim is to strategically further the transfer of knowledge and technology. The **4transfer** group funded under the federal and state "Innovative University" initiative is equally significant. It includes TU Bergakademie Freiberg, Berufsakademie Sachsen, Hochschule für öffentliche Verwaltung und Rechtspflege (FH) Meißen and Landesverband der Kultur- und Kreativwirtschaft Sachsen e. V. Its guiding theme is the inseparable and equal involvement of science, industry, administration, politics and society in transfer processes. The group aims to test innovative formats for the needs-based transfer of knowledge and technology, thereby identifying and solidifying new ways for the four stakeholder groups to work together.



Saxony5 transfer group

4transfer

With regard to research Saxony strives to ...

Offer an environment for the optimal development of creativity and innovation.

Creativity or the ability to create something new or original was and is an important **hallmark** of research in Saxony now and in the future. It is known as the Saxon spirit of research and inventive talent. We are therefore committed to a **science-friendly climate** at all levels. Our goal is to make Saxony an internationally renowned site for the development and implementation of new ideas.

We view research policy transparency and dependability as important pillars of effective and successful research in Saxony. At the Saxon State Ministry for Science, Culture and Tourism (SMWK), we implement this through strategy development and in the course of evaluation processes for funding projects.

We not only emphasise and practice science-friendliness within the Saxon administration, we want to communicate this externally as well. The SMWK is aware of this responsibility and approachable for researchers as well as stakeholders seeking contact and exchange with the science community.

We want to provide fast and uncomplicated advice on all matters in the context of research. With a steadily growing selection of digital information in German and English regarding research and innovation in Saxony, we are expanding our service portfolio. Increasing the visibility of science in Saxony, its capabilities and what it offers beyond state borders is very important to us.

We want to organise exchange processes in **innovative formats** with the community of researchers in the Free State and out-of-state experts in order to identify ideas, trends and developments early on. Making these formats and in particular the foresight processes pursued this way flexible and open is important to us in order to activate a broad creativity potential. It is especially important to us for the younger generation to participate in these processes and contribute their ideas. Here we are going to build on positive experiences with the Science on Stage format organised in the course of the White Paper process.

We see great potential for ideas and creativity in open **exchanges between various scientific disciplines**. We also want to stimulate these exchanges to the best of our ability. Here we see numerous possibilities for incentives, such as suitable calls in applicable funding programmes or in the organisation of interdisciplinary events.

The **SMWK website** offers extensive information about Saxony as a research site as well as research funding options at the state, federal and EU levels. The SAB (Sächsische Aufbaubank) as the Free State of Saxony's central funding institute provides competent and subject-specific advice on state funding instruments (see page page 10). **ZEUSS, the central EU service centre**, is available for questions related to European research funding and administration. Further questions can always be answered in direct exchanges with employees of the Saxon State Ministry for Science, Culture and Tourism (SMWK).

Under the heading **"Science on Stage – Make Way for Science"**, original and creative solutions, ideas and stimuli from researchers for the future-oriented further development of Saxony as a research site were sought in the idea contest accompanying the White Paper process. The submission of contributions and concepts in a variety of formats opened at the beginning of 2023. This contest's diverse results impressively illustrate the high level of motivation on the part of researchers for active participation and reinforce the added value of creative formats for generating ideas.

SMWK website

Research funding

ZEUSS central
EU service centre

Science on Stage

With regard to research Saxony strives to ...

Deliver scientific findings with and for society.

To overcome future challenges, the research community has to involve society, develop an understanding for its concerns and make use of its strengths. With clear research policy offers for citizens, we want to build confidence that the variety of transformation processes can be managed. Perpetual awareness that research is a pillar of prosperity is important for society. It should therefore be comprehensible and perceptible so that people can understand its relevance. We intend to accomplish this through participation and communication.

Participation is of tremendous importance to us because it forms the basis for acceptance. We are convinced that people develop an awareness of co-determination and shared responsibility when they can contribute to the research process. Citizen science, a form of research that actively includes citizens in the scientific process, is a way to utilise a broad range of knowledge, resources and perspectives in order to tackle complex problems. We see great potential here and encourage its application in appropriate fields of research. To this end, we want to support corresponding activities for communication to society.

We want scientists to communicate their work and results openly and coherently in a wide variety of formats and for many different target groups, and will support them in this. Here we see the creative sector as a valuable partner. Examples from the activities of the "Kreatives Sachsen" (Centre for Cultural and Creative Industries Saxony) emphatically demonstrate how cooperation between creative professionals and researchers leads to innovative solutions. It is also decisive for us that **all scientific disciplines** participate in making research perceptible. In the state of Saxony, which is known for the outstanding strength of engineering sciences, we place great emphasis on communicating the impact and importance of the humanities and social sciences. We are committed to ensuring that these disciplines not only make their findings available for research but also contribute them to the current social discourse.

It is important to us for the interplay between science and society to go far beyond technical topics. Cosmopolitanism and diversity, which are fundamental in research, must be transported into society as established practices consistently and whenever possible.

The **COSMO science forum** is a place for society and research to meet in Dresden's historic old town. Current research in Dresden can be experienced here live in various event formats, from a variety of scientific fields and through interactive exhibits. The space is operated jointly by the Barkhausen Institute and the Department of Speculative Transformation at TUD Dresden University of Technology in cooperation with partners of the Dresden science alliance DRESDEN-concept, the Dresden Philharmonic and the Central Library.

"Securing the two major research institutions, the German Centre for Astrophysics (DZA) in Görlitz and the Centre for the Transformation of Chemistry (CTC) in Delitzsch, not only reflects the outstanding development of Saxony's science landscape in recent years and decades but also shows that good science policy consists of long-term planning and courageously seizing opportunities that present themselves. A close connection between science and civil society needs to be an integral part of such efforts today. Only in close communication with society can top-level research successfully tackle and solve the urgent problems of our time. In case of the DZA and CTC, this is happening in an exemplary manner through contributions to the structural transformation in Lusatia and impulses for the Halle-Merseburg-Bitterfeld chemistry triangle as well as scientific communication realised here in the respective regions."
Prof. Dr. Dr. h. c. mult. Christoph Markschies, President of the Berlin-Brandenburg Academy of Sciences and Humanities, Professor for Ancient Christianity at Humboldt University in Berlin, Member of the Expert Commission

With regard to research Saxony strives to ...

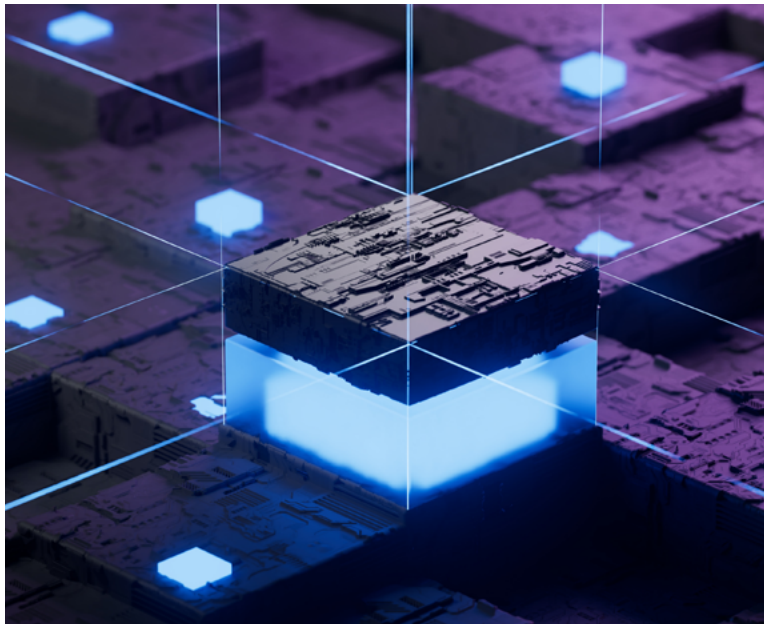
Help shape digitalisation, systematically and structurally.

We want to shape the **digital transformation** with openness and curiosity. Especially in science, we consider openness crucial for the transformation's success and want to ensure that it happens at all decisive levels – in research itself, in teaching, in administration and in the digital infrastructures.

We want to be a methodology and structural pioneer in **research data management** in Germany, and make a decisive contribution to making research datasets accessible for the entire scientific system under the National Research Data Infrastructure (NFDI) initiative. To efficiently bundle resources and expertise, effectively bringing them to bear for the scientific system as a whole, we want the challenges associated with research data and research data management to be taken on collectively by universities and non-university research institutions.

We intend to ambitiously pursue the goal of making Saxony a leading German **research and innovation site for artificial intelligence (AI)**. Here we are guided by the Free State's AI strategy, which addresses topics in the areas of software/algorithms/data, hardware, applications and infrastructure that can be ascertained based on the current state of knowledge, but also very much remain open to new topics. In terms of research, we believe the potential for Saxony lies in AI as an interdisciplinary object of research and as a research tool. We view project-specific and institutional support for Saxon researchers as important tools for realising this potential.

In AI and related fields such as **next-generation computing**, in particular neuromorphic computing and quantum computing, we intend to focus on future-oriented fields in which Saxony has pronounced strengths and promising potential. For us this includes strengths in material research and semiconductor technologies in particular.



The SaxFDM initiative for research data management in Saxony is a promising nucleus that already brings the relevant research data management stakeholders in the Free State together. SaxFDM is an initiative of Saxon universities and research institutions for networking, cooperation and the coordination of research data management activities. It will drive and coordinate research data management activities in Saxony and offers support and advice to help researchers with their technical problems.

"Artificial intelligence is more than a contemporary tool. It reflects our potential and challenges our reason and responsibility in the future."
Prof. Dr. Wolfgang Maaß, German Research Centre for Artificial Intelligence (DFKI), Scientific Director, Professor of Business Informatics at Saarland University, Member of the Expert Commission

With regard to research Saxony strives to ...

Be a home for bright minds from around the world.

Qualified **experts** and top-class **researchers** are the pillars of performance and competitiveness for research in Saxony.

We want to bring bright minds from across Germany and around the world to Saxony and keep them here. To get even more international students and scientists excited about Saxony, we are implementing targeted activities under the Free State's skilled worker strategy and the pact for the recruitment of international skilled workers. In cooperation with our scientific institutions, we target strategically selected regions with specific ecosystems around the world to meet Saxony's demand for skilled workers. Here we strive to have a local presence and to enter into long-term partnerships with the regions that are mutually beneficial. With marketing activities aimed at specific target groups, we also raise awareness worldwide of Saxony as a place to study. Further increasing the study success rate of international students in Saxony and supporting the establishment of networks between our universities, students and companies is important to us as well.

For us, making Saxony a more attractive place to study includes simplifying **access to the state's universities** for students, and subsequently to Saxony's labour market. Aside from instruments that support growth, such as scholarships, we actively work to eliminate obstacles to accessing academic education. We want to identify clear prospects and personal development opportunities for students in Saxony's research or industry.

Saxony's research ecosystem with its close networking with start-ups and industrial enterprises along with **attractive living conditions** in the Free State, including the quality of life, comparatively low cost of living, childcare and education at the highest level, offer an outstanding basis for this. All of these aspects will be communicated even more effectively than before in competing for skilled workers.

We are aware that a cosmopolitan mindset is indispensable here. We actively work towards this and will support measures aimed at establishing a culture of welcome to the best of our ability.

"The skills and abilities of international scientists contribute to strengthening and continuing the outstanding research activities in Saxony. The guidelines impressively demonstrate how the Free State actively promotes the development of a socioculturally open working and living environment, with the aim of making the attractiveness of the research site even better known internationally."
Prof. Dr. Janina Sundermeier, FU Berlin, Digital Entrepreneurship Hub, Assistant Professor for Digital Entrepreneurship and Diversity at the Department of Information Systems, Founder of Digital Entrepreneurship Hub, Member of the Expert Commission

Around 17 % of students (more than 18,000 young men and women) at Saxony's universities currently come from abroad. As a result, the universities have extensive experience with international students and their guidance and support. Saxon scientific institutions also make an important contribution to the recruitment of international scientists, for example, through summer schools and other formats. In addition, the welcome centres at Saxon scientific institutions serve as key partners to support international researchers. They assist with finding a place to live, everyday challenges, right of residence matters and the like. To ensure the supply of skilled workers, Saxony's cabinet approved the first **action plan for the recruitment of international specialists and workers** on 30 August 2022. The universities have committed to placing even more emphasis on the education of young people from abroad, specifically for Saxony's labour market. Examples of support formats include:

- Student recruitment by the Saxon State Ministry for Science, Culture and Tourism (SMWK)
- University coordinator for student recruitment
- Foreign liaison offices
- Measures to ensure study success (for example, supporting German classes in parallel with studies, buddy and mentoring programmes)
- Career services and individual advice for systematic integration into Saxony's labour market

With regard to research Saxony strives to ...

Raise awareness of outstanding performance and of the site.

Our goal is to widely **promote** Saxony's research landscape, its diversity, performance and excellence as well as the outstanding work results of our researchers.

Various instruments of internal and external **science communication** are indispensable for us in this regard. While internal communication – for example, through publications in scientific journals, presentations at scientific conferences and open data – primarily supports professional exchanges between researchers within the scientific community, external science communication is directed at a wider audience and employs a greater variety of methods. Citizen participation, innovative dialogue formats, public presentations and events, interactive exhibitions and digital communication along with radio, television and social media offer countless possibilities to share information about research and include other stakeholders in the scientific gain in knowledge.

Saxony's scientific institutions are already doing excellent work in both forms of communication. To further improve the range and visibility of our excellent research efforts, we want to encourage our researchers to build on specific strengths, for example, in the area of cross-disciplinary publications, to participate in committees, initiatives and (regional, national and global) networks and clusters, and to continue trying out new ways of transferring information, also to target groups outside the scientific system.

Among other things, we bundle information through a central communication channel to externally communicate the sum of individual activities externally. With the **"SPIN2030. Science State Saxony"** campaign, we not only intend to promote Saxony as a science site but especially to focus on the dynamism and creativity of Saxony's university and research landscape. Our goal is to popularise science "Made in Saxony". We are convinced that this contributes to promoting exchanges between stakeholders and strengthens research in Saxony, both as a reliable partner for industry and as a relevant source of ideas for society. Here we are building on the solid foundation of previous communication and public relations efforts by our scientific institutions, and will develop and implement creative formats together.

In the course of our measures for the recruitment of international skilled workers and students, we will use representative offices being established in select target regions for local site marketing efforts. This will not only get students and researchers excited about Saxony. We can also use the resulting contacts to share information about the research site in the respective regions and to improve **visibility**.

"SPIN2030. Science State Saxony": Just like "spin" represents rotation and movement, research in Saxony is often a leader of continuous advancement: Numerous internationally leading institutions define Saxony's diverse research and university landscape. We want to communicate this with the **"SPIN2030. Science State Saxony"** campaign. Large and small events, a road show, a science festival, social media campaigns and formats such as an interactive map allow audiences across Saxony, nationally and internationally to experience the structures and characteristics, research results and the excellence of the science state.

Arte and Deutschlandfunk Kultur launched a new science documentary series in 2023 with the new video format **"Agree to Disagree"** and the parallel **"People of Science"** podcast. Each episode examines a topic of social relevance such as genetic engineering in human medicine or the energy transition with hydrogen. The experts are scientists researching the respective topic and representing in part contrary findings and positions. Illustrating the diversity of scientific findings and interpretations is the objective of the "Agree to Disagree" podcast. The series aims to show that science is a process, which is made visible by the format. The "People of Science" podcast is about the research fields of the guests and their informal resume. Thus the podcast not only illustrates the diversity of science but, by presenting personal profiles, helps inspire people to choose a profession in science.

SPIN2030.
Science State Saxony

Agree to Disagree

People of Science

The White Paper process in Saxony

With the White Paper process, Saxony's state government has initiated an ongoing dialogue between politics, science, industry and society. The steps on the way to the White Paper are comprehensibly documented on the following pages. This shows what the various research policy guidelines are based on.

Research policy design through participation

Presentation of research policy guidelines

Documentation of the process and results

Basis for orientation in research policy decisions

Maintaining the balance between "bundling and reinforcing existing competences" and "establishing new, innovative fields of research and transfer"

Establishing a valid decision-making basis for research policy

Definition of future-oriented expectations and orientation for action

Kick-off to establish an ongoing dialogue between research and politics

1. Inventory
2. Identification/discussion
3. Consolidation
4. White Paper

Meetings of the expert commission

- 30/05/2022 Leipzig: Kick-off meeting
- 09/12/2022 Dresden: 2nd meeting
- 17/04/2023 Leipzig: 3rd meeting
- 11/09/2023 Online: 4th meeting

White Paper forum

Online survey

- 10/03/2022 Workshop "Research in Saxony – status quo" — 26
- 03/05/2022 Workshop "Seizing opportunities. Anticipating risks." — 89
- 06/07/2022 Workshop "Quantum technologies in Saxony" — 37
- 08/09/2022 Leipzig: Conference "Research for the future – the future of research: Saxony's White Paper process" — 126

- 28/03/2023 Online: Symposium "Fundamental and application-oriented research" — 129
- 08/06/2023 Dresden: Inter-ministerial workshop on the draft White Paper — 19
- 10/11/2023 Dresden: Closing conference "Research success for the future"

Exchange platform: Dialogue on research policy in Saxony

Online forum

Idea contest "Science on Stage" → 18 sketches → 03/07/2023 Dresden: Pitching workshop "Science on Stage"

3 finalists

SWOT analysis

Evaluation of RL TG 70

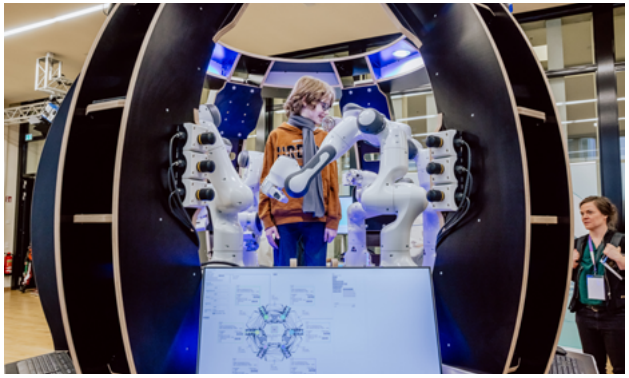
November 2021 | November 2022 | November 2023

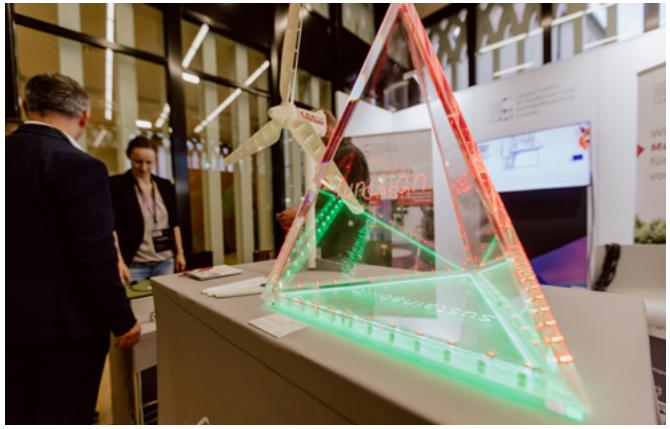
What are the next steps?

"The White Paper process has shown that we can cooperate very well in Saxony. I am pleased that so many representatives of Saxony's science community and beyond contributed their expertise and ideas to the process. I wish to express my gratitude for that. Without this active and varied discourse, the White Paper with its guidelines could not have been created in this form. It was a lively, in part taxing but above all very worthwhile process.

Yet this was just the beginning! It is essential for the dialogue that has been initiated to continue. And of course the insights that were gained require further development and implementation. Thus the stated goal is to make the excellence of Saxony's science landscape even more visible. We will pick up the thread, for instance with the "SPIN2030. Science State Saxony" campaign, and communicate the competences and accomplishments of Saxony's research landscape far and wide."

Sebastian Gemkow





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Sources

Page 8 map: https://www.gwk-bonn.de/fileadmin/Redaktion/Dokumente/Papers/Sachstandsbericht_2022.pdf

Page 10 SMWK: Saxon State Ministry for Science, Culture and Tourism

SMWA: Saxon State Ministry for Economic Affairs, Labour and Transport

Page 11–12 German Research Foundation Funding Atlas 2021. Bonn: Deutsche Forschungsgemeinschaft e. V., retrieved on 18 September 2022 from https://www.dfg.de/sites/foerderatlas2021/down-load/dfg_foerderatlas_2021.pdf

Page 11–12 Destatis. (8 September 2021). Education finances and funding – collection of third-party funds and third-party funds per professor of the universities. (see federal office, publisher), retrieved on 18 September 2022 from https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Bildungsfinanzen-Ausbildungsfoerderung/Tabellen/professoren-einzelne-hochschulen-medizin.html

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