GTAI GERMANY TRADE & INVEST

MARKETS

GERMANY

Insights into Europe's Biggest Economy 1/25

THE VALUE OF WASTE

Germany is vigorously promoting all aspects of the circular economy: from plastic alternatives to recycling technologies, robotics and smart systems

FASTER, LONGER, CLEANER

Rolling out long-distance charging infrastructure for e-trucks across the country

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Faster, Longer, Cleaner

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A Beacon for AI

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"Innovation is the point where change and continuity intersect. Germany continues to welcome great new ideas."

Dear reader,

A new year is now underway: 2025 is likely to bring further global transformation and some disruption. Donald Trump's second term as US President will alter the international business landscape, and voters in Germany are heading to the polls to elect a new government. That will create new dynamics and new priorities. *Markets Germany* will keep you abreast of any changes affecting the business and investment landscape in future issues.

But while change is inevitable, some things will remain constant. The economic and trade partnership between Germany and the United States will continue to be one of the strongest in the world. Germany will still be the largest market in Europe and the biggest economy in the European Union. And we at Germany Trade & Invest will keep offering free and reliable assistance to international companies looking to expand to Germany. We remain firm in our conviction that international cooperation is good for everybody, regardless of geopolitics.

Innovation is the point where change and continuity intersect. Germany's economy continues to generate and welcome great new ideas. Our top story in this edition focuses on efforts to create circular economic models using the latest new technologies. South Korea's Doosan Robotics and Norway's TOMRA are two international companies that have come to Germany and achieved success in this area.

We hope you will enjoy their stories and the many other examples of business ingenuity in this edition — here's to a healthy and prosperous 2025 for all!

Dr. Robert Hermann, *CEO*
Email: invest@gtai.de

Photo: Jan Ladwig

MAJOR PLAYER

Michael Ryu was a natural choice to head up the European arm of the Korean company Doosan Robotics. Not only does he have the right experience, but he is a native German speaker (educated in Frankfurt).

MICHAEL RYU: *MANAGING DIRECTOR, DOOSAN ROBOTICS EUROPE*

In April, the Korean robotics company Doosan Robotics opened its first European branch in Düsseldorf — in response to the increasing demand in Europe for collaborative robots (or "cobots") that work directly alongside humans, performing tasks like palletizing, welding, or loading and unloading machines.

The European branch of Doosan Robotics (which is part of Doosan, founded in 1896) is headed by Michael Ryu. The 44-year-old has a wealth of experience in business consulting, strategy and sales in Korea, the USA and Europe. Previously, he worked at Doosan's construction equipment software venture arm in Los Angeles. Ryu is also a native German speaker, having grown up in Frankfurt.

The company already generates about one third of its turnover in Europe, and Ryu plans to drive further growth from the new German headquarters. "We chose Germany as our location because it is our most important market in Europe — mainly due to its huge manufacturing industry," he explains. His goal is nothing less than to become the European market leader in the field of robotics, initially focusing on regions with high labor costs and a labor shortage.

"We want to expand rapidly in the coming years and contribute to strengthening the economy with our technologies. In five years' time, robots will be a matter of course in many companies, households and even restaurants," says Ryu.

Quick facts

NAME	Michael Ryu
JOB TITLE	General Manager & Head of Doosan Robotics Europe
QUALIFICATION	BA from Yonsei University, MBA from INSEAD
COMPANY NAME	Doosan Robotics Europe (Affiliate of Doosan Robotics)
MAIN LOCATIONS	Korea, Texas (USA), Düsseldorf (Germany)
INDUSTRY	Robotics
STAFF	250
CLIENT BASE	Companies from the automotive, manufacturing, warehousing and logistics, food and beverage, pharmaceutical, construction and packaging industries, including Hyundai, Renault, Mahle, Continental and Nestlé

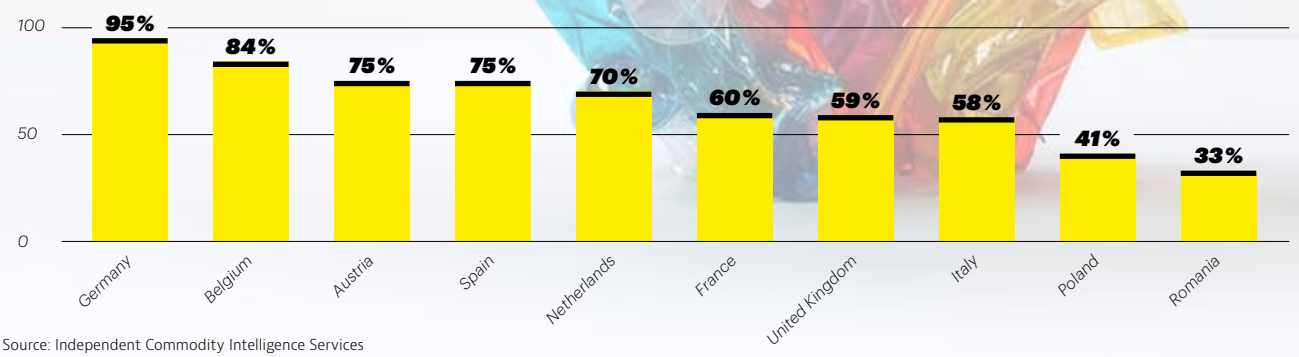
82%

RECYCLING RATE OF TOTAL WASTE IN GERMANY IN 2023

Source: *Umweltbundesamt*

GERMANY IS A PIONEER IN COLLECTING PET BOTTLE WASTE

Average collection rate for disposable and reusable PET bottles (deposit collection systems) for selected European countries in 2022



Source: Independent Commodity Intelligence Services

Photo: Adobe Stock/kamonrat/ generated with AI

THE VALUE OF WASTE

The word 'recycling' conjures up color-coded community trash containers for glass, paper, clothes and electronic waste. But there's a lot more to circular economy opportunities in Germany, as many international companies are finding out.

Where others see waste, we see value," says Nicolai Prytz, Head of Sustainability at TOMRA. The Norwegian company is no newcomer to recycling: it has been in the circular economy business for more than 50 years — and operating in Germany for 20 of those — but it still has new tricks up its sleeve.

TOMRA made its name manufacturing the bottle collection machines that Prytz — a master of the snappy soundbite — calls "reverse vending machines" because they dispense money to shoppers in exchange for their empties in supermarkets all over the world.

That was one of TOMRA's first forays into the circular economy. But the company has been continually updating its technology, and its solutions now use advanced sensor technology, deep learning and AI to enable "resource circularity" in everything from waste management to mining and fresh food sorting. The benefit of circular solutions is that companies can minimize waste, extract value and reduce environmental impact to create a more sustainable future.

In Germany, TOMRA found the ideal environment for their circular business model to grow and thrive. The various technologies that TOMRA uses were developed in German research facilities. In fact, Germany was one of the first countries to adopt producer responsibility legislation that required separated collection of waste, a model that has since spread to many countries in Europe.

THE BOTTOM LINE

Germany is vigorously promoting circular economies in all sectors, not only to save the planet, but also to expand business opportunities created by state-of-the-art digital technologies. Foreign direct investors can come to the party.

Photo: picture alliance/ANP/Koen van Weel

Photo: picture alliance/dpa/CTK/Miroslav Chaloupka

Photo: TOMRA

1 PET plastic bottles and metal cans are inserted into the TOMRA R2 recycling deposit machine. The smart device is designed to ingest several bottles and cans at the same time, and the deposit can be paid out immediately.

2 The Norwegian company TOMRA Feedstock tests its unique returns system for beverage packaging in an Albert supermarket in the Czech Republic in 2023. The contraption can hold a large amount of packaging and sort it without human assistance.

3 TOMRA has chosen a site in North Rhine-Westphalia to construct its new facility. As of 2026, it will be able to process around 80,000 tons of mixed plastic annually from unseparated waste sourced from across Central Europe.

A government priority

A new report commissioned by the Ministry for Economics, Industry, Climate Protection and Energy in the state of North Rhine-Westphalia (NRW) demonstrates just how seriously Germany is taking the opportunities presented by the digital circular economy.

Released in September 2024, the report examines a broad palette of strategies that companies can apply to circularize their business models, including upcycling raw materials, developing particularly durable products, supplementing or replacing conventional sales with rental models and refining product design to create resource-efficient products that are easy to repair and update.

It concludes by describing the unused potential in NRW's digital circular economy and a series of recommendations for the government — including creating incentives and issuing tenders for public contracts. North Rhine-Westphalia was therefore the natural choice for TOMRA when choosing a site to construct its new facility. From the company's TOMRA Feedstock subsidiary, the plant represents TOMRA's exploration of what it calls the "adjacent opportunities" of the circular economy: extracting polymers from trash to enable production of high-grade recycled plastic.

"We're building a plant that can do more granular sorting of plastics, as opposed to traditionally selling the technology to others," says Prytz. "We're developing a new position

in the value chain. It's very much linked to how the market is evolving with increased requirements for recycled content and higher recycling rates."

The TOMRA Feedstock plant, which will go into operation in early 2026, will be able to process around 80,000 tons of mixed plastic annually from ordinary (unseparated) waste sourced from across Central Europe.

The new technology, which deploys sophisticated sensors supported by AI, allows users not just to remove plastics, but to distinguish between different types of plastics.

"If you want to achieve closed-loop recycling, you need to do even finer sorting of it, so you don't end up mixing different types of plastic," says Daniel Sundahl, TOMRA's head of investor relations. "We use a combination of many technologies, and the key is interpreting all this data."

Recycling revolution

TOMRA's case neatly illustrates three aspects of Germany's drive toward a circular economy: the country's strength as an industrial location, the involvement of different sectors (specifically robotics, sensor technology, AI, and recycling) and Germany's research landscape.

Circular value creation is also extremely important for Germany's resilience, making industry more sustainable and less dependent on raw material imports. Cutting-edge technologies like AI can make all the difference. "There are a lot of innovative initiatives in Germany," says Asha-Maria Sharma, AI expert at Germany Trade and Invest (GTAI). "And there are industries here in which it is already profitable today to use AI to improve sustainability."

A Holy Grail

The mere act of recycling — which German households are very familiar with — doesn't begin to reflect the sophistication that goes into circular processes these days. HolyGrail 2.0, for example, is a technology that adds invisible digital watermarks to plastic packaging with

FOUR REASONS WHY GERMANY IS BACKING THE CIRCULAR ECONOMY

With the Circular Economy Act, Germany offers a stable and transparent legal framework that protects and promotes investment.

INDUSTRIAL HISTORY

Germany's history as an industrial power is long and deep, drawing on almost two centuries of heavy industry. The country's government, businesses and scientific researchers have a vested interest in making sure those industries adapt to future challenges and trends.

NEW TECH

The technologies driving circular economies might be state-of-the-art, but they are becoming standard as they are integrated into everyday life. Robotics, laser sensor systems, and deep-learning AI tools — all the technologies German research institutes and companies have been busy developing — have enormous potential in a variety of applications.

GOING GREEN

Conserving the planet's resources is turning into not just an environmental imperative, but also an economic one. The opportunities in recycling raw materials are becoming increasingly apparent to all kinds of companies. The German government is keen to promote investment in a green future.

GEOPOLITICS

The current geopolitical situation has made it crucial for Germany to become more independent of countries supplying raw materials to its industries. A circular economy is a key part of that effort, making sectors better able to re-supply themselves with feedstock via high-tech recycling facilities.

CIRCLES OF INFLUENCE

Interview with GTAI's Peggy Görlitz, Senior Manager for Mechanical & Electronic Technologies

What does creating a circular economy actually mean?
For me, the circular economy is about much more than recycling the end product. We have to think sustainably in the production phase, and I don't just mean using recycled materials and conserving resources, I mean in the whole process, from conception and prototyping to the longevity of the finished products themselves.

How far along is Germany in promoting circular economies?
When I compare us to global markets, Germany is among the top industrial countries. Some smaller European countries might be a little further advanced in individual, newer industry sectors, but they don't have the long-established industrial traditions that Germany has. Germany is one of the pioneers of waste management, and it has impressive recycling rates in various types of refuse and the re-use of different materials. But there is still a lot to do, as many of these technologies are among the most modern developed in recent years.

What advantages does Germany offer for foreign investors?
Germany has extremely sophisticated supply chains in many industries, from plastics production to the automobile industry, and that means a large pool of skilled labor. Not only that, ours is a market with very high standards, and Germany's regional governments also provide incentives, such as funding the training of skilled labor. We've found that all this makes it very attractive for foreign companies, of whatever size, to bring their new products and technologies into the German market. As much of the technology is new, and because we have an excellent infrastructure of research facilities and industry clusters in Germany, we could be exploiting the opportunities even more than we already are

How does GTAI help international companies?
Germany is determined to stabilize and further expand industrial production using the latest sustainable technologies to achieve ecologically and economically viable circular economies, and to establish international standards. We want to attract high-quality foreign direct investments (FDI) to Germany. That's one of the reasons we established, among other things, an FDI scoring system that assesses the sustainability and resilience of a given investment.

information about the material, such as what it's made of and what it's been used to package. For safety reasons, for example,recycled food packaging must be kept separate from chemical packaging.

As plastic waste enters a recycling center, HolyGrail 2.0's high-resolution cameras, installed at sorting units, decode the watermark to sort the waste into plastics that can be used to remake similar packaging and plastics that can be broken down for other uses.

HolyGrail 2.0, a joint German, Danish and French project, is supported by more than 160 major companies, including the food retailer ALDI, and is spearheaded by the European Brands Association (AIM) and the Alliance to End Plastic Waste, who are now trying to make it work on a large scale.

All these technologies follow one core principle: "The better you know what raw materials have been processed in a product, the better you can extract them and use them again," says Sharma.

Another side benefit is an increase in company goodwill. "Companies are being given the opportunity to improve their corporate reputations," Sharma adds. "Because their customers — not just consumers, also other businesses — care about sustainability. They all have compliance guidelines that they have to follow, and those also cover raw materials."

Doing away with downcycling

The applications for this technology go far beyond food packaging. GTAI electronics expert Martin Mayer points out that German research centers are working on a multitude of applications for the lasers and sensors that make sorting more efficient these days.

One example is laser-induced breakdown spectroscopy (LIBS), a technology currently being developed at the Fraunhofer Institute for Laser Technology (ILT) in Aachen, which has a broad range of applications, including in the automobile industry.
"Germany is already doing quite well in recycling end-of-life vehicles, but there is still room for improvement," Mayer explains. "For instance, a lot of aluminum used in cars is of relatively high quality, and at the moment some of it is being downcycled — meaning it is not being utilized to its full potential. This laser technology can recognize the exact chemical compositions to prevent these losses of material potential."

Laser-induced breakdown spectroscopy (LIBS) detects valuable alloys in scrap metal, which recycling robots can then separate by type. This process enables closed-loop material cycles and circumvents downcycling.

Mayer sees plenty of investment potential for non-German companies involved in these processes. "Together with the use of other 3D sensor technologies and AI to process the data, there are completely new possibilities for the recycling industry that can lay the foundation for the automated separation of materials in the future," he says. "Photonic companies that can analyze waste, for example, could certainly come and work together with German recycling companies."

"Recycling is a huge issue in Germany," Mayer adds. "Several initiatives show there is political support for projects in the circular economy, and their necessity is well recognized. The circumstances here are very advantageous."

→

Photo: Fraunhofer ILT, Aachen/Volker Lannert

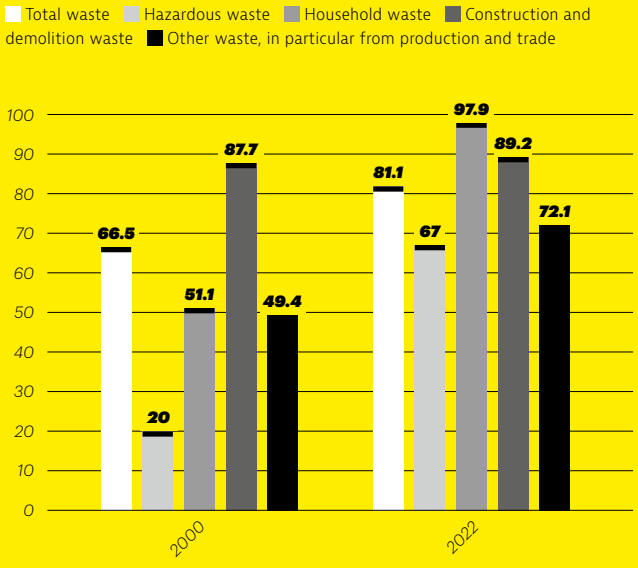
Photo: Desoltik

TOWARDS A CIRCULAR ELECTRONICS INDUSTRY

Schneider Electric and Desoltik aim to revolutionize the semiconductor industry with a circular solution that enables the fully automated disassembly of computer chips from old devices. With the help of AI-based image recognition, chips are localized, evaluated and removed with a Scara robot. This reduces waste, extends chip lifetime, reduces CO_2 emissions and conserves resources such as rare earths.

GERMANY'S CIRCULAR MINDSET

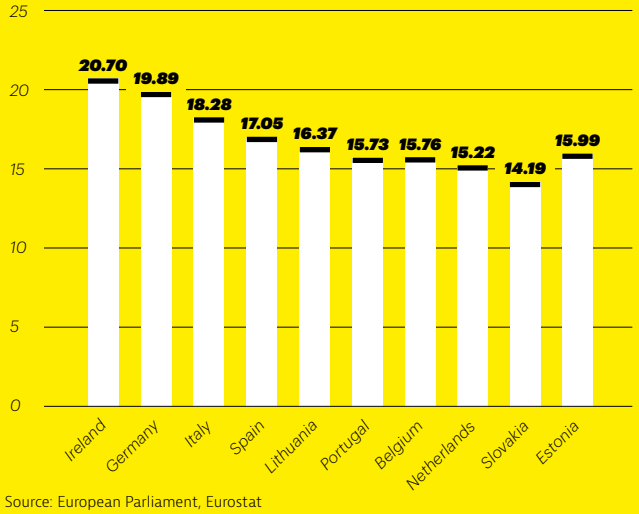
Recycling rates in percent for the most important types of waste in Germany



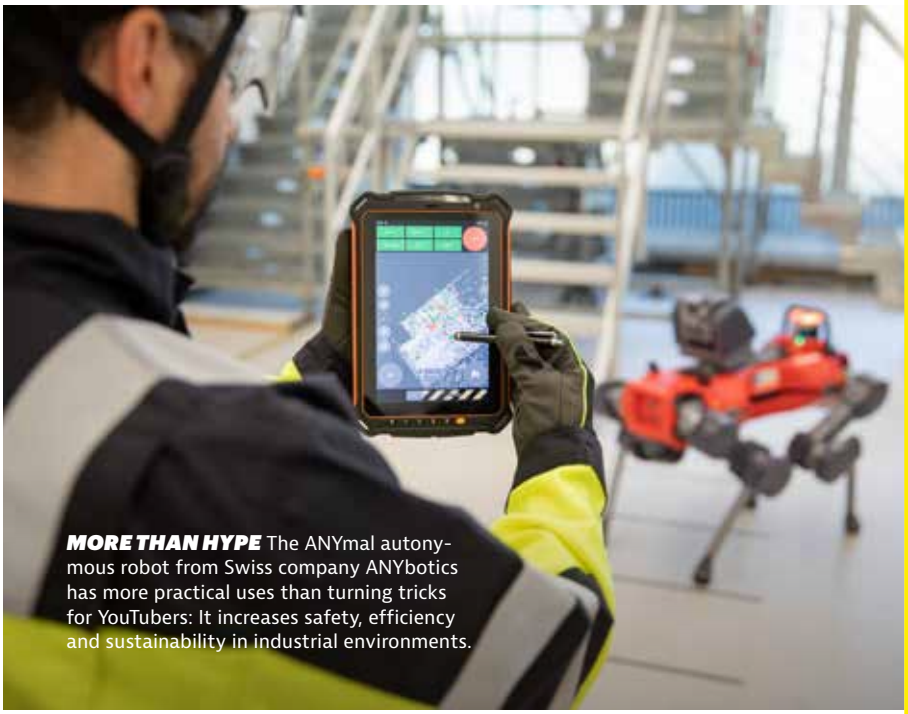
Source: *Umweltbundesamt*

GERMANY PLAYS A PIONEERING ROLE IN EUROPE IN PLASTICS RECYCLING

Top ten: Recycling of plastic by country in kilograms per capita in Europe in 2022



Source: European Parliament, Eurostat



MORE THAN HYPE The ANYmal autonomous robot from Swiss company ANYbotics has more practical uses than turning tricks for YouTubers: It increases safety, efficiency and sustainability in industrial environments.

FDI PERSPECTIVE: ANYBOTICS — THE SWISS START-UP THAT IS TRANSFORMING INDUSTRIAL INSPECTIONS

The famous robot dogs from Boston Dynamics, stars of social media, now have a European rival: The ANYmal. Videos of this metallic quadruped doing parkour, using an elevator and swimming in a Swiss lake have already racked up views on YouTube.

ANYbotics, the Swiss company behind the autonomous robot, has more practical plans for its new star. They focus on increasing safety, improving efficiency and enabling sustainability in heavy industry. As a result, the company is attracting tens of millions of Swiss Francs in investment from European and Silicon Valley investors, as well as from global customers in the oil and gas and chemical industries such as Shell, Siemens Energy and BASF.

In June, the company announced a partnership with Darmstadt-based Energy Robotics, a pioneer in developing AI software platforms for autonomous robotics. The German-Swiss collaboration aims to revolutionize plant monitoring in the energy sector through comprehensive inspection and data integration.

Autonomous inspection increases efficiency in various industries by dealing with challenges such as hazardous environments and unplanned downtime. Excitingly, the deal means ANYmal will debut at the robot park at Energy Robotics' headquarters in Darmstadt, where it will demonstrate its capabilities to customers.

Photos: ANYbotics

→ **We are the cobots**

One company that has a very good idea of what those advantages are is Doosan Robotics. The South Korean giant builds robots and cobots (robots that work directly together with humans) for a variety of industrial applications. In 2024, the company opened its European headquarters in Düsseldorf, where it profits from specialized clusters and research institutes. "Doosan Robotics offers solutions, such as palletizing, sorting and stacking of items, machine tending and welding," says Katharina Viklenko, GTAI's Korea Director. "The accuracy and reliability of robots play a major role in reducing waste materials, optimizing resource use, and contributing to greater environmental effectiveness."

Cobots could be the key to circular processes in industrial settings: Doosan's self-learning robots are able to capture and interpret immense amounts of sensory data and optimize their movements in cooperation with humans. In the event of environmental pollution or the handling of hazardous materials, for example, robots can support specialists and reduce their exposure to risk. "Germany is one of the five major markets for industrial robots and the largest user of robotics in Europe," says Viklenko. "The robotics and automation industry is one of the most innovative in the German mechanical engineering sector."

GTAI worked with the regional investment promotion agency NRW Global Business to advise Doosan on its German expansion. GTAI is particularly focused on expansion projects that promote sustainability.

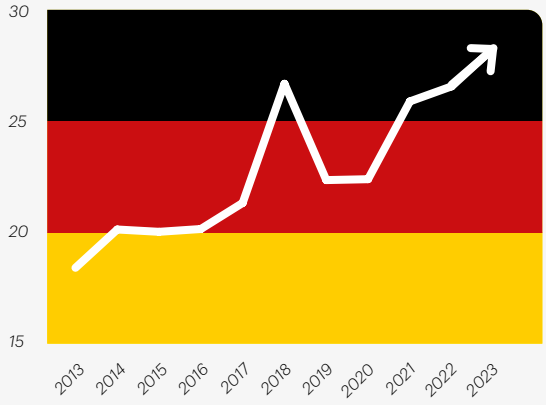
A circular mindset

But the concept of the circular economy goes much deeper than working out how to recycle waste materials more efficiently; it means adopting a holistic attitude to the entire value chain, all the way to the end of a product's life cycle. Many companies are now thinking about the final disassembly of a product even as they design it.

This paradigm shift is based on new strategies including modular architecture and smart fasteners that allow parts of machines to be replaced more easily. More and more products now have standardized, interchangeable and recyclable modules to facilitate disassembly. GTAI's Peggy Görlitz, senior manager for Mechanical & Electronic Technologies, sums it up neatly: "The concept of a circular economy is ancient, but so much of the technology that can make it happen is very new — and that means plenty of opportunity for investors and businesses alike."

AUTOMATING PROGRESS

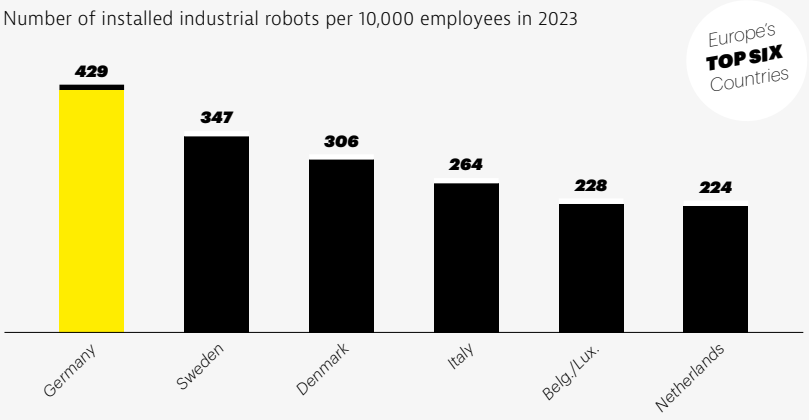
Annual new installations of industrial robots in Germany (in thousand of units)



Source: IFR International Federation of Robotics, 2024

ROBOT DENSITY IN THE MANUFACTURING INDUSTRY

Number of installed industrial robots per 10,000 employees in 2023



Want to get your circular business plans rolling?

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GTAI expert for Automation and Robotics

INNOVATIONS

The global business community admires the spirit of invention that drives the German economy. Here we highlight some of the most intriguing trends and research projects.

Photo: Uli Deck

The opening ceremony of Vulcan Energy's first downstream Central Lithium Electrolysis Optimisation Plant (CLEOP) at Park Höchst near Frankfurt. The plant is expected to be fully operational by the end of 2025.

GREEN LITHIUM

Karlsruhe start-up is building a European supply chain for climate-neutral lithium.

Lithium is a highly sought-after raw material, being the most important metal for electric vehicle batteries. To avoid delivery shortages, Europe needs more robust, ideally shorter supply chains. The German-Australian company Vulcan Energy has made an initial breakthrough in this direction.

Vulcan has developed technology to extract lithium from thermal water pumped up from a depth of two to five kilometers. The heat from the 140- to 180-degree water is used both for the extraction process and for sustainable heat and power generation. The water is then returned to the ground in a closed loop. Vulcan transports the salt-like lithium chloride from the extraction plant in Landau in south-west Germany to a plant 150 kilometers away in Frankfurt. There, the raw material is processed by electrolysis for battery production. The big difference from traditional, CO_2-intensive mining methods is that Vulcan's method is climate-neutral and yields lower-cost lithium of a high quality suitable for battery production.

Vulcan is currently working on streamlining operations, quality testing and staff training. Commercial plants with an annual capacity of up to 24,000 tons of lithium — enough for 500,000 electric car batteries — are expected to be operational by the end of 2025. Customers include major car and battery manufacturers such as Renault and Stellantis.

www.v-er.eu

UNDERWATER LASER CUTTING

Researchers in Saxony have developed laser technology for cutting metals in wet environments.

To facilitate the dismantling of offshore facilities and nuclear power plants, researchers at the Fraunhofer Institute for Material and Beam Technology (IWS) in Dresden have developed a new process allowing the use of lasers under water. This is made possible by state-of-the-art green laser technology. Short-wavelength green lasers with high cutting power (in the kilowatt range) can break through water without being absorbed too much — in contrast to long-wavelength red lasers, which can only be used in dry conditions.

In the new process, the researchers use water as a tool: "We have found a way to replace the cutting gas required in a dry environment with water," explains project manager Patrick Herwig of the Fraunhofer IWS. As water provides higher expulsion forces than gas, the process is more efficient, and a smoother cutting edge is formed. The production of cutting gas is also energy-intensive, which means that less energy is required overall.

The researchers are now ready to test the technology under real conditions with industrial partners. Several companies are interested in using the new laser process to dismantle power plants, especially as no waste or dangerous substances such as radioactive particles are released.

www.iws.fraunhofer.de

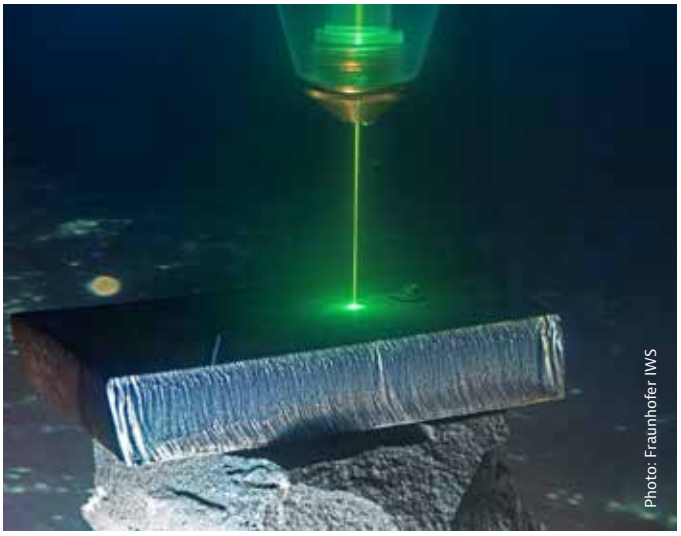
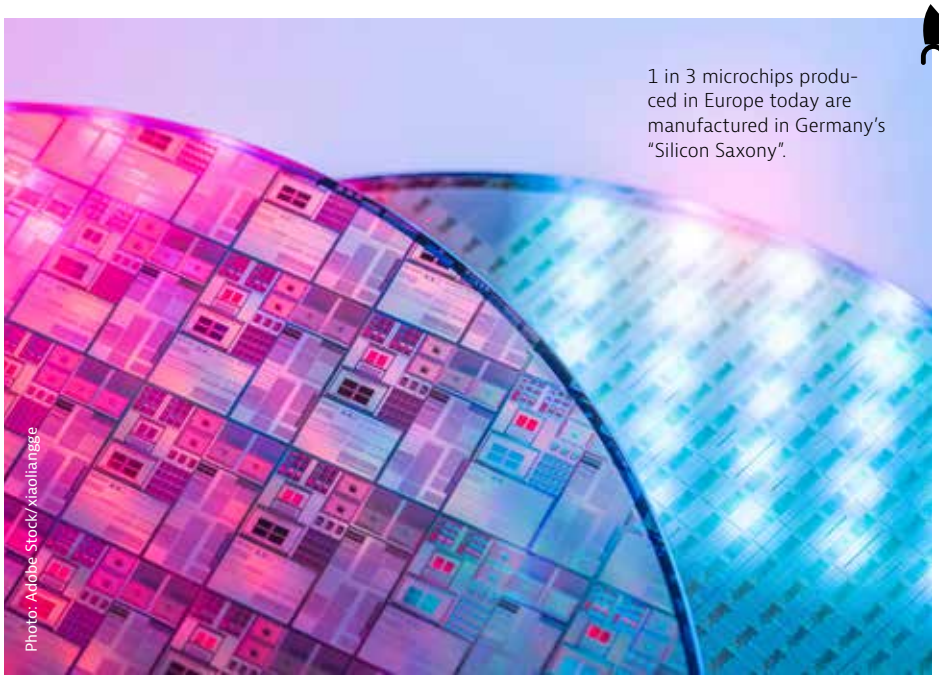


Photo: Fraunhofer IWS

A short-wave green laser capable of cutting with high precision under water has been designed to cut steel and other metals deep in the ocean. The Fraunhofer IWS developed the solution, which has been extensively tested in laboratory conditions in Dresden.



1 in 3 microchips produced in Europe today are manufactured in Germany's "Silicon Saxony".

Photo: Adobe Stock/xiaoliangge

SOFTWARE SAXONY

The growing demand for software solutions is driving rapid growth in the region.

The eastern German regional state Saxony has become the center of semiconductor production in Europe in recent years: One in three European chips is made there. And the software industry is also becoming increasingly important due to the high demand for AI, cloud solutions and open-source software. Almost half of all the 81,000 employees in the industry association Silicon Saxony work in this area. And Germany's silicon hub continues to grow. Not only are existing companies such as Bosch and Infineon expanding their capacities, but international giants such as TSMC are also setting up shop there. The Taiwanese chipmaker's factory alone is expected to create 6000 new jobs. "And for every job at a chip manufacturer, three jobs will be created at suppliers and service providers," says Frank Bösenberg, Managing Director of Silicon Saxony. As a result, the business association expects the microelectronics and software industry in the region to create more than 100,000 jobs in total by 2030.

www.silicon-saxony.de

REINVENTING LITHIUM-ION BATTERIES

Harz start-up aims to revolutionize the battery market.

Next generation lithium-ion batteries that are more powerful and resource-efficient.

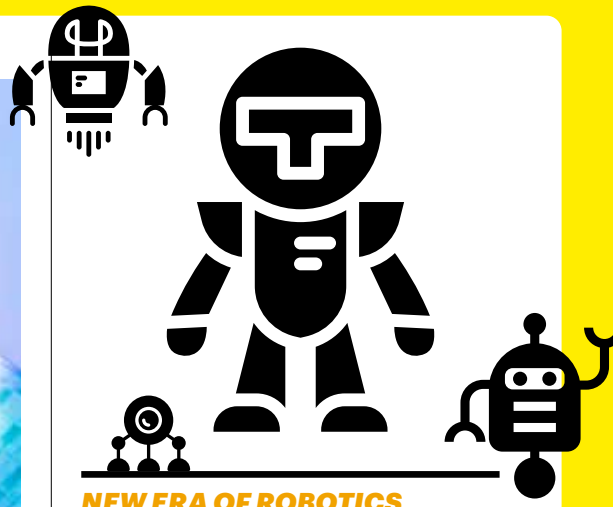
Photo: Adobe Stock/Sashkin

Elfolion, a start-up based in the Harz region in central Germany, has developed a technology based on current collectors that aims to make lithium-ion batteries lighter, more resource-efficient and more powerful. Typically, current collectors are made of conductive metal foils that transfer electricity between the battery, the power source and the respective device. Elfolion's innovation is to replace the foils with glass fabric coated with copper and aluminum, which reduces metal consumption by 90 percent.

The innovative current collectors are said to add 35 percent more battery capacity to electric cars, enabling significantly longer distances." Depending on the battery type, we expect our product to increase the range significantly," claims Technical Managing Director Manfred Danziger.

Elfolion has set up a pilot plant in the Harz region and plans to launch its first batteries within two years. The company is supported by several universities, including the Dresden University of Technology and the Technical University of Munich (TUM).

www.elfolion.de



NEW ERA OF ROBOTICS

German research institutes pool their expertise to play a pioneering role in embodied AI.

To secure a leading position for Germany in AI-based robotics, the German government has established the Robotics Institute Germany (RIG) — a consortium of ten universities and 25 other institutes, research facilities and companies. "We will establish the RIG as an institute that is recognized in Germany and is unique on an international level, shaping cutting-edge research, education and innovation in AI-based robotics and aligning it with Germany's needs," says Tamim Asfour, RIG spokesperson of the Karlsruhe Institute of Technology.

The conditions for achieving these goals are promising. German robotics and AI researchers are among the international leaders and have made significant contributions to the global robotics landscape. The German Ministry of Education and Research is funding the RIG with EUR 20 million over an initial four-year period.

www.robotics-institute-germany.de

SCALING BIOTECH PRODUCTION

Chemical company Wacker opens major mRNA production and research site in central Germany.

Munich-based Wacker has opened a biotech center of expertise in the eastern regional state of Saxony-Anhalt capable of producing more than 200 million vaccine doses annually. The company is also developing innovative mRNA drugs that can be used not only in the fight against pandemics, but also in targeted cancer therapy.

"This is where we produce the active ingredients for tomorrow's medicines — for the German government, but also for other customers," says Christian Hartel, President & CEO of Wacker Chemie. The company has invested EUR 100 million in the new site and created more than 100 new jobs. The chemical company also opened a new biotechnology center in Munich at the end of 2024. Biotechnology is a strategic growth area for Wacker: The division is expected to contribute around one billion euros to sales by 2030.

www.wacker.com

"IF YOU WANT TO INVEST IN HYDROGEN, YOU SHOULD DO IT HERE"

Germany wants to achieve its climate targets by 2045 with the help of green hydrogen and its derivatives and recently adopted a robust H_2 import strategy. The country is laying the groundwork for a strong H_2 economy, creating business opportunities for foreign companies, explains GTAI's hydrogen expert ***Raphael Goldstein.***

In July 2024, the German government adopted a national hydrogen import strategy. Why does the country need such a plan?

RAPHAEL GOLDSTEIN: Germany wants to become a climate-neutral industrialized country by 2045 and is aiming for a long-term, reliable supply of green hydrogen. The German government currently projects that we will need 95 to 130 terrawatt hours (TWh) of hydrogen and H_2 derivatives in 2030 in order to achieve our climate targets, and we will have to import 50 to 70 percent of this. We want to do this within a reliable framework. The strategy concisely explains which instruments Germany will rely on in the coming years to secure the necessary imports.

What are the main instruments?

RG: First of all, the German government wants to strengthen the demand for hydrogen. Funding instruments and incentive systems will be established, and already are in some cases. Germany also wants to promote hydrogen projects abroad where justified. Another important part of the strategy is the development of import infrastructure, for example the designation of corridors for pipelines. The construction of import terminals is being accelerated, and they will be converted to hydrogen and derivative importing terminals. Germany currently relies on various international partners and both bilateral and multilateral forms of cooperation, within Europe and beyond, for the supply of hydrogen and derivatives.

THE BOTTOM LINE

Over the next few years, Germany will focus explicitly on importing hydrogen and hydrogen derivatives. The development of local import infrastructure offers attractive opportunities for international investors.

What's new about this strategy?

RG: The strategy summarizes Germany's position on hydrogen and addresses all the market players specifically, that is producers, project and infrastructure developers, traders, buyers, but also financial institutions, grid operators and stakeholders in producing countries. The strategy clearly states, for example, that we are also focusing on non-European countries and promoting cooperation. It provides clarification that wasn't there before.

What does the promotion look like?

RG: Let me give you a example: Fertiglobe is a Dutch–Emirati joint venture that has won a tender and will be supplying hydrogen derivatives from Egypt to Germany from 2027 onward. The tender came from H2Global, a funding program of the German government.

The money comes from the German Ministry for Economic Affairs and Climate Action and is managed by a foundation. H2Global buys hydrogen or hydrogen derivatives from other countries through an auction. Then, it resells them in another auction to buyers in Germany using Hint.co. Hint.co, based in Leipzig, is a platform owned by the H2Global Foundation.

What sorts of business opportunities does that create in Germany?

RG: The strategy means that we need not only suppliers from abroad, but also infrastructure in Germany to store, trade, transport and use all the hydrogen and derivatives. This opens up interesting prospects for market players and for innovative technologies, precisely because the import strategy explicitly includes hydrogen derivatives.

What role do hydrogen derivatives play?

RG: Shipping hydrogen is often preferred over pipelines for long-distance transport due to its flexibility, the existing port infrastructure, and the ability to import from a wider range of international suppliers. At present, derivatives are used as hydrogen carriers because transporting hydrogen in its gaseous or liquid form is technically challenging and not economical. Take ammonia, a derivative that Germany relies on. It's a raw material for the chemical industry and has been imported for decades, but it's also a hydrogen carrier. To produce hydrogen from it, however, you need facilities called ammonia crackers, and someone has to build them. That requires larger terminals, larger storage capacities, more traders and larger-scale logistics. These are investments in the billions that will be made in Germany over the next few years, and now is the time to secure a piece of that pie. Some companies are already doing this: the US industrial gas manufacturer Air Products and fuel trader Mabanaft, for example, are building the first import terminal for green ammonia in the port of Hamburg.

How will the government be supporting these kinds of projects — for example, ports being developed into H_2 hubs?

RG: The government has introduced legislation that is designed to accelerate the expansion of hydrogen infrastructure by making it easier to obtain approval for infrastructure projects in Germany. The law is still undergoing parliamentary consultation, but if and when it comes into force, it would definitely be a unique feature. So if you want to invest in the H2 economy, you should do it in Germany.

NORTHERN HYDROGEN HUB

The region around **Rostock and Lubmin** in northeastern Germany in particular is developing into an important H_2 center. For example, a main pipeline connecting up the two cities will create a central hub in the nationwide hydrogen core network. This network enables hydrogen to be fed in and out and strengthens the region's position as a central hub for the sustainable future of Germany and Europe.

Numerous projects are underway in Rostock to sustainably produce H_2, furthering the city's target of climate neutrality by 2035. These initiatives are supported by multiple collaborations between companies and research institutions working together to develop new technologies.

An important hydrogen center for Europe is being established in the coastal town of Lubmin. This promotes the establishment of H_2-related industries, and offers a wide range of economic opportunities in the region. The development of H_2 infrastructure and corresponding industries will create new jobs and attract further investment. For example, Deutsche ReGas is planning a floating import terminal and a 200-megawatt (MW) electrolysis plant capable of producing up to 30,000 tons of hydrogen per year.

The centerpiece of the region's expansion is the Rostock EnergyPort, where a 100-MW electrolyzer will be built by 2027, with plans to expand it to 1,000 MW in the long term. The project is supported by a consortium consisting of the German energy companies EnBW, RheinEnergie, RWE and ROSTOCK PORT and uses the proximity to wind and solar parks for efficient and climate-friendly energy generation. Thanks to its port, Rostock offers ideal conditions for an H_2 hub in northeastern Germany — and is all set to become a beacon for climate-friendly energy.

The world's first floating import terminal for hydrogen is to be built on the Baltic coast near Lubmin. It will convert green ammonia into hydrogen, which will then be transported onshore by pipeline.

Photo: Deutsche ReGas

FASTER, LONGER, CLEANER

Germany is creating a nationwide super-charging network for electric trucks to meet the demand in the changing long-distance transport sector. Decarbonized logistics requires intelligent, grid-friendly solutions — and those who act now can profit by helping shape the future of intelligent charging infrastructure.

COMMERCIAL VEHICLE MARKET POWERING UP

Experts from PwC's global strategy team "Strategy&" forecast that by 2030, one in five buses and trucks worldwide will be electrically powered, rising to 90 percent of transport vehicles on the roads by the end of the following decade. In addition to the falling total cost of ownership and stricter regulation, market observers cite advancing technical innovations as the reasons for this development, particularly in Europe.

"After the transport sector struggled for a long time with the switch to electric trucks, we are now seeing a profound change in the industry," says Jörn Neuhausen, Senior Director and Head of Electromobility at Strategy& Germany. "The third generation of electric trucks brings with it new platforms for different customer requirements and broad use in a wide range of application scenarios."

The trend is particularly evident in the German market, where haulage companies are increasingly buying e-vehicles for regional transport. According to figures from the European Automobile Manufacturers' Association (ACEA), sales of electric trucks in Europe fell slightly in the first nine months of 2024 — but not in Germany. Here, the market for electrically powered trucks grew by a whopping 56.8 percent between January and September 2024. The increase in heavy-duty vehicles over 16 tons was even greater: that market rose by 107.4 percent compared to the same period last year.

Electric drive trucks powering up in the eight new charging points at the rapid charging park at Hermsdorfer Kreuz, near Leipzig, which opened in December. The futuristic charging station was built by the Dutch company Milence.

Photo: picture alliance/dpa/Bodo Schackow

A **model of the** charging station of the future can be found next to a highway near Leipzig, on the main road route between Berlin and southern Germany. The Dutch company Milence opened a charging station for eight electric trucks there in December 2024. Beneath a long carport, drivers can charge their vehicle batteries while they take a break and recuperate. Futuristic-looking HGV charging stations will soon be a common sight on Germany's highways: Milence — which is a strategic joint venture between Daimler, Traton Group and Volvo — is planning several charging hubs across the country.

"Germany is one of the key countries for freight transport in Europe. It is therefore vital that the right charging infrastructure is in place to accelerate the transition to electrification," says Anja van Niersen, CEO of Milence. Many other companies will be following their lead, benefitting from the incipient expansion of the long-distance charging infrastructure throughout Germany. The network is of high strategic importance, as 80% of all goods in Germany are transported by road. The national government recently gave the go-ahead — with detailed plans for locations and tenders — for the construction and operation of charging stations for e-trucks along Germany's Autobahns.

THE BOTTOM LINE

The expansion of Germany's national e-truck charging network will generate plenty of opportunities for specialists, grid-stabilizing technologies and other smart solutions providers.

Big plans — big opportunities

The decarbonization of logistics opens up a range of business opportunities for international companies, says GTAI energy expert Tobias Rothacher: "The German market for e-truck charging stations — with all components and services from transformers to charging cables — is young and growing. Those involved now have the chance to shape this market."

The German government's plans envision the following: 2,400 conventional charging points and 1,800 particularly powerful MCS charging points are to be built on trunk roads throughout Germany. MCS stands for Megawatt Charging System and is considered a game changer in the industry. With a charging capacity of 1 megawatt (MW) for trucks, the new technology enables significantly faster charging than the current conventional system. This means e-trucks can be charged during the drivers' mandatory rest period — a 45-minute break after 4.5 hours of driving.

MCS points enable haulage companies in Europe to operate e-trucks efficiently, as drivers can combine statutory rest breaks with charging stops so as not to lose valuable time on the road. Patrick Plötz, Head of the Energy Management business unit at the Fraunhofer Institute for Systems and Innovation Research ISI, sees this as an explicit advantage for smaller haulage companies too: "This enables logistics companies that do not have the option of depot charging to electrify their fleets." It will also allow freight forwarders that do not yet have their own charging infrastructure in the depot to purchase battery-powered trucks.

The German government will award the contracts for the planning, construction and operation of the new charging stations in a tendering process that was piloted during last year's development of a fast-charging network for electric cars. In the first round of tenders in the fall of 2024, contracts were initially awarded for 130 locations (of a planned 350) with fast and slow charging points along the freeways.

According to EU regulations, in future fast-charging facilities for heavy commercial vehicles must be available every 60 to 100 kilometers on all major German freeways. The German government's plans envisage a nationwide network of fast-charging stations with no "blank spots" on the map. Charging stations are to be set up at rest areas; some will be truck stops with restaurants and overnight accommodation.

Invitation for innovation

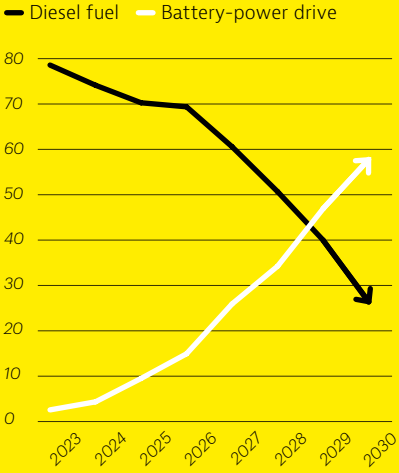
One challenge is to ensure that the expansion of the charging infrastructure doesn't overload the electricity grid. "The grid is not yet designed for such heavy loads everywhere," explains Rothacher. "This forces us in Germany to design the expansion of the charging infrastructure intelligently."

In order to provide sufficient grid power for the energy-intensive fast charging of large commercial vehicles at all locations at all times, both the operators of the charging stations and grid operators are required to work on new solutions. Grid-stabilizing technologies such as bi-directional charging and the standard use of large battery storage systems as buffers will play a major role. If a lot of power is needed because several trucks are being charged quickly at the same time in one place, a local storage system can provide power without placing a massive load on the grid.

"With a continually refilled buffer storage system, the grid connections and cables do not need to provide the full load supply of an MCS charging station purely from the grid," explains Rothacher. "Smart grid solutions like this will be the key to the success of fast-charging infrastructure in Germany." So it's not just the manufacturers and operators of charging stations in Germany who are looking forward to letting the good times roll. Everyone working with smart grid technologies has the opportunity to profit from expansion of the infrastructure.

SALES OF DIESEL TRUCKS SET TO FALL, WHILE ELECTRIC TRUCK SALES ARE RISING

Forecast sales figures for heavy commercial vehicles (12 tons+) in Germany according to manufacturers (number of commercial vehicles in thousands)



Source: German Association of the Automotive Industry, 2024

Thinking of investing in Germany's e-infrastructure?

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GTAI expert for charging networks

A BEACON FOR AI

In Cyber Valley in southwest Germany, international companies are working closely together with the research community to develop artificial intelligence and robotics for innovative applications. The location is a magnet for industry leaders looking to benefit from the German spirit of invention.

Europe's largest private AI laboratory is run by a Finnish company called Silo AI and is currently developing two big projects in southwest Germany. The Finns have been working with the University of Stuttgart and the University of Freiburg for several years, with the joint goal of creating a large language model (LLM) to compete with ChatGPT.

The LLM in question will be openly accessible and will work in all official European Union languages, in contrast to OpenAI's ChatGPT, which has been trained mainly on English-language data. To achieve this, Silo is developing open-source AI models that not only work better with European languages, but also meet strict privacy, security and ethical standards.

It's no coincidence that Silo AI is active in the southwest of Germany — one of the most innovative and economically robust regions in all of Europe. Collaborations like these are not uncommon in "Cyber Valley," Europe's largest center for AI and robotics. There you'll find numerous examples of research institutions pooling their expertise with big international players like Bosch, the Mercedes-Benz Group and Amazon.

"A unique ecosystem for AI and robotics has emerged in the region, which enjoys an international reputation," says GTAI's digital and services industry expert Asha-Maria Sharma.

With its German- and English-speaking communities, Cyber Valley is home to many highly specialized experts and well-connected investors, and companies can easily find talented partners among the many research institutes clustered there.

Bundled AI expertise

The Karlsruhe Institute of Technology (KIT) is a world-leading example of cutting-edge research in Cyber Valley. For instance, Tamim Asfour, Professor at the Institute for Anthropomatics and Robotics at KIT, has more than 25 years of experience in the field. KIT researchers develop learning and collaborating humanoid robots capable of providing support to humans across different domains — from domestic assistance and caregiving to performing tasks in hazardous environment.

"Being part of Cyber Valley allows us to collaborate with the thriving network and vibrant ecosystem of AI and machine learning pioneers," says Asfour.

THE BOTTOM LINE

Cyber Valley in southwest Germany is a leading global location for AI and robotics. It combines research, industry and a strong start-up ecosystem, offering international companies unique growth and networking opportunities.

New discoveries from research in Cyber Valley will be transferred directly to industry. To date, more than 70 start-ups have emerged from the Cyber Valley Start-up Network, supported by a strong investor environment, the AI Incubator mentoring program and money from the Cyber Valley Research Fund. Bosch, for example, registered the most AI patents in the world last year — another indicator of the innovative strength of the region.

Cyber Valley continues to attract other institutions and companies that want to profit from the area's concentrated expertise. For example, the European Laboratory for Learning and Intelligent Systems (ELLIS) opened its first location in Tübingen last summer. ELLIS seeks to advance basic research in machine learning (ML) and transfer it to applications in areas such as medicine and mobility. The new institute will make the region even more attractive for companies who want to benefit from the latest scientific and technological findings to enhance their products and services.

Open doors

The German state of Baden-Wuerttemberg and the Max Planck Society founded a Cyber Valley Office in 2022 to facilitate cooperation between the private and academic sectors. Its director, Florian Mayer, sees himself as a service provider for the valley's players.

"We arrange contacts between research institutions and companies, increase public visibility and answer administrative and legal questions, for example about the European Union's AI law," says Mayer.

GTAI also supports international companies in establishing contacts with players in Cyber Valley, for example by organizing delegation trips. Mayer says interest from international companies in Cyber Valley has seen a significant increase recently. This augurs well for the southwest region in enhancing its status the most important AI and robotics location in Europe.

Want to find out more about AI in Germany?

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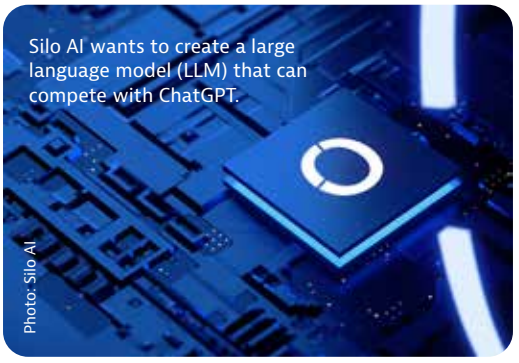
GTAI expert for AI

From its development hub in southwest Germany, Silo AI is developing open-source AI models that are truer to European languages.

Photo: Silo AI

The annual Cyber Valley Days event in Stuttgart and Tübingen combines insights into AI innovations with networking.

Photo: Cyber Valley



Silo AI wants to create a large language model (LLM) that can compete with ChatGPT.

Photo: Silo AI

Photo: picture alliance/imageBROKER/Arnulf Hettrich

Amazon's new artificial intelligence research and development center in Cyber Valley, Tübingen, where it collaborates with the Max Planck Society and local universities.

70
Amazon employees in Tübingen research AI and machine learning

$37.6 bn
revenue generated by Amazon in Germany in 2023

€10 bn
amounts Amazon plans to invest in Germany in cloud logistics and R&D by 2026

FDI PERSPECTIVE: AI RESEARCH IN GERMANY

US giant Amazon has opened its first science hub outside the US in Cyber Valley in cooperation with the Max Planck Society.

AI innovations are not exclusive to Silicon Valley: They also come from Tübingen in southwest Germany. Amazon opened its first science hub outside the US there in 2022 and is now collaborating with the Max Planck Society and universities in the Stuttgart-Tübingen region. "The research community in Tübingen, with its talented experts, plays a key role in our success," says Michael Hirsch, Amazon's site manager in Tübingen. "We are delighted to be part of it."

As well as supporting research projects, Amazon is also funding the education and training of talented PhD students. Scientists from the Max Planck Society also have the opportunity to gain insights into research issues by working part-time at the US tech giant. The results of groundbreaking projects, such as algorithms for causal machine learning, are published by the scientists both in scientific publications and through open-source software.

Amazon's research focuses on technologies such as object-centered learning and environmental perception, which are already used by millions of its customers. For example, the mixed research team has produced software that enables virtual fitting of shoes and sunglasses: Customers can use the app to see how a pair of shoes or sunglasses will look on them from every angle to make better purchasing decisions.

Green Tech ON A PLATE

Germany is becoming the market *du jour* for the vegan food tech industry. Food technology expertise, especially in the country's south and northeast, and a consumer base eager to experiment offer great chances for success.

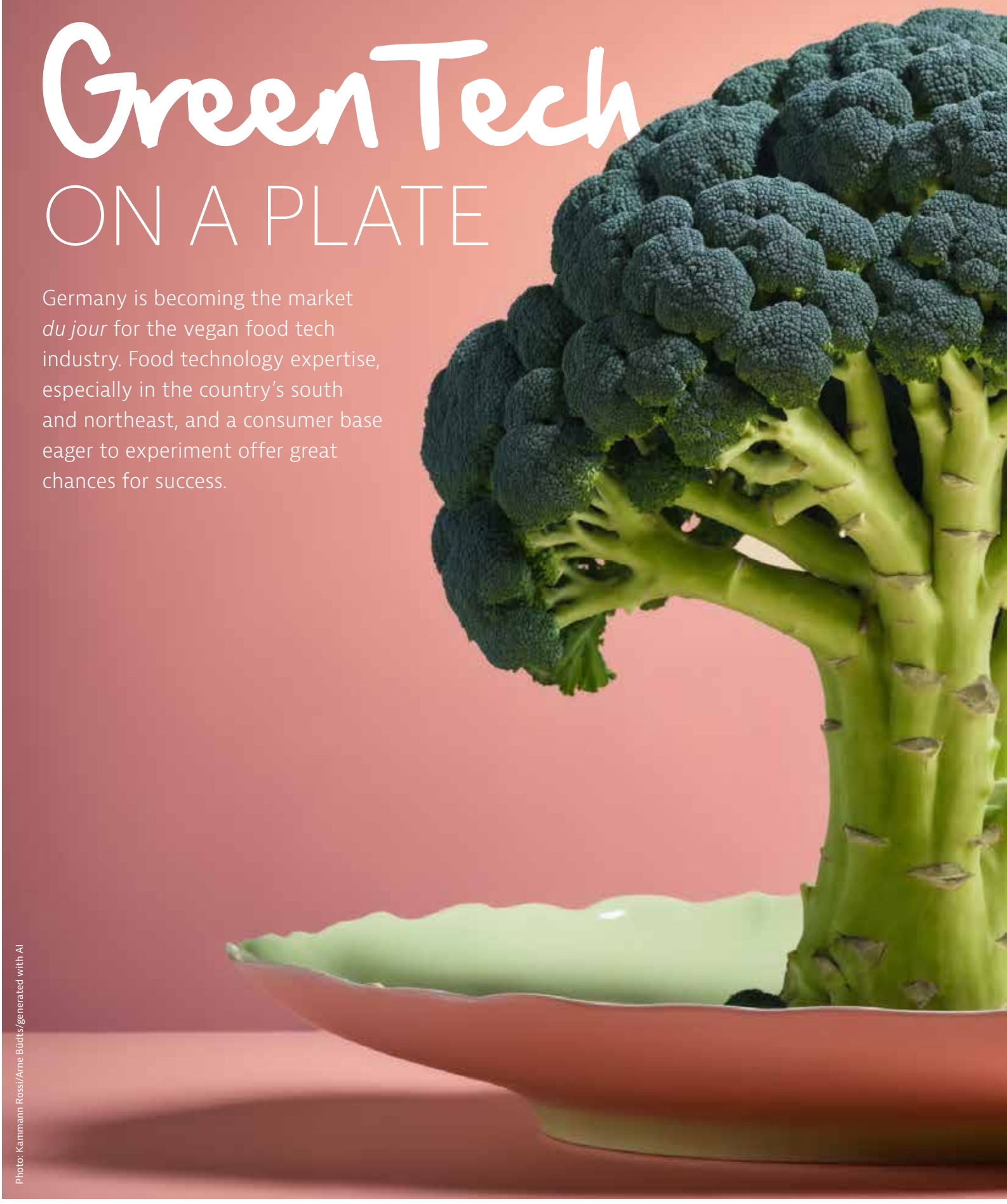


Photo: Kammann Rossi/Arne Büdts/generated with AI

Germany might be known around the world for Oktoberfest, but beer isn't generally the main reason international companies come to Germany. And yet it was a deciding factor that tipped the scales for the Swiss company Planted Foods when it decided to set up a production site in a former brewery in Memmingen (see FDI Perspective box).

Planted Foods doesn't brew suds. It produces meat alternatives from vegetable proteins. But there's a logic to its choice of location. "We work with fermentation, and brewing beer is nothing other than a kind of fermentation," explains Christoph Jenny, the company's co-founder, explaining that the regulation of heat and cold plays a central role in beer brewing, as they do in the production of plant-based meat alternatives. "The property in Memmingen simply offered good technical conditions for our production right from the start."

Planted Foods is one of many companies from the vegan food tech sector finding their way to Germany. One of the main attractions is the sheer size of the market with a target group that is open to plant-based nutrition. There is also a great openness to innovation in the food industry in Germany, says Jenny.

"There's a lot of knowledge in Germany necessary for the plant-based food industry — whether it's technical equipment or specialist expertise for its production."

The trend toward flexibility

Vegan producers don't have to look far to find consumers of its comestibles in Germany — and not exclusively in the cities either. "It's not just foodies in Berlin, Cologne and Munich who buy plant-based food in Germany," observes Jens Tuider, Chief Strategy Officer of ProVeg International.

THE BOTTOM LINE

For vegan food producers, Germany has the ingredients for success: food tech know-how, plant protein cultivation, renewable energy and a captive consumer market.

Tuider lives in Angermünde, a small, fairly remote town in the northeast of Germany on the border with Poland. "Even here there is a broad selection of plant-based meats in supermarkets."

Tuider heads up an NGO that is committed to transforming the global food system toward fewer animal products and more plant-based nutrition. Germany has the largest market in Europe for vegan alternative products in the retail sector, says Tuider, but it's still growing healthily. According to figures from Belgium's Good Foods Institute, total sales of plant-based foods in German retail amounted to EUR 2.2 billion in 2023 — an increase of around eight percent compared to 2022.

But Tuider doesn't see his mission as all or nothing. According to a recent study by the German Ministry of Food and Agriculture, only two percent of respondents in Germany describe themselves as pure vegans, whereas eight percent have a vegetarian diet. The success of plant-based foods here is also down to the 41 percent who describe themselves as "flexitarians": people who still eat meat and animal products but don't do so all the time and are happy to mix their diet with plant-based alternatives.

The power of protein

Germany is also attractive because of its stellar reputation for food technology research. "As a production location, Germany has a long tradition of biotechnology and food technology," says Tuider. "It's extremely helpful for innovative plant-based food manufacturers if they have a site in Germany." For instance, plant-based food manufacturer Prolupin caused a sensation when it emerged as a spin-off of the Fraunhofer Institute for Process Engineering and Packaging. The company specialized in extracting protein from sweet lupins and making it usable as lupin protein isolate (LPI) for milk substitute foods. Prolupin launched its brand Luve in 2015 with a range of diary alternatives: yogurt, ice cream, milk and cream cheese. In 2023, Wide Open Agriculture (WOA), Australia's leading manufacturer of plant-based proteins and a company listed on the Australian Securities Exchange, acquired Prolupin's assets and patents and founded WOA Germany.

"We had been aware for years how much know-how about lupin protein isolates this German company had. When the opportunity presented itself in 2023, WOA seized it," explains WOA Managing Director David Loichen, who is responsible for the company's activities in Germany.

Lupin-based proteins were and are a very specialized field. Finding experts and production facilities is challenging, but WOA acquired both when it took over the Prolupin production site in Grimmen near Greifswald. WOA had already developed "Buntine Protein" in Australia, and the German arm provided a springboard for market entry in Europe.

"In Germany we have excellent conditions for actually commercializing the product and industrializing production," explains Loichen. "In some cases, you need very special technologies and also technical support in the area of plant engineering. And this is a given in Germany because the major plant manufacturers and technical service providers in this field are also based here."

Northeastern culinary delights

Prolupin — now WOA Germany — is located in the regional state of Mecklenburg Western-Pomerania in northeastern Germany, an area attracting more and more companies of the food tech sector. So it's no wonder that a trade delegation trip there last year entitled "The future is plant-based" (organized by GTAI for US and Canadian companies) was a great success. Two Canadian entrepreneurs were so full of enthusiasm after the trip, they started a podcast about the opportunities for vegan food producers in Germany.

3 SPECIAL FEATURES OF THE GERMAN FOOD MARKET

Going vegan, German-style
The global plant-based food market is poised for significant expansion, predicted to reach USD 113 billion by 2031, with strong growth in the Asia-Pacific region as well as in North America and Europe. Germany has by far the biggest established market for vegan food in Europe (sales of plant-based foods were EUR 2.2 billion in 2023), and the fastest-growing one. Investors planning to benefit from this growth trend should be aware of some special features of the German food market:

1

Modernization of the food and beverage industry: German companies operating in the food industry tend to be highly innovative and are investing big in plant-based products.

2

Increased consumer awareness of the benefits of plant-based diets: Meat consumption in Germany fell for the fifth time in a row in 2023, reaching a new low. Meat substitutes are most popular with one group in particular: female, under 50 and well-educated.

3

Competitive price range: One of the main factors hindering the growth of the plant-based market is the comparatively higher price range of meat substitutes. Consumers buy meat substitutes in supermarkets (84%), discount stores (52%), and organic food stores (21%). A low-priced range of substitute products has also become established at discount grocery stores, which is driving market growth and increasing the willingness to buy in this segment. Overall, price (58%) is a more important purchase criterion for consumers than the quality of the product (53%), and the fact that the item is a source of protein (48%).

FDI PERSPECTIVE: PLANTED FOODS

Germany is the most important sales market for the Swiss food tech company Planted. It accounts for the largest share of the company's exports, which make up 75 percent of total sales.

Banking on the growing demand for its plant-based meat products, the Swiss company is building a new additional production facility in Germany. The planned production volume is around 20 tons per day, which will support the creation of around 50 new jobs and doubles Planted Food's current production volume The plant is being built on an old brewery site and will use modern fermentation technology to produce plant-based proteins. "Among other things, it was this property that tipped the scales in favor of the location," says Planted co-founder Christoph Jenny. "Added to this are the ideal transport links, the proximity to the headquarters in Kemptthal and the many specialists from the food industry in Germany."

With a hybrid sustainable energy supply, food production at the facility will be almost CO_2-neutral. Photovoltaics, well cooling and regional district heating will all contribute to the site's energy system, which will be implemented with a German company that specializes in decentralized green energy infrastructures. According to Planted, the production of their recently launched "planted. steak" generates up to 97 percent less CO_2 and uses 81 percent less water than conventional beef. The dedicated plant for plant-based foods is scheduled to go into ramp-up operation in the first quarter of 2025.

Photo: Kammann Rossi/Arne Büdts/generated with AI

Mecklenburg Western-Pomerania has a long tradition of agriculture. "The agricultural sector is open to raw materials , such as lupins, that companies need to manufacture vegan products," says Joy Koppatz from Invest in Mecklenburg-Vorpommern. Local suppliers in Germany can ensure compliance with all the strict nutrition and sustainability standards that label-conscious consumers expect, especially on the German market. "Regional cultivation, a small ecological footprint, short transport routes and renewable energies: none of this is a problem here because the agricultural sector has adapted to this and moved with the times," explains Koppatz.

"The region also has a lot of expertise to offer in research and development in all stages of vegan food processing," Koppatz continues. Food is one of the most important industries, representing about one-third of GDP, there, so the R&D ecosystem is well developed and supported. "We are working here today on the nutritional concepts of tomorrow — so investors and producers who work with us to turn ideas into products are very welcome."

€ 320.7 million

Sales of vegetarian and vegan meat substitutes between 1 January and 11 August 2024 [1]

€ 2.2 billion

Annual sales of plant-based foods in the retail sector in Germany in 2023 [2]

8%

Increase in sales of plant-based foods between 2022 and 2023 in Germany [2]

37.4%

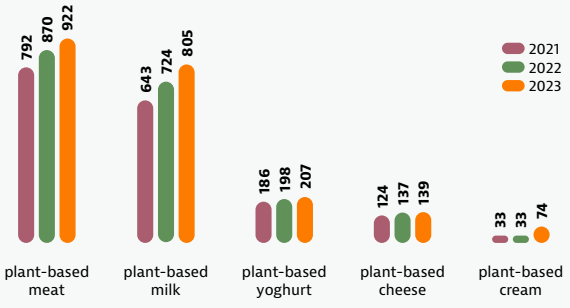
Proportion of German households that bought plant-based meat at least once in 2023 [2]

36.5%

Proportion of German households that bought plant-based milk at least once in 2023 [2]

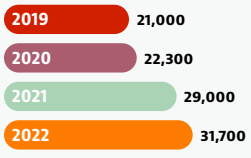
Flying off the shelves

Development of sales of plant-based foods by category in Germany between 2021 and 2023 in € million [2]



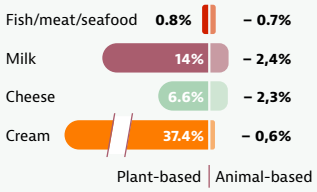
Lupin protein production

Lupin cultivation area in Germany in hectares [3]



Plant vs. animal

Profit and loss in the sales volume of plant-based versus animal-based foods in Germany 2022 to 2023 [2]



Source: 1) BioHandel; 2) Good Food Institute Europe; 3) Gesellschaft zur Förderung der Lupine e.V.

Bowls of post-consumer recyclates (PCR) and post-industrial recyclates (PIR), color sorted and ready for reuse (AI-generated image)

Photo: Adobe Stock/Udomner/generated with AI

CIRCULAR SYNTHETICS ECONOMY

The world needs sustainable synthetic materials, and Germany has the research expertise and well-developed manufacturing infrastructure to help companies create the building blocks of the future.

Synthetic materials are everywhere," asserts Dr. Marcus Vater, Head of Scale-up and Pilot Testing at the Fraunhofer Institute for Applied Polymer Research (Fraunhofer IAP) at Germany's renowned Fraunhofer Society, underlining the importance of his department's work.

It is hard to argue with his logic. From straws to spacecrafts, food packaging to cutting-edge medical devices, plastics and other synthetic materials are present in almost every facet of modern life. Many things we take for granted would simply not exist without them. "The beauty of synthetic materials is that we can adjust their characteristics to fit our needs," explains Vater. "We don't have to settle for whatever nature provides, we can design them as we like."

THE BOTTOM LINE

International companies can exploit the growing German market for synthetic materials recycling.

But their ubiquity has created one big problem: damage to the environment. "When a synthetic product reaches the end of its life and isn't recycled, or returned to the production cycle, that's a huge issue," says Vater's colleague Dr. Jens Balko, Head of the Technical Center for Biopolymers at the Fraunhofer IAP. "Every year millions of tons end up in the environment."

Manufacturers have responded to the plastic waste challenge by setting ambitious targets. "European plastics producers are committed to making production climate-neutral by 2050, with a goal of 65 percent of materials coming from recycled and renewable sources,"

says Alexander Kronimus, Managing Director of industry association Plastics Europe Germany. "Achieving these goals will require a mix of technologies."

Research bodies like the Fraunhofer Society, which is partially funded by the German government, put Germany at the forefront of this essential work. For example, one project has developed new types of polybutylene succinate (PBS) that are recyclable and biodegradable. The technology has already found an application in agriculture, where it is used to protect crops from weeds. Many more applications are ready for market entrance including bottles, cosmetic packaging and technical textiles.

The future of plastics

Another Fraunhofer program has developed a synthetic rubber for use in tires that loses significantly less mass and tread compared to natural rubber. The material is made using dandelions, reducing reliance on natural rubber trees and alleviating supply concerns. German company Continental, a giant of the tire industry, is among the firms to benefit from this research.

There is also the Fraunhofer Cluster of Excellence Circular Plastics Economy — a collaboration between the Fraunhofer Society's various institutes that combines knowledge from across the spectrum of its research projects — that aims to help plastics manufacturers make their products more sustainable.

Jens Balko points to Germany's well-integrated research structures as a major bonus for international companies looking to invest in applied R&D. "Universities have small laboratories, while industry uses huge plants. The Fraunhofer Society was founded to bridge the gap between basic research and industrial processes," he says.

"We have plenty of international customers, including from leading industrial nations, where they don't have structures like this in place," Marcus Vater adds.

Kronimus also sees this setup as a major draw for recyclable synthetics cooperation. "Germany has real potential to become a powerhouse for the circular economy," he says. "Its environment enables companies worldwide to collaborate with top researchers and advance sustainable developments in synthetic materials."

ALL ALONG THE PLASTICS CHAIN

WORLD-CLASS RESEARCH INSTITUTIONS

Germany has multiple top research organizations. Beyond the Fraunhofer Society, the Max Planck Society and the Helmholtz and Leibniz Associations are world-class institutions that can provide groundbreaking research for international companies.

PATHWAY TO SUCCESS

Germany has robust development structures built up over decades, that link education and research to manufacturing. These connect multiple experiments at small-scale labs to mass production for industry, creating a research environment with both breadth and depth of expertise.

INDUSTRIAL MIGHT

Germany is already a major player in the plastics industry. This means international companies can take advantage of a landscape where the necessary infrastructure and facilities are in place, and a qualified workforce with experience in the field is available.

COMPLETE VALUE CHAIN

Germany offers opportunities across the lifecycle of synthetic materials. Every stage of the development of a sustainable composite material, from innovation to production to recycling, is catered to, giving investors security in the form of convenient supply chain solutions.

A circular plastics ecosystem

Germany itself is one of the world's major plastics manufacturers, and the biggest in Europe, accounting for more than 20 percent of the continent's production. This gives inward investors the confidence that all the bases are covered in the circular economy.

"What sets Germany apart from other regions is its locally based, and complete plastics value chain — from production and processing to recycling and machinery manufacturing," explains Kronimus. "This proximity, combined with Germany's robust research landscape, creates ideal conditions for developing sustainable plastics."

Many international firms are already taking advantage of Germany's synthetics ecosystem. Finnish company UPM recently began operations at the world's first biorefinery in Saxony-Anhalt. The plant, which was completed in late 2024 following an investment of some EUR 1.2 billion, produces biochemicals made from sustainable wood sources.

Germany Trade & Invest has established a task force to support international companies looking to set up shop at existing chemical and refinery locations in eastern Germany. "The region has a long history in the chemical industry. It offers an excellent environment for new applications, creating positive conditions in terms of infrastructure and a qualified workforce," explains Verena Schüren, Director of GTAI's Transformation Taskforce. "We are here to make sure companies can take advantage of these opportunities."

UPM's ambition is to "create a future beyond fossils." With its pioneering research sector and strong synthetics manufacturing track record, Germany is already playing a leading role in building that future.

Find out more about circular synthetics in Germany!

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Hannes Farlock keeps a close eye on developments in Hong Kong.

Photo: GICHK

"HONG KONG IS AN IMPORTANT BRIDGE TO GERMANY"

German companies are looking to strengthen economic ties with Asia, but there is still lots of uncertainty. Hannes Farlock, Delegate and Chief Representative of German Industry and Commerce in Hong Kong, gives us his view from the ground of the Asian metropolis with its 7.5 million inhabitants.

The German and Hong Kong economies have been intertwined for decades. How have trade ties developed in recent years?

HANNES FARLOCK: Hong Kong is still an important location for German companies doing business in China and Asia, especially in the areas of sourcing, logistics and professional services. This is in no small part due to its strategic location, efficient infrastructure, comparatively simple tax system and international environment. Many companies use these advantages to manage their supply chains throughout Asia from here and to develop new markets. Naturally, the issue of diversification and "China+X" is also becoming increasingly important.

The official number of German subsidiaries based in Hong Kong has remained constant at just over 400 for several years, although some of these companies have recently downsized their offices due to a difficult order situation and location costs. However, the importance of Hong Kong for the movement of goods between Asia and Germany remains significant.

What role does the increasing influence of mainland China play?

HF: On the operational side of business the changes in Hong Kong have not had a direct impact on German companies. However, Hong Kong's international reputation has suffered greatly. The administrative and legal differences between the Special Administrative Region and mainland China — which remain unchanged and, according to the central government, will continue to exist beyond 2047 — are no longer seen to be as strong as they were in the past.

Meanwhile, Hong Kong's economic ties with the surrounding Greater Bay Area are becoming increasingly visible. Gigantic construction projects such as the "Northern Metropolis" for 2.5 million future residents on the border with Shenzhen are intended to link Hong Kong even more closely with its neighboring city and promote cross-border cooperation. This could create both synergy effects as well as new competitive pressure for Hong Kong. We are keeping a very close eye on how the city will position itself in the coming years and what the implications could be for German companies.

How do Hong Kong companies rate Germany as a location? What's attracting them here?

HF: Companies in Hong Kong value several outstanding features of Germany as a location. One decisive factor is the size of the market. Germany offers access to one of the largest and most prosperous markets in Europe, which makes it particularly attractive for companies looking to expand their customer base. In addition, Germany has a very highly educated workforce. Another key point is data security. Germany relies on high standards guaranteed, among other things, by the establishment of data centers within the EU. This security and reliability are of central importance for companies, especially in the increasingly data-driven global economy.

From the perspective of Hong Kong business leaders, what are Germany's locational advantages compared to other big European economies?

HF: Germany's central geographical location and advanced logistics infrastructure make it an ideal platform for accessing the entire European market. Companies can drive their internationalization strategies quickly and efficiently from Germany. Germany is also known as a leading location for industry and for research. Many branches of industry have a strong presence here, and the intensive promotion of research and development is one of the main reasons for this.

What sorts of companies are looking at Germany to expand their business?

HF: Germany is an interesting location for companies from Hong Kong across all sectors, but particularly for electronics, robotics and consumer goods. Many companies with a Chinese background see Germany as an interesting location for investment. Germany also offers great potential in medical technology, as it is characterized by high standards and innovative developments.

Furthermore, Germany plays a central role in the diversification strategy of Chinese companies. Just as German companies use Hong Kong as a strategic hub for their supply chain diversification into Southeast Asia, Chinese companies are investing in Germany via Hong Kong as an attractive alternative to the USA or other European countries. The latest statistics show that around a third of Chinese direct investments in Germany were accompanied by GTAI via Hong Kong in 2024, which underlines the importance of Hong Kong as a bridge to Germany.

Want to connect to the German AHK in Hong Kong?

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How Germany Works
THE METRICS OF SUCCESS

One of Germany's many strengths as an industrial nation is its adherence to standardization. Industry standards ensure consistent and quality-assured production, as well as supporting interoperability, which increases industrial efficiency, cooperation and ease of use for consumers.

THE HISTORY OF STANDARDIZATION IN GERMANY

1879

Werner von Siemens and Heinrich von Stephan found the world's first **Electrotechnical Association** in Berlin.

1893

All electrotechnical associations in Germany are merged into the **Association for Electrical, Electronic and Information Technologies (VDE).**

1906

The first international standardization organization, the **International Electrotechnical Commission (IEC)**, is founded, with Germany participating through the VDE.

1917

The DIN is initially established under the name **the Standards Committee of German Industry.**

1926

The DIN is renamed the **German Standards Committee.**

1975

The DIN is henceforth known as the **German Institute for Standardization.**

Source: DIN, VDE

THE GERMAN INSTITUTE FOR STANDARDIZATION (DIN)

The DIN is the most important institution for standardization in Germany. In 1917, ten weeks after it was founded, the first DIN standard was published: DIN 1 for tapered pins. These are conical connecting elements that fit into holes to hold machine parts together in detachable connections. DIN experts represent German interests in European standardization at the CEN (European Committee for Standardization) and in international standardization at the ISO (International Organization for Standardization).

STANDARDS FOR BUSINESS AND SOCIETY

Number of norms created by German and international organizations

DIN (German Institute for Standardization)	**CEN** (European Committee for Standardization)	**ISO** (International Organization for Standardization)
35,000 norms	**16,672** norms	**21,000** norms

Source: DIN

INTERNATIONALLY KNOWN STANDARDS THAT WERE ESTABLISHED IN GERMANY

DIN 476
(from 1922):
defines paper sizes, including the widely used A4 size.

DIN 1451
(from 1931):
defines a font that is used for road and public transport signage worldwide.

DIN 4150
(from 1975):
defines guidelines for predicting the effects of vibrations on buildings.

DIN 7991
(from 1986):
describes countersunk screws with hexagon sockets.

DIN 13164
(from 2022):
defines first aid kits for motor vehicles.

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SET UP BUSINESS IN GERMANY

Want to be part of Europe's largest market? We're your first point of contact. **Germany Trade & Invest** (GTAI) provides international companies looking to expand with free, reliable information on the latest opportunities in the German market.

GETTING STARTED IN GERMANY

Our experts are there to help you in all phases of establishing a business in Germany.

www.gtai.de/gtai-en/invest

Germany Trade & Invest (GTAI) is the foreign trade and inward investment agency of the Federal Republic of Germany. We advise and support international companies planning to expand into the German market and assist German companies seeking to enter global markets.

Our consulting services for international companies looking to expand and seeking to establish an own subsidiary or branch office in Germany include:

- Assistance with finding the right site location for their business
- Information on financing and incentives for businesses
- Tax and legal information on setting up a company
- Information, data and statistics about key industries in Germany

All investment-related services and inquiries are treated with the utmost confidentiality and are provided free of charge.

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