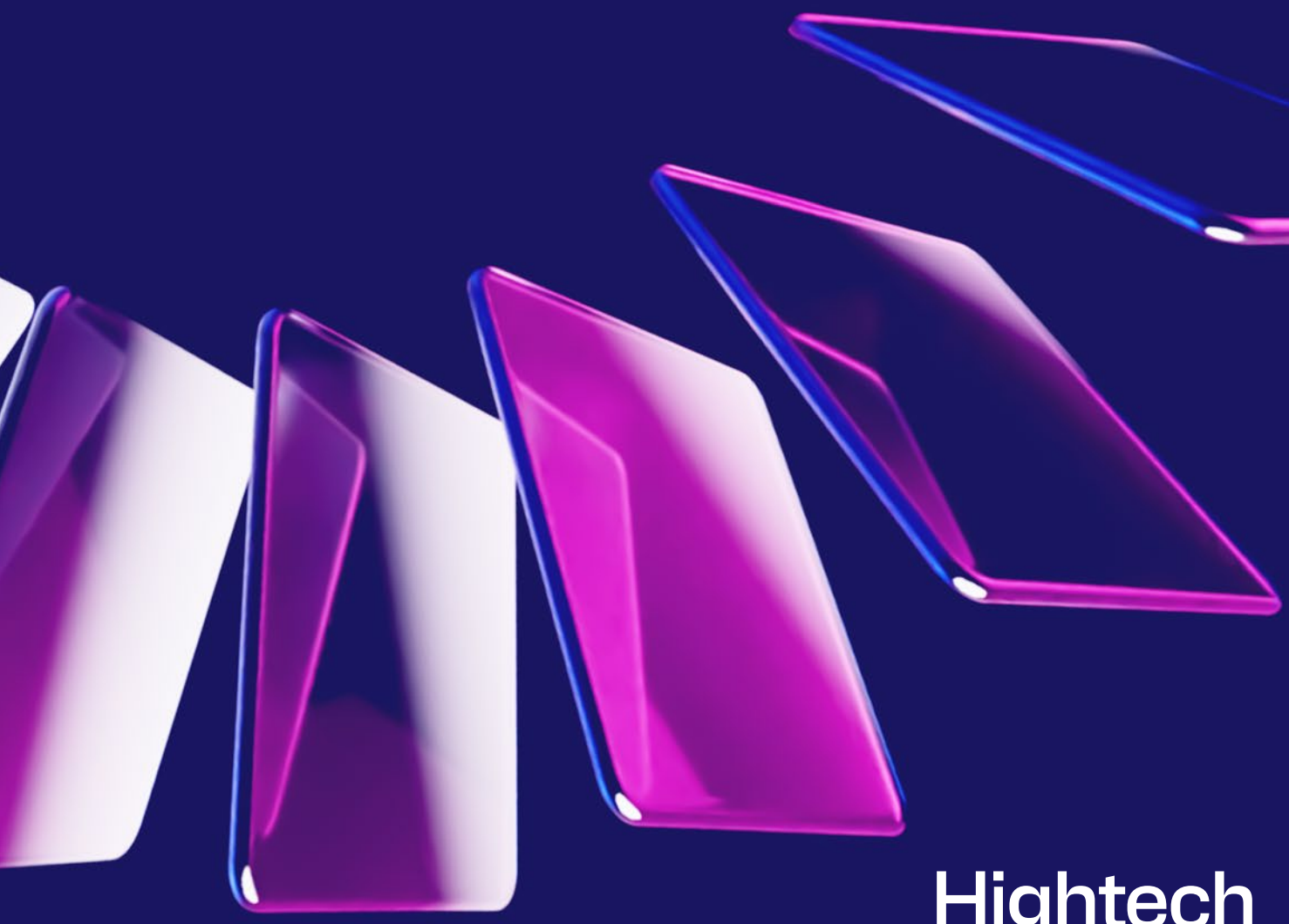
The
Federal Government

High-Tech Agenda Germany



Hightech_
Agenda_
DEUTSCHLAND

Foreword

Dear readers,

'Made in Germany' has been the foundation of our prosperity for decades. I am committed to ensuring this remains true in the future. Looking around the world, it's clear we now need to invest heavily – in ideas, effort and money. After all, change is happening fast – whether in major areas such as artificial intelligence or in the global race for resources and innovative sectors like New Space.

Today's research creates tomorrow's value. We not only want to present innovations convincingly on paper, but also to bring them successfully to market. That's why the High-Tech Agenda Germany focuses on the entire chain – from the initial spark of innovation to the competitive product. We are starting with six key technologies: artificial intelligence, quantum technologies, microelectronics, biotechnology, fusion and climate-neutral energy generation, along with climate-neutral mobility. These pose not just major challenges, but also hold great potential. Research offers the chance to cure previously incurable diseases and to find solutions to complex national security challenges.

It is vital that we use research as a lever for our sovereignty. Science not only needs freedom; it also gives freedom if we lead the competition, set our own trends and shape standards. In times of fierce geopolitical conflicts, technological success makes us independent and strong.

However, sovereignty does not mean giving up partnerships – quite the opposite. The High-Tech Agenda Germany is a call for our whole country to combine forces effectively. This applies to universities as much as to companies as well as to partners at federal, *Länder* and local level. European and international cooperation is embedded in all areas of the High-Tech Agenda Germany and is essential to its success.

My invitation stands: a clear course for the future. Germany must once again become a leading technology nation. The flagships presented on the following pages are ready for a large and dedicated crew.

Dorothee Bär MdB
(Member of the German Bundestag)

Federal Minister for Research,
Technology and Space

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I. Introduction

The High-Tech Agenda Germany stands for enhanced competitiveness, value creation and sovereignty[1] through research and technology. A new generation of 'Made in Germany' technologies should once again be a hallmark of our country. Our regions and clusters should become magnets for top talents, investors and innovative companies. For the people of Germany, this means high-quality, secure jobs and prosperity and progress that is tangible in their everyday lives, both in cities and in the countryside. A thriving research and technology ecosystem is also the foundation for making Germany more resilient, sovereign and secure.

We aim to significantly boost our country's innovative and economic strength by investing more in future technologies. This will be achieved through faster research, development and commercialisation of technologies as well as through a consistent focus on building technology capacities and value creation in Germany and across Europe. The High-Tech Agenda Germany regards academia, industry, politics and civil society as key partners in its implementation and relies on close coordination between the Federal Government and the *Länder*. It aligns German and European research and innovation policy and provides new direction for cooperation with international technology partners. It connects research and technology policy with industrial, regional, labour markets and security policy. It helps reduce dependence in critical technology areas and effectively prevent unwanted technology leakage.

[1] Technological sovereignty provides transparency, traceability and control over infrastructure and data, ensures confidentiality, promotes security and resilience and reduces dependence on individual players and platforms. It is also decisive for the security, defence and competitiveness of Germany and of Europe as a whole.

As a first step, the High-Tech Agenda Germany focuses on priority key technologies and strategic research fields that are central to the country's progress. In each of these areas, Germany has a science and research system that is internationally competitive, a high level of technological capability and innovative companies. However, swift action is needed in each of these areas to strengthen innovation ecosystems, so that Germany is once again not only a leading research location, but also a competitive and sovereign hub for technology and innovation. The measures in the High-Tech Agenda Germany focus on key levers to propel Germany back to the forefront of international technology competition.

For each key technology, we present flagship initiatives with clear timelines. In 2025, we will launch large-scale funding initiatives for next-generation AI models, put Germany's first research satellite for quantum communication into operation and take the next step towards a fusion power plant with a Federal Government action plan. We will make our funding instruments more milestone-driven and introduce new tools for funding and innovation financing to address Germany's persistent weakness in transferring research into application and commercial use. This also involves an active role for the state in public-private partnerships, technology competitions or as an anchor customer.

The path to becoming a leading technology nation is one we must take together. That's why we are launching a process to collaboratively shape the High-Tech Agenda Germany. It is an invitation for the Federal Government's implementation partners from academia, industry and civil society as well as partners in the *Länder* and the EU. In autumn 2025, we will launch an outcome-focused roadmapping process for each of the priority key technologies. We invite the *Länder* and stakeholders from academia, industry and civil society to help design and implement the technology roadmaps. There is great potential within Germany and across Europe to make research and innovation more efficient and effective through joint strategies with a clear division of roles.

We will measure the success the High-Tech Agenda Germany by tangible results and by its impact on competitiveness, sovereignty and research-driven value creation. To this end, we aim to unite the state, academia, industry and civil society behind shared goals and establish consistent, transparent 360-degree high-tech monitoring.

All measures set out in, or arising from, the High-Tech Agenda Germany are subject to the availability of budgetary funds and to the Federal Government's responsibilities under financial constitutional law. Measures under the High-Tech Agenda Germany may also be funded from the special fund for infrastructure and climate neutrality, to the extent provided for.

II. Key technologies

With the High-Tech Agenda Germany, we are initially focusing on six priority key technologies central to our country: artificial intelligence, quantum technologies, microelectronics, biotechnology, fusion and climate-neutral energy generation as well as technologies for climate-neutral mobility.

In each of these areas, the Federal Government is taking the lead, setting key objectives and launching flagship initiatives with clear timelines. We regard the High-Tech Agenda Germany as a joint endeavour of all stakeholders in the science, research and innovation system. Germany will only become a leading technology nation again if we take this path together, with determination and a sense of responsibility for our country. We therefore invite our partners in the *Länder*, along with those from science, universities, non-university research, departmental research institutions, business, industry and civil society to contribute their expertise and ideas to shaping the High-Tech Agenda Germany.

We need our strong research universities, along with science and research organisations and their transfer offices. We need our research infrastructures and strong departmental research institutions to serve as technological enablers and knowledge hubs within innovation ecosystems. We need our innovative start-ups and small and medium-sized enterprises (SMEs) as well as the research-focused industry and the relevant user sectors. We also rely on the participation of the relevant research, business and trade associations. We need our agile innovation agencies – SPRIND and the Cyberagentur – along with an efficient funding landscape. We need bold investors to mobilise the necessary venture and growth capital. We need capable users in civil society and the workplace to bring technological developments to life and put them to productive use. We need civil society actors, because, in order to fully harness the enormous potential of technological innovations in addressing social challenges, it is important to include the views of those directly and indirectly affected from the outset.
We need interaction and synergies at the European level. In German politics and administration, we are called upon at the federal, *Länder* and municipal levels.
And we need everyone who wants to help shape our society – because only together can we make the transition to a vibrant culture of innovation, where ideas grow and inspire a shared vision for the future.

Artificial intelligence

Objectives and key flagship measures

Goal 1

With an AI initiative, we aim to have ten percent of our economic output based on AI by 2030, boost labour productivity and establish artificial intelligence as an important tool in key research and application fields.

- In 2026, we will launch an **AI Robotics Booster** with flagship projects for multi-purpose robots, **showcases for 'embodied AI'** demonstrating the technology's potential applications for the economy, targeted expansion of research infrastructure for science and industry and the establishment of testing and training centres.

- We are launching **flagship transfer projects** for AI applications in key industries (including automotive, chemicals, biotechnology, cleantech, medicine and agrifood) and central research fields (including materials, climate, biodiversity, energy and sustainability research). Starting in autumn 2025, we will hold discussions with a range of experts including AI developers and representatives of key industries and research fields. We will launch the first projects and competitions from 2026. We are developing starting points and blueprints for the customised and competent use of generative AI and AI agents in SMEs.

- We are participating in the planned **IPCEI on artificial intelligence,** thereby driving the development of independent, highly specialised AI models for industry across Europe.

- We support the use of **AI to enable increasingly predictive and preventive medicine in the future.** We will launch a comprehensive portfolio of funding initiatives for the development and use of AI in health research, drug development and medicine while also promoting the transfer of AI innovations into medical care – from prevention to treatment and aftercare.

- We specifically support **AI spin-offs from academia** through EXIST and are creating a nationwide incubation ecosystem as part of the AI Nation initiative. The future EXIST Start-up Factories will also make a substantial contribution, primarily focusing on scaling AI start-ups. With the German Accelerator's global AI competence centre, we are promoting the further international scaling of start-ups in collaboration with AI Nation.

- We support **innovative AI start-ups and SMEs** so they can establish themselves on the market and continue to scale further. We are identifying and improving the most important framework conditions, offering competitions for computing capacity and simplifying the public procurement of innovative services from start-ups by introducing a special direct order value limit of EUR 100,000.

Goal 2

We are measurably improving the availability and usability of AI capacities (algorithms, data, computers, software tools, AI chips) for academia, research, industry, administration and civil society.

- We aim to ensure that at least one European **AI Gigafactory** is located in Germany. To this end, we are supporting the coordination of strong German applications, based on industry-driven public-private partnerships and a strong research environment, in dialogue with industry, academia and the *Länder* until the end of 2025. Operations are planned to start from mid-2027.

- To support regionally distributed data processing capacities for industrial applications, we are considering participating in the planned **IPCEI on edge node infrastructure.**

- We will launch the second stage of the **AI service centres** this year and continue expanding the network, involving the AI Factories in Germany and other EU member states.

- We prioritise **technological sovereignty, interoperable open standards and interfaces, free training data** and the development of **reusable, open source AI solutions.**

- We are strengthening **AI computing capacities, data ecosystems and AI and data skills at universities, non-university research institutions and departmental research institutions**. With this in mind, we are engaging in dialogue with the *Länder* on the gradual expansion of the NHR network, launching funding initiatives as part of the National Research Data Infrastructure (NFDI) and the AI Campus, and, in cooperation with the German Rectors' Conference (HRK), further developing the Higher Education Forum on Digitalisation and enhancing our dialogue with universities. We view free access to scientific results – without technical, legal or financial barriers – as a driver of innovation, particularly through greater use of open access and open data.

Goal 3

We will be a key player in the next generation of AI and in global competition.

- We are strengthening **AI centres of excellence for basic and application-oriented AI research** and their networking with each other and with users, innovators and start-ups in an **AI flagship**.

- Starting later this year, we are launching **funding initiatives for next-generation AI models**, including powerful foundation models and new AI methods.

- We are launching a **software engineering research programme** in 2027 to strengthen the basic technology of AI in a research-driven way.

- We are organising the **AI Action Summit** in Germany during the current legislative period.

- We are leveraging the **potential of AI for the common good** through funding programmes and cross-ministerial joint initiatives as well as investigating the potential of AI to strengthen liberal democracy.

Approach

Strengths

- AI research at a world-class level
- A well-differentiated and well-networked science and industrial R&D landscape
- High level of expertise in industry regarding AI utilisation, industrial robotics and B2B as well as excellent data quality
- Strong open-source community
- By comparison, engineering and AI specialists in Germany are very well trained, with a recent brain gain in AI
- Human-centred focus in AI development
- Generally positive attitude towards AI in the workplace
- Expertise in data protection, certification and governance of data ecosystems in industry and science
- Good AI computing infrastructure in the pre-competitive area
- Good positioning in the development of European data spaces, e.g. for health data
- European and international partnerships

Weaknesses

- Slow transfer to application
- (Basic) AI models, systems and tools too rarely come from Germany
- No major AI developers in Germany
- Restrictions on data availability and access, for example, due to concerns over trade secrets, difficulties in interpreting data protection rules, lack of networking and interoperability, risk aversion and limited data expertise
- Gap in independent computing infrastructure for commercial needs; changeover comparatively costly
- Lack of expertise, financial resources and personnel capacity, especially among SMEs and skilled trades
- Dependence on non-European providers and their closed systems for many basic components such as AI chips, cloud technology and software
- Skills development and design of AI use in operational practice still not sufficiently connected
- Low representation of women in AI research, development and application

Approach

Opportunities

- AI development and market growth are only just beginning; research and development (R&D) remain key
- Availability of large datasets, e.g. in medicine and astrophysics
- Greater availability of open-source AI models and free training data strengthens technological sovereignty
- Focus on safe, trustworthy, sustainable and human-centred AI
- Development of semantically structured, interoperable data ecosystems
- Development of highly integrated and autonomous sector solutions, including in mechanical engineering, industry, medicine, care and agrifood
- Development of competitive AI computing infrastructure by combining private and state requirements, with the state as an anchor customer
- Shaping the use of AI in companies through a strong social partnership
- High demand for automation due to demographic change

Threats

- Risk of dependence exacerbated by geopolitical conflicts, a strong focus on closed systems from the few big tech providers and competitor strategies (including China for domain-specific AI)
- The number of competitors is growing – others have significantly greater momentum and larger financial resources
- High energy costs are a disadvantage for CPU-intensive AI models and applications
- Increasing threats to society and the environment that have not yet been fully recognised
- Increasing centralisation of market power across more and more value chains among (mostly non-European) suppliers

Artificial intelligence has made the leap from a research topic to a decisive competitive factor. More and more companies in Germany are using, or planning to use, AI. Larger companies currently use AI much more frequently than SMEs or civil society organisations. Over 60 percent of employees use AI in their day-to-day work. Two-thirds of the population use generative AI. Studies estimate that AI has the potential to unlock additional value creation of EUR 300–400 billion per year in Germany alone – and ten times that worldwide.

The USA and China are neck and neck in the competition for future market share, while Europe is well placed to catch up. Germany is a key player in AI research. However, other regions of the world dominate value creation in the latest developments, such as generative AI and AI-based robotics. Although Germany was successful in the early phase of innovation, it is falling behind significantly in the commercialisation of AI. This results in increasing competitive disadvantages and dependencies for the economy as a whole.

At the same time, competition is highly dynamic and still open. With the Federal Government's National Strategy on Artificial Intelligence, Germany has laid important foundations for the broad, productivity-enhancing, responsible and human-centred development and use of AI in industry, work and civil society. The basis for strong positioning in global competition is a focus on Germany's specific strengths as an AI location, strengthening the AI economy, enabling participation and targeted skills development for employees, involving social partners and civil society in productive AI use as well as generating a critical mass of developers and users within a European AI and data ecosystem. The aim is to strategically link our excellent AI research with our expertise in key sectors (e.g. robotics, mechanical engineering, the automotive and chemical industries, cleantech, healthcare, medical technology, biotechnology, agricultural technology) and fields of application. Germany has considerable opportunities, particularly in safe, trustworthy, human-centred and sustainable AI applications in industry, financial markets, the security sector, healthcare, environmental protection and food security. At the same time, we will focus on sustainability in the use of the technology, as the rapid spread of AI is also sharply increasing demand for energy and resources. The transparency of large AI models plays a central role here.

Strengthening the transfer of AI into practical application requires expanding the transfer ecosystem, fostering a strong AI start-up scene and improving networking between AI developers, users, innovators and investors. It is essential to expand the necessary capacities for AI applications (computing infrastructure, algorithms and software tools, data ecosystems) and improve access. Strategically, reliable availability and technological sovereignty of solutions must be central factors, particularly through open standards, open-source models and open training data, to avoid consolidating existing dependencies or creating new ones. At the same time, AI skills must be strengthened across the board, including in universities and other research institutions.

Quantum technologies

Objectives and key flagship measures

Goal 1

In quantum computing, we aim to have at least two error-corrected quantum computers that are among the best in European by 2030 and to make them accessible to users.

- We will further develop the most promising system approaches through **a mission-driven hardware competition** starting at the end of 2025 and support scaling to quantum computers with logical qubits over the following four years. The three leading technology platforms, with output orientation, milestone planning and implementation monitoring, compete with each other to encourage even greater focus in the future. This is a significant step towards developing **at least two quantum supercomputers** that deliver real added value and quantum advantage for our industry.

- At the same time, we will drive forward the **development of the software stack**, focused on value creation and specific use cases and always on the best hardware platforms. The software stack will be based on a consistent, modular and open reference architecture with uniform, standardised interfaces, further boosting innovation in quantum computing.

- We will **create favourable conditions for start-ups**, enabling them to succeed in the market through sales and to take on the role of system integrator for quantum computers. We support the transfer of technology from research institutions into practice, for example, by providing services for the qualification of quantum technology components.

- We will continue to support the **purchase of quantum computers** by research institutions and **high-performance computing (HPC) centres**. The aim is to research and integrate quantum computers into the environment of a classical high-performance computing system. The best locations and utilisation strategies will be selected through a competition. Emphasis is on **connecting the HPC and quantum computing communities**.

- We will ensure the rapid transfer of research results to start-ups, SMEs and industry. Key building blocks will include the establishment of **at least three pilot lines from 2026 as strong nodes in a European fab network** ('From Lab to Fab') along with **setting up test centres and user platforms** for use cases in cooperation between research institutions and application industries ('1,000 qubits – 100 applications' measure). This will lay the foundation for industrialising quantum computers in the next decade.

Goal 2

By 2030, we will use quantum sensors to ensure earlier detection of diseases and open up at least one further field of application for the technology.

- We will **explore new fields of application through flagship projects:** we will establish research, development and transfer centres for measuring process parameters in production, mobility (charging cycle monitoring), life sciences (improved imaging) and space activities (satellite positioning). These projects will be launched in 2026.

- We support the **development of quantum sensors for industrial applications**. This includes developing a robust optical atomic clock for field use, characterising quantum magnetic sensors for medical technology and developing quantum-based electrical measurement technology.

Goal 3

In quantum communication, we will strengthen and expand the innovation ecosystem, with greater focus on end-user perspectives.

- In addition to excellent basic research, we will pave the way for **future-proof cyber security in the quantum age** through technology transfer, with innovative measures such as the Grand Challenge for Quantum Communication. Our focus is on ensuring that cyber security and ICT infrastructures benefit significantly from quantum communication technology.

- We will **put the first research satellite for quantum communication in Germany into operation in 2025**. The launch of a second small satellite is scheduled for 2026.

- As part of the **QuNET initiative, we will carry out high-profile key experiments in 2025 and 2026** to test and demonstrate the capabilities of quantum communication. A technology demonstration of the first quantum repeater in 2028 will lay the foundation for long-range quantum communication.

Goal 4

We are strengthening the skilled workforce in quantum technologies.

- With the **skilled labour agenda 'Quantum Future Professionals'**, we are intensifying our training and continuing education measures at all career stages. From 2025, we will support strategies for training and continuing education as well as quantum awareness initiatives. We are expanding talent recruitment and development and strengthening the interdisciplinary training of experts.

Approach

Strengths

- Strong basic research (top 5 in publications)
- High level of public investment in the development of quantum technologies
- Quantum computing: a young start-up scene in the field of the most relevant technology platforms
- Quantum sensor technology: exploratory commitments by large corporations, close cooperation with research institutions
- Quantum communication: an emerging national innovation ecosystem

Weaknesses

- Low venture capital for start-ups compared with international levels
- Quantum computing: no technology groups acting as system integrators
- Quantum sensor technology: not yet ready for industrial markets
- Quantum communication: integration of end users needs improvement

Opportunities

- Work with 27 strong partners in Europe (EU Quantum Strategy/EU Quantum Act) and like-minded international partners, joint development of standards
- Quantum computing: diverse use cases supported by Germany's strong industrial sector
- Quantum sensor technology: connectivity with medical technology, Industry 4.0 and the automotive sector
- Quantum communication: strengthening the cyber security of national and European information and communication structures for the future
- Quantum-safe encryption increases trust in information, communication and identification technologies

Threats

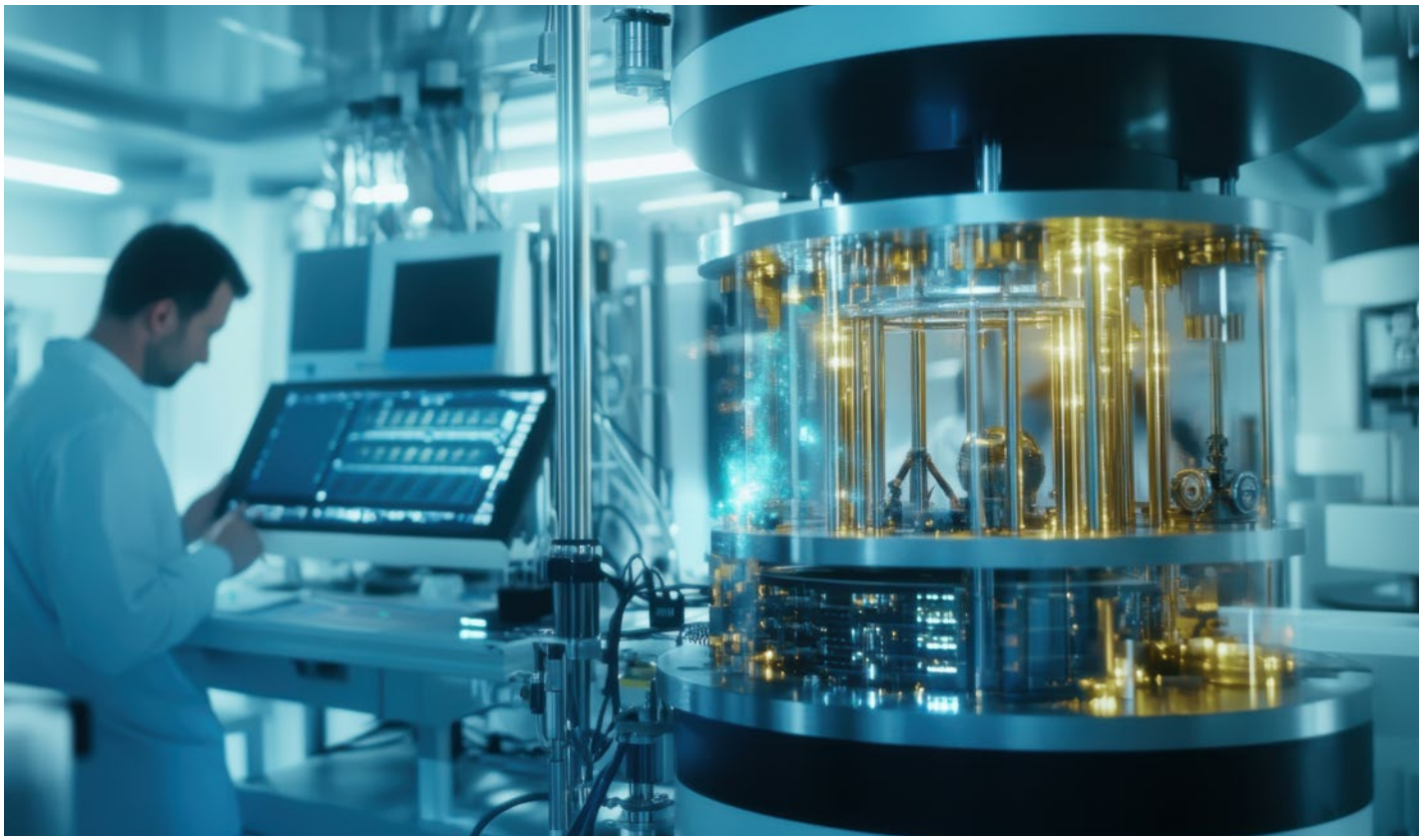
- Strong non-European competition and technological dependence
- Skilled workforce shortages
- Standards are set outside of Europe
- Quantum computing: technological uncertainties in hardware and application development
- Quantum sensor technology: dual use by non-European system competitors
- Quantum communication: the full potential for value creation is not being realised in Germany
- Quantum computers threaten traditional cryptographic processes and with them our entire information infrastructure

Quantum technologies are deep tech at the smallest scale. Quantum technologies, such as quantum computing, quantum sensors and quantum communication, offer numerous new opportunities for our economy and society. By utilising phenomena from quantum physics, medicines can be produced more efficiently, diseases diagnosed earlier and critical communication channels made secure against eavesdropping. The potential value creation from applications of quantum technologies is estimated at around USD 2 trillion worldwide by 2035. Furthermore, quantum technologies have significant implications for Germany's security, for example, in secure communication, navigation and situational awareness.

Germany is well-positioned in international competition, with internationally recognised cutting-edge research and a young, highly dynamic quantum ecosystem of start-ups, major companies and academic institutions.

Backed by extensive public funding programmes, the quantum ecosystem has grown rapidly since 2020, forming strong regional clusters. Particularly noteworthy is the progress in quantum computing, with the establishment of the first demonstrator systems, customised software development and growing interdisciplinary cooperation.

From this starting point, we must ensure that quantum technologies reach their full potential in practical applications and that we can thus emerge from the mid-tech trap. Deep tech at the smallest scale brings huge challenges in practical implementation. We will therefore support focused cooperation between all players in Germany and promote networking, particularly with European and like-minded international partners, to ensure our long-term technological sovereignty.



Microelectronics

Objectives and key flagship measures

Goal 1

We will deliver high-performance 'Designed in Germany' chips and make Germany the European centre for chip design.

- We plan to establish a **Competence Centre for Chip Design** by 2026 and are already discussing its structure with academia and companies this year. In 2025, we will work to foster a vibrant and autonomous design ecosystem in Germany by publishing a challenge on open-source tools for chip design. To ensure trustworthy chip hardware throughout the supply chain, we are also committed to open standards, open hardware, privacy-by-design procedures and international standardisation efforts in this field.

- We are supporting the development of **smart and energy-efficient AI chips** through a design initiative and promoting their introduction into key industries. In 2025, we will launch our first flagship project for the 'supercomputer' in the car, helping to future-proof our automotive and mechanical engineering industries.

Goal 2

We are specifically strengthening the translation of laboratory research into industrial application in growth areas and building an ecosystem for advanced semiconductor technologies in Germany and across Europe.

- With a **'Lab to Fab' accelerator**, we will launch the second stage of the EU Chips Act pilot line at the Research Fab Microelectronics Germany in 2026. We give companies easy access to cutting-edge technologies such as advanced packaging and chiplets. Innovative SMEs, in particular, can also benefit from small-scale productions for new applications.

- We continue to support the **first commercial use of new microelectronics technologies** with companies through Important Projects of Common European Interest **(IPCEIs)**. In coordination with France and the Netherlands, we are preparing another IPCEI in microelectronics to present to the European Commission in 2026. This will lay the foundations for a strong advanced packaging ecosystem and help keep our industry competitive at a global level.

Goal 3

We are boosting the market share of German and European microelectronics companies and strengthening our technological sovereignty.

- With our **'Research, talent pipeline, production' microelectronics position paper**, we are providing clear direction and making Germany an **attractive location for investment in this field.**

- We are using the state aid provisions of the European Chips Act to attract **new factories** for **producing chips, equipment and intermediate products** to Germany and to further expand existing fabs, thus **consolidating Germany's position as Europe's leading chip production location.** This reduces our dependence on third parties and preserves key skills in Germany in the face of international competition.

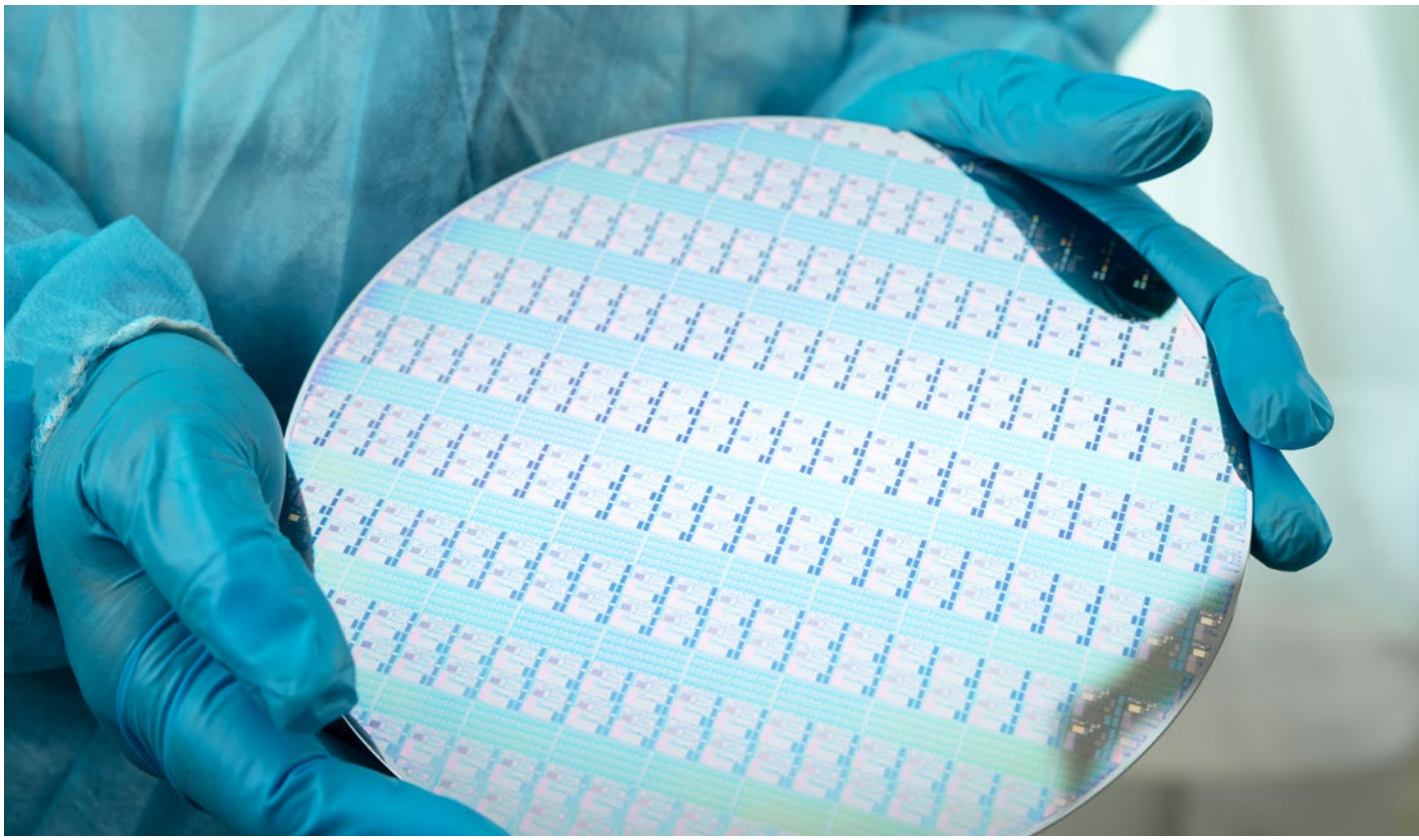
- Through the new Microtec Academy, we are amalgamating **customised training pathways** to produce more and better-trained microelectronics specialists. This is our response to the growing demand created by the establishment and expansion of chip factories and chip design centres.

Goal 4

We are strengthening supply chain resilience and reducing critical dependencies in chip supply..

- We **analyse existing supply chain dependencies** and **opportunities for new microelectronics value creation** and act accordingly in coordination with national and European stakeholders. We aim to substantially strengthen supply chain security, especially for security chips, by expanding production steps in Germany.

- We want to learn from the best, so we are expanding our **partnerships with international technology leaders** and engaging more in multilateral forums. This **reduces technological and geopolitical dependencies** and brings new capabilities to Germany.



Approach

Strengths

- Close links between the microelectronics sector and user industries in Europe
- Largest microelectronics cluster in Europe and a strong research landscape (6th place in publications)
- Technological strengths (5th place in patent applications) and a leader in lithography, power electronics and automotive electronics
- EU working together under the EU Chips Act

Weaknesses

- Limited expertise and no production capacity for high-performance chips
- High energy prices
- Weak 'Lab to Fab' transfer capability
- Growing shortage of skilled labour
- Too few customer industries for high-performance chips in Europe
- Dependencies in chip design software (EU holds only 9% of sales in logic chip design)

Opportunities

- New approaches to boost chip performance through advanced packaging
- High value-creation potential in design (up to 50% of total value creation)
- Germany is a strong technology partner thanks to the Research Fab Microelectronics Germany
- Integration into the EU ecosystem (EU Chips Act and Chips Joint Undertaking)
- Strong growth in demand for high-performance chips in the AI and data centre sectors
- Trustworthy chip hardware should be consistently secure, traceable and reliable throughout the supply chain, from production to the customer, e.g. through innovative AI processes with privacy-by-design
- Reliable international technology partners, some of whom have already made local investments
- Diverse areas of application

Threats

- Dependence on raw materials that are essential for semiconductor production
- Global subsidy race and extremely high R&D investments worldwide
- Microelectronics technologies as a geopolitical tool
- Buyout rather than scaling of start-ups

As digitalisation advances, microelectronics and chips are playing an ever greater role in our daily lives and the world of work. Microelectronics are not only found in mobile phones, tablets and computers Microelectronics also regulate energy supply, manage internet data flows and enable secure, connected and automated mobility. Funding and expanding Germany's existing microelectronics research sector provides the basis for achieving the other goals of the High-Tech Agenda Germany, particularly in AI, quantum technology and energy supply.

Germany is the EU's largest centre for microelectronics. The microelectronics field is research-intensive, contributing about 4% directly and 15% indirectly to Germany's gross domestic product. There is great potential to further increase value creation. With global revenue of USD 630 billion, the chip industry underpins user industries (including automotive, mechanical engineering, energy and medical technology) with more than ten times that turnover.

With a production share of about ten percent of the global market, Europe only produces around half the semiconductors it requires. In addition, Europe is technologically dependent on particularly powerful chips, limiting its ability to act independently in the fields of AI, servers and communications. The availability of security-critical chips also plays an important role in the security and defence capabilities of Germany and Europe. However, there are competitive companies and research institutions in some areas, such as electronics for converting electrical currents, microcontrollers for control and automation and electronics for the automotive industry.

We aim to build on our technological strengths in a rapidly growing international market. According to forecasts, the global chip market will reach USD 1 trillion by 2030. The main drivers are the rapid growth of AI usage and the expansion of cloud computing. Germany has new opportunities to develop its own AI-capable, energy-efficient chips and computing technologies, particularly for industrial applications. The high value-added share of chip design makes it a particularly attractive field of investment for Germany. Microelectronics is also the subject of geopolitical disputes and has significant implications for security. Substantial investment in our own competitiveness and sovereignty is therefore necessary.

Biotechnology

Objectives and key flagship measures

Goal 1

Through biotechnology we will strengthen Germany's sovereignty in developing the medicine of tomorrow and make the country a leading location for health research.

- We are supporting the creation of a **translation centre for gene and cell therapy** in Berlin, which develops innovative therapies. In this way, we aim to 'make the incurable curable' in the future.
- Starting in Q2/2026, we will step up support for interdisciplinary projects that use novel AI methods to deliver **innovative medicines up to 50 percent faster and more cost-effectively** in the future.
- We support **expanding genome sequencing capacity** in Germany to advance the research and development of innovative personalised diagnostics and therapy.

Goal 2

We will make Germany the world's most innovative centre for biotechnology, creating a resource-efficient, competitive industry and increasing the country's added value.

- We will utilise the opportunities presented by **disruptive approaches in industrial biotechnology**, particularly at the interfaces to artificial intelligence and engineering and as a key technology for the bioeconomy. In this way, we are making Germany a technology leader in these pioneering fields and preparing it for the value creation of tomorrow. At the 'BioKI – AI as a Catalyst for the Bioeconomy' conference in November 2025, we will discuss this technology's potential with stakeholders. The first projects will launch in Q1/2027.
- We will increase bio-based added value in the industrial production of materials and chemicals. The first **industry-led public-private partnerships** will launch in Q1/2026.
- We will build on the success of the biotechnology start-up initiative and strengthen the springboard from the laboratory to the economy with **GO-Bio next**.
- We will further expand the **'Industrial Bioeconomy' funding programme**, with a particular view to supporting the critical scale-up of plants through investment.
- We will play a **leading role in the future biotech IPCEI** to support the biotech ecosystem in Europe and bring innovation to market.

Goal 3

We will use biotechnology to develop resilient, crisis-proof agricultural and food systems for the future.

- We will support yield security through **optimised crop protection** to produce sustainable, uncontaminated food. With a new funding guideline, we are advancing the development and use of new methods to protect crops from damage caused by insects and pathogens. The funding regulations are clearly aimed towards company participation, in order to accelerate transfer and, together with industry, we will hold a Partnering Day on the regulations in Q3/2025. The first projects to develop and use new crop protection methods will launch in Q3/2026.
- We will use **modern breeding technologies** to study climate and site adaptation factors in crop plants. In our modern breeding research projects, company participation will be mandatory. This approach thus strengthens cooperation between research and industry and accelerates transfer. The first results will be presented in Q1/2026.
- We will use innovative biotechnological methods and processes to utilise the existing potential for the production of healthy and sustainable food. By Q1/2026, we will work with stakeholders in

biotechnologically produced foods and alternative proteins to identify funding needs for innovation. Projects with industry participation will launch in Q1/2027.

- Through the **PIONEER transfer programme, we are developing alternative protein sources** as a viable pillar of our diet. Companies and researchers work together in interdisciplinary consortia to advance biotechnological innovations. By 2029, evidence-based recommendations for research, practice and policy will be developed to ensure the broad impact of funded projects and prepare for scaling successful approaches.

- We support **innovative strategies for the prevention and treatment of livestock diseases**. In our modern prevention and treatment projects, company participation will be mandatory. This approach thus strengthens cooperation between industry and research, supports the innovative strength of SMEs in particular and accelerates the transfer of results into practice.

Goal 4

We will advance innovative medical technology for the increasingly predictive and preventive medicine of the future.

- By intelligently combining engineering, biotechnology and medicine, we will create new options for sustainable public medical care. To this end, we will continue to strengthen the transfer of innovative ideas into practice by SMEs and focus funding with 'KMU-innovativ: Medizintechnik' next year.

Approach

Strengths

- A high-performance science and research ecosystem with excellent basic research in all fields of application
- Well-developed research infrastructure
- A strong industrial base in the chemical and pharmaceutical industries
- A strong mechanical and plant engineering sector
- Extensive, wide-ranging industry knowledge
- An established ecosystem of specialised SME suppliers
- A networked healthcare data ecosystem linked to the industrial healthcare sector

Weaknesses

- Limited international appeal of German biotech hubs
- Limited availability of venture capital and high regulatory burden for start-ups and companies, resulting in a low transfer rate
- Lack of market incentives in certain areas
- Inhibiting regulatory framework for research-intensive innovations caused by federal fragmentation and differing legal interpretations
- Limited data availability

Opportunities

- Expansion of emerging biotechnology clusters and further consolidation of existing regional activities
- Use of the disruptive potential through the convergence of biotechnology and other future technologies
- Strengthening incentives and support structures for technology transfer at universities and non-university research institutions
- Streamlining and standardising regulation, and accelerating its implementation
- Integration in a strong European research and innovation ecosystem
- Faster availability of data
- Expansion of European, international and multilateral cooperation, including rapid integration with the European Health Data Space (EHDS)

Threats

- Loss of value creation and sovereignty due to the shift of biotechnology activity to other economies with more favourable conditions
- Ongoing indirect subsidisation of biotechnological innovations abroad when intellectual property (IP) generated with public funds and trained talent move overseas
- Blockage of innovative therapies due to regulatory hurdles
- No significant development in green biotechnology and low attractiveness of the research location due to inappropriate regulation
- Leakage of knowledge and technology, with potential for misuse
- Lack of public acceptance of biotechnological products and processes

Biotechnology is highly relevant to medical care, food security, industrial production and a sustainable, circular and competitive economy. It is one of the four priority technology fields of the European Economic Security Strategy and the proposed EU Competitiveness Fund. In 2024, Germany was home to more than 1,000 biotechnology companies, employing around 56,000 people and generating a turnover of EUR 11 billion. They provide considerable added value, already making a significant contribution to our country's prosperity and improving quality of life. However, compared with other countries, the German biotechnology sector lags far behind competitors such as the USA and China, particularly in early-stage financing and high-risk innovation projects.

As a biotechnology hub, Germany has the opportunity to help lead the expected transformation in medicine towards innovative, personalised treatments and a sustainable, bio-based economy, while also helping to tackle global challenges in climate, environmental and resource protection. In 2022, with R&D spending of around EUR 4 billion, the biotechnology sector already showed a very high level of research and development intensity. However, significant potential and demand still remain untapped. Germany is characterised by its strong research sector, innovative capacity and industrial expertise. There is room for improvement, particularly in transferring research results into practical application.

That is why we are strengthening value chains and supporting biotechnology companies and the links between academia and industry with our measures. Additional potential will be unlocked through the use of medical technology and its convergence with other future technologies, such as AI and innovative materials. What is also needed is the consistent simplification and harmonisation of all relevant regulations and their implementation, the expansion of European and international cooperation with strong research partners and the strengthening of collaboration within multilateral processes, including the timely integration of existing health research data infrastructures into the European Health Data Space (EHDS) by March 2029.

Fusion and climate-neutral energy generation

Objectives and key flagship measures

Goal 1

We are making Germany a leading hub for innovation in fusion technologies. We want to make German companies global market leaders in fusion and create jobs.

- By the end of 2025, we will present the Federal Government with a strategic, longer-term **'Fusion Action Plan'** outlining the path to a fusion power plant in Germany.
- We are working with experts to develop the **Fusion Energy Research and Innovation Roadmap (FIRE)** by the end of 2026 to identify the technologies needed for a fusion power plant.
- We intend to establish **hubs** and networking activities for both **magnet and laser fusion** to develop and expand research infrastructures and **technology demonstrators for a fusion power plant**. We will start the conceptual phase in 2025.
- In 2025, we are launching **new funding initiatives** ranging from **'Explorative approaches to fusion research'** to **'Basic technologies for fusion'.**

Goal 2

We support innovations and new technologies for the energy transition to reduce system costs, avoid new dependencies and strengthen the resilience of our energy system. Through cutting-edge research, we are developing 'Made in Germany' energy technologies for the global markets of tomorrow and beyond, thus enabling German manufacturers to take a leading position in the international competition for innovative renewable energies.

In 2025, we will consolidate research into key technologies for the energy transition in a targeted, technology-open **Federal Government Energy Research Programme**. We will cover application-oriented basic research, applied energy research and experimental research in the fields of electricity, heat, hydrogen and energy systems and will launch the following initiatives:

- From 2026, we will launch new **real-world laboratories for the energy transition** to test energy innovations on a system-wide scale. In this way, we create opportunities to gain operational experience with new technology solutions and strengthen the confidence of investors and users.
- In 2026, we will launch a new **deep geothermal energy research initiative** to support our energy policy goals in the heating sector.
- In 2026, we will launch the **Hydrogen Research Hub – Hydrogen4Future** to advance new generations of technology at all stages of the hydrogen chain.

Approach

Strengths

- Germany has an excellent research sector and some of the world's most efficient research infrastructures
- Germany has unique innovation ecosystems
- Germany has some of the best technology developers in the world
- Germany has a diverse range of companies, from start-ups and SMEs to large corporations
- Germany has an excellent international and European network
- A high level of social acceptance for renewable energies
- Established energy research networks
- Continuity in energy research policy

Weaknesses

- High energy and labour costs compared with other countries and a shortage of skilled workers
- Lack of experience in scaling battery factories to gigascale
- Lack of research infrastructure in laser fusion
- Insufficient private capital in the deep-tech/high-tech sector, with a transfer and start-up scene that needs expansion
- State aid procedures can be complex and costly
- Stakeholder networking (academia, industry, *Länder* etc.) is insufficient in some areas

Opportunities

- Strengthening our industrial base through sector coupling; creating new value
- Germany has unique technological selling points, enabling new export successes and global market leadership with the 'Made in Germany' seal of quality
- The state can act as an anchor customer
- Structural reforms and modernisation of the state
- Leveraging innovation potential and opening up new markets through European and international cooperation
- Decarbonisation is a focus of EU policy and of research and innovation funding
- Increasing energy and technological sovereignty
- Increasing the local added value
- Reducing dependence on energy imports and diversifying supplier countries

Threats

- An attractive innovation environment, even among global competitors (including substantial government subsidies, massive R&D investments and greater reductions in bureaucracy in other countries)
- Strong competition from established players, particularly from Asia
- Partly insufficient access and, in some cases, heavy and one-sided dependence on non-European countries for essential raw materials, such as rare earths
- Leakage of knowledge and technology

Energy technologies are a key driver of value creation and a crucial factor in location choice. Energy research offers solutions for restructuring our energy system to provide climate-neutral, safe, reliable and affordable energy for the public and industry in the future. Germany faces intense international competition for innovation in the field of energy technologies. In the international ranking of scientific and technological performance, Germany shares third place with South Korea, behind Denmark and China. In terms of production, China is by far the leading player in manufacturing climate-friendly technologies, particularly in wind power and photovoltaics, ahead of the USA.

Our country has bright minds, expertise and the economic potential to develop new 'Made in Germany' export assets for global energy markets. And these markets are growing rapidly: the global market for renewable energy technologies is projected to grow from USD 700 billion in 2023 to over USD 2 trillion by 2035. Through excellent energy research, our support for young talent and international training programmes, we can provide fresh growth momentum for the German economy and secure its long-term competitiveness. Targeted, technology-open support for innovative energy technologies – from geothermal and photovoltaics to wind, batteries and other energy storage solutions to heat pumps, hydrogen and efficiency technologies – is essential. The European market for electrolyser equipment alone is expected to be worth up to EUR 10 billion by 2030. Global demand for high-performance, sustainable batteries is expected to increase fourteen-fold by 2030 compared with 2020. The global market for lithium-ion batteries alone is projected to be worth USD 183 billion by 2030 (USD 65 billion in 2024).

Increased investment in fusion research will allow Germany to maintain its pioneering role in this forward-looking technology. Fusion technology represents the development of new value-creation structures in research facilities, future power plant and component construction as well as in supply chains. Spill-over effects, such as advanced superconducting magnets and new optical technologies, will allow fusion to become a high-tech driver of our economy. Regulatory research will also be intensified to support, among other things, the development of sub-legal regulations and the further refinement of legal frameworks for nuclear fusion (research) plants outside nuclear law, ensuring that future fusion power plants can be developed and operated under appropriate safety standards.

Technologies for climate-neutral mobility

Objectives and key flagship measures

Goal 1

We aim to establish a competitive battery production and lifecycle management system in Germany by 2035, integrated into a European production network.

- We are strengthening existing battery research and, from 2026, establishing new **battery competence clusters** focused on battery materials (speciality chemicals), battery production (including plant engineering) and solid-state batteries.
- With the **Research Institution for Battery Cell Production (FFB)**, we are creating a new instrument within the German and European innovation ecosystem. The focus is on 'Lab to Fab' and integration with industry. Firstly, the FFB will advance new technologies and materials from the laboratory to mass production and automation (technology push). Secondly, it is designed as an open gigafactory, where established companies and start-ups can use state-of-the-art systems – up to gigafactory scale – to implement their own processes, procedures and future visions, providing fresh impetus (market pull, production research operation). The first construction phase ('PreFab') will begin production research operations in autumn 2025. The second construction phase ('FFB Fab') is scheduled to begin operations in 2028/29, according to current plans.
- From 2026, we will build new, research-based value chains in the battery industry through **vertical application alliances**. This will enable us to combine technology development with application development.
- At national and European level, we will advocate for the **competitiveness of the battery industry as a key sector** and promote a level playing field internationally.

Goal 2

We are strengthening Germany's role as a hub for research and development of technologies for alternative drive systems and climate-friendly fuels in Europe. This will position Germany as the leading global supplier and the largest European exporter of technology in the future.

- We are launching the **'E-Fuels Innovation Booster'** to scale up research and development funding for various e-fuel production processes by 2029. This will be extended to other innovative e-fuel technologies, with a particular view to defossilising the shipping and aviation sectors.
- Through an **initiative to scale up CCU technologies** for utilising unavoidable CO_2 emissions by 2029, we are demonstrating that climate-friendly methanol production can be expanded using selected carbon sources and atmospheric CO_2 and that methanol can be used directly in the mobility sector or as a precursor for e-fuels.

Goal 3

We are making Germany the lead market for autonomous driving, strengthening our technological leadership in ground transport, aviation and shipping, while also becoming a leading global innovator in the marketing and adoption of new mobility technologies.

- We are consistently focusing aviation research on technologies that combine environmental protection, efficiency and growth potential, giving German companies a **strong starting position for future generations of aircraft**.
- We are working together with primary stakeholders to update the **strategic guidelines for the aviation research programme** in order to create an overall roadmap for priority technology fields and modules that will help achieve this goal.

- We support research and development for a **national Hyperloop reference route**.
- We will further develop the **Maritime Research Programme** for shipbuilding to advance new technologies in the areas of decarbonisation of propulsion, underwater robotics and greater autonomy in ship navigation.
- Through the Maritime Research Programme, we support the urgent, short-term technology development needed to achieve the climate targets in shipping, while also supporting **the National Action Plan for Climate-Friendly Shipping (NAPS)**.
- We are strengthening the innovation capacity and independence of the maritime value chain and industry to support the decarbonisation of shipping, while actively contributing to the development of the **European Maritime Industry Strategy**.
- From 2026, we will develop **future mobility systems in model regions**, both urban and rural, through research-based, accelerated technology transfer and AI.
- In 2026, we will select **transformation clusters for climate-friendly urban and regional drone user markets** and applications through a competitive process. These will be developed from 2027 onwards. Together with start-ups, local authorities and end users, we are researching, developing and testing scalable drone-based business models and innovations for climate-friendly urban and rural mobility.
- We will invest heavily in **developing AI and data-based solutions for the mobility** of tomorrow.
- Starting in 2025, we will support the development of a mobility ecosystem that offers a central platform for **integrating autonomous vehicles into the public transport system**. This will make a significant contribution to the provision of public services. To this end, we are developing and testing open, digital core components for driverless, on-demand transport as an extension of public transport services in both urban and rural areas.

Goal 4

We are strengthening sustainability and resource efficiency in the automotive industry and ensuring independence from geopolitical influences.

- We are laying the foundation for **research and innovation in recyclable vehicle components**. In addition to securing independence for essential resources, this is an important step in meeting the requirements of the EU End-of-Life Vehicles Regulation.
- We are improving the **efficiency of electric vehicle charging** through the rapid rollout of Europe-wide bidirectional charging based on common European norms and standards.

Approach

Strengths

- Established innovation ecosystems for smart mobility solutions, batteries and e-fuels
- Knowledge advantage of German companies and a strong ecosystem, including technology transfer in mobility, automotive manufacturing and combustion engines, speciality chemicals and mechanical and plant engineering
- Large domestic market and sales base, with Germany as the lead market in the mobility sector

Weaknesses

- Lack of European coordination, vision and long-term strategy
- High location-related costs (for energy and personnel in particular)
- Low public acceptance of new mobility solutions
- Gaps in scaling, transfer and production of new mobility solutions
- Lagging behind in innovative business models and applications
- European legal framework not supportive of innovation

Opportunities

- EU internal market and strategic positioning through niche markets
- Jobs and health (quality of life)
- Export potential for the supplier industry in autonomous driving, e-fuel and control technologies
- Significant value creation potential in technology-based user markets
- Strengthening the autonomy of the automotive industry through European economic cycles

Threats

- Critical dependence in some areas on strategically important raw materials, such as rare earths
- Lack of availability of green hydrogen for direct use and for e-fuel production
- High global scaling costs
- Fierce international competition

The global mobility sector is changing rapidly, driven by new technologies, shifting habits and, above all, the goal of climate neutrality. Mobility is becoming cleaner, more connected, flexible and diverse. This creates major opportunities for innovation. Progress is particularly evident in drive technologies: electric cars and lorries with batteries and fuel cells are becoming increasingly established as competitive, sustainable solutions for road transport. A strong, innovative automotive and supplier industry will therefore remain a key sector for Germany in the future. Climate-friendly, scalable fuels such as electricity and hydrogen-based e-fuels provide high energy density and are a sustainable solution for aviation, shipping and other selected applications, such as special vehicles or the military. These technologies are growing rapidly worldwide and opening up new markets.

New forms of mobility are becoming increasingly important. Self-driving taxis, buses and on-demand shuttles, drones, agricultural machinery, automated delivery services and entirely new mobility concepts such as the Hyperloop are emerging. They too offer significant potential for growth and sustainability in Germany, given the right conditions. However, Germany is increasingly losing its former position as the leading provider of mobility technologies and is facing growing competition from other regions, particularly China. In some areas we are already dependent (e.g. battery materials) in terms of value creation and skills.

At the same time, Germany still has major strengths in the chemical industry and production technology. The same applies to the development of recyclable materials, alternative drives, climate-friendly fuels, battery research and environmentally friendly technologies for aviation. For this reason, research and development in these areas must now be expanded, better networked through data and pushed towards industrial readiness ('From Lab to Fab'). New technologies and business models must be identified and supported at an early stage because future mobility markets will generate a large share of added value.

III. Technology-driven innovations in strategic research fields

Aerospace

Aerospace is both a driver and an application field for technological developments. In 2024, the sector employed approximately 120,000 people in Germany and generated turnover of EUR 52 billion. Civil aviation remains a dynamically growing high-tech sector. The success of German companies is also built on the technological leadership we have achieved over years and decades. Given the industry's high export rate, 'Made in Germany' technology offers the chance to shape the future of environmentally-friendly aviation worldwide while maintaining growth opportunities and added value.

A strong trend towards commercialisation can be observed within the space sector. At the same time, aerospace is of considerable importance for national security, autonomy (for example, in communications) and achieving climate targets. Future technologies such as artificial intelligence, robotics, quantum communication, Industry 4.0 and new drive systems open up entirely new possibilities.

Selected technology-driven projects:

- **We are developing an ambitious aviation strategy for the Federal Government** that integrates civilian and military aviation issues with the goal of strengthening Germany as an aviation hub. This will be implemented during the current legislative period.
- **We are maintaining technological leadership and strengthening high-tech industrial expertise in civil aviation** to secure a strong starting position for German companies when it comes to future generations of aircraft.
- **We are developing and strengthening hub structures, such as the Space Innovation Hub.** Since 2025, it has served as a contact point for the New Space sector and will be strengthened to support the implementation of innovative research and development projects on civilian and military security needs – all the way through to market maturity.

- **We are shaping the Federal Government's ambitious space strategy, focusing on application-oriented solutions and commercialisation, while ensuring that small and medium-sized enterprises (SMEs) and start-ups are involved in the process.** Among other measures, we use competitive processes for the research, development and procurement of launch systems and services, small satellites, earth observation and satellite communication technologies as well as robotic systems for use in orbit use and for the exploration and study of planetary bodies. In order to increase Europe's independence regarding space activities, we are expanding Germany's involvement in the European Space Agency (ESA) and supporting its transformation. We are also actively engaged in utilising the ISS until 2030, while also exploring possible successor solutions to ensure that Germany can continue to conduct space-based research and development beyond 2030.

- **We are committed to maintaining and further developing operational European satellite programmes, such as the Galileo navigation system.** We aim to create efficient structures and a common framework for key infrastructures, significantly reducing development, use and operating costs by – among other measures – showing strong German government support for common European and global standards.

- **We are strengthening real-world laboratory research into new applications and innovative business models for advanced air mobility**, aimed at creating climate-friendly and sustainable cities and regions.

Health research

Artificial intelligence, innovative health technologies (e.g. next-generation sequencing, gene editing and CRISPR/Cas) and medical technology are driving rapid advances in health research. This is leading to innovative treatments, diagnostics, prevention options and new active ingredients, medicines and medical products – personalised and tailored to the target group. We support technologies that set the course for medical progress in a learning, increasingly predictive and preventive healthcare system and in the care of tomorrow. In this way, we can combat major widespread diseases such as cancer, dementia and cardiovascular disease and also make faster progress on issues such as women's health, antimicrobial resistance and post-infectious diseases such as Long COVID (post-COVID syndrome) and ME/CFS. Ethical, legal and social aspects are considered from the outset in order to ensure that research results and treatments are efficiently and effectively translated into practice.

Medical progress must be accelerated along the entire value chain. The key to this is an excellent, well-equipped research ecosystem that brings together university and non-university institutions on an equal footing and consistently involves companies, ensuring that research findings reach the healthcare sector. University medicine is central to this. At the same time, European and international cooperation are also factored in. By aligning research with industry in medical and healthcare technologies, we tap into this market's enormous growth potential and secure long-term value creation in Germany.

Selected technology-driven projects:

- **We support the targeted integration, use and development of medical datasets of unprecedented scope and detail, linking them to the European Health Data Space (EHDS).** Sources include the Network of University Medicine (NUM), clinical studies, the Health Research Data Centre (FDZ), genomDE, medical registries and the NAKO health study. This supports the development of new diagnostic methods, active substances, medicines, vaccines and therapies, enabling more targeted and personalised prevention, detection, treatment and cure of diseases. The NUM's third funding phase, with new projects and infrastructure such as the integration of the German Biobank Node (GBN), began on 1 July 2025. It serves as a central platform for German biobanks, offering an overview of access procedures and the potential uses of the stored biospecimens. The NUM's long-term funding is to be consolidated by 2026, with connection to the EHDS planned for March 2029.

- **We aim to realise the potential of data-driven health research through artificial intelligence, in-silico modelling and computer simulations of biomedical processes.** Through data utilisation projects and use cases, we support the transfer to clinical applications and public health research, including prediction, more precise diagnosis and treatment, patient stratification, forecasting disease progression and carrying out virtual clinical trials. The first funding regulations for this will be published before the end of the year.

- **We focus on medical technology and smart solutions such as digital applications, adaptive robotics and daily-use sensor technology to drive breakthroughs in medicine and care.** These innovative technologies are being put into practice to help patients and those in need of care to live independently, while supporting medical professionals such as carers and doctors in their daily work. The next step is to publish two new funding measures in Q1/2026.

Security and defence research

Our security relies on research and technology, as the world is undergoing massive upheaval. The changed geopolitical situation, along with new security threats, natural and human-induced disasters as well as criminal, terrorist, hybrid and direct military threats, clearly demonstrate this. Digital threats are also evolving rapidly: disinformation (i.e. targeted fake news) influences the public and ultimately threatens democracy. Cyberattacks can cripple critical infrastructure and quantum computers threaten to breach conventional cryptographic methods. Cyber security is becoming a fundamental requirement for a resilient society.

The goal must be integrated security – as set out in the National Security Strategy – working both domestically and internationally and addressing the full range of security risks, including medium-term and long-term threats. Technical innovation and a resilient society are essential to guarantee security in Germany as the foundation for future sovereignty and competitiveness. To this end, the synergies between civilian and military research and development will also be utilised. Through the Federal Government's framework programme 'Research for Civil Security' and the 'Security Research Innovation Lab', we are accelerating the transfer of innovative solutions into practice via demonstration and testing environments, while also strengthening the innovation ecosystem for integrated security.

Selected technology-driven projects:

- **We will support cooperation between civilian and military research and development in selected technology fields through 'Innovation Hubs for Security and Defence'.** In a dialogue process between with civilian and military users and providers of security solutions, including start-ups, synergies between civilian and military research are to be identified and utilised in order to develop innovative solutions. Research infrastructures that allow work under heightened security requirements should also be utilised. The first hub is planned for the end of 2026, with further hubs to follow in succession.

- **This year, we are publishing a 6G research roadmap** for developing secure and resilient next-generation communication technologies, with a focus through

to 2030. The first milestone in the roadmap is the creation of four 6G transfer hubs in Q1/2026, which will provide extensive research, testing and validation infrastructures for academia and industry. This will enable the creation of transfer-focused ecosystems and the strategic strengthening and safeguarding of the underlying innovation and value creation chains. The roadmap also covers the value-driven strengthening of national and European development, specification and standardisation efforts as well as the expansion of international cooperation, particularly with partners who share our values.

- **We are aligning cyber security research with the changed threat scenario through a new research framework programme, strengthening the cyber resilience of industry, academia, civil society and the state.** We are systematically expanding cooperation, particularly with European partners who share our values. To this end, Germany will play a key role in shaping European research programmes, such as the Cybersecurity Cluster in the EU's 10th research framework programme, and initiatives such as the European Quantum Communication Infrastructure (EuroQCI). We are also strengthening trustworthy cyber security technologies and secure 'Made in Germany' communication solutions with a new funding programme from 2025 to accelerate transfer from science into practice.

- **We are exploring the possibility of using funding instruments provided by the Federal Agency for Breakthrough Innovations (SPRIND) for the defence sector.**

Marine, climate and sustainability research

Research for sustainability is key to innovation in vital future fields. Investments in the necessary technologies ('clean technologies/cleantech') deliver ecological, economic and social benefits. Innovations in sustainable land and ocean use, climate protection and adaptation, clean and secure energy, a climate-neutral, circular economy and resilient cities and regions lay the foundations for a future-proof model of prosperity and help tackle geostrategic challenges. Given the rise in hybrid threats, technological solutions for securing maritime infrastructures and sea routes have become increasingly important. Research and innovative marine technology companies play a key role in enhancing protection levels.

Research into 'clean technologies' drives the development of key technologies – such as in biotechnology, climate-neutral energy generation and climate-neutral mobility – while applying them in line with the objectives outlined above. Other important fields of technology ('green technologies of the future') include recycling, water and wastewater technologies, decarbonised industrial technologies and plants, CO_2 capture, storage and utilisation, CO_2 removal and other environmental and agrifood technologies.

Technological leadership in these areas offers major advantages in the global competition for innovation and in potential key future markets. For example, estimates by the Boston Consulting Group and the German Association for Negative Emissions (DVNE) suggest that Germany could develop a carbon dioxide removal (CDR) industry worth EUR 70 billion a year by 2050, creating between 95,000 and 190,000 jobs. For the European hydrogen economy alone, the European Commission estimates an investment demand of nearly EUR 500 billion over the next 25 years.

Europe is a driving force in the development of clean technologies and Germany plays a leading role; we aim to expand and capitalise on this position. The cleantech market is highly dynamic, with rapidly growing global investment and considerable potential. One priority is the realisation of previously unattainable applications from basic research that rethink existing value chains and make a tangible contribution to sustainability.

Europe is a driving force in developing clean technologies, and Germany plays a pioneering role – we aim to expand and capitalise on this position. The cleantech market is highly dynamic, with rapidly growing global investment and considerable potential. One focus is on realising previously unattainable applications from basic research that rethink existing value chains and make a tangible contribution to sustainability.

Selected technology-driven projects:

- **We are laying the foundations for new economic momentum through efficient technologies for negative emissions (carbon dioxide removal) and climate neutrality**, while strengthening innovations for decarbonisation in industry and SMEs. The aim is to further consolidate Germany's leading position in this field

- **We are expanding research, technology and innovation funding in the circular economy lead market.** We will leverage digitalisation in the cleantech sector with the aim of boosting export opportunities for domestic industry, especially SMEs, and enhancing security of supply in this growth market. From the end of 2025, we will fund flagship projects from academia and industry that develop digital technologies and business models to make products and services circular, extending their lifespan and reuse.

- **We are modernising Germany's research fleet.** Modern research vessels are essential platforms for transfer-focused climate and biodiversity research on our seas and oceans. They also serve as high-tech platforms for testing new technologies.

- **We are expanding application-focused, internationally leading research capabilities and infrastructures in sustainable natural climate protection for climate-relevant ecosystems such as forests, peatlands and coasts.** This will significantly reduce greenhouse gas emissions from the land use sector, strengthen water balance and biodiversity and also create new value chains.

- **We support the energy transition in the fisheries sector.** We will support the development and construction of demonstration 'fishing vessels of the future' powered by alternative energy sources and designed for multifunctional use, thus creating new income opportunities for fishers in the blue economy.

- **We are securing the German Marine Research Alliance (DAM)** with long-term funding in cooperation with the northern German *Länder*. In research missions, we examine the potential of marine carbon dioxide reservoirs, the impacts and adaptation strategies for extreme marine events on the coasts and options for protecting the North Sea and Baltic Sea through sustainable use of these ecosystems.

- **We are strengthening the development and use of autonomous and robotic systems in marine, climate and biodiversity research as well as in agricultural sciences.** We are advancing technology funding for climate adaptation in municipalities, companies and infrastructures, for example, through the development of digital twins. We aim to secure and expand technological sovereignty in climate technologies in Germany and Europe.

Humanities and social sciences

New technologies have a profound effect on society, which is why we give social research the same priority as technological research. The humanities and social sciences are essential in tackling social challenges by providing historical and contemporary knowledge for guidance and action and feeding this into social and political discourse. This is especially relevant in addressing current internal and external threats to democratic societies, such as anti-democratic and inhumane ideologies and attitudes, particularly antisemitism. It is also important to monitor from the outset how new technologies affect the organisation and performance of the welfare state, so that social policy needs can be identified early and the necessary measures developed accordingly. At the same time, the humanities and social sciences play a key role in shaping a responsible, human-centred approach to new technologies by analysing their ethical, social, economic and political challenges and opportunities and by examining the conditions for successfully fostering a society that is open to innovation. After all, innovations in key technologies must always be viewed in terms of their social significance. One of the aims is to record changes in human-machine interaction and to document and understand the evolving role of humans in increasingly automated decision-making processes and their effects.

At the same time, technological developments are also affecting the humanities and social sciences, fundamentally transforming these disciplines in some cases. The digital transformation of the humanities and social sciences has accelerated. Across the full breadth of the humanities, cultural and social sciences – not only in the digital humanities – new methods and research questions are being advanced through computer-aided processes, for example, in linguistics and cultural heritage research. In the social sciences, these methods can provide new quality and scope to the analysis of social structures, new depth to the understanding of social developments and also help to anticipate social trends. To achieve this, the necessary data skills must also be enhanced within the humanities and social sciences.

Selected technology-driven projects:

- **We are strengthening the humanities and social sciences in a new framework programme** to be published in Q1/2026. The knowledge of the humanities and social sciences underpins the protection of the fundamental values of our free and democratic society in times of multiple challenges, helps keep society adaptable and supports and shapes technological innovations, especially in artificial intelligence.

- **We specifically support the expansion of data skills and infrastructures in the humanities and social sciences**, enabling existing data resources to be used for new research questions. This includes creating a data infrastructure for combating extremism from 2026, establishing an academy centre for digital lexicography from 2027 and setting up a European research data infrastructure for comparative democracy research (MEDem).

- **Under the empirical educational research framework programme, we are generating new knowledge** to support a future-oriented education system that equips people with the skills needed to successfully navigate social change and tackle related current and future challenges, such as the digital and socio-ecological transformation. Education is key to advancing research and innovation and to ensuring the long-term development and responsible use of key technologies.

- **We are strengthening the Weizenbaum Institute for the Networked Society.** We place people at the centre of research and innovation in the digital transformation and support the widespread integration of key technologies into society by enhancing understanding of how they interact with social, cultural and political structures.

- **Other successfully established competence structures in key technologies will also be strengthened**, such as the AI and data accelerator KIDA in the agrifood system.

- **We are strengthening social policy research** by funding a centre to monitor the social impact of major societal trends and the effects of new technologies on work, civil society and social security systems. The centre will also help translate these developments into necessary welfare state adjustments. In this way, we are laying the scientific foundations for the sustainable, independent and effective development of the welfare state in a changing society.

IV. Lever for the High-Tech Agenda Germany

An effective research and innovation system is essential for the success of the High-Tech Agenda Germany. Accordingly, we will implement further structural measures to strengthen, modernise and safeguard our research and innovation system. The measures listed here go hand in hand with the High-Tech Agenda Germany and are important additional levers for the planned technology campaigns. They provide the massive investments in key technologies and strategic research fields with the impetus needed to restore Germany to the forefront of technology and innovation.

Lever 1

Accelerate the transfer of knowledge and technology among all innovation stakeholders. Despite excellent research and a well-structured funding system, scientific findings are not sufficiently utilised in industry and civil society in this country.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- A research and application initiative, which will consistently focus funding on technology transfer between academia, departmental research institutions, local authorities, civil society and companies with a strong research and development focus, while creating greater leapfrogging capacity and transparency in the funding system. Among other measures, the creation of a German Applied Research Association (DAFG) as a funding policy framework to permanently strengthen application-focused research and innovation at higher education institutions.

- Increase and speed up scientific spin-offs by introducing standardised spin-off contracts at universities and research institutions. Exceptions may still be granted in individual cases, for example, based on model contracts.

- To better tap into the huge potential of innovative SMEs and forward-looking start-ups in Germany, whose innovative strength supports many of the goals of this agenda and boosts growth, prosperity and competitiveness. In addition, strengthening business-friendly transfer instruments such as the technology-open Central Innovation Programme for SMEs (ZIM) and the pre-competitive research and development programmes Industrial Collective Research (IGF) and INNO-KOM.

- The EXIST Startup Factories are taking Germany's science-based start-up ecosystem to a new level. The ten new factories will significantly increase the number of growth-oriented high-tech spin-offs from universities and research institutions in the coming years. Furthermore, EXIST will be consolidated and strengthened as the Federal Government's flagship programme for spin-offs from academia; it currently produces 250 new start-ups per year.

- The transfer initiative 'Rückenwind für Innovation' identifies and analyses obstacles to transfer. The aim is to develop and implement specific proposals to further improve the transfer and support of innovation activities, with the involvement of external expertise from stakeholders and innovation players.

In addition, we will also significantly improve funding and the framework conditions in the areas of intellectual property (national IP strategy), start-ups (including support for female entrepreneurs, e.g. EXIST-Women), standardisation and transfer (transfer incentive systems, strengthening of transfer and innovation networks). In doing so, we will also specifically focus on the impact-oriented funding of technology-related social innovations.

Lever 2

Significantly ease the burden of fragmented funding bureaucracy on the country's innovation players and use structural reforms to modernise the legal framework, thus fostering a dynamic innovation and transfer process. In this way, we are creating a new culture that empowers our creative minds. With digitalisation, reduced bureaucracy and modern regulation.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Adoption of the Research Data Act, further development of the Health Data Utilisation Act and connection to European data spaces to better exploit the innovation potential of data for research, civil society and the state.

- Adoption of a Freedom of Innovation Act to give research and development more freedom and also to relieve companies from fragmented funding bureaucracy.

- Opening and experimentation clauses and real-world laboratories to safely test innovative technologies or business models under real-world conditions, bring them into practice and scale them up more quickly; make the legal framework more innovation-friendly.

- End-to-end digitalisation of the entire funding process (including the creation of funding regulations) and further automation of the documentation process to establish a fully digital funding process without media discontinuity for all parties involved (applicants, funding bodies and project management agencies).

- Strengthening the attractiveness of research allowances to boost Germany as an investment location and to provide agile, legally secure and open-top support for commercial research and development activities.

- Testing experimental funding formats in selected pilot projects in priority innovation fields to enable the rapid rollout of successful new funding formats and regulatory simplifications after practical trials.

In addition, we will systematically optimise public procurement and continue to leverage the potential of innovative public procurement in the mutual interests of the state and the economy, reduce bureaucracy and streamline project funding regulations, establish pragmatic and uniform standards for data protection and IT security – particularly in administration – and introduce an AI support tool to provide advice on EU research and innovation funding.

Lever 3

Establish new financing instruments for research and development, further develop the venture capital market and make venture capital investments more attractive to achieve greater leverage from public innovation financing. Compared internationally, Germany mobilises less venture capital for future technologies, especially for the capital-intensive growth and scaling phase in the deep tech sector.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Strengthening the German venture capital market through the development of a Germany Fund, which will also include a Future Fund (to be consolidated) as well as through improved regulatory and tax conditions under which institutional investors can invest in start-ups and venture capital funds.
- WIN initiative to more than double to over EUR 25 billion. Creation of a Future Fund II to further support spin-offs and growth in the deep tech and biotech sectors.
- Strengthening the state's role as an anchor customer to help deep tech companies establish themselves in the market. Establishing and strengthening new forms of public-private partnerships in research and development to support promising innovations, minimise risks and leverage funding.

In addition, we will also explore further ways to facilitate investment in innovation-focused, high-risk investment models and encourage success and results in funding through milestone-based financing instruments.

Lever 4

Strengthening resilience in the science system and expanding research security, science communication and participation as cross-cutting tasks. Academia, and research in particular, are increasingly exposed to risks that also threaten our democracy and our system of values.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Develop guidelines for handling sensitive international contexts with the Alliance of Science Organisations and improve the advisory infrastructure to strengthen research security and the resilience of the science system. This also raises awareness of security issues and minimises the risk of knowledge and technology leaks and potential misuse.
- Supporting independent China studies to pool research expertise, build evidence-based knowledge and provide informed advice about China for academia, politics, industry and civil society, enabling resilient and risk-assessed cooperation.
- Structural and financial strengthening of science communication and journalism, building on existing activities and involving all relevant stakeholders (in particular #FactoryWisskomm, Science Years), to make science communication an integral part of research and academia and raise its public profile.

In addition, we plan to introduce further measures to strengthen research security, expand citizen participation in research and work strategically with science organisations to enhance science communication, participation and scientific policy advice, including within the objectives of the Pact for Research and Innovation (PFI) and the Academies' Programme.

Lever 5

Attracting, supporting and retaining skilled labour and talent – from Germany and abroad. Skilled labour shortages threaten our capacity for innovation. We are committed to an equal and inclusive science system. Our technology and industrial base should draw on the widest possible talent pool, as excellent and innovative research is the result of diverse perspectives. To ensure innovative technologies can be used productively, we are strengthening employees' skills across the board.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Global Minds Initiative Germany to offer opportunities to the brightest international minds and talents in Germany's science system and strengthen the research sector in the long term. Germany is positioned as a safe haven for academic freedom, with excellent research infrastructures and diverse career prospects, making it one of the most attractive academic locations in the world.

- Create clear medium-term employment prospects for academics through reform of the Academic Fixed-Term Contract Act (WissZeitVG) and attractive staffing structures, which are to be reliably retained for innovation developments in research institutions.

- Further development of the 'MINT Action Plan' to attract young STEM talent in key technologies, including funding STEM summer camps at universities and research institutions for female students in their last two years of secondary school ('Summer of Science') to address the gender gap in STEM and encourage more young women to study STEM subjects.

- Further development of the Girls' Day campaign, the 'YouCodeGirls' initiative (gender-sensitive methodological and didactic concepts for careers guidance and for raising awareness of IT topics and professions) and the 'Klischeefrei' initiative to strengthen gender-equitable career and education guidance, attract more women to technical professions, especially IT, and raise awareness among skilled workers throughout the education chain of stereotype-free career and education guidance.

- Further development of the Skilled Labour Strategy to secure Germany's skilled labour base and address the challenges of demographic change and structural transformation.

- Creation of a digital agency for skilled labour immigration ('Work-and-Stay Agency') as a single point of contact for foreign skilled workers to streamline immigration processes and speed up the recognition of foreign professional qualifications and degrees.

- Expansion of the services of the Global Certification and Consulting Centre (GCCC) within the context of the EXIST programme as a one-stop shop for international high potentials looking to start a business in Germany.

In addition, we want to explore ways to speed up visa issuance for international students, academic specialists and potential start-up founders. We aim to expand the range of DAAD funding measures as far as possible, improve overall working conditions in science and research and introduce measures to promote inclusion and equal opportunities. We also want to enhance vocational qualifications and further training, particularly through a qualification campaign for young people and the continuation of the National Skills Strategy (NWS).

Lever 6

Expand European and international cooperation in research and innovation and focus it on the priorities of the High-Tech Agenda Germany. Transnational exchange is the basis for excellence and progress, increases the efficiency of our funding and leverages synergies. We consider innovation, competitiveness and sovereignty in close collaboration with our European and international partners.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Improving the framework conditions for cooperation in the European Research Area (ERA) and supporting the establishment and expansion of data spaces to achieve the best possible synergies by effectively linking regional, national and European research and innovation policies and data spaces. In future, the National Research Data Infrastructure (NFDI) will play a key role in this as a national player.

- Commitment to reforming EU state aid law to enable faster procedures that a more conducive to innovation, to facilitate investment in research, development and technology transfer and to strengthen Europe's competitiveness.

- Consistent consolidation of the EU Capital Markets Union to improve access to venture capital for innovation in Europe.

- Intensifying and diversifying bilateral and multilateral cooperation with strategically relevant partner countries and focus regions to support German high-tech stakeholders, access global knowledge flows, open new markets and reduce dependencies.

- Reliable funding for innovative start-ups and SMEs for cross-border collaborative projects under Eurostars and other transnational, business-friendly programmes such as ZIM and the IGF-funded network, CORNET.

In addition, we want to closely link the implementation of the High-Tech Agenda Germany with the EU's next research framework programme, take measures to strengthen international location marketing and actively support connectivity with EU initiatives and their implementation through early positioning.

Lever 7

Ensure the supply of critical raw and processed materials and strengthen the industrial basis for Germany as a high-tech location. Raw and processed materials are the key to vital future technologies and are essential for Germany's strategic autonomy, resource independence and the development of a circular economy.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Skilled workers from Germany and abroad are supported in order to expand the skilled labour base in raw material exploration and use as well as in materials innovation and also to strengthen the knowledge base in Germany while simultaneously boosting the national labour market.

- Innovative, data-driven approaches in 'design for circularity' will be tested and industry-specific solutions for the circular economy developed so as to embed circular economy principles and more efficient resource use right from the start of the value chain. The connection and integration of industry-relevant and material-related data ecosystems is essential for this.

- Innovative ways of using and exploiting key resources to develop their market potential will be supported and tested.

- With the new BMFTR specialist programme 'Material Innovations for Transforming Economy and Society' (Mat2Twin), we are strengthening the technological foundation for a resource-independent and competitive industrial base in Germany. By taking a data-driven approach to developing effective substitute materials, resources can be preserved and dependencies on raw materials can be reduced.

- As a strong partner in the EU initiative Advanced Materials for Industrial Leadership, we are actively advancing the development of an innovative, safe and inclusive ecosystem for advanced materials in Europe.

Lever 8

Invest strategically in research infrastructure to boost Germany's international competitiveness and address the investment backlog in the science sector. Without continuous investment, Germany cannot retain its leading position as a centre of research and innovation.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Implement the shortlisted projects from the research infrastructure prioritisation process to maintain and enhance Germany's international competitiveness and innovative strength. We emphasise the role of research infrastructure as the foundation of new, research-driven innovation and value-creation ecosystems.
- Strengthen the NFDI's capacity for comprehensive data storage, processing and provision at universities and research institutions, expand capacities in public and private data infrastructures and enhance the data skills of researchers and early-career scientists to promote the digital storage, use and exploitation of research data. Interoperability and connection with technology-focused data ecosystems in the economy, such as for innovative recyclable materials (MaterialDigital).
- Develop European database resources to lastingly strengthen the resilience and redundancy of research data.
- Strengthen Germany's participation in European and international coordination processes regarding research infrastructures to maintain the country's role as a major global science nation.

Lever 9

Remove obstacles to civil-military research cooperation and strengthen collaboration. Only through close exchange and cooperation between civilian and military research institutions can potential synergies be realised and Germany's position as a research hub strengthened amid intensifying international competition for key technologies.

Priority projects that make a significant contribution to the High-Tech Agenda Germany:

- Create favourable conditions for funding security-related research and encourage greater exchange between civilian and military research institutions in Germany, Europe and NATO.
- Create a funding framework for security and defence research to enable more targeted cooperation between universities, non-university research institutions, the Bundeswehr and industry. The skills and expertise of Bundeswehr universities can also be used effectively in collaborative research networks.
- Targeted support for spin-offs from academia under the EXIST start-up grant and EXIST research transfer programme that follow a dual-use approach.

V. Outlook and implementation

With the High-Tech Agenda Germany, the Federal Government is realigning its research, technology and innovation policy with a clear focus on greater value creation, competitiveness and sovereignty. For the High-Tech Agenda Germany to succeed, we must work together at all levels. We therefore invite our partners from science, universities, non-university research, the business community, industry, administration and civil society as well as from the *Länder* and the European Union, to contribute to the implementation and development of the High-Tech Agenda Germany.

We hold regular dialogue sessions with the *Länder* on the High-Tech Agenda Germany. This allows us to better coordinate the funding of research, technology and innovation at federal and *Länder* level, pool resources and increase the impact of public investment. A shared understanding of regional priorities supports the development of high-tech regions with clear competence profiles in the respective areas of Germany.

360-degree high-tech monitoring is a key element in implementing the High-Tech Agenda Germany. It not only tracks progress towards achieving the goals of the High-Tech Agenda Germany, but also provides an overall picture of Germany's position in research, technology and innovation.

Kick-off for the High-Tech Agenda Germany

We will host a launch event for the High-Tech Agenda Germany in autumn 2025. The aim is to bring together all relevant stakeholders including investors and key customers to initiate the collective implementation of the High-Tech Agenda Germany. The launch event marks the start of two key aspects through which we aim to advance the High-Tech Agenda Germany together: technology roadmaps for the six prioritised key technologies and the continuous development of the key technology portfolio. In the future, we also plan to hold a high-tech summit to reflect on progress and bring together the results of the roadmapping and portfolio processes.

Technology roadmaps

For each of the priority technology fields within the High-Text Agenda Germany, we will run systematic roadmapping processes involving the *Länder* and key stakeholders.

Developed jointly with the key stakeholders in each field, the roadmaps will set out a framework that defines specific milestones and relevant indicators and aligns the stakeholders' initiatives accordingly.

The roadmaps build on the measures and goals of the High-Tech Agenda Germany outlined here. They integrate additional measures, identify important catalysts and framework conditions with leverage and thus serve as a basis for efficiently coordinating the activities of all the various players.

For each technology field, there will be a separate roadmapping process with scope for flexibility which, depending on the field, builds on existing (possibly international) roadmapping processes, uses established dialogue formats and, where necessary, supplements and develops these further. For all technology fields, creating and implementing the roadmaps is a dynamic learning process that can and should respond to future developments. To support this, the roadmaps are integrated into the 360-degree high-tech monitoring system (see below).

In addition, to safeguard Germany's long-term competitiveness, an overarching mission statement on Germany's desired position in international competition in the medium and long term will be added to the existing objectives for each of the key technologies.

The six prioritised key technologies are all linked to each other and other technology fields. We will therefore consider synergies between complementary technologies as part of the roadmapping process.

Further development of the key technology portfolio

We will continuously develop the portfolio of priority key technologies in dialogue with academia, industry and civil society.

The High-Tech Agenda Germany focuses on selected measures for six priority key technologies that are particularly critical for Germany in the new geopolitical landscape. It will be crucial to review this focus over the long term in light of current and possible future developments – including through dialogue with our European and international partners – and to adapt and expand it if necessary.

- Part of the High-Tech Agenda Germany will therefore entail a thorough examination of technological trends, emerging value creation models and (geo-)political developments.

- To support this, we will launch an intensive dialogue in 2026 with relevant stakeholders from academia, industry, politics and civil society, together with selected European partners, to jointly discuss the relevance of new or additional key technologies against a defined set of criteria.

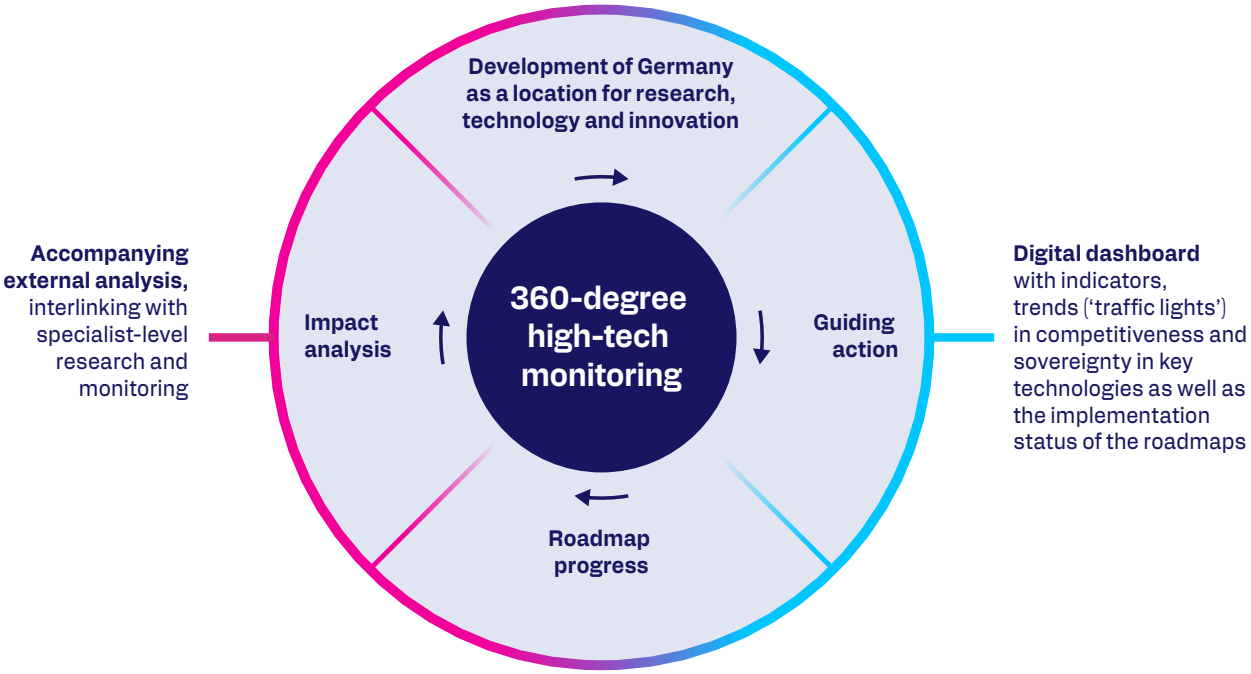
- To this end, we will also use strategic foresight methods for the early identification of potentially relevant developments.

- We will directly link this process with the 360-degree high-tech monitoring and, to this end, are further developing the existing data-based and AI-supported tools for tracking and identifying emerging key technologies.

Monitoring

We are setting up 360-degree high-tech monitoring to drive an impact-oriented research, technology and innovation policy.

As an integral part of implementing the High-Tech Agenda Germany, a digital dashboard will show the current performance of the research and technology system, including developments in the prioritised key technologies and progress on the technology roadmaps, and make this information available at any time (see graphic). We will bring together existing data sets to provide standardised, straightforward access to all relevant information on Germany as a prime location for research, technology and innovation in international comparison. In addition, an external analysis is planned in order to assess the impact of the roadmapping process on developments in the research and technology system.



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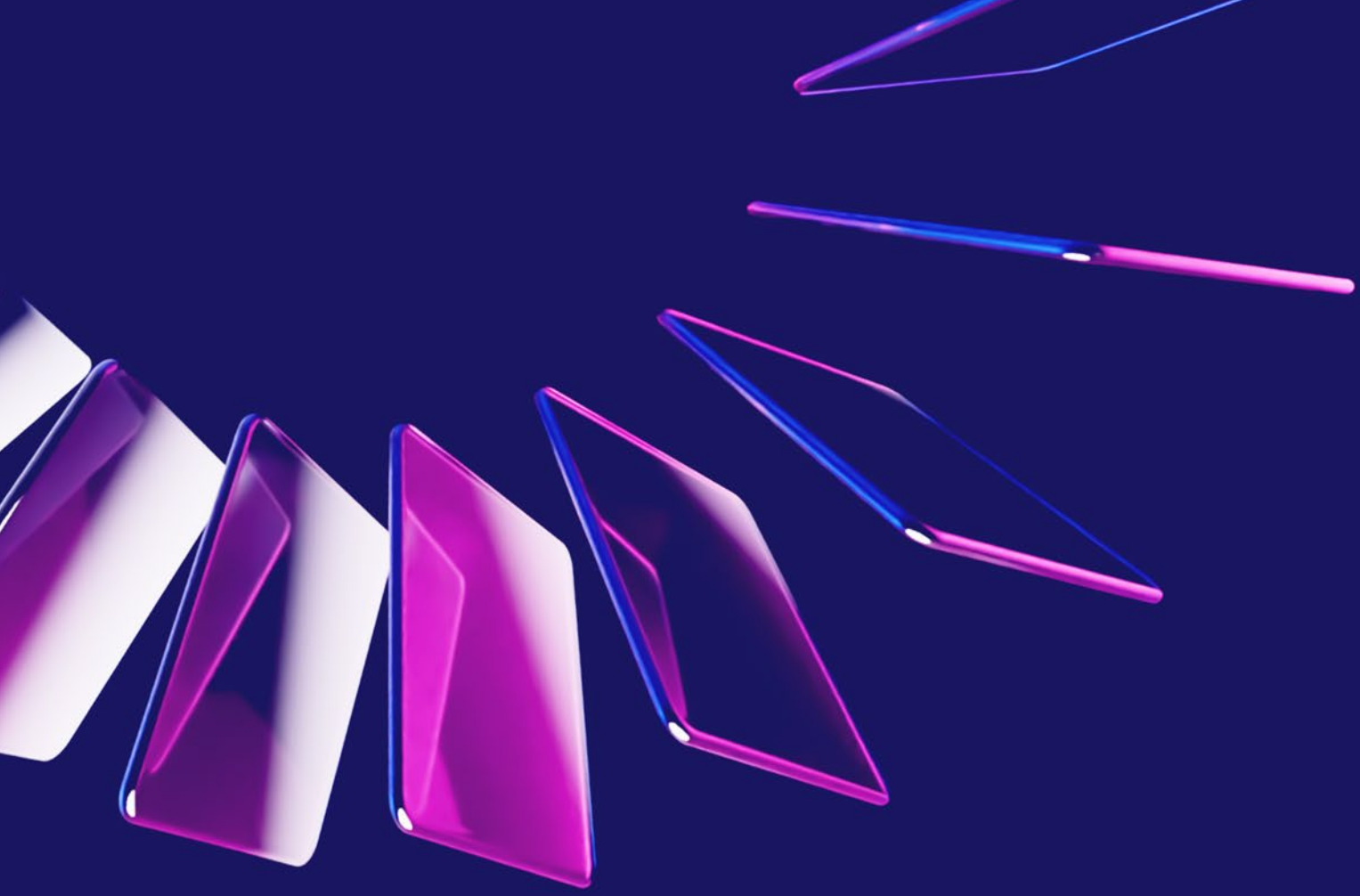

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