

Managing the transition, strengthening growth

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Executive summary

Germany's growth model – built on the export of high-quality capital goods in a multilateral trading system – has long been a success story. Now, it is coming under increasing pressure. In location competition, Germany offers a mixed picture of strengths and weaknesses. The stagnation that has now lasted for five years is making structural problems more and more visible, while protecting the natural foundations of life is becoming increasingly urgent. The global shifts in geopolitics are driving the urgency for Germany and Europe to take security and defence more into their own hands. But this should not obscure the fact that we also need to move ahead on addressing major societal and economic challenges and managing the climate transition. We must understand the current urgency to act as an opportunity to finally tackle structural weaknesses head on. Given the wide range of challenges we face, we must pull multiple levers at the same time. This position paper presents the following recommendations for action on five key areas of intervention:

- **Managing the transition to climate neutrality:** Investment is the path to managing worsening climate change. Climate investment incentives must focus on cost-effectiveness. Key levers are a reliable and rising carbon price signal and the provision of a financing and support framework, especially for innovative climate technologies. This will require resilient banks and financing tools that bolster companies' equity base. It is important to advance the capital market union in Europe and harness more of the financial assets of households as a source of transition finance. In order to accelerate approval procedures, not only do processes need to be streamlined but the approval authorities themselves also need to have more staff and better technical equipment. Offers need to be made to low-income households and those residing in densely populated urban areas, in particular, to incentivise a greater adoption of renewables among the population. Granting a climate bonus to mitigate any burdens that may arise can support this. Carbon removal must be developed as an additional pillar of climate policy. To this end, new governance, market and financing structures should be developed to incorporate private capital and establish carbon markets in Germany, the EU and globally.
- **Driving digitalisation and strengthening innovative capacity:** Germany's competitiveness and productivity depends to a significant degree on its innovative capacity. Its innovation ecosystem, which has so far been very effective, is at risk of losing ground to international competitors. In particular, it is behind in the development of new technologies – which include digitalisation. In order to secure its competitiveness in the long term, innovation capacity and digitalisation must be promoted at the cutting edge and across the broad economy. At the cutting edge, capacities for researching technologies of the future must be developed and Germany's strengths in academic research must be safeguarded. Mission-oriented components of economic policy that provide direction and a focus on specific technologies of the future can be helpful in order to initiate fundamental innovations. The special role of businesses that conduct research on a continuous basis suggests that the most comprehensive incentives possible should be provided to preserve R&D capacity through broadly effective, technologically open approaches. Technologically specific approaches support the research of new technologies. Further improvements in access to suitable finance are crucial for technology- and growth-oriented start-ups. It is also important to strengthen innovative capacity and digitalisation across the broad business community, for which support measures must be provided below the R&D threshold. Without advances in innovations and digitalisation on a broad scale, it will not be possible to achieve economically measurable progress in productivity or growth and the capacity of the German economy to renew itself will be significantly impaired.

- **Addressing demographic change and expanding the supply of labour:** Looking ahead, Germany's working-age population will shrink significantly and the mismatch between skills offered and skills wanted is already making it difficult to fill vacancies. In order to rise up to the demographic challenge, Germany must mobilise more employable people as well as future-proof the pension system. The public sector, business and training providers must further improve the incentives, motivation and provision of skills needed for people to engage in qualified work. Relevant starting points include needs-oriented skills development and lifelong learning but also an improved work-life balance as well as occupational healthcare. Productivity growth must also be strengthened in order to reduce the need for skilled workers and strengthen economic growth. This requires innovations and investment in physical assets and human capital. Stronger digitalisation and the use of AI are appropriate starting points but they require the acquisition and development of relevant skills. Not least, Germany must become more attractive for skilled workers from other countries, for example through the removal of stifling bureaucracy as well as the recognition of foreign qualifications, early delivery of German language instruction, needs-based training and retraining and swift integration of workers into the labour market and society.
- **Securing a sustainable supply of energy and natural resources:** Germany's energy security and achieving climate targets both depend entirely on the availability of sufficient electricity from renewables. In order to maintain the momentum of expansion, the forthcoming reform of the Renewable Energy Sources Act (EEG) must focus on cost-effectiveness as well as investment security, further speeding up approval procedures and securing the allocation of sufficient land. There is a need to speed up the expansion of electricity grids, increase electricity storage capacity and make electricity consumption more flexible in order to better align electricity supply and demand. New gas-fired power plants are needed to cover the residual load. In addition, solutions need to be developed to meet the high capital requirements of grid operators. To enable the ramp-up of the green hydrogen industry, it is necessary to coordinate generation, demand and transport capacities through policy decisions and economic incentives. Appropriate measures include a regulatory and funding framework for the establishment of hydrogen distribution networks, an internationally recognised certification system for hydrogen as a commodity and timely decisions at EU level on trans-European hydrogen networks. With a view to the country's dependence on mineral imports, our focus must be on emphatically pushing ahead with the circular economy and material efficiency, carefully weighing up the benefits and drawbacks of increasing raw materials extraction in Europe and diversifying the sources of raw materials by forging new strategic alliances with resource-rich countries. The measures agreed under the EU Critical Raw Materials Act need to be fleshed out and swiftly implemented in close collaboration with the business community, as well as financed with corresponding budget funds.
- **Strengthening international competitiveness:** We need internationally competitive businesses to ensure growth and prosperity in Germany. To achieve this, we need not just productivity growth but good location conditions, which means we need to meet the economic challenges around digitalisation, innovative capacity, labour supply as well as energy and raw materials security. In addition, we need to vigorously drive forward the reduction of administrative burdens, simplify the tax system and invest in the modernisation of Germany's transport infrastructure. The transport infrastructure is increasingly eroding and there is a great need for investment at all levels of administration. For example, improving the structure of municipal finances and simplifying and accelerating complex approval and awarding procedures would contribute to strengthening investment. In designing the transformation to climate neutrality, it is important to avoid disadvantages in international competition and harness opportunities in global markets. Reliable location conditions and planning certainty for investment, faster market penetration of climate-friendly technologies and support for innovation in the area of environmental and climate protection are key prerequisites for this to succeed. Important competitiveness frameworks are set at EU level, so that economic policy measures must be designed in alignment with EU policies and geared to strengthening the EU internal market.

Motivation: Embracing the urgency to act as an opportunity

For the past five years now, Germany has been stuck in a stagnation that is making structural problems more and more visible. As a result, our material prosperity is increasingly threatened. To be sure, some of the risks to the drivers of our growth have been foreseeable for many years now, such as the rapid decline in the supply of domestic labour as a result of the upcoming successive retirement of the baby boomer generation. Over the past decade, however, the need to take action has been obscured by an upswing that was heavily driven by

export demand and bolstered by the rise of China, which was supported by German industrial goods and cheap energy from Russia. The need to take action is now becoming all the more pressing, especially since the rapidly accelerating warming of the Earth is increasing the urgency to make substantial progress in reducing greenhouse gas emissions and, thus, successfully completing the green transition, and the geopolitical shifts are making it increasingly clear that Germany and Europe must take their security and resilience more into their own hands and quickly make up for past omissions.

We must understand the immediate urgency to act as an opportunity to finally tackle structural weaknesses head-on and take effective countermeasures. Only if we succeed in driving change and strengthening Germany as a business location and, thus, the growth of our economy on a sustainable basis can we tackle accelerating climate change and safeguard our prosperity in a changed global environment. This paper illustrates the need for action and provides impetus for solutions to manage the transformation and strengthen growth. It focuses on achieving climate neutrality, driving digitalisation and strengthening innovative capacity, managing demographic change, safeguarding energy and raw materials supplies and strengthening international competitiveness.

Given the wide range of challenges we face, we must pull multiple levers at the same time. The transition towards climate neutrality requires clear guidelines and an economically attractive framework so that businesses and households undertake the necessary investments. Innovation and digitalisation must be advanced both across the broad economy and at cutting-edge level. In order to address the demographically induced labour shortage, government and business must mobilise more of the working-age population, attract skilled migrants, improve education and training and increase labour productivity. Sustainable energy security requires a systematic expansion of renewables, faster approval procedures and the release of sufficient sites for generation. The ramp-up of the green hydrogen industry, which is central to the decarbonisation of industry and parts of transport, requires further political decisions, especially with a view to strengthening demand for hydrogen. Future-proofing the supply of mineral resources requires close cooperation between policymakers and the business community in the implementation of projects from mining to recycling. In order to remain internationally competitive, it is also necessary for Germany to press ahead with reducing bureaucracy and ensuring an efficient transport and communications infrastructure.

1. The starting point: a complex mix of economic and structural challenges

Germany's growth model – built on the export of high-quality capital goods in a multilateral trading system – has long been a success story. Now, it is coming under increasing pressure. The COVID-19 pandemic, the massive supply chain disruptions it triggered, Russia's aggression in the middle of Europe, the ensuing price shock in energy and living costs as well as the European Central Bank's monetary policy response have hit Germany and its important export industry particularly hard. At the same time, geopolitical rivalries continue to intensify, especially between the superpowers USA and China, and the cooperation between the USA and Europe that has grown over decades can no longer be taken for granted. All of this is contributing to persistently high uncertainty. The complex mix of cyclical and structural challenges, as well as the ongoing struggle to find appropriate economic policy responses in a rapidly changing world, are weighing heavily on the sentiment of businesses and households and making them more reluctant to invest. Corporate investments and investments in dwellings, which are also necessary for the transition to succeed, are well below the pre-crisis level of 2019, while Germany's gross domestic product is currently merely on the pre-pandemic level, unlike in other industrialised countries. It is true that public-sector investment, which is of key importance for infrastructure, has developed more positively in recent years than private investment and is now moderately above the pre-crisis level. Nonetheless, as measured against other large industrialised countries, public-sector investment activity remains subdued in relation to economic output and the worsening deterioration of ageing roads, railroads, bridges and tunnels is reflected in the net investment expenditure on public infrastructure which, with the exception of the years 2020 and 2021, has been consistently negative already since 2004.

In location competition, Germany currently offers a mixed picture of strengths and weaknesses. As far as its strengths are concerned, however, it is at risk of losing ground. Germany's strengths include good access to finance even for small and medium-sized enterprises and a generally efficient innovation ecosystem. Businesses still see the availability of skilled labour as a location advantage but it is at risk of eroding due to worsening skilled labour shortages as a result of demographic ageing. The efficiency of Germany's transport infrastructure still receives good marks internationally but it has recently deteriorated sharply. Germany has recently fallen behind in various international competitiveness rankings. Low public investment, a disproportionately high tax burden on investment returns by international standards and high energy costs, especially in comparison with the US and Canada, are a disadvantage in international location competition, as is the administrative burden deplored by many businesses. This is compounded by the vulnerability of supply chains that was brought to light by the crises of the

past years. A growing number of small and medium-sized enterprises fear that their competitive position in international markets will foreseeably deteriorate.

Meanwhile, protecting the natural foundations of life is becoming increasingly urgent and the global changes in society and geopolitics are becoming increasingly clear. Biodiversity is on the decline, global warming and extreme weather events are on the rise all over the world – and therefore so is the pressure to quickly move away from fossil technologies, not just in the automotive sector. At the same time, as the world is becoming increasingly fragmented into blocks, geostrategic considerations are becoming more and more important. Resilience and technological sovereignty are being given more importance than efficiency, protectionist trends and industrial policy are en vogue around the world. Amid scarce public-sector finances, the need to significantly increase defence spending is competing with other important policy objectives. Given the rapid transformation of economies and societies, populist currents are growing. The resulting concerns must be taken seriously and addressed with future-oriented solutions that convince and win people over. Merely turning back the clock, on the other hand, would gamble away the prosperity we have worked hard to build for decades. The time to act is now!

2. Key challenges for German economic policy: Analysis of current situation and recommendations for action

2.1 Managing the transition to climate neutrality

Climate change has the potential to cause significant economic damage – in Germany and Europe. The pressure to act on climate change is rising. The year 2024 was the hottest since record-keeping began and the first year in which, according to EU climate data, the global average temperature was 1.5°C above pre-industrial temperatures. The economic damage caused by the emission of one tonne of carbon dioxide is now estimated at EUR 1,000 and more. This is significantly more than the price of the respective emission right in the European Emissions Trading System, which is currently below EUR 100. This shows that the cost of carbon dioxide for society as a whole is still being insufficiently taken into account, so that supporting tools are needed.

Achieving the interim emissions targets in 2030 is an important milestone and requires further efforts. In 2024, greenhouse gas emissions in Germany were 48% lower than in the reference year 1990. Thus, the annual target was just barely reached, also because of persistently weak output, especially in energy-intensive industry. Projection data published by the Council of Experts on Climate Change, however, shows that the energy and climate-policy measures thus far initiated are insufficient to reach the 2030 greenhouse gas reduction targets (-65% compared with 1990), 2040 (-88% compared with 1990) and 2045 ('net greenhouse gas neutrality'). The need for action is most urgent in the transport and building sector, where the sectoral goals from the Federal Climate Change Act were missed yet again in 2024. The national Fuel Emissions Trading Act that applies to these sectors will be implemented under the European Emissions Trading System 2 (EU-ETS 2) from 2027. The reduction targets of the EU Effort Sharing Regulation, according to which Germany is required to lower its emissions in the non-ETS-1 sectors by 50% on 2005 by the year 2030, apply here as well. On the basis of the current trend, this reduction target is expected to be missed, with the threat of financial burdens looming from billions of euros in necessary purchases of additional emissions certificates.

German enterprises are increasingly addressing the issue of climate neutrality – but still investing too little. Most of the businesses in Germany support the goal of climate neutrality – and undertake corresponding investments. Figures from the KfW Climate Barometer show that the climate investments of the German business sector increased again, reaching EUR 85 billion in 2023. However, with +5% in real terms, the increase was significantly lower than in the previous year. Besides, the growth was essentially driven by large enterprises. They expanded their climate investments again considerably on the previous year (+19% in real terms). At the same time, the generally higher price level, rising financing costs and the economic slowdown have clearly put the brakes on climate investment by SMEs, which decreased by 10% overall on an inflation-adjusted basis in 2024.

Households continue to drive the energy transition forward even though sentiment has dropped slightly. After their willingness to be proactive increased in the wake of the energy crisis, households have become slightly disenchanted with the energy transition. Nonetheless, four in five households still back the whole-of-society project. Furthermore, another 1.2 million households adopted energy transition technologies last year. Overall, around one in three households in Germany currently use a heat pump, photovoltaic system, solar thermal system, home battery, combined heat and power system, wood pellet heating or an electric car. Rates of adoption increased in almost all groups, although previous patterns remain. In the coming years it will be necessary to make attractive offers particularly to low-income households and those residing in multi-family houses and densely populated urban areas to encourage more of them to switch to renewables. In doing so, it will be necessary to prevent social

tensions that might arise through burdens from rising carbon prices. The participation of all groups of the population will be a key element. This can also be achieved by reducing burdens through a climate bonus, for example.

Cost-effectiveness and financing opportunities are key levers for stimulating climate investments.

Uncertainty around the cost-effectiveness of climate investments is being regarded as the main impediment for taking action by households as well as businesses, followed by a lack of financial resources. An important tool to address this is to have a reliable and predictably rising carbon price signal so that the costs of fossil technologies reflect the cost of climate damage and, accordingly, make climate-friendly technologies more cost-effective. The lack of financial resources for implementing climate projects underscores how important it is to provide an adequate financing and support framework, including with subsidies, reduced-interest loans or risk assumption, for the deployment of novel climate technologies. This applies in particular in the current environment of higher interest rates. Furthermore, expanding a suitable offering of financing instruments that boost equity (e.g. equity capital, mezzanine financing) and funding alternatives that preserve equity (e.g. leasing) can help enterprises meet the upcoming financing requirements.

Risk-adjusted financing offers can significantly advance the green transformation. Climate investments are often characterised by complex risk profiles, large investment volumes and long investment horizons. In order to address their financing needs, the full spectrum of available financing tools should ideally be utilised. Businesses currently fund most of their climate investments from their own resources. However, bank financing remains the second most important source of funds for German SMEs. This requires solvent and resilient banks that know and appropriately manage their environmental risks. German banks have usable capital reserves (4.7% of risk-weighted assets). The banks' assessment of climate risks is already having an effect. The EUR 7.7 trillion in financial assets held by households in Germany also constitutes a potential source of finance. Households are also showing a great willingness to use green financial investments. Creating more transparency, simplifying investor information and improving financial literacy can help to direct more of these assets towards the financing of transformation projects. Strengthening capital market finance can also improve the opportunities for funding the transformation. It is therefore important to drive the capital market union project forward in Europe. Lowering transaction costs by more closely integrating financial market infrastructures and bringing about greater uniformity of insolvency and tax laws are important areas of action.

Removing non-financial investment barriers will support the dissemination of energy transition technologies.

On a life-cycle basis, electric vehicles and heat pumps already deliver cost advantages under the current support scheme thanks to technological progress. With regard to heat pumps, for example, the electricity price relative to a fossil-fuel based alternative represents an important key. Affordability concerns raised by households can be allayed by providing cost transparency at the time of investment and by having installers who are familiar with the new technologies and enable optimal installation. Targeted training offers can support this. Businesses also regard lengthy planning and approval procedures as another impediment to investment. This needs to be addressed in order to incentivise significantly more climate investment in the business sector. Not only do processes need to be streamlined in order to speed up approval procedures but the approval authorities themselves also need to have more staff and better technical equipment.

Carbon removal must be developed as an additional pillar of climate policy. Given the current growth in greenhouse gas emissions, it can be assumed that by the middle of the century they will reach a level that will be too high to limit global warming to below 2°, preferably 1.5°C. Sequestering and storing carbon will therefore become an important cornerstone of climate policy along with driving rapid emissions reduction towards zero and adaptation to climate change. It is important to set adequate incentives for the development and use of relevant carbon removal activities. Thus, the public sector could provide grants, premiums or tax incentives to promote research and development. It can also improve the environment for private venture capital. Promotional loans can incentivise pilot projects and the diffusion of carbon removal technologies across the market. In addition, new governance, market and financing structures should be developed to incorporate private capital and establish carbon markets in Germany, the EU and globally that take carbon removal into consideration.

2.2 Driving digitalisation and strengthening innovative capacity

Germany has an effective innovation ecosystem whose strengths lie in academic research and higher-value technology. Germany is generally quite well positioned in international innovation ranking indices. In the current edition of the Global Innovation Index, for example, Germany ranks 9th of 132 countries. The strengths of Germany's innovation ecosystem consist in a strong research sector and pronounced R&D activities in large enterprises. Germany has succeeded in significantly increasing its R&D ratio, that is, R&D expenditure as a percentage of GDP, for the past almost two decades. Its strengths are in automotive engineering, mechanical engineering and

environmental technologies. However, the R&D ratio has not made any further progress since the outbreak of the COVID-19 pandemic. Reaching the 3.5% target – initially aspired to by 2025 – appears to be a long way off.

Germany lags behind in the development of completely new technologies. New technologies, such as information technologies in the US since the 1960s, were hardly developed in Germany. Accordingly, measured by the volume of scientific publications and patents, Germany is lagging far behind the leading countries in the research of technologies that are relevant for digitalisation. It appears hardly likely that it will catch up with them in the short to medium term. This is of concern particularly with regard to digitalisation technologies, as they are seen as having high growth potential while at the same time penetrating deeper and deeper into other technological fields. As a result, Germany is at risk of being prevented from realising important growth potential while falling behind in its traditional strengths. In general, digitalisation often constitutes the technological basis that makes innovation possible in the first place. Digital data therefore represents important input in innovation processes, digital technologies make it possible to develop innovative products and services and improve efficiency and new forms of interaction with customers and business partners accelerate innovation cycles.

The transfer of knowledge and the broad application of digital technologies are areas worthy of improvement. The fact that the share of innovators in the SME sector has been on the decline for almost two decades shows that the broad application of innovations is becoming increasingly rare. Small businesses and enterprises without own R&D, in particular, have ceased innovating. German businesses also continue to occupy only a mid-table position in Europe in the application of digital technologies despite the surge in digitalisation in the course of the pandemic. A systematic, strategy-based expansion of digitalisation is relatively uncommon across the broad private sector.

Innovation and technology policy in Germany is clearly geared to academic research and R&D in businesses, while promotional measures below the R&D threshold tend to be rare. Germany has a differentiated offering of support measures that address all phases and all actors in the innovation process. But the focus is clearly on the early stages of the innovation process and, typically, on R&D promotion. This is corroborated by the fact that R&D-based innovation projects have the greatest spillover effects and that this is where businesses face the most formidable financing challenges. However, non-R&D-based innovations and digitalisation activities are also valuable from an economic point of view. They account for a large portion of innovation success in the SME sector, have a favourable cost-benefit ratio and make an important contribution to the functioning of the innovation ecosystem as a whole. Without advances in innovations and digitalisation on a broad scale, it will not be possible to achieve economically measurable progress in productivity growth and the capacity of the German economy to renew itself will be significantly impaired.

Innovation capacity and digitalisation must be promoted at the cutting edge and across the broad economy. At the cutting edge, capacities for researching technologies of the future must be developed, and Germany's strengths in academic research must be safeguarded. Ground-breaking, mission-oriented components of economic policy and focusing on specific technologies of the future can be helpful in order to encourage fundamental innovations that cannot or are too slow to emerge from the market process in Germany. Identifying appropriate missions and designing specific measures, however, places high demands on economic policymakers. In order to avoid misguided decisions, it is necessary to have a good source of information and well-founded advice without becoming exposed to lobbyism. The strategies developed must have operational visions and be systematically implemented. This includes the allocation of appropriate financial resources. It would be advisable to further expand academic research and, for example, create additional professorships for technologies of the future and make more funds available for the realisation of research projects. Other starting points involve promoting the attractiveness of Germany's academic system to researchers from abroad and the research infrastructure, such as the availability of computing centres for research on AI.

The R&D capacities of businesses also need to be improved. Skills shortages, capacity and financing-related constraints top the list of innovation barriers. Financing difficulties can be mitigated by expanding support for R&D. Public-sector support for R&D in enterprises in Germany tends to be lower than in comparable countries. The special role of businesses that conduct research on a continuous basis suggests that comprehensive incentives should be provided wherever possible to ensure that they preserve their R&D capabilities through broadly effective, technologically open approaches. Technologically specific approaches support the research of new technologies. With regard to the skilled labour required for R&D tasks, it is important to increase the number of university graduates from the relevant technological fields and attract more foreign experts. Expanding academic research also creates better opportunities for cooperation between the private sector and academia and expands the pool of experts for R&D undertaken by businesses.

It is crucial for technology- and growth-oriented start-ups to further improve access to suitable finance.

Technology- and growth-oriented start-ups play a key role for the innovative potential of economies. Establishing new technologies and associated business models in the market is at the core of their business activity. The German start-up ecosystem has grown considerably in the past decade. Often, however, accessing suitable finance in the form of venture capital is still easier in important comparison markets, particularly in the capital-intensive growth phase. Current initiatives such as the Future Fund or the WIN Initiative address this issue. Germany has potential in mobilising institutional investors such as insurers or retirement funds to invest in venture capital. Making progress in the European capital market union is also important in order to create a larger and more liquid market for the financing of start-ups.

Innovative capacity and digitalisation must also be driven forward broadly across the private sector. The bulk of enterprises generate innovations with experience-based skills resulting from informal processes of on-the-job learning and understanding, as well as interactions with the business environment. Businesses also tend to expand digitalisation without own R&D activities. Broad financial support measures must therefore be provided below the R&D threshold. With respect to developing capacity, the first step is to tackle the general shortage of skilled labour. Approaches can range from measures adopted in schools through vocational and academic training and education to activating the domestic workforce and migration policy. The specific recruitment problems in innovative and digitally active enterprises include insufficient social, digital and mathematical/statistical skills and a lack of further additional technical qualifications. Learning processes can be stimulated by advisory services and, where appropriate, financial support for the introduction of appropriate management practices or for improving incentives for innovation or knowledge flows within the enterprise. Regional cluster initiatives also promote exchange between non-R&D-active enterprises. The strategic capacities of businesses also constitute important starting points because strategic orientation crucially determines their innovation and digitalisation efforts. Overall, in the short to medium term it is important that digital technologies be applied within businesses and that applications of digital technologies be integrated into product and service offerings. In order to prevent digitalisation from creating heightened security risks, investments in protecting digital systems will also need to be ramped up.

2.3 Addressing demographic change and expanding the supply of labour

In the coming years, Germany will clearly feel the effects of demographic change and this will have a massive impact on the labour market. As baby boomers increasingly exit the workforce in the coming years, the domestic labour force in Germany will shrink more and more while the number of people of retirement age will grow considerably. Without an adequate response, this will further exacerbate the shortage of skilled labour. In the median population scenario of the Federal Statistical Office, the population aged 15 to 64 would shrink by 2.1 million (4%) while the number of people aged 65 and older would grow by 2.5 million (13%) by the year 2035.

The skilled labour shortage will worsen as a result. To be sure, it has eased in most cyclically sensitive sectors owing to the economic slowdown of the past few years. But according to the recent KfW-ifo Skilled Labour Barometer, in October 2024 skills shortages were still affecting operations in 32% of businesses and 39% of enterprises in the services sector. In its analysis of bottlenecks for the end of the year 2023, the Federal Employment Agency classified around 40% of skilled occupations as shortage occupations, among them occupations in the areas of energy technology, IT and software development, healthcare and nursing, as well as construction.

The number of job seekers is currently three times higher than the 1.3 million vacant positions. This shows a mismatch that is often due to the qualifications offered. In particular, there are far more unskilled workers looking for jobs than there are unskilled job vacancies. This mismatch can worsen unless steps are taken to address it. It is conceivable that both unemployment and demand for skilled workers rise, as the green and digital transition entails further structural change that is shifting the sought-after qualifications further from the industrial to the services sector. This also shifts the demand for skills and it is to be expected that existing qualifications will often no longer meet the demand in the future. Training and education are becoming increasingly important for the response, combined with career flexibility. In order to reduce the skills shortages, however, more needs to be done.

Germany must mobilise more employable people in order to meet the demographic challenge. As of now, Germany still has a good supply of skilled workers. But we need greater labour force participation and demand-oriented qualifications to secure our prosperity and manage the digital and climate-neutral transition. There is particular potential for mobilising women and employable people in the age group of 63 to 75 years to join the labour force. In addition, the public and private sector can both make a greater effort to upskill unemployed and low-skilled workers in line with their needs and integrate them into the labour market.

The public sector, business and training providers must further improve the incentives, motivation and provision of skills needed for people to engage in qualified work. Appropriate avenues include demand-

oriented training and an educational culture that encourages self-driven lifelong learning as a goal worth aspiring to and counts on support from the public and private sector. Furthermore, we need to expand child daycare and professional nursing care to better reconcile work and family life, reduce shortages of educators and teachers and offer attractive partial retirement arrangements and occupational healthcare. In 2022, the Federal Government already adopted an employment, skills and workforce strategy that targets these leverage points. This must be built upon and further developed appropriately.

Germany must increase productivity growth because its weak productivity development raises the need for skilled workers and hampers economic growth. This requires innovations and investment in physical assets and human capital. Digitalisation and AI offer promising opportunities to reduce the need for scarce skilled workers through automation. Businesses and administrations are behind and need to catch up. The skills shortage is a common impediment here. Strengthening productivity growth and digitalisation requires support for innovation, innovative start-ups and an expansion of the venture capital market. In addition, more young people must be motivated to take up STEM occupations. The percentage of women here is still low. The IT skills of SMEs must be improved because the shortage of skilled IT workers is hampering digitalisation.

Germany must become more attractive for skilled workers from other countries. In the past years, the growth in the number of people in employment was driven almost exclusively by foreign workers. We must do more to attract and integrate skilled workers from other countries into the labour market and society. Third countries outside Europe are becoming more and more important for this because the other EU states are facing a similar demographic trend as Germany until 2050. Stifling bureaucracy needs to be removed, good German language skills must be taught early, workers need to be trained in line with demand where required and all sides need to work on integration. The Skilled Immigration Act is a first step that makes immigration to Germany easier and more transparent for skilled workers and improves the conditions for integrating into the labour market. Businesses and public-sector employers should make use of the improved framework. Where skills are lacking, businesses and training centres must upskill workers. The share of unskilled and unemployed workers is significantly higher among employable foreigners than Germans and their labour force participation is much lower. Besides, attractive prospects for remaining in the country must be created. These include affordable housing and child daycare opportunities.

2.4 Securing a sustainable supply of energy and natural resources

Achieving climate targets and securing Germany's energy supply depends entirely on the availability of sufficient electricity from renewables. Russia's war of aggression against Ukraine and the resulting risks to Germany's supply of fossil fuels have shown that expanding renewables is not just necessary for the climate but is also an important strategic key to Germany's energy security. In recent years, the expansion of renewables has significantly gained momentum through, among other things, speedier approval procedures, requirements for the allocation of land for wind generators, improved support conditions and falling prices of solar modules. In 2024, the share of renewables in gross electricity consumption grew to 55%, an increase of around 9 percentage points since the year 2022.

The challenges remain large: Electric vehicles, heat pumps, electrolyzers and low-carbon industrial production are expected to more than double today's electricity demand by 2045. Under the Renewable Energy Sources Act (EEG) of 2023, domestic onshore wind generation capacity is to nearly triple and photovoltaic (PV) solar generation is to more than quadruple between now and 2040. Offshore wind generation capacity is also to increase nearly eightfold by 2045. In order to maintain the momentum of renewables expansion, the forthcoming reform of the EEG must consider not just cost efficiency and improved market integration of renewables but also investment security, further streamlining approval procedures and the allocation of sufficient land for the expansion of renewables.

As more electricity from weather-dependent, intermittent renewables is fed into the grid and conventional power plant output declines, further measures are required in order to align electricity demand and supply as closely as possible. This includes, in particular, accelerating grid expansion, increasing electricity storage capacity and making electricity demand more flexible. In order to cover the residual load, there is a need for early investment in gas power plants that can one day run on climate-neutral hydrogen. The regulatory framework must be created or adapted so that the necessary investment can be undertaken. There is also a particularly high need to invest in expanding transmission and distribution lines in electricity grids, which will amount to EUR 420 billion by 2037, according to estimates by Dezernat Zukunft. Expanding the transmission grid alone will require annual grid investments of the recent past to almost triple by 2037. Given the grid operators' high need for capital, which cannot be mobilised via the market in a sufficient volume within the existing regulatory framework, legislators must develop solutions to finance the upcoming investments.

Green hydrogen from electricity is a key building block for achieving climate neutrality in Germany. It is essential for decarbonising industry, parts of the transport sector and as a seasonal storage medium to secure electricity and heating supply in prolonged phases of low wind and solar electricity feed-in. The ramp-up of green hydrogen is still in an early stage – in Germany and around the world. Owing to market failure and the chicken-egg conundrum in establishing generation, demand and transport capacity, political direction and economic incentives are key to a coordinated ramp-up. Important foundations for accelerating market ramp-up were created with the most recent decisions on the creation and funding of the hydrogen core network, the launch of tenders for the climate protection agreements and the issuance of funding notifications on follow-up financing for hydrogen-relevant IPCEI (Important Projects of Common European Interest) projects. The need for action, however, remains high. Necessary measures include, for example, a regulatory and funding framework for the establishment of hydrogen distribution networks and hydrogen storage facilities, as well as an internationally recognised proof of origin and certification system for hydrogen as a commodity. In addition, creating reliable demand is a prerequisite for further investment on the supply side. Looking ahead, Germany will be heavily reliant on green hydrogen imports. Approaching potential exporting countries early is therefore important. Furthermore, timely decisions will need to be made at EU level on the planning and funding of trans-European hydrogen networks.

Germany is also heavily dependent on imports of many minerals used in technologies of the future.

Because of the high geographical concentration of raw material extraction and processing and the resulting risks, vulnerable supply chains face high future demand for specific raw materials in the course of the green and digital transition. A study conducted by IW Consult and Fraunhofer ISI on behalf of KfW (2024) illustrates how highly dependent value creation in Germany already is on specific raw materials. For example, around 30% of gross value added in manufacturing is based on the production of goods containing copper, 10% of goods containing lithium and 22% of goods containing rare earths.

The green and digital transition will significantly increase global demand for both bulk metals and special metals. At the same time, global competition for raw materials that are of strategic importance for the production of relevant key technologies is growing. Based on the climate action measures already existing or announced worldwide, the International Energy Agency expects total global demand for mineral resources for climate-friendly energy technologies to double from the current level by 2030. Against this background, securing a resilient future supply of raw materials is imperative in order to achieve Germany's climate targets as well.

In order to reduce the dependency on raw material supplies and the associated risks for Germany and Europe, it will be critical to adopt cross-cutting measures that strengthen resilience and competitiveness as well as raw material-specific approaches. We must forcefully push ahead with the circular economy and material efficiency, carefully weigh up the benefits and drawbacks of increasing raw materials extraction in Europe and diversify the sources of raw materials by forging new strategic alliances with resource-rich countries. This will include paying close attention to international environmental, social and human rights standards. Transparency-building measures therefore deserve particular emphasis. What remains to be noted is that raw materials sovereignty in Germany and Europe cannot be had for free. Policymakers and the business community must jointly weigh up cost efficiency against greater supply security.

With their raw materials strategies and initiatives, the EU and Germany have already taken important policy decisions for a more future-proof raw materials supply. With the EU Critical Raw Materials Act (CRMA) that entered into force in 2024, the EU for the first time established guidelines for strategically important raw materials, both for expanding extractive capacities and processing and recycling capacities within Europe and for diversifying sources of supply. Now more than ever, the agreed measures need to be fleshed out and swiftly implemented in close collaboration with the business community, as well as equipped with corresponding budget funds. The agreement with the Mercosur states that is to be put to the vote in the context of the Global Gateway Initiative is also intended to strengthen raw materials supply security. At federal level, the Raw Materials Fund established by the Federal Government and managed by KfW is expected to make an important contribution to the supply security of Germany and Europe through the promotion of projects in the areas of mining, processing and recycling both at home and abroad.

2.5 Strengthening international competitiveness

We need internationally competitive businesses to ensure growth and prosperity in Germany. This requires us to have good location conditions and, therefore, to meet the economic challenges. With an exports-to-GDP ratio of 43% and an imports-to-GDP ratio of 39%, Germany is a very open economy for its size. The international networks of value-added trade have significantly contributed to growth and prosperity in the past. Some 27% of domestic value added goes to meet final demand outside Germany's borders and around one in four jobs in Germany depend on exports. Businesses need favourable location conditions in order to maintain their

edge over foreign competitors and contribute to value added and employment in Germany in the future. Germany has some strengths but these are at risk of eroding. Germany has recently fallen behind in various international competitiveness rankings. Not only large enterprises are demanding better conditions. Small and medium-sized enterprises, too, are increasingly concerned about Germany as a business location and their own competitiveness. Around 29% of SMEs that compete with foreign enterprises expect their competitive position to deteriorate in the next three years. By pushing ahead with digitalisation and strengthening innovative potential, safeguarding the supply of labour, energy and raw materials, Germany is taking steps to remain an attractive location. Beyond this, however, there are other ways in which international competitiveness needs to be strengthened.

In order to strengthen Germany's location competitiveness, relentless efforts must be made to tackle bureaucracy. Enterprises perceive bureaucracy as a significantly greater risk to their competitiveness at their German location. Bureaucracy is a prerequisite for rules-based trading that provides legal safety and enables fair economic management. However, growing bureaucracy increases the risk that the costs outstrip the benefits. To be sure, the administrative burden index measured by the Federal Statistical Office, which describes the effort involved in dealing with classic 'red tape' (such as filing applications, submitting reports, providing evidence) shows that the burden is lower today than just a few years ago. At the same time, however, the more broadly captured compliance costs incurred from meeting legal requirements have continued to increase, as identified by the National Council for the Review of Legal Norms in its latest 2023 Annual Report. In order to cut bureaucracy, there is a need to reduce complexity, increase the speed of procedures, digitalise processes and improve the customer orientation of the administrative authority. Information and reporting obligations must be examined for the burden they indirectly place on small and medium-sized enterprises as well – irrespective of whether they formally apply only to larger enterprises.

Germany must also invest in modernising its transport infrastructure. Without efficient road and railway networks, waterways, seaports and airports, a production that is based on the division of labour and cross-border trade is unthinkable. Although Germany's transport infrastructure is still regarded as good, it is increasingly eroding and there is a great need for investment at all levels of administration. To a considerable extent, this also affects local government, where the perceived backlog of investment in transport infrastructure amounted to some EUR 48.3 billion in 2023, EUR 9.7 billion more than the year before. Structural improvements to municipal finances would help strengthen investment. There is also a need to simplify and speed up complex approval and awarding procedures in order to drive investment in transport infrastructure.

In structuring the transition to climate neutrality, it is important to avoid disadvantages in international competition and harness opportunities in global markets. Transformative processes go hand-in-hand with profound changes that present many opportunities for businesses but which are also daunting for some. In order to create acceptance and gain support for the transformation, it is important to harness opportunities and avoid possible risks. This also applies to the transition of the private sector to climate neutrality. The far-reaching changes in the economic and regulatory environment are a particular challenge for businesses that compete vigorously with international rivals. Around 150 nations have now committed to the goal of net zero. This will make green markets the lead markets of the future. Growing demand for climate technologies and greenhouse gas-neutral products potentially opens up considerable opportunities for growth and employment for German enterprises. Large enterprises mostly see the transformation of the German economy as a positive with a view to their own competitiveness and most of them expect the green transformation to make Germany a more attractive location for business. However, particularly among SMEs there is concern that environmental and climate regulations might become a risk for their own competitiveness. So long as important EU trading partners continue to have a significantly lower level of climate ambition, effective protection from competitive disadvantages is needed, especially for energy-intensive industries. The Carbon Border Adjustment Mechanism recently introduced by the EU and the planned contracts for difference – state subsidies to the operating costs of climate-friendly production processes – go in this direction. At the same time, the opportunities of the transformation must also be made accessible for small and medium-sized enterprises. This will require reliable location conditions and planning certainty for investment, faster market penetration of climate-friendly technologies and support for innovation in the area of environmental and climate protection.

Economic policy measures must be aligned with EU policies and geared to strengthening the EU internal market. Important conditions for the international competitiveness of German enterprises are established at EU level, such as the Carbon Border Adjustment Mechanism, but also international trade agreements that make it easier for enterprises to pursue diversification strategies to make their supply relationships more resilient. At European level, initiatives such as the European Economic Security Strategy address the fact that national security interests now play a greater role in international economic relations than just a few years ago. The European Chips Act and the Critical Raw Materials Act account for the fact that countries outside Europe, too, are working to make their businesses and economies competitive and at the same time resilient in the changed geo-economic

conditions. It is important to advance and contribute to shaping these initiatives. A strong EU internal market also needs good financing options and an efficient allocation of financial resources, for which it is important to develop the capital market union further. In order to rise up to the challenges of international competition, cohesion between the EU member states and the development of the EU internal market are vital. For Germany, a clearly pro-European position is therefore key.

3. Outlook: Shared responsibility for growth and prosperity in Germany

Policymakers are called upon to introduce necessary structural reforms with courage and determination. Suitable frameworks need to be created and incentives set in order to meet the challenges outlined.

Completing the transition to climate neutrality and adapting to climate change, driving digitalisation and strengthening innovative potential, managing demographic change and securing the supply of labour, ensuring a sustainable supply of energy and raw materials, strengthening international competitiveness and modernising the infrastructure – in order for this to succeed, policymakers must create suitable frameworks, set incentives and implement effective support measures. Important levers and possible solutions were laid out in the preceding chapters. In order for businesses and households to respond to these incentives and opportunities, economic policymakers face the task of designing measures and regulations coherently and with a reliable perspective and, where necessary, setting priorities. This also requires them to take reciprocal interactions between measures into account and carefully configure instruments in such a way that they mobilise the creative forces of all actors, enable broad participation and mitigate social hardships in the transition process. Simplifying the complex tax system and future-proofing the pension system contribute to this goal as well.

Private stakeholders, too, are called upon to adapt to the changed environment, harness opportunities and mitigate risks. Businesses are responsible for further developing business models and designing growth strategies, revising and adapting their value chain relations and supply chains as well as implementing necessary investments and innovations. Opportunities in growing markets at home and abroad arise from, for example, demographic change, digitalisation, climate action and environmental protection. If businesses set up efficient and resilient relations with their suppliers, this will reduce risks from adverse events. Even if businesses already have an own interest in responding flexibly to the challenges, there is still room for optimising relevant approaches.

Germany has the potential to successfully tackle the existing structural challenges. The German economy has proven its capacity for renewal time and again, most recently in the first decade of this century, in which Germany transformed itself from 'sick man of Europe' to 'European powerhouse'. The change process that is now necessary involves substantial investment from the private and public sector. It also requires citizens to be more willing and quicker to adapt – whether by participating more in the workforce, by pursuing continuous learning and training, or by reducing their own energy consumption. In order for the necessary changes to be implemented successfully it is therefore decisive to find a broad consensus on reforms in society and strengthen people's faith in the success of the measures.

Appendix: Further reading

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