Baden-Württemberg

Innovation and Future Agenda Baden-Württemberg

The Länd of Innovation – Shaping the Future Together Through Innovation

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Baden-Württemberg is one of the world‘s leading hubs for innovation. Our region is home to an above-average number of global market leaders and hidden champions. According to a 2023 study by the German Economic Institute, Baden-Württemberg ranks third in innovation strength, behind Massachusetts and California. Research and development expenditure in Baden-Württemberg reaches a global peak of 5.6 percent of GDP. A strong culture of innovation within our businesses and research institutions is deeply embedded in our DNA. We are a land of inventors and innovators.

Especially in times of **polycrises and deep uncertainty in parts of society,** we must stay on course with innovation and progress. Our goal is to preserve the **industrial engine** of our economy, secure the reliable foundation of our medium-sized businesses, and position the economy as a whole for a strong and sustainable future. Through the state‘s key innovation funding programme, **Invest BW,** we support **new technologies** and lay the foundation for **new value creation** in our region. We want Baden-Württemberg to remain a **great place to live, learn, and work** for many people from both Germany and abroad in the years to come.

With the **Innovation and Future Agenda Baden-Württemberg,** we are creating sustainable jobs in urban and rural areas, ensuring that our region remains attractive to people from here and across the world. Since 2014, our funding measures have triggered an investment volume of **around €20 billion**[1] in the future of our state. We aim to continue playing a pioneering role on the global stage and must maintain our position as an export-driven economy. That is why we are continuously developing our research and innovation networks and forging strong alliances. To ensure that the brightest minds in our state not only receive excellent education but also benefit from outstanding conditions for research and science, the state government has invested approximately €4.5 billion from state and third-party funds in the construction and renovation of university buildings, university hospitals, and research institutions since 2014. Of this amount, around €3.4 billion in state and third-party funds have been allocated through the Baden-Württemberg State Property and Building Construction Administration (VBV). Further expansion and the continued development of the research landscape in economically critical future technologies are strategic priorities of the state government.

With our innovation strategy and **state agencies,** we have addressed all key future topics and are driving them forward. Through our **strategic dialogues** on the automotive industry, agriculture, healthcare, as well as affordable housing and innovative construction, we have created a new working format to support transformation processes. By using participatory instruments such as citizen dialogues, people actively contribute to shaping these developments. Our formats have since been recognised as best practices and have been adopted at both the federal and EU levels. With the restructuring of the state development plan, we are taking into account the megatrends of our time and coordinating land-use demands associated with transformation. One of the state government’s objectives is to reduce the consumption of new land in order to preserve and maintain development opportunities for future generations.

The university hospitals of the state, nine universities, 23 universities of applied sciences, and the unique Baden-Württemberg Cooperative State University (DHBW), along with numerous private and non-university research institutions, conduct cutting-edge research at a world-class level. This excellent research and science ecosystem is closely linked to relevant businesses through five innovation

1 From the EU, Federal Government and State level

campus models in the fields of AI, mobility, health, quantum technologies, and sustainability. We also ensure the high demand for skilled professionals by supporting and modernising the infrastructure of vocational education.

The state government has also entered into strategic partnerships with major international innovation hubs, such as those in the USA, China, Israel, Japan, Singapore, and the United Kingdom, and maintains its own foreign offices in these locations. We leverage these alliances with globally strong regions to jointly advance key future topics.
A particular focus is on the state partnership with California, which emphasises digitalisation, new mobility, and climate protection, enabling close alignment with trends in Silicon Valley. The state partnership with Maharashtra in India, which supports businesses and academia in market expansion, has been further strengthened through a cooperation agreement aimed at attracting Indian skilled professionals. Long-standing partnerships, such as with Kanagawa Prefecture in Japan, are used to promote collaboration in AI and the healthcare industry.

Additionally, we are establishing new partnerships, for example, with the high-tech hub of Singapore, the gateway to the Association of Southeast Asian Nations (ASEAN).
In light of geopolitical changes, the state government places great importance on further diversifying interdependencies, supply chains, and cooperative relationships while enhancing resilience. European cooperation remains a key priority, with initiatives such as the partnership with the Spanish region of Andalusia to develop a hydrogen economy or the collaboration with Flanders in Belgium, particularly in the field of microelectronics and semiconductors.

We want to inspire **confidence** in the people of our state. The challenges worldwide are immense, and **crises** have become the new reality. However, the substance and creativity of Baden-Württemberg as a location give us reason to be both confident and optimistic. We are embracing the challenges of the future with a clear ambition: to remain one of the most innovative and economically strong regions in the world for decades to come. This will not happen automatically – it requires a collective effort. With our Innovation Agenda, we are laying the foundation to ensure that our state remains a **great place to live in the future,** offering good jobs, a high quality of life, and a sense of optimism.

Artificial intelligence, quantum technology, and supercomputers as game changer

Artificial Intelligence (AI) and particularly generative AI is a key tool for renewing our economy. We aim to use AI to tackle **existential problems,** such as fighting cancer, making our workplaces smarter and more efficient, and unlocking **enormous value creation potential** in our region through new products and services. AI can also advance climate protection with precision technology in agriculture. AI affects all sectors, and Baden-Württemberg has taken a pioneering role as the **first state** in Germany to develop a comprehensive **AI position paper.** We see it as our **mission** to use AI responsibly to improve people's lives in our state. This includes ensuring that everyone can move freely and safely. That is why we also use AI in law enforcement and the judiciary, where AI provides automated support to judges, for example, in handling mass litigation cases. Furthermore, promising impulses are emerging from the creative industries, including applications in the healthcare and pharmaceutical sectors (Serious Games).

Quantum technology is opening entirely new doors. Quantum sensors enable unprecedented levels of measurement accuracy, which could unlock groundbreaking possibilities in medical diagnostics. Quantum computing has the potential to solve highly specialised tasks, such as in materials research or process optimisation. The full potential of these technologies unfolds in quantum networks. Baden-Württemberg is home to outstanding excellence in quantum science research and is investing in the Innovation Campus **Quantum^{BW}** to connect academic and industrial research and development in the field of applied quantum technology. This allows us to enhance international visibility and increase our attractiveness.

For a successful path into the digital future, we need enormous computing capacities. We have been planning for this with foresight and ambition for years. Closely integrated with excellent storage infrastructures, supercomputers form the foundation for the rapidly growing fields of data analysis and AI, as well as for quantum computing experiments. Thanks to the **state strategy for High-Performance Computing (HPC) and the High-Performance Computing Centre (HLRS) Stuttgart,** Baden-Württemberg holds a leading position nationwide and an internationally top-tier status in **supercomputing.**

What we have achieved so far:

→ With the **Cyber Valley Innovation Campus,** we have created a **European AI beacon.** Cyber Valley connects fundamental research with practical applications and societal dialogue. Scientific findings are translated into real-world applications through collaborations, education, and start-up ventures – creating new value in our region. At the same time, Cyber Valley is training the sought-after AI experts of tomorrow. Through the AI Innovation Centre for Learning Systems and Cognitive Robotics, we make cutting-edge AI research accessible to our highly innovative small and medium-sized enterprises. The establishment of the world's first **ELLIS Institute** in Tübingen – born from the European Laboratory for Learning and Intelligent Systems (ELLIS) network – further enhances the global impact of our research excellence. The most talented AI scientists from around the world work there in an exceptional environment, developing groundbreaking new ideas.

→ The Innovation **Park AI (IPAI)** in Heilbronn is emerging as a Europe-leading AI value creation ecosystem on a 23-hectare campus – transforming excellent research results into top-tier products, services, and business models. As the **Global Home of Human AI,** the focus is on ethically responsible and human-centred AI. Additionally, the IPAI aims to set new standards in climate protection and sustainability. High-performing universities in the region and global industry leaders are coming together at **IPAI,** forming strong networks with key partners from business and academia. Among them are renowned international research institutions, such as ETH Zurich with its only European satellite campus, TU Munich, and École 42.

→ We have established **550 AI professorships** across the state. **More than 850 AI start-ups** are developing new, highly innovative business models – including pioneering companies such as Aleph Alpha, Neura Robotics, and Vialytics. With regional **AI labs and the AI Excellence Centres united under the AI Alliance Baden-Württemberg,** we are creating a strong statewide network. Our goal is for global players, SMEs, and start-ups to make AI a core element of their business models.

→ With **Quantum^{BW}**, global industry leaders have joined forces with universities and research institutions across the state to drive research and development in the future fields of quantum sensing, quantum computing, and quantum networks. By combining Baden-Württemberg's unique scientific and economic expertise, we are actively shaping the quantum revolution. Our aim is to leverage this technology to achieve major advancements in medicine, mobility, and climate protection.

→ The **High-Performance Computing Centre** at the University of Stuttgart **(HLRS)** is one of three national high-performance computing centres in Germany and ranks among the world's most significant and renowned institutions in **supercomputing.** A unique feature of the HLRS on a national level is that it can also be **used by businesses.** Now in its third funding phase, we are continuously advancing our supercomputer – even in challenging times. Research institutions and companies utilise the supercomputer to lay the foundation for entirely new products and services. Additionally, Europe's **first commercial quantum computer** is located in Ehningen.

→ Baden-Württemberg offers ideal conditions for establishing an **AI Living Lab.** We aim to build on the existing structures in the state and leverage the extensive expertise gained from initiatives such as the Test Area Autonomous Driving Baden-Württemberg (TAF BW), the data platform of the AI Alliance, the ROUTINE Living Lab, and collaborations between robotics research centres in Stuttgart, Karlsruhe, and Tübingen. Further key foundations include the Karlsruhe Research Factory for AI-integrated Production and the SmartProduction-Park. Our goal is to provide all stakeholders across the entire innovation chain with legally secured access to AI living labs – enabling the application of digital technologies and AI in Baden-Württemberg from fundamental research to innovative start-ups

What we still aim to achieve:

→ Baden-Württemberg aims to become an increasingly prominent **international hotspot** for AI-based products, services, and business models. We attract bright minds from around the world and are expanding our networks beyond state borders – both across Europe and internationally.

→ **AI, with people at its core,** should become a **major opportunity** for both the economy and society across the entire state. To achieve this, we aim to inspire enthusiasm among citizens while addressing any concerns. We are systematically establishing the foundations for excellence and value creation through AI, which will serve as a basis for driving further key innovations.

→ For the development of **Quantum^{BW}** and the consolidation of existing expertise, the state is providing around €32 million for the period 2023 to 2027. The strategic objectives and areas of action for QuantumBW are outlined and summarised in Baden-Württemberg's quantum strategy.

→ **High-performance and specialised chips** will further drive the advancement of AI. That is why we are working to strengthen Baden-Württemberg's profile as a **chip ecosystem.** To achieve this, we aim to establish international collaborations and work closely with our excellent researchers and scientists.

→ In Heilbronn, our innovative **State Graduate Centre for AI** will focus on cutting-edge research in key technologies such as **chip design, robotics, cybersecurity,** and **quantum technology.** This research will take place within a close-knit network of universities, research institutions, and the IPAI. The primary goal is to connect excellent research with businesses, the local start-up scene, and, through universities, with relevant institutions across the state. Here, we are pioneering new approaches.

→ With AI, we aim **to strengthen and support** our **judiciary** and the **rule of law.** This will help ensure an environment where businesses and citizens feel secure and can fully exercise their rights. At the heart of this approach are people and the common good – court decisions will always be made by humans, not machines.

Digitalisation, data, and industry 4.0 as sources of new prosperity

Digitalisation is an ongoing task. With our cross-ministerial and comprehensive **digitalisation strategy, digital.LÄND,** we have already achieved a great deal – but there is still much to do. Our mission is to make Baden-Württemberg a leading region for digital transformation. That is why the state government is investing in **digital infrastructure** as well as in the **digitalisation of business, science, agriculture, and public administration.** We are also testing the **use of cutting-edge AI in administration,** significantly simplifying and accelerating bureaucratic processes. While digitalisation offers immense potential, we are also aware of its risks. That is why we are addressing them with our cybersecurity strategy and cybersecurity architecture.

What we have achieved so far:

→ The **backbone of our economy** and society is **ultra-fast internet** in both urban and rural areas. Today, more than **72 percent of all households** already have access to a gigabit-capable internet connection.

→ With the **Economy 4.0 Initiative Baden-Württemberg (IW4.0)** and programmes such as **Invest BW,** the largest innovation programme in our state's history, as well as the **Digitalisation Grant Plus,** we specifically support **small and medium-sized enterprises** in digitalising their business models.

→ Baden-Württemberg is **the industrial heart** of Europe and home to **numerous global market leaders.** As a **central point of contact,** the **Allianz Industrie 4.0** supports companies and research institutions on their path to digitalisation. We start at the education level, expanding our established **Learning Factories 4.0** with AI application modules. To drive the transformation towards more sustainable production, we support businesses with two innovation competitions for climate-neutral production using Industry 4.0 solutions. With the **Fraunhofer Technology and Innovation Campus S-TEC in Stuttgart,** the **Smart Production Park** in Karlsruhe, and the **de:hub Artificial Intelligence** in Karlsruhe as well as the **de:hub Future Industry** in Stuttgart, we are future-proofing our industry in **robotics and automation.**

→ Our **"Agriculture 4.0 – nachhaltig.digital"** (Agriculture 4.0 sustainable.digital) strategy aims to make agriculture future-proof and modern. Digitalisation offers enormous potential, especially for small-scale farming, helping to drive innovation and efficiency in the sector.

→ We need to accelerate the **digitalisation of public administration** in collaboration with the federal government and municipalities. The **Digitalakademie@bw** supports and guides municipalities and regions on their path to digital transformation.

→ In public administration, AI presents an opportunity to manage increasing complexity and address the growing competition for skilled professionals more efficiently. Cutting-edge AI methods can significantly simplify and accelerate administrative processes. With the nationwide first deployment of generative AI in administration through the F13 prototype, we have already demonstrated the immense potential of AI for administrative work. The state government's **innovation lab** is leading the way with the **AI assistant F13** within the state administration. We rely on **innovation partnerships** with businesses and technology communities to bring the vision of a modern administration to life more quickly.

→ With the **service portal service-bw,** citizens in Baden-Württemberg have long had access to reliable information on administrative services. The state's **Open Data portal "daten.bw"** provides central access to a wide range of administrative data from Baden-Württemberg – simple, fast, and free of charge.

→ With Germany's first **Cybersecurity Act** and our **cybersecurity strategy,** Baden-Württemberg has established key foundations for secure and successful digitalisation. The services of the **Baden-Württemberg Cybersecurity Agency** (CSBW) for public administration and municipalities form an essential basis for cross-level digitalisation projects. Through the consultation framework for small and medium-sized enterprises (SMEs – developed by the Ministry of the Interior and implemented by CSBW – we are making a significant contribution to the economy. Our "Cybersecurity Check for SMEs" is currently gaining nationwide attention.

What we still aim to achieve:

→ We want our companies to be innovation leaders in AI. To achieve this, we will continue to rely on and further strengthen our excellent networks between research and industry. Companies from Baden-Württemberg should take a leading role in **Business-to-Business (B2B) models and robotics.**

→ We therefore plan to continue pursuing the goals of the **digital.LÄND** digitalisation strategy with commitment and to complement it with a **data strategy.**

→ Well-developed **IT and cybersecurity structures** are key enablers for successful business models and high public acceptance.

→ We aim to promote interdisciplinary collaboration between creative and non-industry companies, as this cooperation is a key prerequisite for a successful digital transformation and holds significant economic potential (Cross-Innovation).

→ We see Virtual Reality (VR) and Augmented Reality (AR) as key applications whose potential we aim to further harness and integrate with other technologies. This will enable us to remain competitive globally and to future-proof existing business models as well as education and training concepts.

→ We will continue to drive forward the **digitalisation of public administration** with full commitment and test the application of new technologies. Our goal is to strengthen the **"Digital First" approach,** using analogue processes only where absolutely necessary.

→ We aim to automate and accelerate **building permit procedures** using AI. Our long-term goal is to enable automated processing of building applications with manageable complexity, up to the point of generating a decision proposal. This will help relieve administrative workload, allowing resources to be focused on handling complex construction projects.

→ We aim to develop new approaches to keep pace with the rapid innovation in the field of AI. To this end, we plan to expand F13, based on the lessons learned, and integrate it with the AI platform KI4BW to provide a professional AI support system across the state. This will ensure sovereign AI functions for all ministries and the workplace of the future throughout the state. With the support of a modern, application-oriented AI ecosystem for public administration, we will realign our administrative processes to meet the challenges of both today and tomorrow. AI can make an important contribution to this. To plan and support this, the state intends to establish an AI competence centre for the state administration.

Mobility & the car of the future: invented and rolled out in Baden-Württemberg

The car was invented in Baden-Württemberg. The roughly 300 automotive companies based here, along with over 1,000 suppliers, generate annual sales of more than €135 billion. The entire automotive cluster employs nearly half a million people. For years, companies, universities, and research institutions in Baden-Württemberg have been working to lead the state into the mobility of the future, one that meets the needs of both the people and the economy, while also being climate-friendly. Whether it's a climate-friendly powertrain or connected cars, the future is tangible across the state. We need to compensate for job losses in combustion engine technology by creating new opportunities, such as in electric mobility, the hydrogen sector, the production of synthetic fuels, and in the development of connected and automated vehicles. This is achieved primarily through a clear focus on innovation. We are not only focusing on new climate-friendly, efficient, and digital technologies in cars and trucks, but also in public transport and rail passenger services.

What we have achieved so far:

→ With the **Strategic Dialogue for the Automotive Sector Baden-Württemberg (SDA),** we have taken the lead and brought together all relevant stakeholders from business, science and research, as well as civil society. The state of Baden-Württemberg has supported the Strategic Dialogue for the Automotive Sector BW with more than **€400 million** from 2018 to 2023 and invested multiple times that amount in initiatives that contribute to the goals of the SDA.

→ The Strategic Dialogue is an **innovation hub** for advancing the future of mobility. Together, we have made significant progress in establishing a **comprehensive charging infrastructure** for electric vehicles and have helped create favourable regulatory conditions at the EU and national levels. A number of innovative projects, such as the fuel cell research factory HyFab and the Innovation Campus Future Mobility, have emerged from the Strategic Dialogue. With the **Advice Centre for Transformation Knowledge BW,** we have created a central point of contact to ensure that small and medium-sized enterprises receive support during the current structural transformation.

→ Our **State Agency for New Mobility Solutions and Automotive, e-mobil BW GmbH,** is driving the transformation of mobility in Baden-Württemberg with its extensive network. As a central point of contact, it supports the transition to new drive technologies and mobility solutions as an **innovation agency.**
To achieve this, e-mobil BW connects science and industry, technologies and application fields, as well as people and markets.

→ The **Innovation Campus Future Mobility,** where the University of Stuttgart and the Karlsruhe Institute of Technology (KIT) combine their strengths, is increasingly becoming a hub for the mobility of tomorrow.
The electric vehicle of the future will be increasingly digitalised, connected, and automated. It will be developed and built from the start in a way that allows for the **recycling** of its components and materials, and it aims to **operate in the future without the use of lithium, cobalt, and rare earth elements.** At the same time, our networks of research and industry are working to ensure that not only the hardware, but also the **software in vehicles** is made in Baden-Württemberg.
With the **Test Area Autonomous Driving Baden-Württemberg (TAF BW),** which we are currently enhancing with a "Digital Twin" as a virtual representation of reality, we are testing new intelligent mobility and particularly supporting SMEs in trialling this technology.

→ With the **battery cell research factory,** the **Centre for Digitalised Battery Cell Manufacturing,** the **fuel cell research factory HyFab,** and the Stuttgart test centre for drives using regenerative technologies for new vehicle concepts, we have established forward-looking model factories, laboratories, and test environments. Additionally, through projects such as DigiBatPro4.0, AgiloDrive, and AgiloBat, we have launched extensive collaborative initiatives to ensure our companies succeed in the international markets with state-of-the-art powertrain technologies. Collaboration with companies and research partners plays a crucial role in the success and further development of battery cell, hydrogen, and fuel cell technologies, as well as electric motor technologies.

→ We are **digitising and electrifying the railway system.** A key project in this effort is the "Digital Hub Stuttgart" – the first digital railway hub in Germany. By the mid-2030s, nearly 500 kilometres of track around Stuttgart will be equipped with **digital signalling and safety technology,** and our rail vehicles will be fitted with the corresponding systems. This will lead to increased capacity, as well as improvements in operational quality and punctuality. Additionally, we are procuring modern trains for the next 30 years – for example, battery-electric trains are already operating in the Ortenau region. Digital ticketing in public transport and the state-wide Check-in/Check-Out system "CiCoBW" allow passengers to board and start their journey without needing to know the fare structure. Billing is done at the end of the day with a best price guarantee. This is how advanced and accessible public transport looks.

What we still aim to achieve:

→ We aim to ensure that Baden-Württemberg companies roll out the technologies for the mobility of the future worldwide. This will create new jobs in our state. In Baden-Württemberg, we want not only to develop and produce climate-friendly vehicles, but also to create intelligent solutions for **connected mobility and logistics.**

→ The success we have achieved with the state-wide **e-charging infrastructure** for passenger cars is one we aim to replicate for **battery-electric trucks.** To this end, we have conducted a location and area analysis and are determined to drive the expansion of regional charging infrastructure as well as depot charging across the state. We also plan to further expand the necessary refuelling infrastructure for hydrogen-powered heavy-duty vehicles.

→ We aim to address the advancing digitalisation of vehicles through **open-source collaborations,** thereby empowering small and medium-sized enterprises to secure value creation and jobs in Baden-Württemberg through new products and business models.

→ Autonomous driving in public transport can contribute to a substantial improvement in the public transport offer – both in urban and rural areas. We aim to make the opportunities arising from this available as soon as possible, in the interests of the population and the local automotive industry, as well as to reduce the harmful effects of traffic.

Contributing to greater climate protection and sutainability with future technologies and greentech, and setting global standads

Baden-Württemberg is world-renowned for its high-quality industrial products, its innovative service sector, and its extensive, diverse, and excellent landscape of science and research. In 2021, Baden-Württemberg's universities were the most successful in Germany in the EU Green Deal Call of the EU Research Framework Programme. In 2023, nearly 20,000 GreenTech companies generated a gross value added of approximately €23.1 billion. With around 200,000 employees, the GreenTech sector is a growth engine in Baden-Württemberg.

Batteries, fuel cells, and electrolysers are key technologies for a stable and secure power supply, as well as for an emission-free energy supply based on renewable energies. For this reason, Baden-Württemberg is focusing on the research, development, and industrialisation of these technologies. In **battery cell research,** Baden-Württemberg is home to a **unique cluster** of universities and institutes working on the batteries of tomorrow. Additionally, **hydrogen and fuel cell technologies, including electrolysers,** offer tremendous export potential for companies based here in international markets. This presents companies in Baden-Württemberg with opportunities to become leading providers across the entire hydrogen value chain.

The **Innovation Campus Sustainability (ICN)** is transforming the Upper Rhine region into a hub for pioneering sustainability research. The initiative involves the University of Freiburg and the Karlsruhe Institute of Technology (KIT), aiming for breakthrough innovations in urban planning, food systems, and the transition to renewable resources. The focus is on rapid implementation.

Baden-Württemberg has received Germany's **first excellence cluster in the field of architecture,** focusing on "Integrative Computer-Based Planning and Construction for Architecture (IntCDC)". Research is dedicated to harnessing the full potential of digital technologies to enable significantly improved planning and construction.

With the establishment of the Strategic Dialogue for **Affordable Housing and Innovative Construction BW,** the state government has created an innovation platform where experts work on solutions for key challenges in the construction sector. Alongside the creation of affordable housing and the transformation of the construction industry, the focus is on innovative and ecological construction and renovation, as well as circular economy principles.

The new State Development Plan (LEP) is adapting spatial planning to current trends. It provides a flexible framework for future-proof developments and innovations by coordinating land use across regions and disciplines. Through participatory formats, relevant stakeholders are actively involved early on in shaping the LEP's content.

What we have achieved so far:

Greentech and innovative use of regionally renewable resources:

→ The **State Strategy for Resource Efficiency,** originally adopted in 2016, was expanded by the state government in 2024. With this strategy, we support the economic and technological transformation towards a resource-efficient, circular, and internationally competitive economy.

→ With the flagship research project **DeMoBat,** we are focusing on the industrial dismantling of battery modules and electric motors to optimise the recovery of strategically important raw materials such as cobalt, nickel, manganese, lithium, and rare earth elements. Through the **"R-Beton"** funding programme, we are supporting the widespread availability of recycled concrete. Additionally, with the **"Phosphorus Recovery"** funding programme, we have established the first large-scale phosphorus recovery plants in the state, making Baden-Württemberg a European leader in this field.

→ In a **sustainable bioeconomy,** wastewater and waste treatment plants become important raw material suppliers. The goal is to extract valuable resources from waste and wastewater and reintegrate them into the economic cycle. The state, together with the European Commission, is supporting the construction and implementation of five modular **biorefineries** through the EFRE-funded **"Bioeconomy Bio-Ab-Cycling"** programme.

→ To develop an economic model that decouples growth from resource consumption, the continuous advancement of existing production and business models is essential. The **circular bioeconomy** and the **biologisation of the economy** will play an increasingly important role in this transformation.

The **State Strategy for Sustainable Bioeconomy,** originally adopted in 2019, was further developed and expanded by the state government in 2024. Through this strategy, we support over **100 innovation** projects as well as numerous **pilot and demonstration projects.** Key focus areas include new production systems and conversion processes for biomass, innovations along food and value chains, and the development of fine and specialty chemicals produced biotechnologically or with the help of microorganisms, which will become cornerstones of a sustainable economy. A particular emphasis is placed on closing raw material and nutrient cycles, the high-value utilisation of by-products, residues, waste, wastewater, and the use of CO_2 as a resource.

→ With the **Timber Construction Initiative BW,** Baden-Württemberg has set the trend for sustainable building with wood, extending its influence beyond state borders. Through this initiative, the state aims to promote a liveable, climate-friendly, and future-proof building culture. As a result, Baden-Württemberg has held the highest timber construction rate for several years and boasts Germany's most progressive building regulations for the realisation of sustainable wooden buildings.

→ Baden-Württemberg is a national leader in the wood-based **bioeconomy.** With the **Technikum Laubholz** research institution, we are shaping the future of **wood utilisation,** making Baden-Württemberg a pioneer for Germany and Europe. At the Innovation Hub in Göppingen, we are developing innovative and high-quality applications for hardwood, helping to build a resilient and future-proof economy while contributing to our climate protection goals. With the new pilot plant for producing textile fibres from local beech wood, we are taking an innovative approach that will revolutionise the textile industry.

Battery and hydrogen/fuel cell technology:

→ Baden-Württemberg is **Germany's leading hub for battery research,** with our scientific community working alongside companies to cover the **entire value chain** – from raw materials and production to recycling. Additionally, the **qualification programme "Quali-BattBW"** supports the development and expansion of expertise in battery development and manufacturing along the battery value chain.

→ With the international research platform **CELEST,** we are setting new standards in energy storage research. CELEST brings together the expertise of 29 institutes at the Karlsruhe Institute of Technology (KIT), the University of Ulm, and the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW).

In 2020, together with industry, academia, and associations, we developed the **Hydrogen Roadmap BW,** providing a clear strategy for **establishing a hydrogen economy** in Baden-Württemberg. This roadmap has been implemented and continuously advanced through the **H2BW platform** at the state agency e-mobil BW since 2021. So far, the state government has allocated around €500 million for innovative projects, ranging from research initiatives to large-scale model regions.

We support the transfer of cutting-edge technology knowledge into education with the "Learning Workshop for Future Hydrogen and Fuel Cell Technology" at the vocational commercial school in Backnang.

<u>What we still aim to achieve:</u>

→ The state government has set the goal of establishing Baden-Württemberg as a **model region for GreenTech.** Our vision is for Baden-Württemberg to become a global lead market and key provider of green technologies. To achieve this, we are launching the **"GreenTech BW Platform",** which will bundle and showcase activities across the state. Additionally, we plan to establish a **GreenTech Alliance** to further strengthen collaboration. At the same time, the platform will serve as a central contact point for businesses both within Baden-Württemberg and beyond. Our ultimate goal is to create an internationally recognised showcase for **"GreenTech made in BW".**

→ With the **State Strategy for Sustainable Bioeconomy 2025–2029,** Baden-Württemberg is consistently pursuing a bio-based, sustainable, and circular economy, establishing itself internationally as a **leading region in the field of circular bioeconomy.** The increasing use of bio-based materials, as well as the integration of structures, principles, and processes from living nature into technology and production, forms the basis for numerous structural innovations. These innovations will help lay a climate-neutral foundation for Baden-Württemberg while also creating new economic sectors, whose value creation largely remains within the region.

→ Baden-Württemberg aims to set further trends as a European **model region for "Carbon Removals"** through timber construction. This initiative is expected to create new, future-proof jobs and business models. To achieve this, the state is strengthening its collaboration with the EU and will continue to expand the **Timber Construction Initiative BW.**

→ The battery of the future should be sustainable, fair, and climate-neutral, and it should be developed and produced in Baden-Württemberg. With the international **excellence cluster POLiS,** we are pursuing the **vision of a post-lithium era.** Our scientists are researching batteries based on **sodium, magnesium, calcium, aluminium, and chloride ions.** These post-lithium batteries have the potential to store more energy, enhance safety, and provide a cost-effective, long-term solution for mass applications, such as stationary and mobile electrochemical storage systems.

→ Baden-Württemberg also aims to remain a leader in **fuel cell technology.** Through IPCEI[2] Hydrogen, the state and Baden-Württemberg's industry are leveraging a key instrument to drive the development of **hydrogen technologies** and secure long-term benefits from market growth. Three selected projects from Baden-Württemberg-based companies – Robert Bosch GmbH, Daimler Truck AG, and EKPO Fuel Cell Technologies – are set to **scale fuel cell** technologies. These projects focus on the manufacturing of fuel cell systems for stationary applications, as well as the development and production of fuel cell stacks and zero-emission heavy-duty fuel cell trucks.

→ With the **HyFab Research Factory for Hydrogen and Fuel Cell Technology at the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW)** in Ulm, and the HYKOS Competence and Innovation Centre for Hydrogen Technologies and Cognitive Energy Systems at the Fraunhofer Institute for Solar Energy Systems (FhG ISE) in Freiburg, we aim to establish Baden-Württemberg's companies as world-leading manufacturers and exporters of these technologies. The industrialisation of fuel cell and electrolyser production will be driven by cutting-edge technology from Baden-Württemberg.

2 Important Project of Common European Interest

Innovations for greater quality of life and health

In Baden-Württemberg's healthcare industry, around 1,100 companies in medical technology, the pharmaceutical industry, and biotechnology are engaged in research, development, and production. These companies employ over 88,000 people and generate an annual turnover of approximately €25 billion. The biotechnology, pharmaceutical, and medical technology sectors provide modern, future-oriented jobs and contribute to securing long-term prosperity. With a 9.2% share of the total economy, the healthcare industry is the fastest-growing economic sector in Baden-Württemberg. As a result, healthcare is a key focus of the state government's efforts. With around one million employees, the healthcare sector is one of Baden-Württemberg's leading industries. We aim to leverage cutting-edge technologies and research breakthroughs to ensure that Baden-Württemberg and Germany remain at the forefront of the global medical and healthcare industry.

What we have achieved so far:

→ With the cross-ministerial strategy dialogue **"Forum for Healthcare Location Baden-Württemberg" (FSGBW),** we have supported over 60 innovative projects with funding of **€125 million.** Together with science and research, industry, and healthcare providers, we are successfully advocating for optimal framework conditions in the healthcare sector at both the EU and national levels.

→ The Forum for Healthcare Location Baden-Württemberg is particularly focused on improving the use of health data to advance healthcare services and strengthen innovation. The Baden-Württemberg Health Data Utilisation Roadmap outlines both successfully implemented measures and future tasks. Key impulses from this initiative have already been incorporated into the Health Data Utilisation Act and the Digital Act. Another core focus of the forum is strengthening Baden-Württemberg as a hub for pharmaceuticals and medical technology, thereby ensuring a more resilient healthcare supply chain.

→ **The Centres for Personalised Medicine** (ZPM) at the university hospitals of Freiburg, Heidelberg, Tübingen, and Ulm have been officially designated in hospital planning since 2019 and hold a pioneering role nationwide. The expansion of the **ZPM network** into a regional, cross-sector healthcare structure is already well advanced. Additionally, the application of personalised medicine to immune-mediated diseases has begun. This enables us to offer our citizens optimal healthcare, particularly in cancer diagnostics.

→ As part of the **Digitalisation Strategy for Medicine and Healthcare,** we have supported around 50 projects with funding exceeding €20 million. With the telemedicine project docdirekt, we laid the foundation for video consultations in Germany. The AI real-world lab ROUTINE serves as a European flagship project, creating **experimental spaces** for the successful integration of AI into healthcare services. As a co-financier, we support more than 650 projects through **funding from the Hospital Future Fund,** enabling essential investments in technical and IT infrastructure for hospitals. This includes the implementation of digital admission and discharge management systems and digital nursing and treatment documentation. By doing so, we enhance the quality of medical treatment options and improve connectivity across different healthcare sectors, both within hospitals and in cross-sector care coordination.

→ At the **Innovation Campus Health & Life Science Alliance Heidelberg Mannheim,** application-oriented fundamental research is being successfully conducted across institutions and disciplines to bring innovations in prevention, diagnostics, and therapy into everyday medical practice. The state supported the development of the Innovation Campus with over €23 million from 2021 to 2023 and continues to fund the initiative.

→ We also support close collaboration between science and industry for the healthcare of the future through flagship projects such as the **research campus "Mannheim Molecular Intervention Environment (M²OLIE)" and the future cluster nanodiag BW.**

→ By establishing a satellite facility for **"Virus-Based Therapies"** of the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB) in Biberach, we are strengthening collaboration between research and industry in this key future field. Therapeutic viruses can be used as biological tools to combat infections, serve as vaccines, or treat cancer, offering tremendous potential for new therapies and further reinforcing Baden-Württemberg as a leading healthcare hub.

What we still aim to achieve:

→ We aim to further strengthen the healthcare industry as a key sector in our state. To achieve this, we are committed to the responsible use of health data for the benefit of patients. Our goal is to establish Baden-Württemberg as the **"place to be" for an innovative healthcare industry.**

→ With a **digital platform for health data,** Baden-Württemberg aims to accelerate and simplify the exchange of critical patient data between university hospitals, hospitals, and medical practices. The platform **MEDI:CUS** (Medical Data Infrastructure: Cloud-Based, Universal, Secure) is set to launch in 2025 with its first services. This will establish a statewide infrastructure to drive innovation across the entire region.

→ Starting in 2024, we aim to consistently implement the measures outlined in the "Strategy to Improve Medical Translation for Baden-Württemberg". This includes creating **favourable framework conditions and streamlining approval processes** for science and industry, ensuring that research findings are translated more quickly into practical healthcare applications, ultimately benefiting patients.

→ We aim to strengthen regional networks connecting industry, research, and healthcare. Our state agency BIOPRO plays a key role as a central partner in these networks, serving as an essential link to connect the state's excellent knowledge and expertise. **Technological advancements in diagnostics, treatment methods, and innovative medical products** should be developed in Baden-Württemberg. We also strive to fully harness the opportunities presented by **AI, gene therapy, and cell therapy** for healthcare, research, and industry in our region.

Aerospace as a high-tech industry of the future & for resilience

Baden-Württemberg is one of **Germany's leading hubs for the aerospace industry,** with key academic partners such as the University of Stuttgart and the DHBW. The sector employs around 16,000 people in the state, generating an annual turnover of approximately €5 billion. Key strengths of the region include an outstanding research infrastructure, **a tight-knit network of high-performing manufacturers and suppliers, and a highly specialised equipment industry.** The Baden-Württemberg aerospace sector invests around 17.5% of its revenue in innovation, making it a technology driver for many other industries for decades. Furthermore, the aerospace sector holds significant potential for new business fields and digital services in areas such as telematics, autonomous driving, climate and environmental protection, resource efficiency, agriculture, security, and disaster management.

Closely linked to aerospace, as well as to the mobility sector and mechanical engineering, is the **security and defence industry,** which employs around 15,000 people in Baden-Württemberg (excluding suppliers). As diverse as its connections to other industries is the range of product categories developed and manufactured in the state, including observation satellites, engines, drone defence systems, defence electronics, and more. Baden-Württemberg holds a leading position in key technologies such as radar technology, guided missiles, and satellite communication systems. Most products in the security and defence industry are **dual-use applications,** meaning they can be used for both security and defence purposes as well as for civilian applications.

What we have achieved so far:

→ With the 2023 launch of the **aerospace strategy "THE aerospace LÄND – On to New Horizons",** we are giving a significant boost to the aerospace sector in Baden-Württemberg. The strategy is built on digitalisation, sustainability, and collaboration. We are creating a strong network that connects cutting-edge research with innovative companies.

The widespread availability of high-speed data transmission systems via satellite, as well as high-precision Earth observation data and navigation services, is essential for **future competitiveness.** Since 2016, we have been advancing these technologies through the collaborative project "Integrated Digital Research Platform for Affordable Satellites" (IRAS). This initiative focuses on the development of propulsion systems, structures, electronics, and production technologies, while also exploring cost-effective alternatives to traditional, high-cost satellite development under the "New Space" approach.

→ At the University of Stuttgart – home to one of Europe's largest aerospace faculties – two Collaborative Research Centres are working towards **climate-neutral aviation** through highly integrated aircraft development and the exploration of new orbital regions for satellite applications. This highlights both the research excellence and the significance of Stuttgart as a leading science and innovation hub.

→ With the **e-Fliegen BW test fields** at the Lahr and Mengen-Hohentengen sites, Baden-Württemberg has established a unique testing infrastructure for advancements in electric and autonomous flight.

What we still aim to achieve:

→ We aim to continue research activities in the field of **climate-neutral fuels** for aviation and support their scaling up to market readiness.

→ We aim to further develop the **test fields for the aviation** of the future and integrate new aviation technologies into intermodal transportation concepts of the future.

→ Sustainable space technology from Baden-Württemberg should become a **hallmark of quality.** To achieve this, we plan to establish a **"Green Space"** centre.

→ We aim to secure and expand Baden-Württemberg's contributions to space exploration, for example, through ESA missions. At the same time, we are advancing the understanding of opportunities in emerging economic models in low Earth orbit and beyond. We see "New/Next Space" and the "Lunar Economy" as opportunity spaces that we want to open up for researchers and businesses from Baden-Württemberg.

→ We are actively promoting Baden-Württemberg as a

leading **destination for studies, research, and qualification** in aerospace engineering, for example, through the THE NERDLÄND campaign. Young people with a passion for science and technology are warmly welcomed in our state.

Shaping the future with start-ups and solving real-world problems

Baden-Württemberg is an attractive hub for start-ups! With Start-up BW and the **NXTGN initiative,** we are connecting start-up activities across the state and supporting founders. This approach leverages the strengths of our regions and transforms them into a collective advantage. The impact is clear: for the first time, the **number of start-ups is rising** outside major urban centres.
We need start-ups to renew our economy – they are drivers of innovation, using their business models to solve real-world problems.

What we have achieved so far:

→ To strengthen and showcase the regional start-up ecosystem and Baden-Württemberg's strengths, we launched the **Start-up BW campaign. "THE Start-up LÄND**" brings together all support measures and funding programmes for founders and start-ups in Baden-Württemberg.

→ Since 2017, the **Start-up BW Young Talents** programme has reached nearly 15,000 students, introducing them to entrepreneurship education.

→ Since its introduction, the **Start-up BW Innovation Voucher** has supported over 700 start-ups in developing innovative projects, with a total funding volume of more than €14.5 million.

→ Since 2017, the **Start-up BW Accelerators,** which have received over €17 million in funding, have supported around 1,800 start-up teams in developing innovative business ventures. Since 2021 alone, the supported start-ups have secured approximately €210 million in funding and investment, while creating around **2,900 new jobs.**

→ With the Start-up BW **Female** Accelerator, we have been specifically addressing **female founders** since the beginning of 2024.

→ As part of the early-stage financing programme **Start-up BW Pre-Seed** and the Corona relief programme **Start-up BW Pro-Tect,** over 350 start-ups have received more than €74 million in funding. Additionally, co-investments amount to at least €15 million.

→ Since 2018, 145 municipalities have participated in the state competition for **start-up-friendly communities, Start-up BW Local.** A total of 101 award-winning municipalities have received €435,000 in funding.

→ Since 2018, **Start-up BW International** has supported nearly 400 start-ups from Baden-Württemberg in participating in international market expansion and delegation trips, as well as trade fairs and global start-up events, with funding of around €900,000.

→ The state supports start-ups in the area of **venture capital** in various ways. This includes the **Start-up BW Seed Fund,** the **Start-up BW Innovation Fund, the venture capital fund Grazia Equity,** and the **venture capital fund Mätch.VC,** with Baden-Württemberg's promotional L-Bank as the anchor investor. Additionally, in 2023, we launched the Start-up BW Regio Inno Growth programme. Together with L-Bank, we have also introduced the Start-up BW Regio VC financing initiative, which provides an additional **€40 million** to support private financing initiatives in our regions. These funds are allocated through direct investments or fund participations, helping to advance promising models developed with initiative and commitment.

→ With the NXTGN Initiative: Next Generation (formerly Gründermotor), we have supported the development of **over 1,100 university-affiliated start-up projects** since 2018, preparing them for a successful market entry.
As an interface between science and industry, NXTGN aims to further strengthen cross-regional collaboration in start-up support, both among universities and between academia, industry, the start-up community, and the investment sector. The NXTGN network is currently applying for the "Startup Factory" flagship competition by the Federal Ministry for Economic Affairs and Climate Action. In the future, up to ten cross-regional start-up hubs, known as Startup Factories, will play a key role in Germany's start-up ecosystem. Baden-Württemberg, through the NXTGN network, is applying to become a leading platform for cooperation between science, industry, and the start-up community, positioning itself among Germany's top Startup Factories.

What we still aim to achieve:

→ Start-ups are a key success factor – they accelerate our economy, transform new ideas and technologies into business models, and drive value creation and innovation in Baden-Württemberg. That's why we are committed to continuing our strong support for start-ups in Baden-Württemberg through a comprehensive package of measures and dedicated efforts.

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