



Transformation Paths for Germany as an Industrial Nation

Key points for a new industrial policy agenda

September 2024

Commissioned by



+



+



BDI

Boston Consulting Group partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities. BCG was the pioneer in business strategy when it was founded in 1963. Today, we work closely with clients to embrace a transformational approach aimed at benefiting all stakeholders—empowering organizations to grow, build sustainable competitive advantage, and drive positive societal impact.

The German Economic Institute (IW) is a private economic research institute in Germany, which is an advocate of a liberal economic and social order. The IW works to improve understanding of how business and society function and interact.

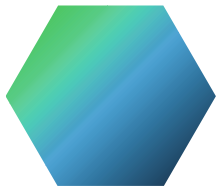
The Federation of German Industries (BDI) is the leading organization representing German industry and industry-related service providers. With 39 industry associations, 15 regional offices, and more than 100,000 companies employing around eight million people, the BDI is the voice of the German industry. The BDI advocates for a modern, sustainable, and successful industrial sector in Germany, Europe, and worldwide.



Transformation Paths for Germany as an Industrial Nation

Key points for a new industrial policy agenda

September 2024



Key Messages and Executive Summary

Germany is losing ground structurally as an industry location, falling far behind relevant competitors in two thirds of the key location indicators

Accounting for a fifth of gross value added and around 16% of all employees, the German industrial sector is a key pillar of the German economy—for comparison, in the United States it accounts for around 11% of value added and 10% of employment. If we include the wider industrial services network, i.e., services used by the industrial sector such as trade or logistics, it even accounts for nearly one third of gross value added.

Germany as industrial location is losing ground

FIGURE 1 | Overview of key location indicators for the German industrial sector

 Economic development	Industry (total)	Gross value added ↘	Production ↘	Employment ↘	Exports ↘	Business climate ↘	Capital stock ↘			
	Gross value added	Mech. Engin. ↘	Automotive ↘	Metals ↘	Chemicals ↘	Oth. base mat. ↘	Energy ↘	Electrical ↘	Others ↘	
 Cost burden	Energy prices	Electricity →	Gas →	CO ₂ →	H ₂ →					
	Labor costs	Wage costs →				Labor productivity →				
	Taxes & levies	Corporate tax →				Income tax →				
	Bureaucracy	Bureaucratic expenditures ↘	Duration of approval procedures →			Digitalization of administration →	Implementation capability of administration ↘			
 Quality of the industrial location	Infrastructure	Telecommunications ↗	Power grid: stability →		Power grid: capacity ↗		Road, railway, waterway →			
	Skilled labor	Education level ↘				Skilled labor availability ↘				
	Resilience	Access to raw materials →		Resilient supply chains →		Dependency on exports ↘				
	Innovation	Research activity →				Development of future technologies →				
	Other factors	Legal certainty →		Stability of politics ↘	Intel. property protect. ↘		Financial system ↘	Global market access →		
 Transformation dynamics/incentives	Decarbonization	Industrial decarbonization ↗	Transport decarbonization ↘		Heat decarbonization ↗		Energy transition ↗			
	New infrastructure (Green) energy access	Power grids !	H ₂ infrastructure ✓		CO ₂ infrastructure !!		Charging infrastructure !	Railway !		
		Renewables !	Secured power supply !!		LNG ✓		Green molecules !!			
	Location attractiveness today:		Expected development:				Basis of comparison:			
	High Med. Low Not applicable		↘ Declining ↗ Improving → Constant !! Strongly behind plan ! Slightly behind plan ✓ On track				✓ Comparison against global competitors 🇩🇪 Comparison against current German targets			

Source: Analysis BCG and IW

The growth momentum of the German industrial sector has significantly slowed in recent years. After the challenging COVID-19 years, the energy crisis has most recently caused the collapse of production in energy-intensive industrial sectors in particular. This slump came at the end of a period in which investments in the country's competitiveness had already been stagnating for some time. At less than 12% of GDP, the private investment ratio was below that of important competitors (e.g., United States at 13%, France at 14%, and Sweden at 16% of GDP) and needs to rise significantly in view of the required transformation investments.

The spike in energy costs since the energy crisis has exacerbated German companies' traditional cost disadvantages in terms of labor costs, taxes, and levies to an extent that they can no longer compensate with their previous location-based strengths such as high productivity, innovative strength, and stable framework conditions. In a growing number of indicators, Germany is falling behind important competitors such as the United States, China, and other industrial nations. Bureaucratic requirements burden companies and delay urgently needed investments. The energy and transport infrastructure is accumulating a growing backlog, while digital infrastructure development is too slow. In addition, new structural challenges such as the growing shortage of labor and skilled workers and the destabilization of global supply chains are putting companies under pressure.

On the other hand, the climate transformation has so far only triggered very limited investment impulses. Of the approximately €860 billion in required additional investments calculated in 2021 for "Climate Pathways 2.0," only a fraction will actually have been made by the end of the decade and around a third is still insufficiently incentivized by regulations. In particular, the ramp-up of low-carbon energy sources and the modernization of energy infrastructure are falling short of their targets despite the significantly more ambitious recent regulation.

In contrast to many previous crises, the current one is also of a structural nature, with several pillars of Germany's previous industrial success having become destabilized at the same time. The Russian war of aggression against Ukraine has likely brought an end to the days of cheap fossil gas imports for the foreseeable future. The demographic crisis and a weakening education system will turn Germany's traditionally strong supply of labor and skilled workers into a deficit in the coming years. The lead that the country has built up over decades in areas such as combustion technology is losing importance, and the German export model is increasingly under pressure due to growing geopolitical tensions, global protectionism, and locational weaknesses.

One fifth of German industrial value creation is at risk in the medium term, primarily due to high energy costs and shrinking markets for existing German core technologies

The energy crisis has created a lasting competitive disadvantage for energy-intensive industrial sectors. Higher prices for fossil fuels have raised the production costs of entire sectors by at times more than 25%. As a result, producers in energy-intensive primary commodity sectors in particular will still face a cost disadvantage of up to 15% at the end of the decade compared to competitors in China and the United States, which means that the risk of a creeping migration of production and investments will continue to grow.

One fifth of industrial value creation at risk mid-term

FIGURE 2 | Gross value added and threat to the German industrial sector

Gross value added by industry in Germany (= width of bars, base year 2019) and **potential value at risk** (= red coloring)



Producers at the end of the value chain feel the effects of the energy crisis less directly, although some are threatened by an impending technological change. The German automotive industry and companies in the fossil plant engineering sector are particularly threatened by a significant contraction of the global market for their core technologies. The resulting impending loss of production carries an even greater risk of de-industrialization in Germany due to the size of these industries.

With the closely intertwined nature of the German industrial sector, the impact on individual sectors also becomes a broad-based risk. The primary commodity industries indirectly generate more than €80 billion in additional value added through the purchase of intermediate goods and services. The automotive sector, mechanical and plant engineering, and the electrical and digital industry together account for around €270 billion. In addition, primary commodity industries also contribute to value creation in downstream sectors, such as basic chemicals as a core supplier of the pharmaceutical industry.

At the same time, the global climate transformation in particular is opening up new growth opportunities for Germany—in new markets with revenues of more than €15 trillion in 2030

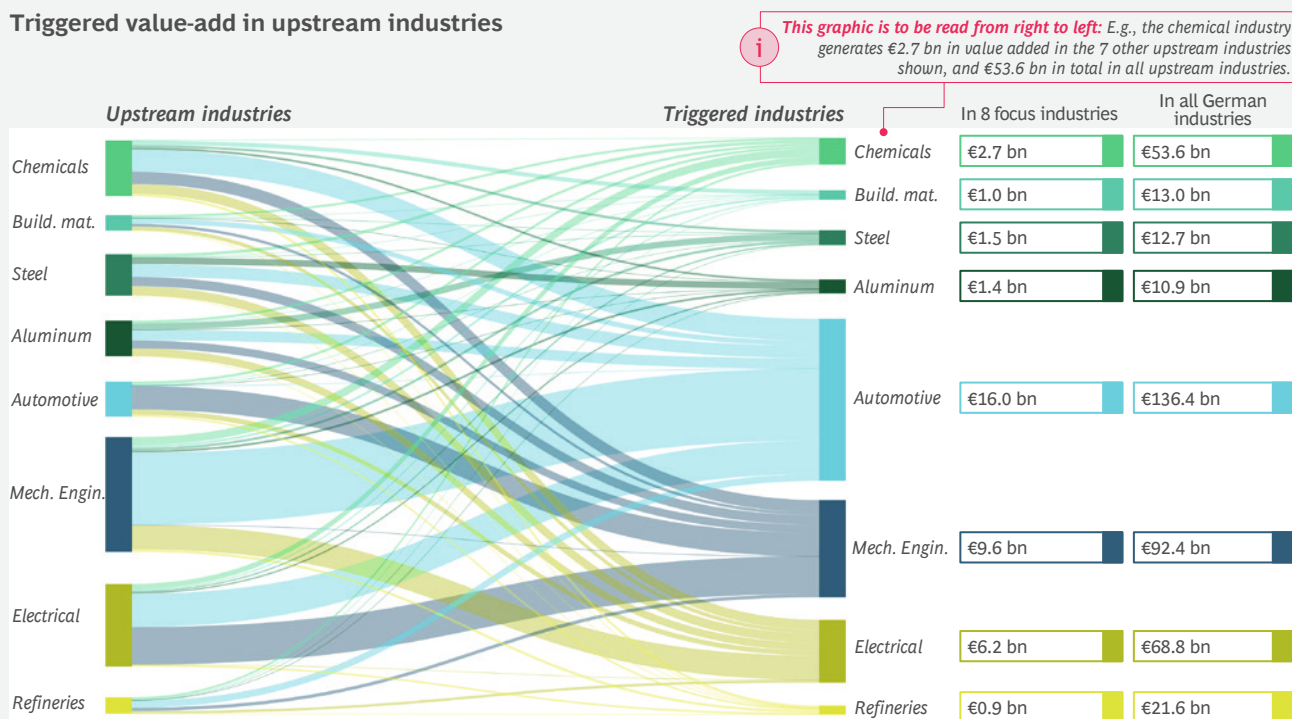
Fundamental global trends such as the climate transformation, digitalization, and health will create new markets worth billions worldwide in the coming years. By 2030, these fields alone are expected to generate global sales of more than €15 trillion per year.

Germany has a solid foundation to create new industrial value, particularly in climate technologies, industrial automation, and healthcare. The country has traditionally had competent experts in engineering professions (although the threat of future gaps is looming), many companies with a high level of technological expertise, a strong innovative base, and good research institutions. In sectors such as automotive and pharmaceuticals, Germany boasts well-established

Dependencies due to high industry interdependencies

FIGURE 3 | The value creation web—indirect value added by industrial sectors in Germany

Triggered value-add in upstream industries

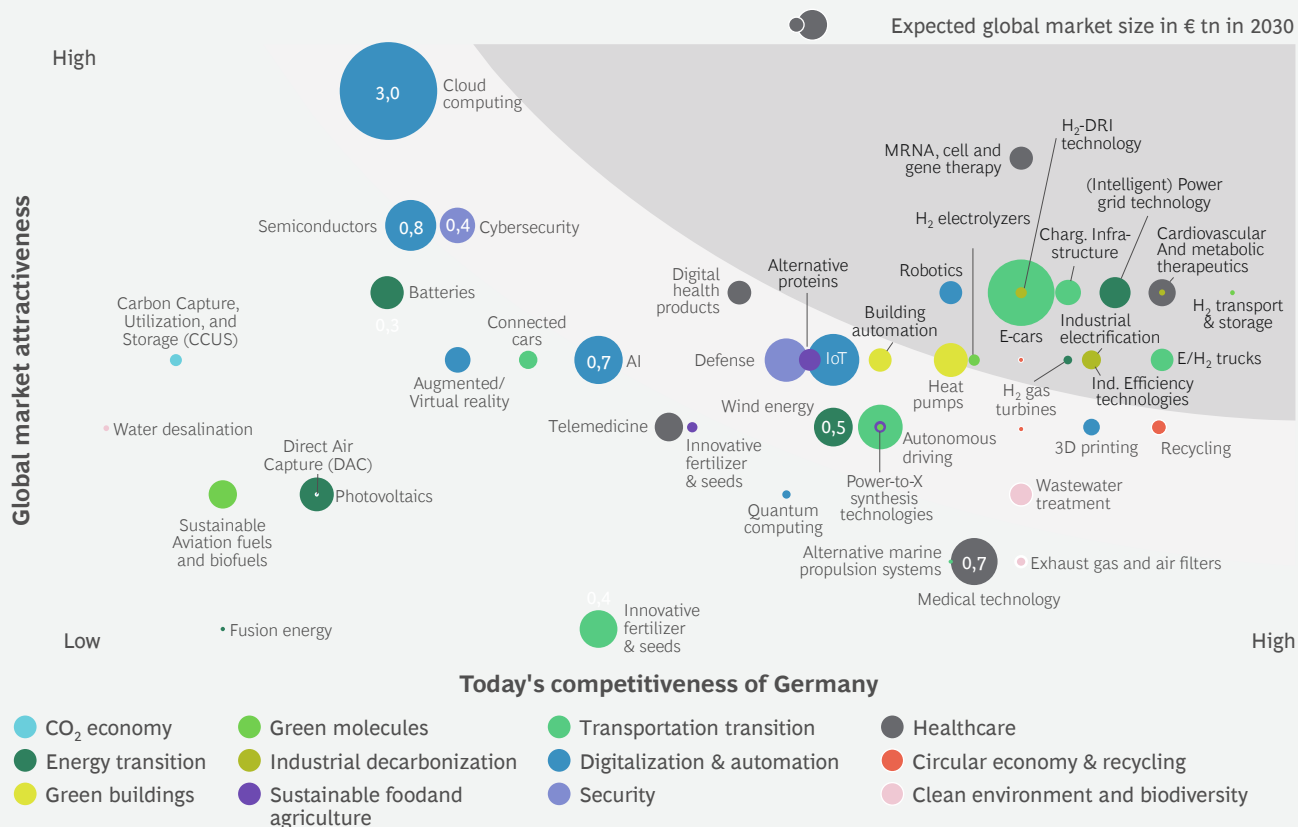


Note: Statements on indirect value added can only be made for individual focus industries (right). Addition across different focus sectors is not permitted due to duplication

Source: OECD Inter-Country Input-Output (ICIO) Tables (2023); Analysis BCG and IW

Germany well-positioned in several growth markets

FIGURE 4 | Growth markets according to global market attractiveness and German competitiveness



Source: Analysis BCG and IW

global market leaders. At the same time, Europe’s pioneering role in global climate protection can create a strong domestic market, particularly for many climate technologies, offering an important foundation from which to scale new products for the global market.

Whether Germany continues to grow as an industrial location will depend largely on the success of German companies in these future-oriented markets—success which is also crucial for the future of the German primary commodity sectors, as they depend largely on strong sales markets in Germany and Europe.

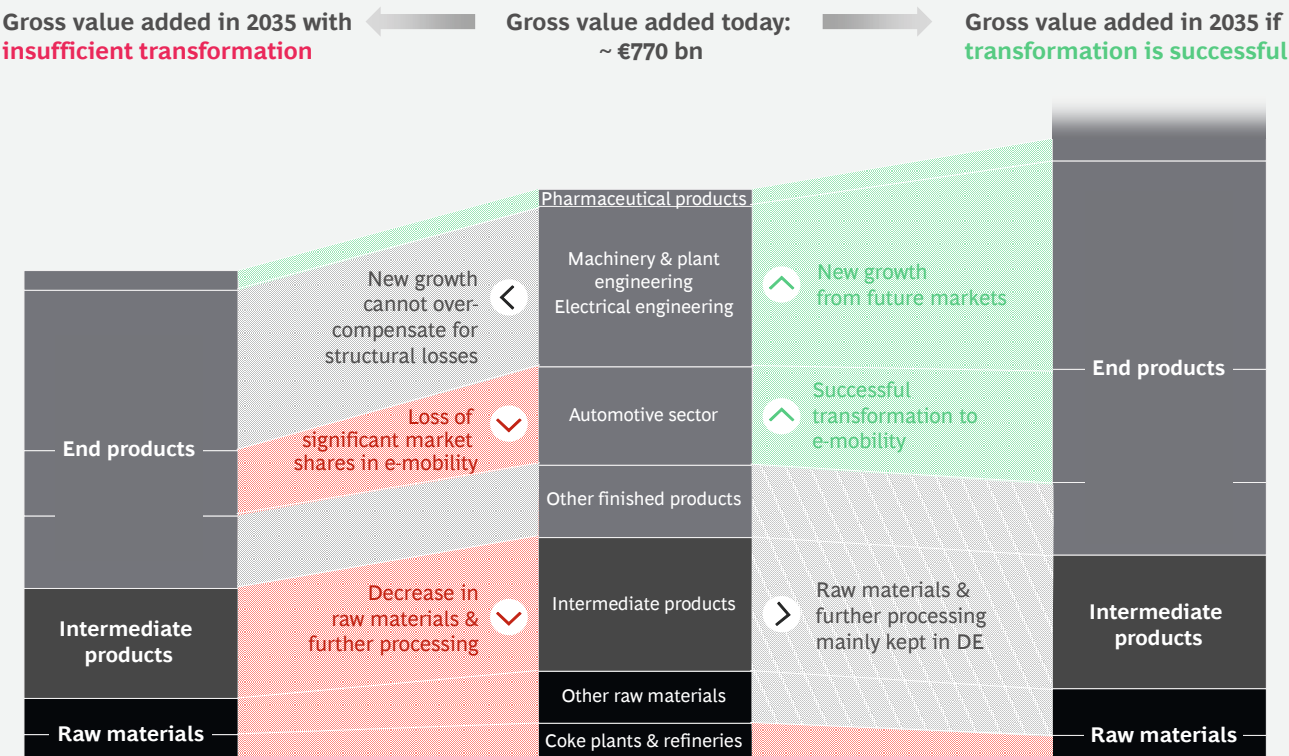
However, Germany is competing with countries that support the development of these future-oriented markets with strong industrial policies. If it wants to translate its good foundation into actual growth, Germany should more proactively support the development of new industrial value creation politically.

In order to remain successful in the future, Germany must reinvent itself as an industrial nation

If things continue as they are, the deindustrialization process in Germany threatens to accelerate further in the coming years. Energy-intensive industrial sectors are plagued by growing competitive disadvantages from high energy costs and burdened by the climate transition. The automotive industry is at risk of losing market share to new competitors from China in the future (e-)car market, which could in turn cause the mechanical engineering industry to lose key national sales markets, while at the same time access to the global market is growing more difficult. And in the major future technologies associated with the climate transition, Germany is at risk of losing out to countries such as the United States and China, which are actively supporting the development of these industries.

New growth needs a resolute transformation

FIGURE 5 | Gross value added today and in two transformation scenarios for 2035



Source: Federal Statistical Office (2023), Analysis BCG and IW

The chemical industry needs to change key production chains

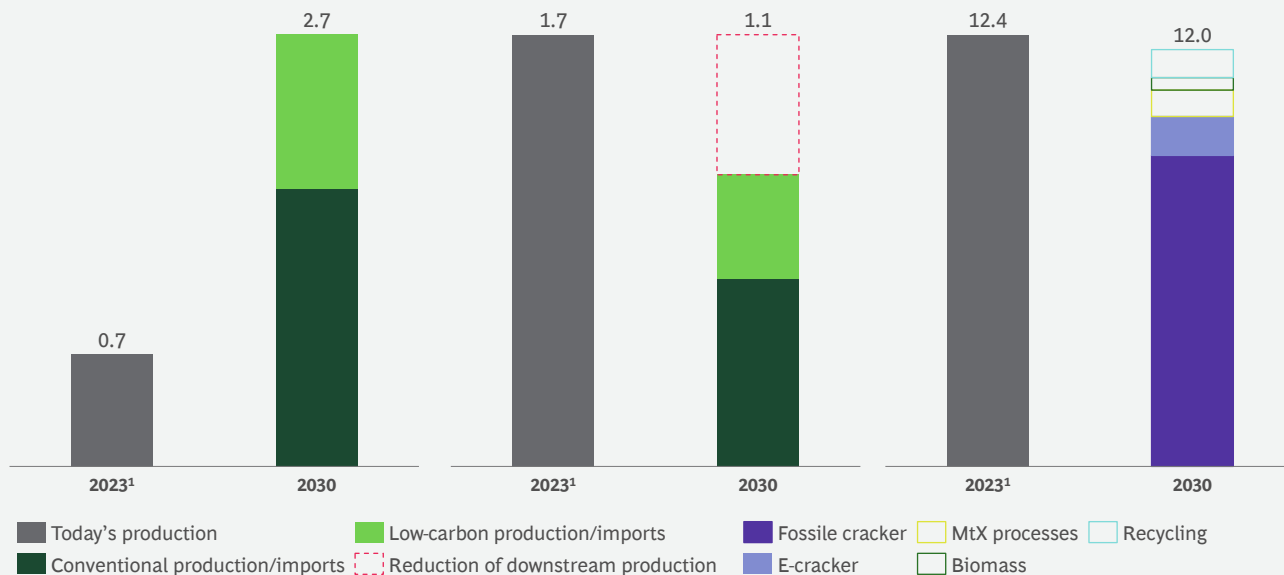
FIGURE 6 | Transformation pathway of different chemical value chains

Methanol: Increasing demand due to MtX processes, imports likely

Ammonia: Partial decline in exports & import of downstream products (esp. fertilizer)

High-Value Chemicals: Shift to new processes and feedstocks

Raw material requirements (in Mtpa)



1. The 2023 starting value is assumed to be the average of 2021 & 2022, in order to account for the recovery compared to 2022 production.
 Note: The low-carbon source for NH₃ & MeOH is based on the RED III industry target of 42% low-carbon hydrogen in material use | VCI (2023).
 Source: Analysis BCG und IW

However, this scenario is not inevitable. Germany can continue its history as a successful industrial nation—if it transforms large parts of its value chain. In the midst of a production crisis and in spite of considerable energy cost disadvantages, the energy-intensive industrial sector must transform its sites towards climate neutrality. It will need targeted financial support and better access to low-carbon energy sources, along with the infrastructure that goes with them.

The future of the automotive sector depends largely on whether German manufacturers also succeed in electromobility. Germany must lay the foundations for a new global technology leadership by establishing a strong European domestic market for e-cars, building a competitive battery value chain, and investing in digitalization and software expertise.

Sectors such as mechanical and plant engineering and the electrical industry are facing historic growth opportunities, especially from the global climate transformation. To translate this opportunity into actual growth, they need a strong European market behind them—and incentives to build up domestic production.

In hardly any other industry is the necessary transformation as fundamental as in basic chemicals. The sector is very energy-intensive, has a strong export focus and, due to the complexity of its products, cannot be protected effectively against low CO₂ imports with instruments such as the CBAM. The pressure on competitiveness, already declining since the energy crisis, is further exacerbated by rising effective CO₂ prices, the shift to renewable energy sources, and the replacement of fossil raw materials. Therefore, the industry needs a fundamental shift as a forward-looking strategy: This could take the form of a reorganization of value chains, for example, by increasing imports of selected very energy-intensive basic materials while maintaining the value-added chains built upon them. It could also involve significant investments in retrofitting existing facilities and developing new production technologies such as methanol-to-olefins, electrification, and the use of biogenic and recycled hydrocarbons. Moreover, the sector could direct its focus toward new growth areas, such as those emerging from the climate transformation, where the German basic chemicals industry, with its strong innovative capacity and close integration with other sectors, can unlock significant growth potential.

Germany needs an industrial policy agenda—and the biggest transformation effort since the postwar period

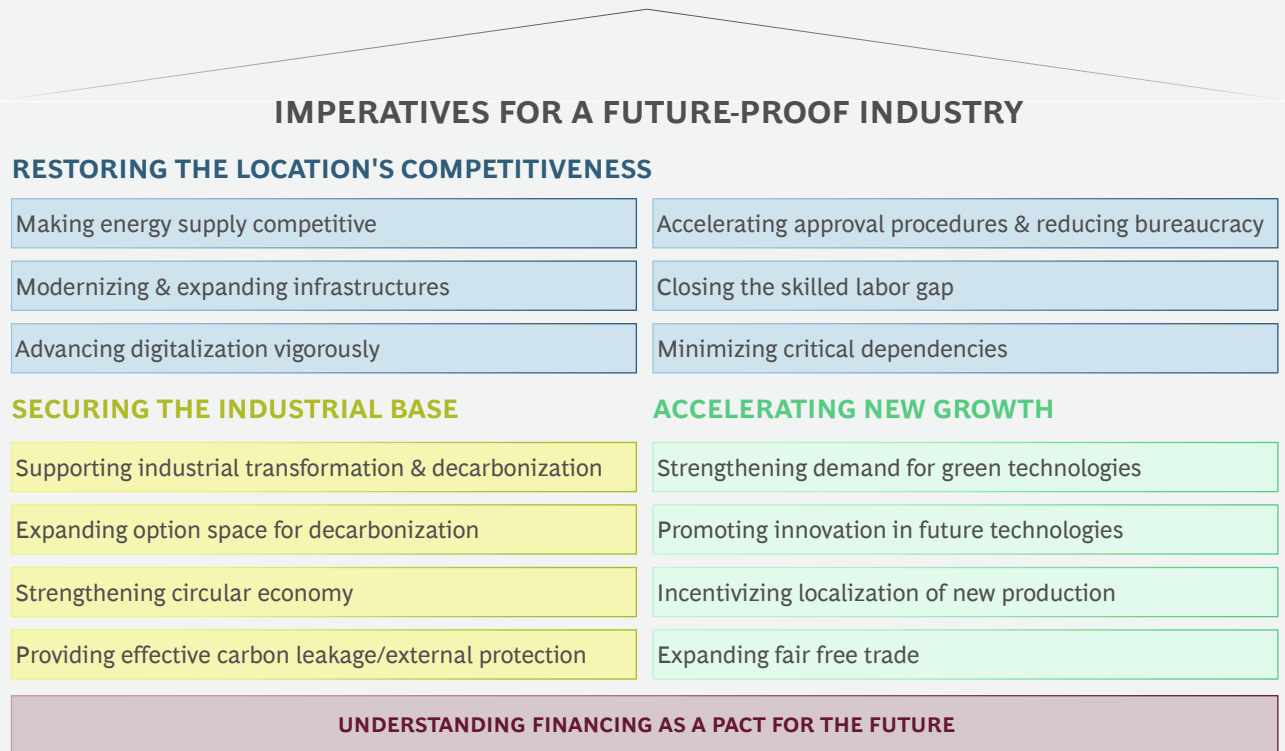
Restructuring Germany as an industrial location will require a monumental industrial policy and entrepreneurial effort. There are no simple answers to the current structural crisis and the very different ways in which the industrial sectors are affected. Policymakers need to take action in many areas at the same time—and everywhere significantly more consistently than in the past.

Germany must make its locational conditions broadly competitive again:

1. The German industrial sector needs a competitive energy supply again. Measures include making cost efficiency and security of supply much more central to the necessary restructuring of the electricity system, distributing the cost of expansion better, giving industrial users targeted and reliable relief where necessary, and efficiently stimulating the expansion of secured capacity. At the same time, the ramp-up of renewable molecules should be supported with stronger regulatory incentives for their production, import, infrastructure, and use.
2. The transformation will require an enormous infrastructure program with substantial investments in electricity, hydrogen, and carbon grids as well as charging infrastructure. At the same time, Germany must deal with the significant investment backlog in its transport infrastructure, especially in the rail sector.
3. Germany needs a comprehensive digitalization offensive to prepare for the upcoming AI revolution. Catching up with the world’s digital leaders will require significantly higher investments—first and foremost in the expansion of telecommunications networks, in education, research, and innovation, and in AI-capable computing and server capacities.

Imperatives for the transformation

FIGURE 7 | Overview of 15 action areas for a successful transformation



Source: Analysis BCG and IW

4. Companies must be freed from bureaucratic restraints. This will require an acceleration of the digitalization efforts and numerous existing processes—and a paradigm shift by reducing inefficient regulation, for example by avoiding “gold plating” in EU requirements.
5. Germany must close its labor and skills gap, one of the biggest threats to future industrial growth. Germany needs a national education offensive, significantly more qualified immigration, and a much greater use of digitalization, automation, and robotics. In addition, it has to more effectively leverage the existing workforce potential—through increased full-time employment, greater labor market participation, and longer working life spans.
6. Germany should reduce its critical dependencies and avoid creating any new ones. Strategic import partnerships should be established for critical raw materials, while at the same time German and European raw material extraction and processing should be increased. Germany should also strengthen the domestic production of particularly critical primary products such as semiconductors and batteries.

In order to maintain Germany’s industrial sector across the board—one of the country’s greatest strengths—politicians must support the industrial base:

7. Energy-intensive industries such as steel, chemicals, and building materials are facing considerable economic challenges from the climate transition. To continue to produce competitively in the future, they need targeted financial support to convert their plant base and compensate for the at times considerable additional cost of green energy sources. In addition, the development of green lead markets in selected sectors should be supported so as to reduce this funding need in the medium term.
8. To make the transformation as economical as possible for companies and public budgets, federal and state governments should make broad use of the full range of technological options for decarbonization—and enable the use of carbon capture and storage (CCS), including the considerably cheaper onshore carbon storage. This also includes promoting carbon capture and utilization (CCU).
9. Policymakers need to strengthen the circular economy so as to secure the resource base for primary commodity industries, minimize raw material dependencies, enable defossilization of the chemical and upstream refinery sectors, open up growth opportunities through new circular

business models, and support resource conservation and decarbonization in general.

10. In addition, the industrial sector should be protected more effectively against the growing risk of carbon leakage in the future, meaning the migration of emissions-intensive industrial production or investments to countries with less ambitious climate protection. This will require fundamentally reviewing the effectiveness and solving the problems of the EU’s carbon border adjustment mechanism (CBAM), significantly developing the system of CBAM and free allocations further, and potentially developing additional instruments for companies that are severely affected and not currently covered.

To enable industrial growth in the future, Germany must create new value and accelerate growth in emerging markets:

11. It needs to strengthen domestic demand for green technologies. Implementing the German and European climate transition means a gigantic investment program in climate-friendly technologies and infrastructure and could lay the foundation for companies in these sectors to position themselves successfully in rapidly growing global markets. Germany should create much more attractive framework conditions for users of these technologies and make green technologies competitive with fossil alternatives in all sectors.
12. Germany should invest much more heavily in research and development—especially in key future-relevant fields such as the transitions in propulsion, energy and heating technologies, as well as digitalization, and healthcare. To this end, Germany should close the gap to the global leaders in public research spending and at the same time mobilize more private venture capital to scale up new companies.
13. In selected growth sectors, policymakers should actively encourage the localization of new production in the context of a common European location policy, allowing them to compete with other major economies that are currently creating self-serving—and in some cases unfair—starting conditions for their companies in these sectors.
14. At the same time, a global free market remains of paramount importance for Germany as an export country. Policymakers should therefore continue to work towards strengthening global free trade, further expanding free trade agreements, and reinforcing the European sales market.

15. Successfully mastering this transformation will require extensive additional investments in Germany by 2030—a total of around €1.4 trillion, to be raised by both the private and the public sector and financed long-term as part of a pact for the future.

Germany shares many of the described challenges with its European neighbors, including rising energy costs, expanding EU bureaucracy, challenging demographic trends, and growing geopolitical tensions. In addition, German industrial policy is heavily dependent on European framework conditions. Consequently, some of these issues must and can be addressed with joint European initiatives.

Funding this transformation will require additional investments of more than €1 trillion by 2030 alone—shouldering it will be a multi-generational effort

The transformation of Germany as an industrial location will require one of the greatest transformation efforts since the postwar period—and additional investments of around €1.4 trillion by 2030.

Some of these investments—such as in modernizing the transport infrastructure—must be borne directly by the public sector. At the same time, higher public spending is needed to mobilize some private investments, such as supporting companies in their transformation and stimulating domestic demand for green technologies. In total, this expenditure will create a fiscal gap of over €70 billion

FIGURE 8 | Overview of 15 imperatives and potential regulatory levers

Additional investment required by 2030

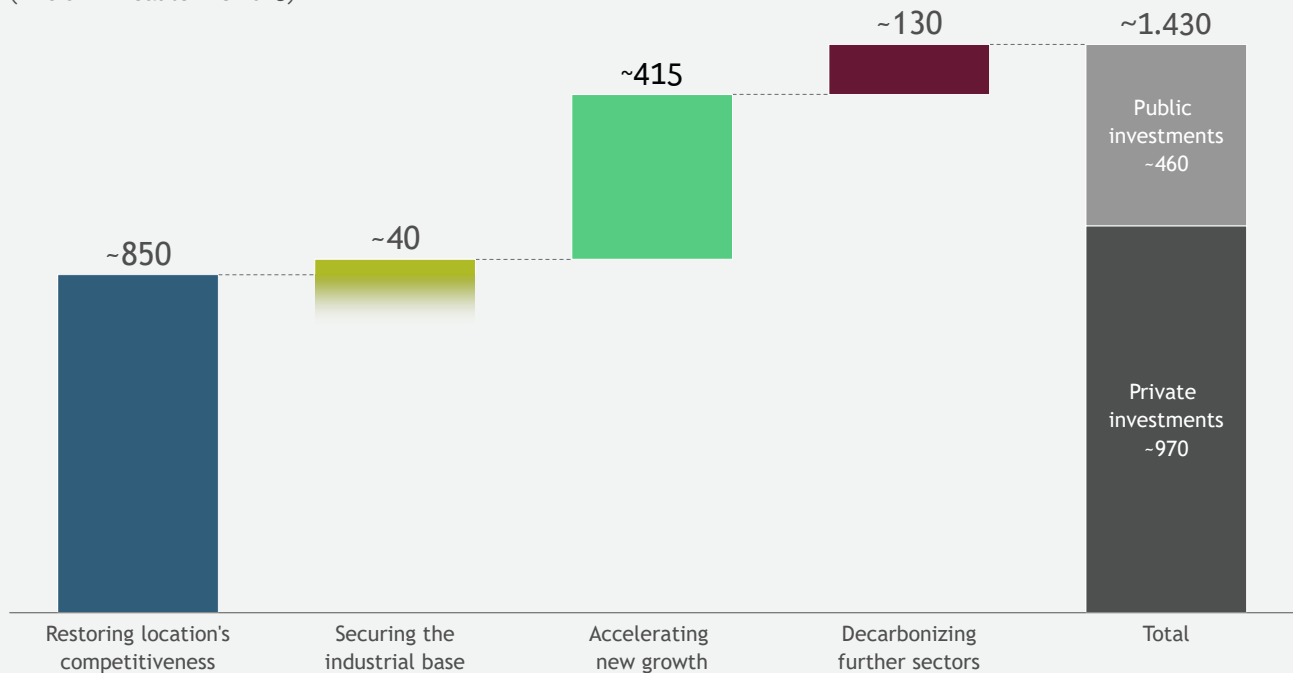
RESTORING THE LOCATION'S COMPETITIVENESS	Making energy supply competitive (Cost-efficient expansion of electricity systems; targeted relief for industrial electricity prices; access to affordable renewable molecules)	€410 bn
	Modernizing & expanding infrastructure (Acceleration of grid expansion & renewable energy; H ₂ and CO ₂ infrastructure; road, rail, and waterway; charging/H ₂ refueling infrastructure)	€164 bn
	Advancing digitalization vigorously (Expansion of digital infrastructure; support for digital innovation & education; digitalization of the public sector; simplification & protection of data exchange; AI initiative)	€93 bn
	Accelerating approval procedures & reducing bureaucracy (Digitalization & technical improvements; bundling of responsibilities & processes; legal simplifications; changes in environmental law)	-
	Closing the skilled labor gap (Harnessing full labor potential; national education campaign; promotion of qualified immigration; digitalization & automation)	€97 bn
SECURING THE INDUSTRIAL BASE	Minimizing critical dependencies (Increase in material efficiency; reduction of import risks; strengthening EU raw material extraction; localization of critical products)	€88 bn
	Supporting industrial transformation & decarbonization (Sufficient carbon contract for differences (CCfDs); expansion of investment support for new facilities; industrial electricity price relief; support for heat transition; green lead markets)	€35 bn
	Expanding option space for decarbonization (Development of regulatory framework for CCUS in Germany and the EU; enabling broad CCUS deployment; creating societal acceptance)	-
	Strengthening the circular economy (Expansion of availability of secondary raw materials; improvement of the quality of secondary raw materials; price reduction for secondary raw materials where necessary)	€4 bn
	Providing effective carbon leakage/external protection (Effective review of CBAM 2025; reduction of CBAM bureaucracy; protection of exports; support of international cooperation)	-
ACCELERATING NEW GROWTH	Strengthening demand for green technologies (Mainly in the transport, energy transition, heating transition, and molecular transition sectors)	€173 bn
	Promoting innovation in future technologies (Framework & vision for long-term innovation; transfer between research & business; promotion of R&D; venture capital mobilization)	€130 bn
	Incentivizing localization of new production (Mainly targeted promotion through subsidies & tax incentives; qualitative localization criteria)	€112 bn
	Expanding fair free trade (Simplification of free trade agreements; conclusion of new free trade agreements; adjustment of free trade agreements new types of goods)	-
	Understanding financing as a pact for the future	€~ 1.430 bn ¹

1. Incl. € 126 bn for decarbonizing further sectors, see figure 9

About €1.4 trillion additional investment required by 2030

FIGURE 9 | Additional investment required by 2030 to transform the German industry

Cumulative additional investment 2024-2030
(in € bn in real terms 2023)

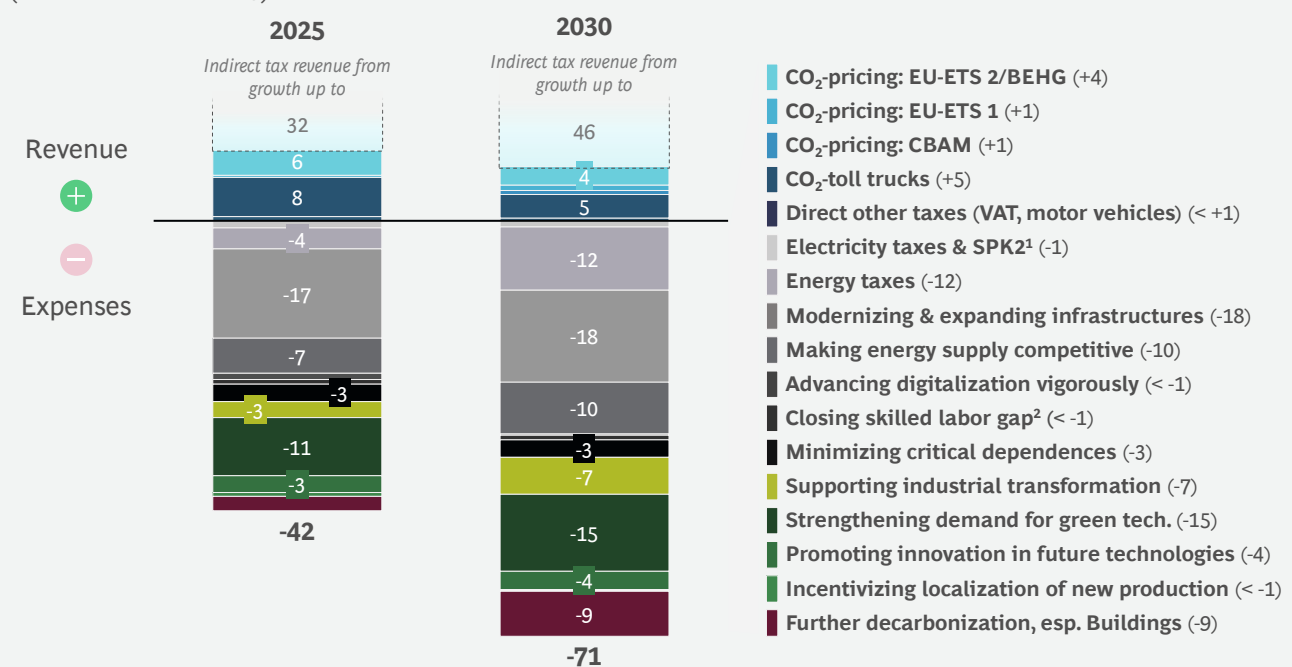


Source: Analysis BCG and IW

Over €70 billion additional fiscal burden in 2030

FIGURE 10 | Added fiscal burden for the German industrial transformation in 2030

Fiscal burden compared to 2023
(in € bn real terms 2023)



1. Electricity price compensation; 2. Exclusively federal education expenditure included | Note: KTF subsidies in 2023 largely covered by ETS/BEHG revenues, therefore effect from special assets not shown separately; Indirect tax revenues modeled on the basis of Oxford Economics and not included in totals
Source: Oxford Economics, Analysis BCG and IW

per year until 2030—even before accounting for other financial obligations such as the necessary increase in defense spending. However, some of this expenditure will be offset by rising public revenues, as an investment program of this size will trigger additional economic growth.

These financing needs are enormous, but not unprecedented. On an annual basis, €1.4 trillion in additional investment corresponds to just under 5% of Germany's gross domestic product (GDP). A total of around €460 billion needs to be invested by the public sector by 2030 (1.6% of GDP)—a level comparable to the funds used under the Marshall Plan (1.3% of GDP) and direct development aid for the reconstruction of Eastern Germany (1.0% of GDP).

This funding gap can be closed—but it will be a (multi-)generational effort that should involve all areas of society. It will likely exhaust all current savings, prioritization, and financing options and will also require new borrowing, for instance in the form of new special funds.

Germany is facing years of decisions as an industrial location—will the transformation succeed?

Germany is at a crossroads. The energy crisis was an economic shock for the German industrial sector, bringing a significant slump in production, particularly in energy-intensive sectors. In addition to high energy costs, however, Germany is facing a number of other structural challenges that pose a fundamental threat to Germany's substance as an industrial location. The polycrisis is hitting a country that is largely unprepared after two decades of upswing.

Germany has failed to make foresighted use of the dividends of those two decades, taking a too timid approach to future-oriented investments in education and research, expansion of renewable energies, modernization of infrastructures, or digitalization. As a result, it has lost considerable competitiveness as an industrial location. At the same time, key industrial sectors failed to set the course for technological change and new growth.

Without decisive countermeasures, Germany faces a scenario of creeping deindustrialization in which energy-intensive industrial sectors gradually shift their pro-

duction to other locations, the automotive industry loses significant global market share in electromobility, and German companies fall behind in future technologies.

However, this scenario is not inevitable. Germany continues to be a land of ideas with excellent engineering expertise and reliable cutting-edge technology that will be needed more than ever in the coming decades—especially to tackle the global climate transformation.

Germany must “invest its way to the future.” Positioning it in the coming decades for new growth as an industrial location will require a fundamental transformation that goes far beyond simply improving domestic location conditions. To prepare its industrial sector for the coming decades, Germany needs a multifaceted transformation in response to the structural polycrisis—to be undertaken together with and for Europe. Germany and Europe need a strong industrial policy agenda.

The transformation paths outlined here are a proposal for such an industrial policy agenda, with the vision of a technologically strong industrial nation at its core—a nation with a broad industrial base on its path to climate neutrality, boasting a combination of innovative domestic markets, strong local value creation, and a continued high level of exports. If this transformation succeeds, Germany can take the lead in a development that has to happen worldwide in the long term, allowing Germany's industrial sector to remain a growth driver and continue its success story in the coming decades.



About the Authors

Dr. Jens Burchardt is Managing Director and Partner at BCG's Berlin office, co-founder of the BCG Center for Climate & Sustainability, and co-author of the first and second Climate Paths study. You may contact him by e-mail at Burchardt.Jens@bcg.com.

Dr. Patrick Herhold is Managing Director and Senior Partner at BCG's Munich office. He is co-founder of the BCG Center for Climate & Sustainability and co-author of the first and second Climate Paths study. You may contact him by e-mail at Herhold.Patrick@bcg.com.

Dr. Elisabeth Richenhagen is Principal at BCG's Hamburg office. She is a core member of the global Climate & Sustainability and Industrial Goods practice areas and co-author of the second Climate Paths study. You may contact her by e-mail at Richenhagen.Elisabeth@bcg.com.

Dr. Thilo Schaefer is Head of the Digitalization and Climate Change Cluster at the German Economic Institute in Cologne. You may contact him by e-mail at Thilo.Schaefer@iwkoeln.de.

Dr. Henry Goecke is Managing Director of IW Consult in Cologne and an expert in big data analytics. You may contact him by e-mail at Goecke@iwkoeln.de.

Co-authors:

Rebecca Borchard (BCG)

Luisa Buche (BCG)

Rasmus Groß (BCG)

Christian König (BCG)

Leander Müller (BCG)

David Scheer (BCG)

Cornelius Bähr (IW)

Dr. Tillman Hönig (IW)

Malte Küper (IW)

Dr. Thorsten Lang (IW)

Acknowledgements

We would like to express our special thanks to the Federation of German Industries (BDI) and its member associations, as well as the more than 100 participants and experts from companies and associations for their commitment, their extensive constructive contributions, and their support in validating our analyses—as members of the steering committee and stakeholder group and as participants in numerous workshops and bilateral expert discussions during the course of preparing this study.

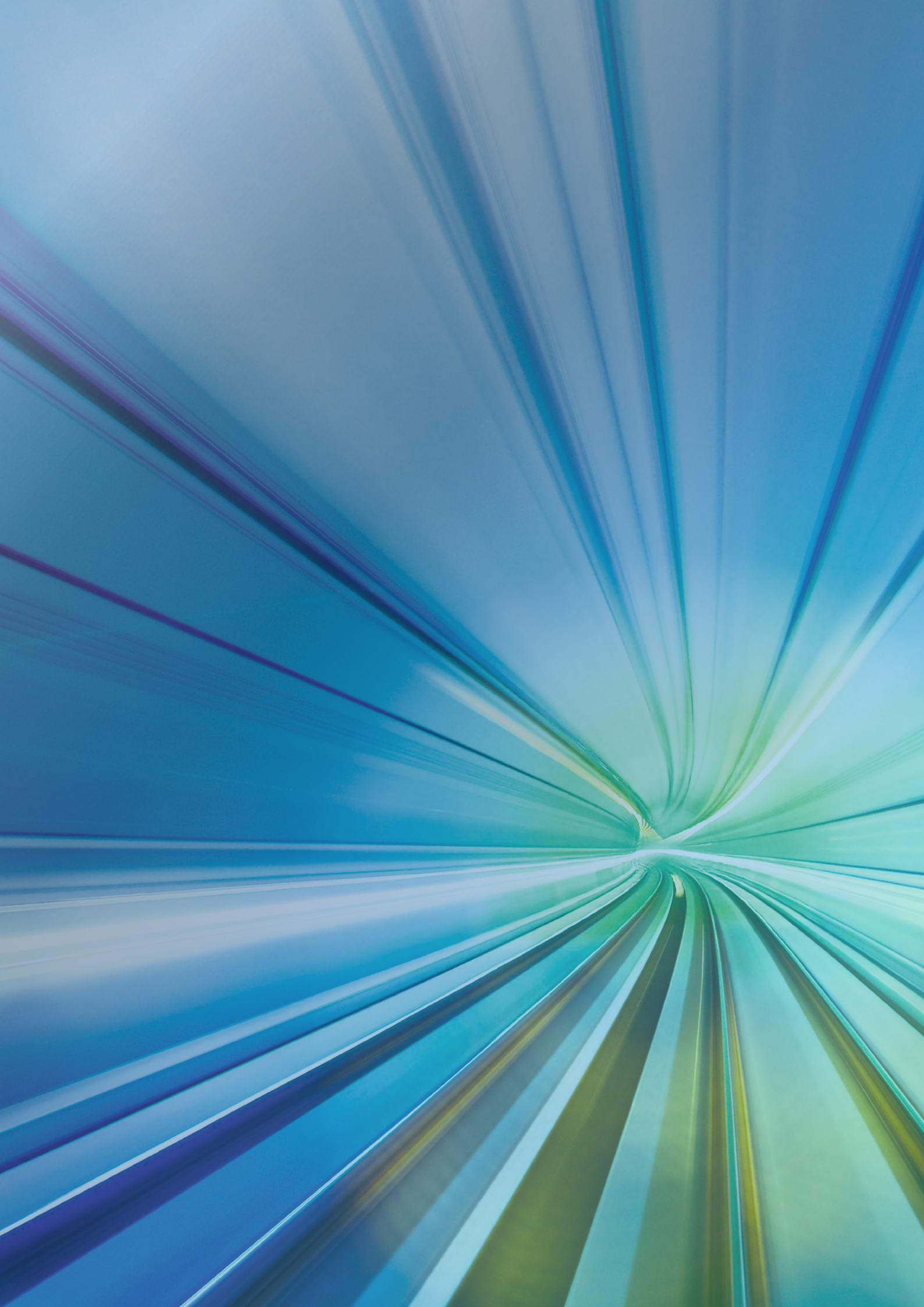
In particular, we would like to thank the BDI team, with whom we wrote this study in close cooperation: Holger Lösch, Dr. Carsten Rolle, Dr. Eike Blume-Werry, Maximilian Fricke, Dr. Eberhard von Rottenburg, Dr. Klaus Deutsch, Dr. Thomas Holtmann, Uta Pfeiffer, Dr. Joachim Hein, Cara Bien, Petra Richter, and Wilko Specht.

Representing the many experts at BDI member associations and companies, we would like to thank the members of the steering committee, comprising the following individuals (in alphabetical order): Mark Becker-von Bredow, Matthias Belitz, Thomas Dederichs, Loïc Geipel, Jörn Higgen, Jessica Klassen, Dr. Christian Küchen, Manuel Mohr, Nima Nader, Dr. Alexander Nolden, Philip Nuyken, Annkathrin Paulus, Sandra Reus, Jan Christoph Schaffrath, Dr. Christian Schimansky, Götz Schneider, Dr. Martin Theuringer, Alexander Zafiriou, and Matthias Zelinger.

We would also like to thank the members of the study's scientific advisory board for their methodological support and many helpful and constructive comments (in alphabetical order): Dr. Sabine Fuss, Dr. Veronika Grimm, Stefan Kapferer, Stefan Koerzell, Dr. Kai Niebert, Dr. Andreas Löschel, Dr. Karen Pittel, and Dr. Jens Südekum.

We also thank the experts at Boston Consulting Group, Martin Feth, Martin Jakob, Dr. Marc Morawietz, Joonas Päiväranta, Kathrin Pannier, Alexander Meyer zum Felde, Stefan Schönberger, Sebastian Schrapp, Jonas Schroeder, and Nicole Voigt, as well as the experts from the German Economic Institute, Dennis Bakalis, Dr. Vera Demary, Andreas Fischer, and Thomas Puls.

Finally, we would like to thank Greta Andersen, Daria Gauger, Ulrich Kremer, Susanne Krohm, Julia Oppel, Florian Schambergen, Anna Stanger, and Daria Wawrzinek for their support with the content, graphics, editing, and organization.



For information or permission to reprint, please contact BCG at permissions@bcg.com.

© Boston Consulting Group 2024. All rights reserved. September 2024



