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COMMISSION STAFF WORKING DOCUMENT

2024 Country Report - Germany

Accompanying the document

Recommendation for a COUNCIL RECOMMENDATION

on the economic, social, employment, structural and budgetary policies of Germany

{COM(2024) 605 final} - {SWD(2024) 600 final}

European Commission

Germany

2024 Country Report

#EURO at 25

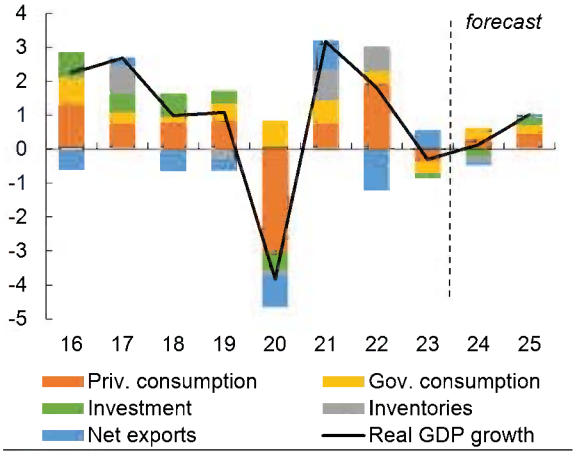
Germany's economy is facing bleak growth prospects

After a recession in 2023, Germany's growth prospects remain weak ([1]). In 2023, GDP contracted by 0.2%. In 2024 and 2025, Germany is expected to have the lowest GDP growth in the euro area at 0.1% and 1.0%, respectively. Fiscal policy conditions have tightened. Investment is also affected by the high interest rates and set to remain below pre-pandemic values. However, consumer spending is likely to give a boost to the economy as households are expected to benefit from real wage increases and see their purchasing power rise. Given signs of a recovery in global economic activity, German exports are expected to recover somewhat in late 2024 but to rise broadly in line with imports (see Graph 1.1).

Economic output has returned to its pre-pandemic level, but only barely. Germany stood above its Q4 2019 level in Q4 2023 by only 0.1%. This puts Germany's recovery since the COVID-19 pandemic at the lower end of the scale of EU countries (Graph 1.2). In 2023, consumer spending and investment were still below their pre-pandemic levels.

Inflation continues to abate. It is projected to reach 2.6% in 2024 and 2.4% in 2025, down from a peak of 11.6% in October 2022. This mainly reflects the wholesale price of gas and electricity decreasing from historic highs. However, the phase-out of energy measures and higher fuel costs are expected to contribute to overall inflation in 2024 and 2025. The main driver of inflation in 2024 and 2025 is forecast to be the service sector, as wage increases will have a temporary inflationary effect. After significant losses in 2022, real wages started to stabilise in 2023. Real wage growth is expected to accelerate as more wage negotiations reflect the recent inflation peak.

Graph 1.1: **Components of GDP growth**



in per cent

Source: Eurostat, European Commission

The labour market has been particularly robust but there are significant labour shortages. In spite of limited growth, the German labour market has proven resilient. In 2023, the unemployment rate remained at 3.1%, below the job vacancy rate of 4.0%, and well below the EU unemployment rate at 6.1%. However, significant regional disparities remain in terms of unemployment (Annex 17). This strong performance also means that labour shortages remain particularly high, and they are expected to persist given the accelerating demographic ageing. The high share of women working part-time and lower labour market outcomes of people with a migrant background are additional constraints (Annex 14). Hours worked per person employed are among the lowest in the EU at 1 342 hours, and they fell by a further 0.3% in 2023. Labour taxation

([1]) The cut-off date for the data used to prepare the 27 Country Reports was 15 May 2024.

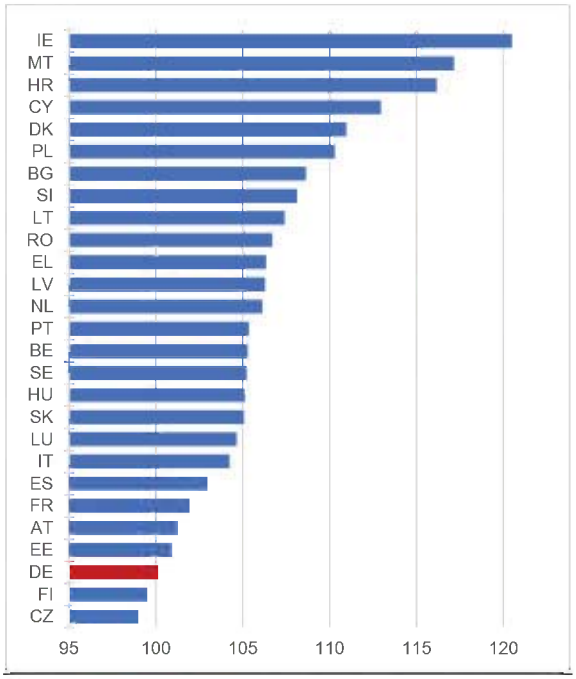
continues to provide weak incentives to increase hours worked (Annex 19). As labour shortages persist, firms are retaining workers even if they are in economic difficulty. From 2022 to June 2023, 15-20% of German companies hoarded labour, the highest share in large EU economies ([2]). Over time, significant labour hoarding may limit the capacity of the economy to adjust.

The current account surplus has rebounded but is expected to remain below the pre-pandemic level. Recent trends are assessed in the in-depth review for Germany ([3]). The current account surplus bounced back from 4.2% of GDP in 2022 to 5.9% in 2023. This reflects a gap between savings and investment, which is sustained by a slow recovery of private investments and consumption. Yet, it is not expected that the current account would increase back to the pre-pandemic peak of 8.2% of GDP in 2019. The in-depth review also shows that the tradeable sector is retrenching, and external competitiveness is challenged, as reflected by a declining global export market share.

External factors and structural vulnerabilities weigh on Germany's competitiveness

Geopolitical tensions, high energy prices and technological shifts have affected Germany's economy. In the past, Germany's strong industrial base was a major driver of economic growth. However, the share of manufacturing in gross value added has fallen since 2016 (from 22.9% in 2016 to 20.8% in 2023). Germany is particularly vulnerable to geopolitical developments given its export-focused industry and high degree of integration in global value chains. Some industries, particularly the automotive sector, have struggled to shift to sustainable and innovative technologies (Annex 12). High energy prices have compounded the decline in the industrial base, leading to a substantial reduction in output from energy-intensive industries. Overall, manufacturing is no longer driving growth as it used to, and no other sector seems to fully fill the gap.

Graph 1.2: **GDP in Q4 2023 compared to Q4 2019**



Source: Eurostat

To achieve sustainable growth, it is crucial to move ahead with the green transition and decarbonise the economy. Germany quickly diversified its energy supply away from Russian gas imports, reducing its gas demand between August 2022 and January 2024 by 16% (Annex 7), while ensuring security of supply. The country increased imports from the European Economic Area and put three floating storage regasification units into operation. Germany also plays an important role in both the supply of and demand for clean technologies. It is one of the leaders on eco-innovation and performs strongly both in absolute numbers and in the share of green patents (Annex 5). However, in 2022, its share of renewable energy in gross final energy consumption - at 21% - was still below the EU average of 23%

([2]) VoxEU, 2024, *A new survey-based measure of labour hoarding in the EU*, cepr.org.

([3]) European Commission, 2024, *In-Depth Review for Germany*, SWD(2024) 101 final; economy-finance.ec.europa.eu.

(Annex 7). Grid expansion and reinforcement are needed to integrate additional renewable energy and to give business greater planning predictability.

Box 1: Germany's competitiveness in brief

Germany maintains a high level of competitiveness driven by a diversified economy with a strong industrial base and dynamic small and medium-sized enterprises (*Mittelstand*). The level of labour productivity is high, and Germany benefits from a high degree of trade integration, especially into the single market. Although it is mostly driven by large firms, Germany still performs well on innovation in comparison with its EU peers. However, competitiveness challenges remain:

- **shortages of skilled labour and low education outcomes** limit the potential for growth, hinder the green and digital transitions and are a bottleneck to investment;
- **obstacles to investment** such as a high administrative burden and lengthy planning and permitting procedures are barriers to progress on the green transition and productivity-enhancing investments, particularly in research and innovation;
- **the slow pace of digitalisation of the public administration and gaps in the digital infrastructure** are a drag on productivity.

Demographic change is accelerating, and the lack of qualified staff is the number one concern voiced by companies. The working age population is expected to decline more in Germany than in other EU countries, with the population aged 20-64 falling from 50 million in 2023 to 46 million by 2035 ([4]). Since 2015, 2.6 million net new jobs have been created, and the employment of foreign nationals has increased by 2.3 million. Still, in 2023, 60.9% of people aged 20-64 with a non-EU nationality were in employment, compared to 83.8% for German citizens. Germany has taken steps to facilitate the arrival and integration of skilled migrants. The Law on the further development of immigration of skilled workers entered into force in three stages (November 2023, March 2024, June 2024), reducing the earning threshold and facilitating the recognition of foreign qualifications.

The slow pace of digitalisation, limited administrative capacity and worsening education outcomes are additional drags on future growth. The digitalisation of public services is progressing slower than in other Member States and there is still a high backlog in building digital infrastructure, despite recent progress (Annex 10). This curbs Germany's competitiveness as a business location and limits companies' ability to make productivity gains through digitalisation. The digital transition is also limited by a shortage of skills, particularly in profiles relevant for the green and digital transitions. In addition to demographic change, low education outcomes and a high share of young people leaving school early are other factors that aggravate labour shortages, undermining productivity and growth (Annex 15).

These structural challenges are reducing Germany's overall competitiveness. In the global competitiveness ranking produced by the International Institute for Management Development, Germany fell from 6th to 22nd place in less than a decade. It ranked even lower on aspects such as tax policy, prices, attitudes and values and on basic and technological infrastructure (Annex 12).

(4) European Commission, 2023, *2024 Ageing Report. Underlying Assumptions and Projection Methodologies*, economy-finance.ec.europa.eu.

Germany performs relatively well on implementing the European Pillar of Social Rights, but challenges persist in terms of equality in education and access to training, employment and housing (Annex 14). Almost 1 out of 4 children were at risk of poverty or social exclusion in 2022, putting Germany far behind its national target of reducing the number of children living in (quasi-)jobless households by 300 000 until 2030. Socio-economic background has a strong impact on education outcomes and labour market integration. The share of children below the age of 3 enrolled in formal childcare is below the EU average, hampering

full-time employment of women and equal opportunities for children. The share of young people leaving school early, is high and now exceeds the EU average. The level of digital skills remains below the EU average. Despite house prices falling from their peak in 2022, housing affordability has not improved as rents and interest rates have increased. The share of people living in households with housing costs above 40% of their disposable income increased to 11.9% in 2022, above the EU average of 8.7% (Annex 12 and 14).

The debt brake will lead to further fiscal consolidation, while public investment remains constrained

2024 is the first year where the national debt brake will be fully applicable since it was created in 2009. The debt brake limits new borrowing from the federal government to 0.35% of GDP and it prohibits any new borrowing at Länder level ([5]). Until 2020, the debt brake was in a phasing-in period. In response to the COVID-19 pandemic and the energy crisis, the government activated the national emergency clause in 2020 and suspended national fiscal rules until 2024. Full reactivation of the debt brake requires strong consolidation of government finances and limits the government's ability to make public investments and other productive spending.

At the same time, a ruling issued by the constitutional court constrains the available fiscal space by limiting the use of extra-budgetary funds. When the emergency clause was activated from 2020 to 2023, the German government sought to increase its available fiscal space by

Box 2:

UN Sustainable Development Goals (SDGs)

Germany performs above the EU average and is further improving on most SDGs related to productivity (SDGs 8 and 9) but needs to catch up with the EU average on quality education (SDG 4). Germany has a robust labour market with high employment, low levels of long-term unemployment and a declining number of young people not in education, employment or training (NEETs). Although Germany's investment share of GDP is slightly below the EU average, it has some of the highest R&D spending in the EU. Germany is below the EU average and moving further away on SDG 4 (quality education), which hampers economic growth and competitiveness. Worsening education outcomes, a high number of young people leaving school early and weak basic digital skills risk exacerbating the skills shortages (Annex 1).

Out of the 17 indicators, 5 SDGs remain below the EU average. These relate to quality education (SDG 4), environmental sustainability (SDG 13) and fairness (SDGs 5, 7 and 10).

([5]) For details on the debt brake see: Bundesministerium der Finanzen (BMF), 2022, *Kompendium zur Schuldenregel des Bundes*, bundesfinanzministerium.de.

repurposing credit authorisations and using extra-budgetary funds ("special purpose vehicles"). On 15 November 2023, the constitutional court annulled such practices, arguing that they circumvented the fiscal rules of the debt brake. This further limits the scope for government spending, including public investments.

In recent years, new needs have required additional funding. Since 2020, over EUR 100 billion have been transferred yearly from the federal budget to the pension system, constituting around 23% of the federal budget and around 32% of pension expenditure in 2022 ([6]). In 2022, the government created an EUR 100 billion extra-budgetary fund to increase defence spending.

Overall, public investment remains constrained in Germany. It has been below the EU average for the past two decades. From 2000 to 2022, Germany had a public investment ratio of 2.2% of GDP against the EU average of 3.2%. Combined with recent difficulties in raising private investment, this may have a long-lasting impact on the country's growth prospects.

([6]) Bundesministerium für Arbeit und Soziales (BMAS), 2023, *Rentenversicherungsbericht 2023*, bmas.de.

IMPLEMENTATION OF KEY REFORMS AND INVESTMENTS USING EU INSTRUMENTS

Funding from the Recovery and Resilience Facility (RRF) and cohesion policy funding is mutually reinforcing Germany's efforts to boost its competitiveness and foster sustainable growth. In addition to the EUR 28 billion of RRF funding (Annex 3), cohesion policy provides Germany with EUR 19.9 billion for the 2021-2027 period. Combined support from these two instruments is equivalent to around 1.2% of GDP, against the EU average of 5.4% of GDP (Annex 4).

Under its recovery and resilience plan (RRP), Germany has launched important policy measures that are expected to boost the country's competitiveness. In particular, the RRP includes measures to ease the bottlenecks to investment, modernise the public administration, support the green and digital transition as well as improve on education and skills. However, given the limited size of the RRP, further action is needed to tackle key challenges and boost competitiveness (Section 3).

The implementation of Germany's RRP is significantly delayed. Germany has submitted one payment request, corresponding to 36 milestones and targets in the plan and resulting in an overall disbursement of EUR 4 billion on 28 December 2023 (see Annex 3). Challenges concern the allocation of sufficient resources to the management of the RRP.

Cohesion funding helps tackle Germany's growth and competitiveness challenges and reduce the country's territorial and social disparities. Under the 2014-2020 programming period, support focused on the areas of research and innovation, renewable energy and social cohesion. For the 2021-2027 programming period, support focuses on these same areas and on improving living and working conditions. The priorities set out in the European Regional Development Fund (ERDF) and European Social Funds Plus (ESF+) 2022 programmes remain valid (Annex 17).

Easing investment bottlenecks

Germany's RRP contains measures that will help tackle the regulatory bottlenecks to investment. The reforms in the RRP are important steps to accelerate planning and approval procedures for transport and to help municipalities make further investments. Progress on the planned initiatives and additional action to lower the barriers to investment could help improve the overall framework for private and public investment, including swift and effective use of both EU and national funds (see Section 3).

Unlocking green investments

Germany has taken steps to decarbonise its economy and industry. Under its RRP, Germany is investing in the green hydrogen value chain to help decarbonise the economy. The RRP contributes to accelerating the market uptake under the important projects of common European interest initiative. To complement this, the ERDF provides support to two hydrogen model regions (Annex 4).

Under the RRP, Germany has started making investments that promote climate-friendly transport. The RRP has provided financial support to businesses and individuals to buy 240 000 electric or low-emission cars. The roll-out of charging

infrastructure has started. The investment framework supporting the shift to low-emission buses has also been adopted.

With the help of RRF funding, residents receive support to make energy-efficiency renovations. The RRP finances a large-scale renovation programme to increase the energy efficiency of residential buildings, while complementary support is provided by the EDRF for the energy renovation of public and social infrastructure, businesses and research institutes.

Supporting the digital transition

The RRP is helping Germany invest in the digitalisation of its public services. It supports a national reform to digitalise administrative services. 70 public services have been made available online under these RRP measures. In total, businesses and individuals will benefit from full digital use of 100 of the most important Länder services and 115 federal services.

The RRP also supports strategic cross-border digital investments. It funds investment in microelectronics and communication technologies, contributing to a large-scale cross-border European initiative to improve the EU's capabilities in electronics design. The RRP is contributing to a large-scale European initiative to foster the industrial deployment of smart cloud and edge solutions.

Investing in people for economic growth and social resilience

The RRP supported research into and the development of vaccines against COVID-19. This contributed to the development and roll-out of the successful BioNTech vaccine. Germany supplied 165 million BioNTech vaccine doses, more than 70% of all supplied vaccines. Worldwide, 3 billion doses of the BioNTech vaccine were produced in 2020.

Germany is investing in the digitalisation of its health system. Under its RRP, Germany is modernising hospitals and local health administrations to improve their digital infrastructure, emergency capacities, tele-medicine, robotics and IT and cyber security. This complements ERDF programmes by supporting e-health services to reduce the regional differences in access to healthcare.

Complementary action using EU instruments improving early childhood education and care (ECEC) and whole-day schooling. Under its RRP, Germany is creating 90 000 additional ECEC places by building new facilities and refurbishing existing ones. To complement this, Germany's ESF+ operational programmes fund training for childcare staff and increase the supply of whole-day schools.

Germany is implementing reforms and investments enhancing digital teaching and learning. Under its RRP, to facilitate digital teaching, Germany is equipping teachers with mobile digital devices and providing scientific content for centres of competence in digital education.

EU funds provide support to young people entering the labour market.

Box 3:

Combined action for more impactful EU funds

To boost economic growth and maximise the impact of EU funding, Germany's RRP includes reforms that support investments under other EU instruments, creating important synergies and complementarities between action under the different funds. For example, to reduce CO_2 emissions in the transport sector, Germany's RRP promotes the purchase of purely electric vehicles by providing a ten-year tax exemption. Germany is combining this RRP reform with ERDF and RRF-funded investment in sustainable interconnected transport solutions to link different modes of transport seamlessly. This will increase the joint impact of the various measures.

Under its RRP, Germany has provided financial support to keep at least 70 000 apprentices in employment. To complement this action, ESF+ programmes support young people with a migrant background to develop skills and take up apprenticeships.

FURTHER PRIORITIES AHEAD

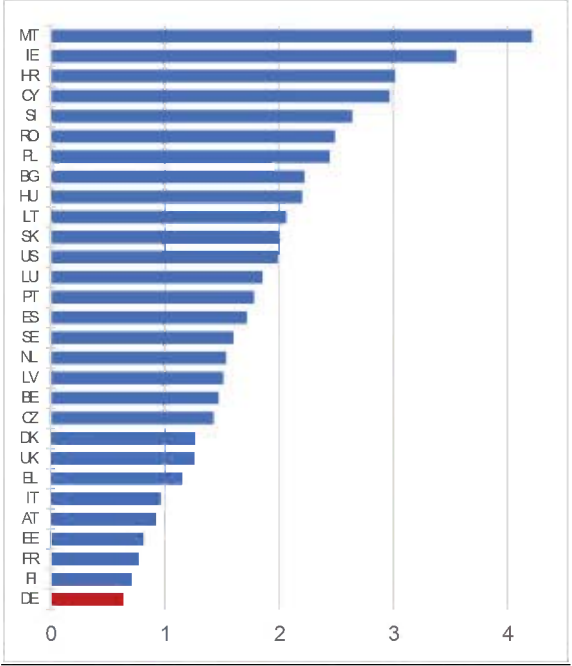
Germany's economic model faces multiple challenges related to obstacles to private investment such as high administrative burden, public investment needs, digitising the public administration and improving the digital infrastructure. Tackling skills and labour shortages, keeping up the momentum on the green transition and modernising the pension system are also urgent priorities. Achieving growth that is more inclusive, sustainable and competitive will require reassessing the tax mix. Tackling these challenges will help boost Germany's long-term competitiveness and ensure the resilience of its economy. It will also help make further progress in achieving the UN Sustainable Development Goals.

It is important that the identified challenges are addressed both at the national and regional level to reduce regional disparities and improve the administrative and investment capacity in a balanced way across the country.

Enhancing public investment and removing obstacles to private investment are key to boosting competitiveness

Low potential growth also reflects a lack of investment. Germany is forecast to have the lowest potential for growth in the EU in the coming years (Graph 3.1), at 0.8%. The projected decline in the working age population will be a significant drag even if further measures are taken to increase the labour supply. So far, investments have not been enough to offset the reduction in the workforce by raising productivity growth and building up capital ([7]).

Graph 3.1: **Estimated average yearly potential growth, 2023-2028**



Source: Commission spring forecast 2024

Obstacles to private investment persist. The main barriers to investment reported by firms are the availability of skilled staff (92%), energy costs (89%) and uncertainty about the future (77%). Firms in Germany report more often than the EU average that business regulations (69%) and the lack of digital infrastructure (52%) are barriers to investment ([8]). In a survey from 2023, 92% of firms reported that they perceived a substantial increase in the bureaucratic burden in recent years and as a result, 58%

([7]) Higher public and private investment spending would also help to address the investment-savings-gap as outlined further above.

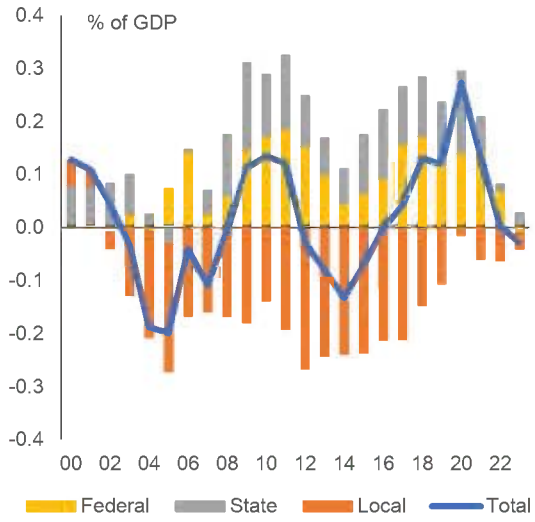
([8]) European Investment Bank (EIB), 2023, *EIB Investment Survey 2023: European Union Overview*, eib.org.

plan to avoid investing in Germany in the future ([9]). The federal government has taken several measures to improve the business environment by reducing bureaucracy and providing incentives for investment. For example, the Growth Opportunities Act entails greater scope for depreciation or loss offsetting (Annex 19). However, the volume is small (EUR 3.2 billion or 0.1% of GDP), and the administrative simplifications only provide marginal relief to specific sectors ([10]). Easing the business regulations that restrict access to certain services and professions could help unlock productivity gains and boost competition (Annex 12).

Public investment has lagged behind investment needs. The public investment needs regarding infrastructure, education and training as well as for the twin transition are large, with the investment gap for the next decade estimated to be at least EUR 600 billion (14% of 2024 GDP) ([11]). Investment at federal level was below depreciation last year. At municipal level (about 40% of public investment), net investment has been negative continuously, resulting in a decrease in the capital stock ([12]) (Graph 3.2). This is also due to differences and fluctuations in the financial situations of municipalities and Länder ([13]).

Spending on research and development is stagnating. Germany's research R&D intensity is at a high level but static and it is below the national target (2022: 3.1% against the target of 3.5% for 2025). R&D output has fallen when measured as a share of most cited publications and patent applications. Private-sector spending on R&D remains concentrated in the automotive sector ([14]). Moreover, SMEs' share of business R&D expenditure is very low (0.20% in 2021 against the EU average of 0.38%), with no growth over the last decade (Annex 11).

Graph 3.2: **Net investment by government level**



Source: Destatis

Low business dynamism and the lack of financing options for start-ups and scale-ups may hinder the modernisation of the economy. Firm birth rates in Germany are below the EU average (Annex 11), and self-employment is declining, partly due to bureaucratic hurdles. For example, it takes a new firm 122 days to obtain an operating licence, almost four times the average for all economies ([15]). The share of high-growth businesses in Germany is below the EU average and falling. Although overall financing may not be a major concern, financing for start-ups and scale-ups seems to be limited by comparatively low levels of

([9]) Institut für Mittelstandsforschung (IfM), 2023, *Analyse zur Bürokratiebelastung in Deutschland*, ifm-bonn.org.

([10]) IW Köln, 2024, *Wachstumschancengesetz: Investitionen fallen nur sechs Milliarden Euro höher aus*, iwkoeln.de.

([11]) According to an estimation by IW Köln and IMK, these areas require an additional EUR 600 billion of public investment or subsidies over the next decade; see also: IW Köln., 2024, *600 Milliarden Euro für eine zukunftsfähige Wirtschaft*, iwkoeln.de.

([12]) KfW Research, 2023, *KfW-Kommunalpanel*, kfw.de.

([13]) Bertelsmann Stiftung, 2023, *Kommunaler Finanzreport 2023*, bertelsmann-stiftung.de.

([14]) Stifterverband, 2023, *Analyse – Forschung und Entwicklung in der Wirtschaft 2021*, stifterverband.org.

([15]) World Bank, enterprisesurveys.org.

growth- and late-stage venture capital (Annex 11). As the largest EU economy, Germany would benefit from deeper European capital markets.

Institutional investors mostly invest in low-risk, low-yield assets. In general, they play an important role in financing investment and innovation as they have the capacity to mobilise large sums and bear the risks involved. However, German institutional investors such as pension funds (*Pensionskassen and Pensionsfonds*) stand out in an international comparison for their risk aversion with a low share of investments in private equity ([16]). Regulations on portfolio management in such funds and the differences between the Länder may limit the amount of exposure to high-yielding asset classes. Overall, strengthening the role of institutional investors as capital providers could help deepen capital markets and improve efficiency and investment growth.

High interest rates and construction costs are a drag on housing investments. Investment in housing construction has fallen for the last 3 years as financing conditions deteriorated and construction costs increased (Annex 12). Even before then, the number of dwellings completed was considerably below the government target of 400 000 (the peak in 2020 was 306 000). Demanding regulatory standards, regulatory differences across Länder, lengthy permitting procedures and the lack of digitalisation are barriers to expanding supply. The gap between housing supply and demand has widened and is now estimated at up to 800 000 dwellings ([17]), exacerbating housing affordability challenges (Annex 14).

Further digitising and streamlining the public administration is key to unlocking the growth potential

The slow pace of digital transformation is a challenge to the competitiveness of the economy. The rate of digitalisation of firms stalled in 2023 ([18]). Progress on digital infrastructure, digital skills and digital public administration is an important prerequisite to reducing the bureaucratic burden on firms and boosting the use of digital technologies to stimulate productivity growth (Annex 12).

Fibre coverage and very high-capacity network (VHCN) coverage in rural areas remain key challenges, particularly for SMEs. Despite improvements, Germany is still below the EU average for VHCN in rural areas (37.6% in Germany against the EU average of 55.6%). Total fibre coverage is increasing (29.8%) but is still considerably below the EU average of 64.0% (Annex 10). The risk of a deepening digital divide between rural and urban areas persists. The increase in federal funding for fibre connections and implementing the 2022 gigabit strategy have the potential to remedy these issues, though expansion is slowed by the limited capacity of local administration to grant the related permits.

The lack of digital public services is a drag on the business environment. Germany's RRP contains several measures to support the implementation of digital public services, including electronic identification systems, and modernising registers, but the German National Regulatory Control Council considers that the country is not close to achieving its target of digitalising all essential public services nationwide ([19]). The recent cut to public funding for the digital transformation

([16]) EIOPA *Insurance Statistics*, eiopa.europa.eu.

([17]) Pestel-Institut, 2024, *Bauen und Wohnen 2024 in Deutschland*, mieterbund.de.

([18]) Bundesministerium für Wirtschaft und Klimaschutz (BMWK), 2023, *Digitalisierungsindex*, de.digital.

([19]) Nationaler Normenkontrollrat, 2023, *Stellungnahme des Normenkontrollrates*, normenkontrollrat.bund.de.

of public administration may create additional delays.

Digitalisation needs to go hand in hand with changes to internal processes and systems in public administration. This includes streamlining electronic record keeping and leveraging artificial intelligence to automate tasks. The seamless integration of digital platforms while maintaining data security and accessibility poses a significant challenge. The federal state structure adds complexity, resulting in a multitude of systems that are not interoperable. There is a need for continued coordination and cooperation across all administrative levels and more ownership when delivering digitalised processes. Further legal adjustments may be needed to ensure IT solutions can be centrally developed for nationwide roll-out. Rapid implementation of the once-only technical system will reduce the administrative burden for firms (Annex 12).

Improving the tax mix is key to a more inclusive, sustainable and competitive growth

The tax and benefit system still creates disincentives to work more hours, affecting the labour supply. Workers in Germany face the second highest level of taxes and social security contributions on earnings in the EU (Annex 19). In combination with the transfer system, this reduces the incentive to increase ours worked, especially for low-wage and second earners, often women (Annex 14). Mitigating the high marginal effective tax rates by merging benefits and adopting a uniform marginal tax rate avoiding sudden hikes in the tax rate could improve labour supply and provide budgetary revenue ([20]). Although Germany has taken action to improve incentives for second earners, the tax combination III/V is maintained for the moment. The already existing alternative (*Faktorverfahren*) is used by less than 1% of eligible couples ([21]). Reforming the marital tax-splitting system (*Ehegattensplitting*) could improve the incentives to work and increase employment by up to 185 000 full-time equivalents ([22]).

Germany's share of environmental taxes is below the EU average. Total environmental taxation is on a downward trend since it peaked at 2.6% of GDP in 2003, down to only 1.6% in 2022. Both energy and transport taxes are below the EU average (Annex 19). The levy on diesel and petrol, in eurocent per litre, has been unchanged since 2003, but the introduction of the new CO_2 price and its increase in 2024 have raised prices noticeably.

Corporate taxes play a role in Germany's attractiveness as a business location. Germany has one of the highest corporate income tax rates in the EU, including the local trade tax (*Gewerbesteuer*), at 29.9% ([23]). The average effective tax rate is also comparatively high at 27.0% in 2022 (EU average: 19.4% (Annex 18). Corporate tax in combination with the trade tax form a complex and untransparent tax system. Tax compliance costs are among the highest in the EU ([24]). The recently introduced option for partnership companies (*Personengesellschaft*) to be taxed like capital companies is an improvement as it eliminates the difference in effective taxation, especially for higher tax rates. Recent initiatives to review the tax depreciation rules and increase R&D tax credits are cost-effective ways of providing more incentives to invest, and

([20]) Blömer and Peichl, 2023, *Reformoptionen im deutschen Grundsicherungs- und Transfersystem sowie bei der Ehegattenbesteuerung*, svr-wirtschaft.de.

([21]) Bundesrechnungshof, 2021, *Bemerkungen 2020 zur Haushalts- und Wirtschaftsführung des Bundes*, bundesrechnungshof.de.

([22]) German Council of Economic Experts, 2023, *Annual Report 2023/2024*, svr-wirtschaft.de.

([23]) Only Portugal has a higher rate (31.5%). See: OECD, 2023, *OECD Tax Database: Table II.1.*, stats.oecd.org.

([24]) EU Commission, *Tax compliance costs for SMEs*, 2022, op.europa.eu.

experts suggest expanding them further ([25]). At the same time, there is potential to simplify the corporate tax system by reducing the scope for exemptions.

To tackle the fiscal challenges, efforts could be made to strengthen the Independent Fiscal Institution (IFI). The German IFI, an advisory board, has a narrow mandate and needs additional funding. The policy dialogue with the government and parliament could be improved by grounding it in law. There is also scope to improve access to information.

Tackling skills and labour shortages is an urgent concern

The shortage of skilled workers remains a major constraint on production ([26]). Approximately half of all companies struggle to fill vacancies, even in the long term. This creates major obstacles to business activity ([27]). There are some 3 million people (6.8% of the extended labour force) on the margins of the labour market, including 1.3 million unemployed people who are looking for work and 530 000 people who work part-time and would be willing to work longer hours. There is also scope to tap the potential of the inactive population. Groups with relatively low employment rates and greater labour market potential include people with low qualifications (employment rate of 66.1% in 2023), people born outside the EU (67.1%), and in particular women born outside the EU (56.4%). While citizens of other EU countries have almost as high employment rates as Germans, it is taking time to integrate refugees into the labour market (employment rate at about two thirds the rate of German citizens) and people fleeing Ukraine (one third the rate) ([28]).

Shortages of skills are also impacting competitiveness, innovation capacity and the twin transition. Although the rate of adults enrolled in learning in the past 12 months is above the EU average (53.7% vs. EU 39.5% in 2022), there are significant shortages of skilled workers in many growth-inducing areas essential for the green and digital transition and for boosting R&I capacity. According to the European Labour Authority, shortages affected several occupations related to the green transition, such as construction managers, electricians and engineers. There are also fewer people with at least basic digital skills than the EU average (DE: 52% vs. EU 55% in 2023). Ongoing reforms of skilled immigration may alleviate the shortage of skilled workers to a certain degree. At the same time, companies lacking skills and staff may be considering investing in IT automation.

The deterioration in the level of basic skills is an increasing concern. According to the latest results of the PISA survey (Programme for International Student Assessment, 2022), around 3 out of 10 young students in Germany lack a minimum level of proficiency in mathematics, and 1 in 4 in reading and science. This is nearly double the share in 2012. The decline in the mean scores for maths and reading between 2018 and 2022 alone is about the same size as the typical gain students make over an entire school year.

The socio-economic and migration backgrounds of students have a rising influence on their educational

([25]) IW Köln, 2024, *Der Effekt der Sofortabschreibungen auf die Attraktivität des Steuerstandorts*, iwkoeln.de.

([26]) 533 000 vacancies could not be filled because there were no qualified unemployed people to fill them. See also: IW Köln, 2023, *Jahresrückblick 2022*, iwkoeln.de.

([27]) Deutsche Industrie- und Handelskammer (DIHK), 2023, *DIHK Fachkräftereport 2023/24*, dihk.de.

([28]) Institut für Arbeitsmarkt- und Berufsforschung (IAB), 2024, *Zuwanderungsmonitor Februar 2024*, iab.de. Employment following the national definition, referring to employment subject to social security contributions.

outcomes. The rate of under-achievement increased especially among students with disadvantaged and migrant backgrounds, posing a challenge for equal opportunities and intergenerational mobility. In 2022, about half of students with a disadvantaged background did not reach minimum proficiency in mathematics in the PISA survey (up to 46.6% from 32.6% in 2012). Between 2012 and 2022, the share of foreign-born students among 15-year-old students doubled to 26%. About 2 out of 3 foreign-born students achieve low scores in mathematics (64% against 21.9% of German-born students), amongst the highest rates in the EU. Germany also has one of the highest rates of young people leaving school early in the EU (12.2% against the EU average of 9.6% in 2022). The rate is particularly high for non-EU-born students (29.4%) and for young people with low-educated parents ([29]). The new ten-year federal programme '*Startchancen*' targeting mainly disadvantaged students is expected to start in the 2024-2025 school year. It is a step in the right direction, but it only covers up to 10% of German schools.

Insufficient provision of early childhood education and care (ECEC) limits both equal opportunities for children and the full-time employment of parents, especially women. In 2022, 93.7% of children between 3 and school age attended ECEC, below the EU-level target of 96%. Too often in Germany, having a child is linked to being out of employment. The employment rate of women aged 25-49 with children was 76.1% in 2023, around 10 pps lower than for women without children. This is also reflected in one of the highest gender gaps in part-time employment in the EU (36.9 pps in 2023 against the EU average of 20.2 pps), resulting in significant gaps in gender pay (17.7% vs EU 12.7%) and pensions (27.6% vs EU 26%). The RRF will supplement national investments by creating 90 000 places in childcare. However, this is still below the shortfall in supply of around 430 000 ([30]). In addition, there is current unmet demand for 529 000 whole-day school places, limiting parents' ability to take up full-time employment ([31]).

Modernising the pension system

Population ageing is putting pressure on the pension system. The workforce contributing to the statutory pension system is declining, pension expenditure is expected to increase, creating pressure to raise contribution rates and the federal subsidy or to let pension levels fall. Supporting the use of company pensions as well as state-subsidised capital-based private pension schemes (*Riester-Rente*) could help secure pension adequacy. However, only around half of employees acquire entitlements to company pensions. Also, the *Riester-Rente* suffers from requiring investment in low-yielding safe assets and high administration costs. The plan to build up a capital-based component in the statutory pension system (*Generationen-kapital*) with yearly capital investments of EUR 12 billion (0.3% of GDP) improves pension sustainability only to a limited extent. Longer working lives contribute to both pension system sustainability and higher pensions. However, since 2014, Germans can take early retirement without a loss of entitlement after 45 years of work. About one third of people retiring yearly (260 000 people) use this possibility.

Keeping up the momentum on the green transition

Germany is not on track to reach its greenhouse gas reduction targets, despite improvements. Under the Effort

([29]) European Commission, 2023, *Education and Training Monitor 2023*, europa.eu.

([30]) Bertelsmann Stiftung, 2023, *Fachkräfte-Radar für KiTa und Grundschule 2023*, bertelsmann-stiftung.de.

([31]) IW Köln, 2023, *Noch 700.000 Ganztagsplätze müssen geschaffen werden*, iwkoeln.de.

Sharing Regulation, Germany aims to reduce emissions by 50% by 2030 compared to 2005 levels. It has made notable progress on sectoral decarbonisation, particularly in the energy sector. In 2023, there has been a 12% surge in installed renewable energy capacity, primarily due to a significant increase in solar photovoltaics. Germany's plan to cover at least 80% of gross electricity consumption with renewable energy by 2030 is ambitious (2023: 51.8% ([32])). Germany has taken significant steps to implement reforms to accelerate the roll-out of renewable energy. However, it is backtracking on the goal of its territorial just transition plan to phase out coal (Annexes 6 and 7).

Sectoral decarbonisation remains a challenge, particularly for the transport and buildings sectors. The transport sector increased its final energy consumption by 6.3% in 2023. It requires significant investment in public transport and freight infrastructure, far exceeding the measures included in the RRP. For instance, while the RRP supports the upgrade of seven rail lines to fast-track lines, major rail line expansion projects have been delayed or halted as the investment gap until 2027 is at least EUR 18 billion ([33]). There is also a need to ensure the roll-out of electric vehicles by providing infrastructure. In 2023, Germany had about 112 000 publicly accessible charging points, one for every 15 e-vehicles against the EU average of 1:10. On buildings, Germany needs to step up action on the energy renovation beyond the RRP to reduce primary energy consumption by 39% by 2030 from 2018 levels, as outlined in its long-term renovation strategy. Residential final energy consumption increased by 4.1% between 2018 and 2022. The share of renewable energy in heating and cooling is also comparatively low (17.5% in 2022, below the EU level of 24.8%) (Annex 7).

Building on the recent progress made on renewables, action is needed to further expand and reinforce the grid. To reduce the curtailment of renewable energy of more than 8 TWh in 2022, and to enable the integration of additional renewable energy capacity, Germany's electricity grid needs significant upgrading and expanding ([34]). With the regulatory framework adapted to support the integration of renewable energy into the grid and to accelerate grid expansion, challenges remain for the transmission grid in enabling long-distance transport and avoiding congestion. For instance, long-distance transport has been hampered by delays in the construction of the high-voltage lines '*SuedLink*' ([35]) and '*SuedOstLink*'. Work to upgrade and digitalise the distribution grid is also needed to avoid congestion, integrate distributed renewable energy sources, ensure cybersecurity, and cater for increased demand by electrifying the heating and cooling, transport and industry sectors. To these ends, implementing the planned public investments needs to be accelerated (Annex 7).

([32]) Umweltbundesamt, 2024, *Renewable energies in figures*, umweltbundesamt.de.

([33]) Frankfurter Rundschau, 2024, *Finanzkrise bei der Bahn: Ausbauprojekte auf der Kippe*, fr.de.

([34]) Bundesverband Erneuerbare Energie (BEE), 2021, *Neues Strommarktdesign*, klimaneutrales-stromsystem.de.

([35]) Handelsblatt, 2022, *Betreiber Transnet: Stromautobahn Suedlink erst 2028 fertig*, handelsblatt.de.

Box 4:

The mid-term review of cohesion policy funds for Germany

The mid-term review of the cohesion policy funds is an opportunity to assess cohesion policy programmes and to tackle emerging needs and challenges in EU Member States and their regions. Member States are reviewing each programme taking into account, among other things, the challenges identified in the European Semester, including in the 2024 country-specific recommendations. This review forms the basis for a proposal by the Member State for the definitive allocation of 15% of the EU funding included in each programme.

Germany has made progress in implementing cohesion policy programmes and the European Pillar of Social Rights, but challenges remain (Annexes 14 and 17). Significant regional disparities persist in terms of employment and labour productivity, although the less developed regions have gradually been catching up on labour productivity. Against this background, it remains important to continue the implementation of planned priorities, with particular attention to: (i) research, development and innovation, especially in the east of the country, education and training to tackle the challenges posed by the twin transition; (ii) business development and support for businesses, in particular SMEs; (iii) energy efficiency and renewable energy, climate change adaptation and carbon footprint; (iv) continuing to mobilise cohesion policy for the twin transition in regions with high-performing sectors; (v) quality and inclusiveness of education, training and lifelong learning to acquire labour market relevant skills; (vi) active inclusion and improving employability, in particular for disadvantaged groups.

Germany could also benefit from the opportunities provided by the Strategic Technologies for Europe Platform (STEP) Regulation to support the development or manufacturing of critical technologies in digital technologies, clean and resource-efficient technologies, and biotechnologies, and to tackle shortages of labour and skills in these sectors. ([36])

There is scope to improve sustainable agricultural practices and the protection of carbon sinks. Farming practices continue to pollute water bodies with nitrates and pesticides above the monitoring thresholds. Rewetting peatlands could reverse the trend of falling net carbon removals, alongside action to mitigate emissions from this sector and to promote carbon sequestration (Annex 6).

([36]) Regulation (EU) 2024/795, europa.eu.

KEY FINDINGS

With its wide policy scope, Germany's RRP includes measures to address a series of structural challenges, in synergy with other EU funds, including cohesion policy funds, by:

- **Taking steps to decarbonise the economy and the industry through** reforms and investments in building renovations, clean transport, decarbonising industry and the hydrogen value chain;
- **Supporting the digital transition** by investing in key technologies and in the digital transformation of the automotive industry, and public administration;
- **Investing in people to boost economic growth and social resilience** through reforms and investments in education and training, including early childhood education and care (ECEC), and healthcare;
- **Addressing investment barriers** by accelerating planning and approval procedures and building up the administrative capacity of local authorities.

The implementation of Germany's RRP is facing significant delays which require decisive actions to ensure a successful implementation of all the measures of Germany's RRP by August 2026.

Beyond the reforms and investments in the RRP and Cohesion programmes, Germany would benefit from:

- **Increasing public investment**, including at regional and local levels;
- **Limiting budget transfers to the pension system to avoid crowding out public investment.** Actions may include reforming the financing side and strengthening company pensions and capital-based pensions;
- **Raising the employment rate of older workers**, including by reducing incentives for early retirement;
- **Implementing tax measures to boost inclusive growth and sustainable competitiveness,** for example by providing stronger incentives to increase hours worked, reducing the tax wedge, relying more on environmental taxation or further improving investment incentives through corporate taxation;
- **Boosting competitiveness and private investment** by removing obstacles and administrative burden, strengthening alternative forms of financing for new companies, and supporting R&D and IT spending;
- **Speeding up the digital transformation** by promoting digital skills and accelerating the digitalisation of public administration and the roll-out of very high-capacity digital networks, especially fibre optics, with a focus on rural areas;
- **Tackling the shortage of skilled workers**, among others by improving education outcomes, more action on re-/upskilling and support for people to join the labour market, and incentives to increase hours worked;
- **Maintaining the momentum on the green transition** by reinforcing, expanding and further digitalising electricity networks to ensure smooth integration of an increasing share of renewable energy, and by focusing on the decarbonisation of high-emission sectors, in particular transport and buildings.

ANNEXES

LIST OF ANNEXES

LIST OF TABLES

LIST OF GRAPHS

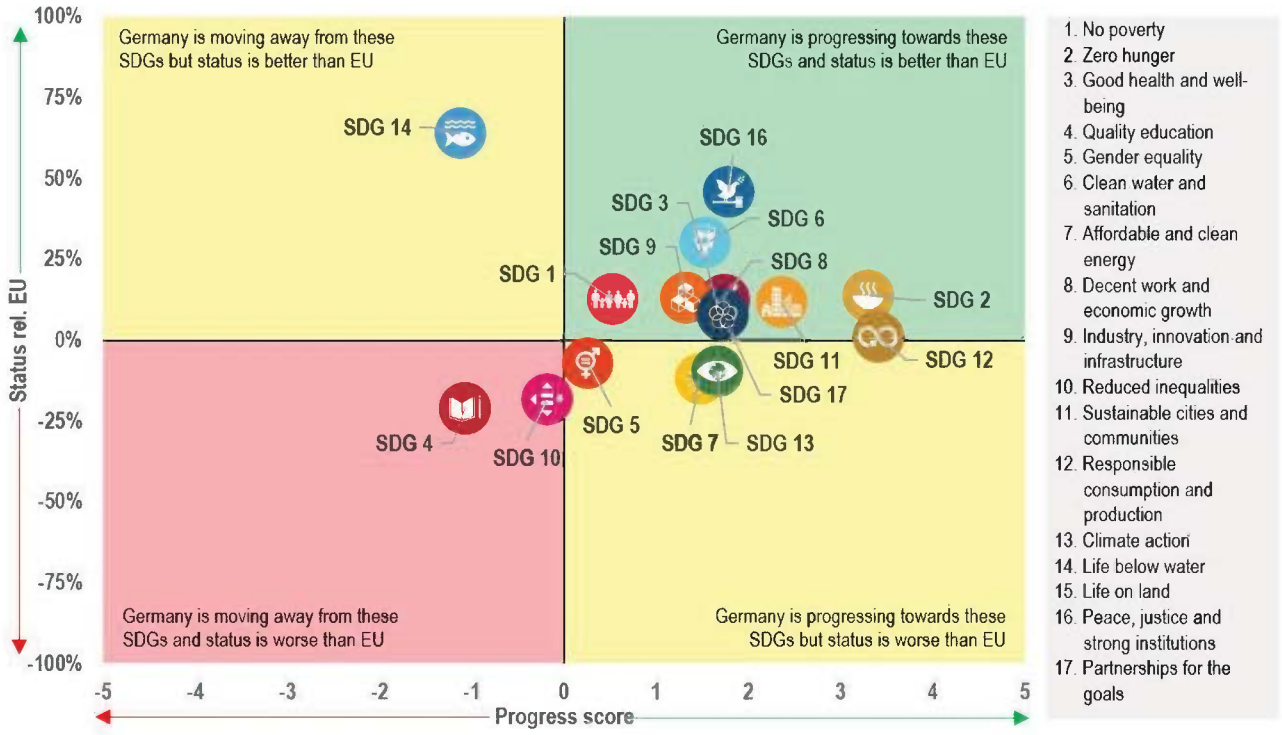
LIST OF MAPS

ANNEX 1: SUSTAINABLE DEVELOPMENT GOALS

This Annex assesses Germany's progress on the Sustainable Development Goals (SDGs) along the four dimensions of competitive sustainability. The 17 SDGs and their related indicators provide a policy framework under the UN's 2030 Agenda for Sustainable Development. The aim is to end all forms of poverty, fight inequalities and tackle climate change and the environmental crisis, while ensuring that no one is left behind. The EU and its Member States are committed to this historic global framework agreement and to playing an active role in maximising progress on the SDGs. The graph below is based on the EU SDG indicator set developed to monitor progress on the SDGs in an EU context.

While Germany performs well on most of the SDG indicators related to *environmental sustainability* (SDGs 2, 6, 9, 11, 12), it is moving away from the targets for SDG 14 and, though improving, still needs to catch up with the EU average on affordable and clean energy (SDG 7) and climate action (SDG 13). Germany has made some progress on energy consumption indicators, including the share of renewable energy in gross final energy consumption (SDG 7; from 15.5% in 2017 to 20.8% in 2022). Nevertheless, it remains below the EU average (23%) and its energy import dependency increased from 64% of gross available energy in 2017 to 68.6% in 2022. On SDG 13 (Climate action), net greenhouse gas emissions decreased from 10.9 tonnes per capita in 2017 to 9.3 tonnes per capita in 2022, although they still remain above the EU average (7.3 tonnes per capita in 2022). Average CO_2 emissions per km from new passenger cars fell considerably in the 5 years between 2017 and 2022 (154.2 g in 2017 vs 105.9 g in 2022) and are now below the EU average (109.8 g in 2022). Germany performs well on sustainable agricultural production and has reduced agriculture's environmental impact. It reduced ammonia emissions and nitrate in groundwater (SDG 2), although both remain above the EU average, and achieved

Graph A1.1: **Progress towards the SDGs in Germany**



For detailed datasets on the various SDGs, see the annual Eurostat report 'Sustainable development in the European Union'; for details on extensive country-specific data on the short-term progress of Member States: Key findings – Sustainable development indicators. A high status does not mean that a country is close to reaching a specific SDG, but signals that it is doing better than the EU on average. The progress score is an absolute measure based on the indicator trends over the past 5 years. The calculation does not take into account any target values as most EU policy targets are only valid for the aggregate EU level. Depending on data availability for each goal, not all 17 SDGs are shown for each country.

Source: Eurostat, latest update of 25 April 2024. Data refer mainly to the period 2017-2022 or 2018-2023. Data on SDGs may vary across the report and its annexes due to different cut-off dates.

reductions in premature deaths due to fine particulate matter (SDG 11). Various measures in the recovery and resilience plan (RRP) that support the use of renewable hydrogen in industry and the transport sector will help reduce greenhouse gas emissions and increase the share of renewable energy.

Germany is performing well on some SDG indicators related to *fairness* (SDGs 1, 3, 8). However, though improving, it still needs to catch up with the EU average on gender equality (SDG 5) and affordable and clean energy (SDG 7). On quality education (SDG 4) and reducing inequalities (SDG 10), Germany needs to catch up with the EU average and is moving further away from the SDG targets. Germany generally performs better than the EU average in areas linked to poverty, health and decent jobs and growth. On health (SDG 3), road traffic deaths and fatal accidents at work have declined and are proportionally below their level in the rest of the EU. Smoking prevalence dropped below the EU average (23%, vs 25% in the EU in 2020). At the same time, 19% of the adult population was obese in 2019, up from 16.9% in 2016 and above the EU average of 14.8% (in 2022). On gender equality (SDG 5), the unadjusted gender pay gap is particularly high in Germany (17.7%, vs 12.7% in the EU in 2022). While the overall share of people at risk of poverty or social exclusion (SDG 1) is slightly below the EU average (21.1%, vs 21.6% in the EU in 2022), there is a significant urban-rural gap (SDG 10). There is room for improvement on integrating non-EU citizens into education and training and into the labour market (SDG 10). Germany performs worse than the EU average on EU/non-EU citizenship gaps for early school leaving (20.1 pps, vs 17.1 pps in the EU in 2023), as well as for the share of young people not in education, employment or training (15.7 pps vs 11.1 pps in the EU in 2023) and for the employment rate (22.9 pps, vs 13.2 pps in the EU in 2023). Tertiary educational attainment (SDG 4), although improving, remained below the EU average in 2023 (38.4%; EU: 43.1%). The German RRP helps improve educational outcomes for students with a learning backlog, often from disadvantaged backgrounds, and promotes apprenticeships.

Germany performs well and is further improving on SDGs on *productivity* (SDGs 8 and 9) but is moving away from the SDG target and needs to catch up with the EU average on quality education (SDG 4). Germany performs above the EU average on SDG 8 (Decent work and economic growth) and on SDG 9 (Industry, innovation and infrastructure). With 3.13% of GDP allocated to R&D in 2022, Germany has some of the highest R&D spending in the EU. The share of R&D personnel in the active population rose from 1.66% in 2017 to 1.85% in 2022 (EU: 1.53% in 2022). However, Germany is below the EU average and moving further away from the targets for SDG 4 (Quality education), which is hampering growth and competitiveness. The share of low-achieving 15-year-olds in mathematics increased significantly from 21.1% in 2018 to 29.5% in 2022. A rising number of young people leave education early (10.3% in 2018, vs 12.8% in 2023), well above the EU average (9.5% in 2023). Adult participation in learning in the past 4 weeks is below the EU average (DE: 8.3%; EU: 12.7% in 2023). This is also reflected in the low share of adults with at least basic digital skills (52.2%, vs 55.6% in the EU in 2023). The German RRP targets bottlenecks related to the digitalisation of administration and the economy, for instance by supporting the digitalisation of vehicle supplier companies. It also further helps address challenges related to digital education and training.

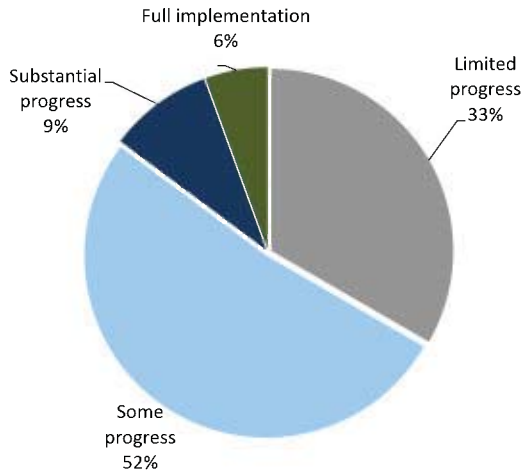
Germany is performing well on SDG indicators related to *macroeconomic stability* (SDGs 8, 16, 17) and has further improved its performance. Germany performs well on SDG 16 (Peace, justice and strong institutions), showing a stable and secure environment for pursuing economic activities, and on SDG 8 (Decent work and economic growth). Germany further increased its employment rate from 78.9% in 2018 to 81.1% in 2023, which is very high compared to the EU average (75.3% in 2023). The share of young people not in education, employment or training reached 8.8% in 2023, below the EU average (11.2%), and long-term unemployment is low (1% vs EU 2.1% in 2023). In contrast, at 21.9% of GDP in 2023, Germany's investment share, although improving, remained below the EU average of 22.7% of GDP. The RRP includes a package of reforms to speed up public investment and tackle investment bottlenecks to unlock private investment and reduce the savings-investment imbalance.

As the SDGs form an overarching framework, any links to relevant SDGs are either explained or depicted with icons in the other Annexes.

ANNEX 2: PROGRESS IN THE IMPLEMENTATION OF COUNTRY-SPECIFIC RECOMMENDATIONS

The Commission has assessed the 2019-2023 country-specific recommendations (CSRs) ([37]) addressed to Germany as part of the European Semester. These recommendations concern a wide range of policy areas that are related to 12 of the 17 Sustainable Development Goals (see Annexes 1 and 3). The assessment considers the policy action taken by Germany to date ([38]) and the commitments in its recovery and resilience plan (RRP) ([39]). At this stage of RRP implementation, 67% of the CSRs focusing on structural issues from 2019-2023 have recorded at least 'some progress', while 33% recorded 'limited progress' (see Graph A2.1). As the RRP is implemented further, considerable progress in addressing structural CSRs is expected in the years to come.

Graph A2.1: **Germany's progress on the 2019-2023 CSRs (2024 European Semester)**



Source: European Commission.

([37]) 2023 CSRs : EUR-Lex - 32023H0901(05) - EN - EUR-Lex (europa.eu)

2022 CSRs: EUR-Lex - 32022H0901(05) - EN - EUR-Lex (europa.eu)

2021 CSRs: EUR-Lex - 32021H0729(05) - EN - EUR-Lex (europa.eu)
2020 CSRs: EUR-Lex - 32020H0826(05) - EN - EUR-Lex (europa.eu)
2019 CSRs: EUR-Lex - 32019H0905(05) - EN - EUR-Lex (europa.eu)

([38]) Including policy action reported in the national reform programme and in Recovery and Resilience Facility (RRF) reporting (twice a year reporting on progress in implementing milestones and targets and resulting from the payment requests assessment).

([39]) Member States were asked to effectively address in their RRPs all or a significant subset of the relevant country-specific recommendations issued by the Council. The CSR assessment presented here considers the degree of implementation of the measures included in the RRP and of those carried out outside of the RRP at the time of assessment. Measures laid down in the Annex of the adopted Council Implementing Decision on approving the assessment of the RRP, which are not yet adopted or implemented but considered credibly announced, in line with the CSR assessment methodology, warrant 'limited progress'. Once implemented, these measures can lead to 'some/substantial progress or full implementation', depending on their relevance.

Table A2.1: **Summary table on 2019-2023 CSRs**

Germany	Assessment in May 2024*	RRP coverage of CSRs until 2026**	Relevant SDGs
2019 CSR 1	**Some Progress**		
While respecting the medium-term budgetary objective, use fiscal and structural policies to achieve a sustained upward trend in private and public investment, in particular at regional and municipal level.	Some Progress	Relevant RRP measures being implemented as of 2020, 2021 and planed as of 2022, 2023.	SDGs 8, 9, 16
Focus investment-related economic policy on education,	Limited Progress	Relevant RRP measures being implemented as of 2020, 2021 and planned as of 2022.	SDGs 4, 10, 11
research and innovation;	Some Progress	Relevant RRP measures being implemented as of 2020,2021 and planned as of 2022 and 2023.	SDGs 9, 10, 11
digitalisation and very-high capacity broadband;	Some Progress	Relevant RRP measures being implemented as of 2020, 2021 and planned as of 2022.	SDGs 9, 10, 11
sustainable transport	Some Progress	Relevant RRP measures being implemented as of 2020 and 2021.	SDGs 10, 11
as well as energy networks	Some Progress	Relevant RRP measures being implemented as of 2020, 2021 and planned as of 2023.	SDGs 7, 9, 10, 11, 13
and affordable housing, taking into account regional disparities.	Limited Progress	Relevant RRP measures being implemted as of 2021.	SDGs 1, 2, 8, 10, 11
Shift taxes away from labour to sources less detrimental to inclusive and sustainable growth.	Some Progress	Relevant RRP measures being implemented as of 2021.	SDGs 8, 10, 12
Strengthen competition in business services and regulated professions.	Limited Progress		SDG 9
2019 CSR 2	**Some Progress**		
Reduce disincentives to work more hours,	Some Progress	Relevant RRP measures are being implemented as of 2021.	SDGs 8, 10, 12
including the high tax wedge, in particular for low-wage	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021.	SDGs 8, 10, 12
and second earners.	Limited Progress	Relevant RRP measures planned are being implemented of 2020, 2021.	SDGs 8, 10, 12
Take measures to safeguard the long-term sustainability of the pension system, while preserving adequacy.	Limited Progress	Relevant RRP measures planned as of 2021.	SDG 8
Strengthen the conditions that support higher wage growth, while respecting the role of the social partners.	Substantial Progress	Relevant RRP measures are being implemented as of 2021.	SDG 8
Improve educational outcomes and skills levels of disadvantaged groups.	Limited Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDGs 4, 8, 10
2020 CSR 1	**Some Progress**		
Take all necessary measures, in line with the general escape clause of the Stability and Growth Pact, to effectively address the COVID-19 pandemic, sustain the economy and support the ensuing recovery. When economic conditions allow, pursue fiscal policies aimed at achieving prudent medium-term fiscal positions and ensuring debt sustainability, while enhancing investment.	Not relevant anymore	Not applicable	SDGs 8, 16
Mobilise adequate resources and strengthen the resilience of the health system, including by deploying e-health services.	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDG 3
2020 CSR 2	**Some Progress**		
Front-load mature public investment projects	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDGs 8, 16
and promote private investment to foster the economic recovery.	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDGs 8, 9
Focus investment on the green and digital transition, in particular on sustainable transport,	Some Progress	Relevant RRP measures are being implemented as of 2020 and 2021.	SDG 11
clean, efficient and integrated energy systems,	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2023.	SDGs 7, 9, 13
digital infrastructure and skills,	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDG 4, 9
housing,	Limited Progress	Relevant RRP measures are being implemented as of 2021.	SDGs 1, 2, 8, 10
education	Limited Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDG 4
and research and innovation.	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022, 2023.	SDG 9
Improve digital public services across all levels	Limited Progress	Relevant RRP measures are being implemented as of 2021 and planned as of 2022.	SDGs 9, 16
and foster the digitalisation in SMEs.	Some Progress	Relevant RRP measures are being implemented as of 2020 and 2021.	SDGs 8, 9
Reduce the regulatory and administrative burden for businesses.	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 nd planned as of 2022.	SDGs 8, 9

(Continued on the next page)

Table (continued)

2021 CSR 1	**Not relevant anymore**		
In 2022, maintain a supportive fiscal stance, including the impulse provided by the Recovery and Resilience Facility, and preserve nationally financed investment.	Not relevant anymore	Not applicable	SDGs 8, 16
When economic conditions allow, pursue a fiscal policy aimed at achieving prudent medium-term fiscal positions and ensuring fiscal sustainability in the medium term.	Not relevant anymore	Not applicable	SDGs 8, 16
At the same time, enhance investment to boost growth potential. Pay particular attention to the composition of public finances, on both the revenue and expenditure sides of the budget, and to the quality of budgetary measures in order to ensure a sustainable and inclusive recovery. Prioritise sustainable and growth-enhancing investment, in particular investment supporting the green and digital transition.	Not relevant anymore	Not applicable	SDGs 8, 16
Give priority to fiscal structural reforms that will help provide financing for public policy priorities and contribute to the long-term sustainability of public finances, including, where relevant, by strengthening the coverage, adequacy and sustainability of health and social protection systems for all.	Not relevant anymore	Not applicable	SDGs 8, 16
2022 CSR 1	**Substantial Progress**		
In 2023, ensure that the growth of nationally financed primary current expenditure is in line with an overall neutral policy stance, taking into account continued temporary and targeted support to households and firms most vulnerable to energy price hikes and to people fleeing Ukraine. Stand ready to adjust current spending to the evolving situation.	Substantial Progress	Not applicable	SDGs 8, 16
Expand public investment for the green and digital transitions, and for energy security taking into account the REPowerEU initiative, including by making use of the Recovery and Resilience Facility and other Union funds.	Substantial Progress	Not applicable	SDGs 8, 16
For the period beyond 2023, pursue a fiscal policy aimed at achieving prudent medium-term fiscal positions.	Full Implementation	Not applicable	SDGs 8, 16
Improve the tax mix for more inclusive and sustainable growth, in particular by improving tax incentives to increase hours worked.	Some Progress	Relevant RRP measure are being implemented as of 2021.	SDGs 8, 10, 12
Safeguard the long-term sustainability of the pension system.	Limited Progress	Relevant RRP measure are being implemented as of 2021.	SDG 8
2022 CSR 2			
Proceed with the implementation of its recovery and resilience plan, in line with the milestones and targets included in the Council Implementing Decision of 13 July 2021.	RRP implementation is monitored by assessing RRP payment requests and analysing reports published twice a year on the achievement of the milestones and targets. These are to be reflected in the country reports.		
Swiftly finalise the negotiations with the Commission on the 2021–2027 cohesion policy programming documents with a view to starting their implementation.	Progress on the cohesion policy programming documents is monitored under the EU cohesion policy.		
2022 CSR 3	**Some Progress**		
Remove investment obstacles	Limited Progress	Relevant RRP measure are being implemented as of 2021.	SDGs 8, 9
and boost investment in very-high-capacity digital communication networks.	Some Progress		SDG 9
2022 CSR 4	**Some Progress**		
Reduce overall reliance on fossil fuels and diversify their imports	Some Progress	Relevant RRP measures being planned as of 2020, 2021 and 2023.	SDGs 7, 9, 13
by improving energy efficiency, incentivising energy savings,	Some Progress	Relevant RRP measures being planned as of 2021 and 2023.	SDG 7
diversifying energy supplies and routes,	Substantial Progress	Relevant RRP measures being planned as of 2020, 2021 and 2023.	SDGs 7, 9, 13
removing investment bottlenecks, further streamlining permitting procedures, boosting investment in and accelerating the deployment of electricity networks and renewable energy,	Some Progress	Relevant RRP measures being planned as of 2021.	SDGs 7, 8, 9, 13
and further advancing participation in energy-related cross-border cooperation.	Limited Progress	Relevant RRP measures being planned as of 2021.	SDGs 7, 9, 13
2023 CSR 1	**Substantial Progress**		
Wind down the emergency energy support measures in force, using the related savings to reduce the government deficit, as soon as possible in 2023 and 2024. Should renewed energy price increases necessitate new or continued support measures, ensure that these are targeted at protecting vulnerable households and firms, fiscally affordable and preserve incentives for energy savings.	Substantial Progress	Not applicable	SDGs 8, 16
Ensure prudent fiscal policy, in particular by limiting the nominal increase in nationally-financed net primary expenditure in 2024 to not more than 2.5%.	Some Progress	Not applicable	SDGs 8, 16
Preserve nationally-financed public investment and ensure the effective absorption of RRF grants and other EU funds, in particular to foster the green and digital transitions. Implement public investment initiatives as planned.	Full Implementation	Not applicable	SDGs 8, 16
For the period beyond 2024, continue to pursue a medium-term fiscal strategy of gradual and sustainable consolidation, combined with investments and reforms conducive to higher sustainable growth, to achieve a prudent medium-term fiscal position.	Full Implementation	Not applicable	SDGs 8, 16
Improve the tax mix for more inclusive and sustainable growth, in particular by improving tax incentives in order to increase hours worked.	Some Progress	Relevant RRP measure are being implemented as of 2021.	SDGs 8, 10, 12
Safeguard the long-term sustainability of the pension system.	Limited Progress	Relevant RRP measure are being implemented as of 2021.	SDG 8

(Continued on the next page)

Table (continued)

2023 CSR 2			
Significantly accelerate the implementation of its revised recovery and resilience plan, also by ensuring sufficient resources, and swiftly finalise the addendum and the REPowerEU chapter with a view to rapidly starting its implementation. Proceed with the speedy implementation of cohesion policy programmes, in close complementarity and synergy with the recovery and resilience plan.	RRP implementation is monitored by assessing RRP payment requests and analysing reports published twice a year on the achievement of the milestones and targets. These are to be reflected in the country reports. Progress on the cohesion policy programming documents is monitored under the EU cohesion policy.		
2023 CSR 3	**Limited Progress**		
Speed up the digitalisation of the entire service chain for public services and	Limited Progress	Relevant RRP measures are being implemented as of 2021 and planned as of 2022.	SDGs 9, 16
improve people's digital skills.	Limited Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2022.	SDG 4
Remove investment obstacles	Limited Progress	Relevant RRP measure are being implemented as of 2021.	SDGs 8, 9
and boost investment in very-high-capacity digital communication networks.	Some Progress		SDG 9
2023 CSR 4	**Some Progress**		
Increase efforts to further reduce the overall reliance on fossil fuels by	Some Progress	Relevant RRP measures are being implemented as of 2020, 2021 and planned as of 2023.	SDGs 7, 9, 13
boosting investment in and accelerating the deployment of renewable energy and electricity networks through improved administrative capacity and streamlined processes, including permitting procedures.	Some Progress	Relevant RRP measures being implemented as of 2021.	SDGs 7, 8, 9, 13
Step up energy efficiency efforts in transport,	Limited Progress	Relevant RRP measures being implemented as of 2021 and 2021.	SDGs 7, 9, 11, 13
building and industry, including through investments in heating systems and	Some Progress	Relevant RRP measures being implemented as of 2020 and 2021 and planned as of 2023.	SDGs 7, 9, 13
further policy measures aimed at the provision and acquisition of skills and competences needed for the green transition.	Limited Progress	Relevant RRP measures being implemented as of 2020, 2021 and planned as of 2022.	SDG 4

Note:
* See footnote ([39]).
** RRP measures included in this table contribute to the implementation of CSRs. Nevertheless, additional measures outside the RRP are necessary to fully implement CSRs and address their underlying challenges. Measures indicated as 'being implemented' are only those included in the RRF payment requests submitted and positively assessed by the European Commission.
Source: European Commission

This Annex provides a snapshot of Germany's implementation of its recovery and resilience plan (RRP), past the mid-way point of the Recovery and Resilience Facility's (RRF) lifetime. The RRF has proven central to the EU's recovery from the COVID-19 pandemic, helping speed up the twin green and digital transition, while adapting to geopolitical and economic developments, and strengthening resilience against future shocks. The RRF is also helping implement the UN Sustainable Development Goals and address the country-specific recommendations (see Annex 2).

The RRP paves the way for disbursing up to EUR 28 billion in grants under the RRF over the 2021-2026 period, representing 0.7% of Germany's GDP ([40]). As of mid-May 2024, EUR 6.25 billion has been disbursed to Germany under the RRF.

Germany still has EUR 21.8 billion available in grants from the RRF. This will be disbursed after the assessment of future fulfilment of the remaining 97 milestones and targets ([41]) included in the Council Implementing Decision ([42]) (CID), ahead of the 2026 deadline established for the RRF.

Germany's progress in implementing its plan is recorded in the Recovery and Resilience Scoreboard ([43]). The scoreboard gives an overview of the progress made in implementing the RRF as a whole. Graph A3.1 shows the current state of play as reflected in the scoreboard.

Table A3.1: **Key facts of the German RRP**

Initial plan CID adoption date	13 July 2021
Scope	Revised plan with REPowerEU chapter under assessment
Last major revision	8 December 2023
Total allocation	EUR 28 billion in grants (0.7% of 2023 GDP)
Investments and reforms	26 investments and 15 reforms
Total number of milestones and targets	133
Fulfilled milestones and targets	36 (27% of total)

Source: RRF Scoreboard

Germany has submitted a REPowerEU chapter to be added to its RRP, to phase out its dependency on Russian fossil fuels, diversify its energy supplies and produce more clean energy in the coming years. The chapter is now under assessment by the Commission and, once adopted, it will contribute to ensuring the supply of affordable, secure, and sustainable energy.

The plan has a strong focus on the green transition, dedicating 47% of the available funds to measures that support climate objectives and 48.1% of its total allocation to support the digital transition. It also retains a strong social dimension with social protection measures, especially related to social cohesion and education.

With one payment request completed, Germany's implementation of its RRP is significantly delayed. The Commission gave a positive assessment of the payment request on 28 November 2023, taking into account the opinion of the Economic and Financial Committee. This led to EUR 4 billion being disbursed in financial support on 28 December 2023 ([44]). The related 36 milestones and targets covered reforms and investments such as the completion of projects related to electro-

([40]) GDP information is based on 2023 data. Source: https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/index.html?lang=en

([41]) A milestone or target is satisfactorily fulfilled once a Member State has provided evidence to the Commission that it has reached the milestone or target and the Commission has assessed it positively in an implementing decision.

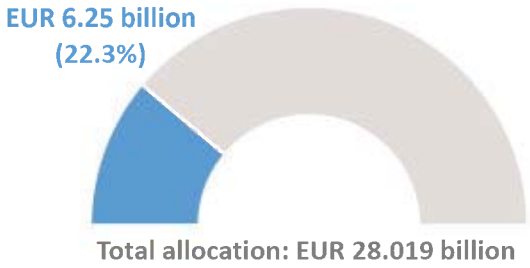
([42]) https://data.consilium.europa.eu/doc/document/ST-10158-2021-ADD-1/en/pdf

([43]) https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/country_overview.html

([44]) When requested payments are disbursed, the pre-financing is cleared proportionally. The net amounts are quoted here.

mobility and charging infrastructure, research in hydrogen and the roll-out of hydrogen-related projects, support for microelectronics, and the digitalisation of railways, and others in the areas of promoting the digitalisation and the efficiency of public administration as well as the acceleration of the planning and approval procedures in the transport sector, the development of vaccines, and the support for childcare and apprenticeships.

Graph A3.1: **Total grants disbursed under the RRF**



Note: This graph displays the amount of grants, including pre-financing, disbursed so far under the RRF. Grants are non-repayable financial contributions. The total amount of grants given to each Member State is determined by an allocation key and the total estimated cost of the respective RRP.
Source: RRF Scoreboard

As of 15 May 2024, Germany is working towards its second payment request. Table A3.2 highlights some relevant measures achieved so far, and some that will be implemented before 2026 to keep making Germany's economy greener, more digital, inclusive, and resilient.

Table A3.2: **Measures in Germany's RRP**

Reforms and investments implemented
• Agreement for learning support for learners with pandemic learning backlogs • Expansion of childcare • Support to electric cars
Upcoming reforms and investments
• Reform package to tackle investment bottlenecks • Digitalisation of administration and public health • Energy-efficient renovations in buildings

Source: FENIX

EU funding instruments provide considerable resources for recovery and growth to the EU Member States. In addition to the EUR 28 billion of Recovery and Resilience Facility (RRF) funding described in Annex 3, EU cohesion policy funds ([45]) provide EUR 19.9 billion to Germany for the 2021-2027 period ([46]). Support from these two instruments combined represents around 1.16% of the country's 2023 GDP, compared to an EU average of 5.38% of GDP ([47]). Cohesion policy supports regional development, economic, social and territorial convergence and competitiveness through long-term investment in line with EU priorities and with national and regional strategies.

During the 2014-2020 programming period, cohesion policy funds boosted Germany's competitiveness, with tangible achievements notably in research and innovation, renewable energy and social cohesion. By the end of the eligibility period in December 2023, 2014-2020 cohesion policy funds ([48]) had made EUR 20.7 billion available to Germany ([49]), of which EUR 12.3 billion has been disbursed since March 2020, when the COVID-19 pandemic began ([50]). 2014-2020 cohesion policy funds supported research and innovation projects, triggering EUR 1.45 billion of private investment. Over 4 500 businesses introduced new products to the market, enabled by EU support to their research and innovation activities. Thanks to cohesion policy funds, more than 5 900 start-ups were created and over 56 500 businesses received support, which helped them create nearly 21 800 new jobs. Support to promote the use of renewable energy resulted in a 142 MW increase in renewable energy production. During the same period, around 3.4 million participants benefited from European Social Fund (ESF) support in Germany. Among them were more than 1 million migrants or people with a foreign background, including minorities.

In the current programming period (2021-2027), cohesion policy will provide a further boost to Germany's competitiveness, to the green transition and to social cohesion, improving the living and working conditions of Germany's people. In 2021-2027, the European Regional Development Fund (ERDF), with an allocation of EUR 10.8 billion, aims to strengthen research and innovation capacities and support the uptake of advanced technologies, mainly in SMEs. Around 43 500 businesses are expected to receive support. The ERDF will also support the green transition, focusing on the improvement of energy efficiency and the use of renewable energy, which is expected to result in a yearly greenhouse gas emissions reduction of over 1 million tonnes of CO_2 equivalent. The Just Transition Fund (JTF) will boost innovation, promote economic diversification and counteract deindustrialisation in the four Germany regions where the phase-out of fossil fuel extraction and related activities are expected to have the strongest socio-economic impacts (North Rhine-Westphalia, Saxony, Saxony-Anhalt and Brandenburg). The EUR 2.5 billion allocated to Germany under the JTF will support approximately 4 300 businesses. Furthermore, it will improve education facilities for over 27 000 people annually and enable nearly 7 400 people to participate in professional training to address negative demographic trends and labour and skills shortages, which are particularly problematic in these regions. The European Social Fund Plus (ESF+) supports labour-market measures (EUR 1.8 billion), social inclusion (EUR 2.14 billion), social innovation (EUR 0.24 billion) and education and training measures (EUR 2.13 billion). These education and training measures are focused on improving equal access to education and training as well as improving the quality, inclusiveness and labour-market relevance of education and training (e.g. green and digital skills). Lifelong learning will be promoted as well. With this work, cohesion policy supports

([45]) In 2021-2027, cohesion policy funds include the European Regional Development Fund, the European Social Fund Plus and the Just Transition Fund.

([46]) European territorial cooperation (ETC) programmes are excluded from the figure. In 2021-2027, the total investment, including national financing, amounts to EUR 40.3 billion.

([47]) RRF funding includes both grants and loans, where applicable. The EU average is calculated for cohesion policy funds excluding ETC programmes. GDP figures are based on Eurostat data for 2022.

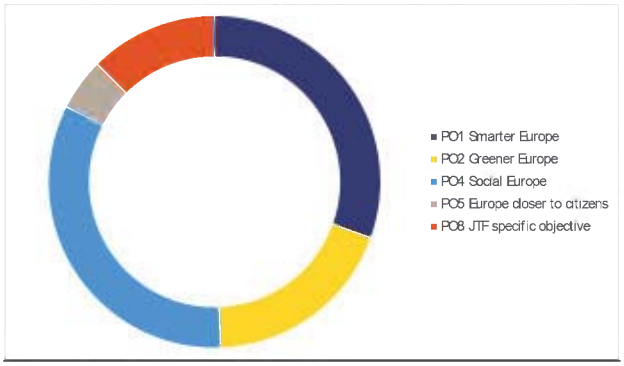
([48]) In 2014-2020, cohesion policy funds included the European Regional Development Fund and the European Social Fund. REACT-EU allocations are included but ETC programmes are excluded.

([49]) In 2014-2020, the total investment, including national financing, amounted to EUR 33.0 billion.

([50]) Cut-off date: 14 May 2024.

the UN Sustainable Development Goals (SDGs) in Germany, in particular SDG 9 (Industry, innovation, infrastructure), SDG 8 (Decent work and economic growth) and SDG 7 (Affordable and clean energy).

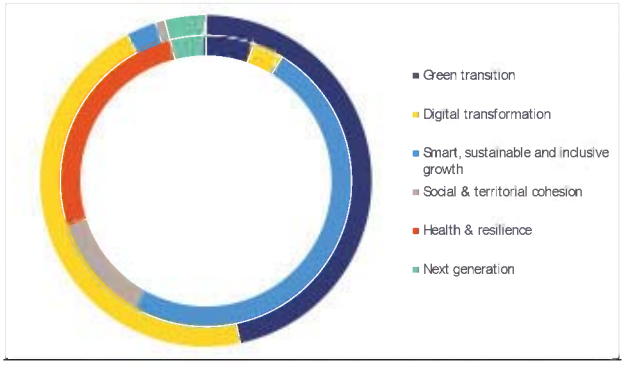
Graph A4.1: **Distribution of cohesion policy funding across policy objectives in Germany**



Source: European Commission

Through combined action, cohesion policy and the recovery and resilience plan (RRP) have a mutually reinforcing impact in Germany. For instance, the ERDF supports the creation of a regional hydrogen ecosystem, to develop the hydrogen value chains of the future. These investments complement support from the RRP in the field of hydrogen, based on an interregional intervention logic and focusing on future hydrogen transport and tank infrastructure. ERDF investments in this area have a regional focus, covering two hydrogen model regions and complementary components of the hydrogen economy. In these strategy-based projects, the entire value chain – from the production of green hydrogen to transportation, storage and use – is being tested. This also includes new ways of hydrogen production (such as using urban or industrial waste water as a source of hydrogen), knowledge transfer activities to SMEs from specialised research centres on hydrogen like 'H2BlackForest' and 'H2 test lab', or testing activities on the use of hydrogen via the 'Hydrogenium' centre. Another example is support under both the ERDF and the RRP in the field of digitalisation of businesses and public services, as well as interconnected electric mobility in urban areas. The contribution of cohesion policy and RRP funding by policy objective is illustrated by Graphs A4.1 and A4.2.

Graph A4.2: **Distribution of RRF funding by pillar in Germany**



(1) Each RRP measure helps achieve the aims of two of the six policy pillars of the RRF. The primary contribution is shown in the outer circle while the secondary contribution is shown in the inner circle. Each contribution represents 100% of the RRF funds. Therefore, the total contribution to all pillars displayed on this chart amounts to 200% of the RRF funds allocated to Germany.
Source: European Commission

The Technical Support Instrument (TSI) helps Germany strengthen its public administration and create a better enabling environment for EU and national investment. The TSI has funded projects in Germany to design and implement growth-enhancing reforms since 2018. The support provided in 2023 included action to among others, support climate adaptation by focusing on wildfire prevention assistance; further strengthen the spending review framework; improve security at the port of Hamburg; and improve specific monitoring and audit systems.

Germany also receives funding from several other EU instruments, including those listed in Table A4.1.

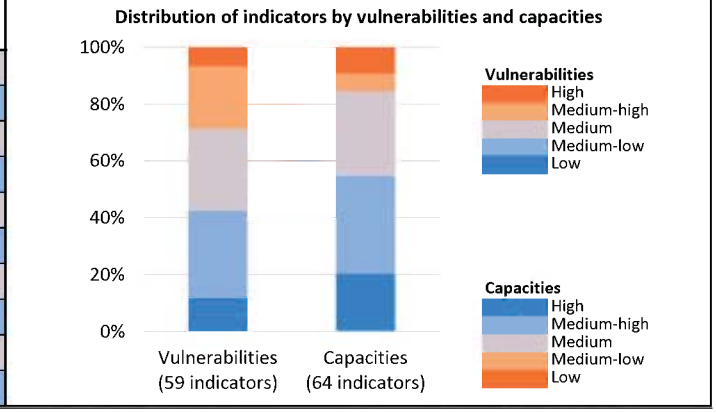
Table A4.1: **Support from EU instruments in Germany**

EU grants		
	Amount 2014-2020 (EUR million)	Amount 2021-2027 (EUR million)
Cohesion policy	20 673.3	19 860.6
RRF grants (1)	-	28 018.5
Public sector loan facility (grant component) (2)	-	188.0
Common agricultural policy (3)	55 100.0	30 744.0
EMFF/EMFAF (4)	219.6	211.8
Connecting Europe Facility (5)	2 415.5	1 096.2
Horizon 2020 / Horizon Europe (6)	10 127.0	5 168.0
LIFE programme (7)	177.7	110.6
EU guarantees		
	EU Guarantee (EUR million)	Volume of operations (EUR million)
European Fund for Strategic Investment 2015-2020 (8)	2 757.1	7 943.0
InvestEU 2021-2027 (9)	302.9	644.6

(1) RRF implementation period is 2021-2026.
(2) The public sector loan facility's programming period is 2021-2025 and the amount reflects the national share in its grant component reserved until the end of the period.
(3) Common agricultural policy programming periods are 2014-2022 and 2023-2027.
(4) EMFF – European Maritime and Fisheries Fund, EMFAF – European Maritime, Fisheries and Aquaculture Fund.
(5) Data on the Connecting Europe Facility covers transport and energy and has a cut-off date of 15 May 2024.
(6) Data on Horizon Europe (2021-2027) has a cut-off date of 13 May 2024.
(7) 2021-2027 data on the LIFE programme has a cut-off date of 15 May 2024.
(8) The amount of the EU guarantee signed under the EFSI Infrastructure and Innovation Window was derived based on the signed amount of the operations and the average internal multiplier, as reported by the EIB (cut-off date is 31 December 2023).
(9) The amount of the EU guarantee and of the volume of operations signed under InvestEU includes the EU compartment as well as the Member State compartments (cut-off date is 31 December 2023).
Source: European Commission

Table A5.1: **Resilience indices across dimensions for Germany and the EU-27**

Dimension		DE 2023 RDB	DE 2024 RDB	EU-27 2024 RDB
Overall resilience	Vulnerabilities			
	Capacities			
Social and economic	Vulnerabilities			
	Capacities			
Green	Vulnerabilities			
	Capacities			
Digital	Vulnerabilities			
	Capacities			
Geopolitical	Vulnerabilities			
	Capacities			



(1) The synthetic indices aggregate the relative resilience situation of countries across all considered indicators. For an indicator, each country's relative situation in the latest available year is compared with the collection of values of that indicator for all Member States and all years in the reference period.
Source: Resilience Dashboards - version spring 2024, data up to 2022

This Annex uses the Commission's resilience dashboards (RDB) ([51]) to show Germany's relative resilience capacities and vulnerabilities ([52]) that may be of relevance for societal, economic, digital and green transformations, and for dealing with future shocks and geopolitical challenges ([53]).

According to the set of resilience indicators in the RDB, Germany has medium overall vulnerabilities and medium-high overall capacities, both of which have remained broadly stable with respect to last year's dashboard. This is also reflected in the distribution of indicators across the various resilience dimensions: less than 30% of vulnerability indicators fall into the medium-high or high category, whereas around 20% of capacity indicators fall into the low or medium-low category.

In the social and economic dimension, Germany has medium-low vulnerabilities and medium-high capacities, both of which have remained stable compared to 2023. Vulnerabilities continue to be below the EU average, but the variation in performance explained by students' socio-economic background remains high, as does the proportion of people employed in energy-intensive sectors. Government debt has dropped noticeably compared to the 2023 RDB. Germany maintains its strong capacities in terms of the household saving rate, employment rate, and insurance sector solvency capital ratio.

In the green dimension, Germany's capacities and vulnerabilities remain steady, at medium-high and medium respectively. It stands out for its high capacities, such as the high number of environmental patents per capita, its high energy and resource productivity and its performance in urban wastewater treatment. At the same time, its vulnerabilities related to the number of fatalities from climate extremes, the energy used in ICT and the soil-sealing index continue to be well above the EU average.

In the digital dimension, vulnerabilities and capacities remain stable, at medium level. Germany reduced several of its capacities with a decline in the number of young people participating in online learning activities, a decreased use of online courses, and a drop in the value of e-commerce sales after the COVID-19 pandemic. Germany's capacities in terms of the advanced digital competence of

([51]) Resilience is defined as the ability not only to withstand and cope with challenges but also to undergo transitions, in a sustainable, fair, and democratic manner. See: European Commission, 2020, *Strategic Foresight Report: Charting the course towards a more resilient Europe*, ec.europa.eu.

([52]) Vulnerabilities describe features that can exacerbate the negative impact of crises and transitions, or obstacles that may hinder the achievement of long-term strategic goals, while capacities refer to enablers or abilities to cope with crises and structural changes and to manage transitions.

([53]) This Annex is linked to Annex 1 on SDGs, Annex 6 on the green deal, Annex 8 on the fair transition to climate neutrality, Annex 9 on resource productivity, efficiency and circularity, Annex 10 on the digital transition and Annex 14 on the European pillar of social rights.

adults and young people also continue to be relatively low while the increase of value added in the ICT sector contributed positively to its capacity. On a more positive note, the country's vulnerabilities have remained stable with respect to the 2023 RDB, with Germany performing the best in the EU for 5G readiness.

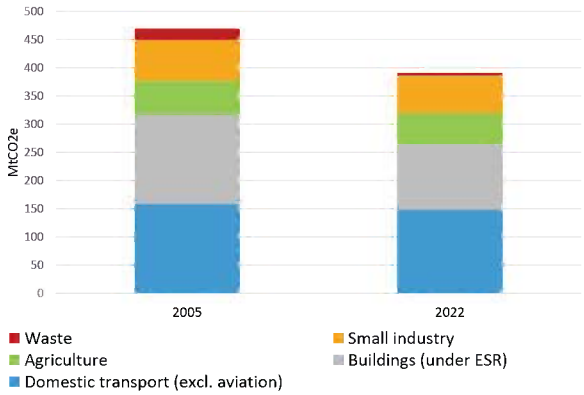
Germany's medium geopolitical resilience capacities remain below the EU average, while its vulnerabilities, medium-low, are above the EU average. The country has improved its intra-EU trade in energy. It has also maintained a strong net international investment position, making it resilient to global capital flows and financial distress. On the other hand, the employment gap between EU and non-EU nationals living in Germany remains high.

Germany has made progress in the green transition, with more action needed to specify the funding framework for the climate and energy transition and the policies needed to reach its 2030 effort sharing target, on biodiversity and ecosystem protection, and other areas. This Annex provides a snapshot of climate, energy, and environment aspects of the transition in Germany ([54]).

Germany's draft updated national energy and climate plan (NECP) lacks key information on investment needs and funding sources to achieve its 2030 climate and energy targets. The plan lacks information on the total investment needs for the planned policies and measures. The plan outlines some but not all sources of financing and lacks a consolidated overview of funding sources and needs. This means it is not possible to identify potential funding gaps. As a consequence of the Federal Constitutional Court annulling in late 2023 the transfer of pandemic related credits into the Climate and Transformation Fund, a large share of the funding in the draft plan is uncertain ([55]).

Current policies and measures in Germany are insufficient to reach its 2030 effort sharing target ([56]) **and it has yet to specify further planned action**. Germany's 2022 greenhouse gas emissions from its effort sharing sectors are expected to come in at 19.4% below 2005 levels. Current policies are projected to reduce Germany's emissions from the effort sharing sector by 34.6% from 2005 levels by 2030 ([57]). Germany has not provided a scenario 'with additional measures'. This is problematic as it is projected to fall short of its effort sharing target, to reduce by 50% from 2005 levels, by 15.4 percentage points. This highlights the importance of planning and implementing more ambitious climate action. The draft updated NECP reiterates Germany's commitment to achieve climate neutrality by 2045.

Graph A6.1: **Greenhouse gas emissions from the effort sharing sectors in Mt CO2eq, 2005-2022**



Source: European Environment Agency

There is scope for increasing Germany's target for renewable energy in its final updated NECP ([58]). Germany's renewable energy contribution set in its draft updated NECP, 40% by 2030, is slightly below the requirement of 41%. Its energy efficiency contribution of 160.5 Mtoe in final energy consumption for 2030 set in the draft updated

([54]) This Annex is complemented by Annex 7 on energy transition and competitiveness, Annex 8 on the fair transition to climate neutrality, Annex 9 on resource efficiency, circularity, and productivity, and relevant topics in other annexes to this country report.

([55]) European Commission, 2023, *Assessment of the draft updated National Energy and Climate Plan of Germany*, commission.europa.eu

([56]) The national greenhouse gas emission reduction target is laid down in Regulation (EU) 2023/857 (the Effort Sharing Regulation). The aim is to align action in the sectors concerned with the objective to reach the EU-level economy-wide target of greenhouse gas reductions of at least 55% compared to 1990 levels. The target also applies to the sectors outside the current EU Emissions Trading System, notably buildings (heating and cooling), road transport, agriculture, waste, and small industry (known as the effort sharing sectors).

([57]) The effort sharing emissions for 2022 are based on approximated inventory data. The final data will be established in 2027 after a comprehensive review. Projections on the impact of current policies ('with existing measures', WEM) as per Germany's draft updated NECP.

([58]) The EU target set out in the revised Renewable Energy Directive is to have 42.5% of gross final energy consumption coming from renewable energy sources by 2030, with the aspiration to reach 45%. The formula in Annex I to Directive (EU) 2023/1791 sets the indicative national contribution for Germany at 194.23 Mtoe for primary energy consumption and 155.95 Mtoe for final energy consumption. European Commission, 2023, Commission Recommendation of 18/12/2023 Germany, commission.europa.eu

NECP reflect the contribution required by the Energy Efficiency Directive.

Continued effort is crucial to achieve the shift to zero-emission transport in Germany ([59])**.** Cars are used for over 89% of the distances travelled (above the EU average of 85%). In 2022, battery electric vehicles made up 2% of Germany's car passenger fleet, a significantly higher share than the EU average (1.2%), but the continued increase in this share is challenged by the cuts to financial incentives. In 2023, Germany had about 125 000 publicly accessible charging points, one for every 15 e-vehicles (against the EU average of 1:10). Freight transport by road is slightly below the EU average (72%, EU: 75%), with a higher share of inland waterways and rail. 53% of the railway network is electrified (EU average: 56%). Improving the quality and service of rail operations would help stimulate demand for public transport and ease road congestion ([60]).

The rewetting of peatlands gives a prospect of reversing the trend of falling net carbon removals by the land use, land-use change and forestry (LULUCF) in Germany. Germany is experiencing a concerning trend that net carbon removals from the LULUCF sector have fallen since 2017. To reach its 2030 LULUCF target, additional carbon removals of -3 751 kt CO_2eq are needed ([61]). According to the latest projections for 2030, Germany is expected to meet this target ([62]).

Germany's climate change risks include a particularly high risk of flooding (including coastal floods), with potentially high economic impacts. Germany has made significant progress on climate adaptation, particularly on assessing and monitoring risks and impacts. It revised its national adaptation strategy (with an update in 2024) and plan and requires the federal state and municipal governments to implement climate adaptation strategies. Germany has a high share of insurance coverage against climate risks, except for coastal flooding, and a relatively low climate protection gap ([63]). Germany has scope to improve its climate adaptation policies, engagement with vulnerable stakeholders, and its use of private-sector capacities and funding ([64]).

Air quality in Germany continues to give cause for serious concern, despite recent improvements. The latest available annual estimates (2020) by the European Environmental Agency indicate that Germany suffers some 356 years of life lost for every 100 000 inhabitants due to exposure to particulate matter (PM2.5) and 123 years due to NO_2 exposure. The indicator for smog-precursor emission intensity to GDP fell by 40% between 2008 and 2021 to reach 0.6 tonnes/EUR 10. All three metrics were below the EU average.

Despite efforts to protect biodiversity, the state of ecosystems is still a matter of concern. By the end of 2021, Germany had protected 37% of its land. According to the indicators tracking the conservation status of protected habitats and species in Article 17 of the Habitats Directive, 30% of habitats and 26% of species were in a good conservation status, and over a third of habitats and species remained in a bad conservation status. According to the latest available data (2016), the Common Farmland Bird Index was 84.4, above the EU average. Germany also has one of the highest shares of red-listed species and habitat types for several classes in the EU, many of which, however, are still in decline.

Intensive agriculture has a major impact on ecosystems, biodiversity and air quality. The annual output value of Germany's agricultural sector was EUR 55.4 billion ([65]) in 2023. The share of utilised agricultural area under organic farming increased to 9.7% in 2021, broadly in line with the EU average of 9.1%[9] but still far from the national goal of at least 30% of agricultural area under organic

([59]) Unless otherwise indicated, data in this section refer to 2021. See European Commission, 2023, *EU transport in figures*, transport.ec.europa.eu

([60]) In 2020, road vehicle drivers experienced peak-hour delays of 30 hours on average in Germany (EU average: 29 hours).

([61]) National LULUCF targets of the Member States in line with Regulation (EU) 2023/839.

([62]) Projections submitted in Germany's draft updated national energy and climate plan, 2023.

([63]) On the climate protection gap, see the annotations to Table A6.1.

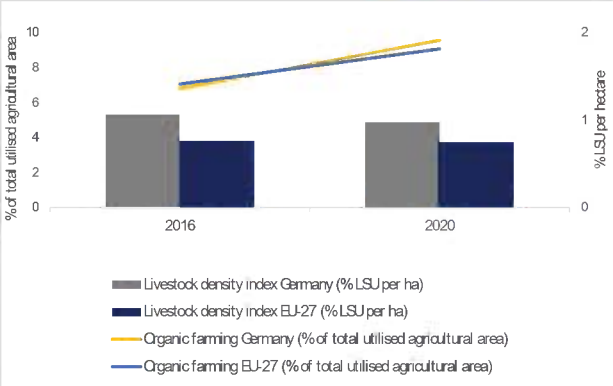
([64]) See the Commission's 2023 assessment and recommendation on Germany's progress on climate adaptation.

([65]) Production value at basic price (2015=100).

farming by 2030. According to the impact assessment for the Soil Monitoring Law ([66]), 59% of Germany's soil could be considered as unhealthy ([67]). Over 50% of agricultural land has a nutrient surplus, while the loss of organic carbon affects 43% of cropland area. Germany's livestock density index decreased from 1.04 to 0.98 between 2010 and 2020, remaining above the EU average of 0.75. Livestock production is distributed very unevenly among the regions. The main hot spots are in the West/North-West and in the South-East. Most regions reported a fall in the number of livestock units, except in Weser-Ems and Münster. Germany produced 131 kg of food waste per person in 2020, which represents the EU average.

Intensive poultry and pig farming is the industrial activity that puts the highest burden on the environment in terms of ammonia emissions into the air and nitrate pollution of water. Overall, the agricultural sector was responsible for generating 82% of all ammonia emissions in 2021, against the EU average of 90.7%. Only 2.7% of agricultural land in Germany is irrigated and the water abstracted for agricultural purposes accounted for 1.4% of all water abstracted in 2019.

Graph A6.2: **Changes in livestock density and organic farming evolution**



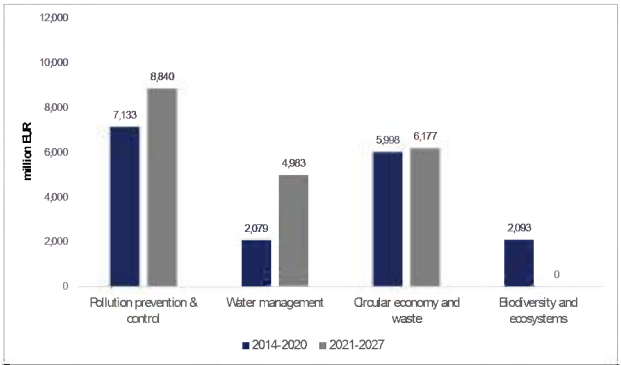
Livestock unit (LSU)/ha of UAA: it measures the stock of animals (cattle, sheep, goats, equidae, pigs, poultry and rabbits) converted in LSUs per hectare of UAA.
Source: Eurostat

The issue of nitrate pollution of water bodies persists, especially in hotspots with a high livestock density. The latest figures for the gross nitrogen balance on agricultural land in Germany indicate an average surplus of 53.4 kg of nitrogen per hectare per year in 2019, lower than in previous years. The nitrates content in groundwater is slightly below the EU average, at 20.2 against 20.5 mg nitrates/l with 26.7% of groundwater monitoring stations indicating levels above the maximum 50 mg nitrates/l. Nitrate pollution can be directly linked to the very high livestock density, which affects surface water quality and quantity in affected areas. By contrast, the gross phosphorus balance was -4.8 kg/ha in 2019. The chemical status of waterbodies is affected by pesticide contamination. In 2021, 16% of surface monitoring sites were reported to have pesticide levels exceeding the thresholds set by the Water Framework Directive. This is lower than in 2018, but above most other EU countries.

([66]) European Commission, 2023, *Impact assessment for the Directive on Soil Monitoring and Resilience*, environment.ec.europa.eu (see p. 10, pp. 189-190, pp. 835-845).

([67]) However, not all soil degradation processes could be quantified for all land uses. This number simply indicates an order of magnitude.

Graph A6.3: **Environmental investment gap, annual average**



The numbers are computed by the European Commission based on the latest internal reports, Eurostat, EIB and national data sources.
Source: European Commission

Although investments in measures to protect biodiversity have increased, Germany would benefit from investing more in sustainable water management and pollution prevention. According to the latest estimates, the overall environmental investment needs for 2021-2027 are at least EUR 73.7 billion a year, against the financing baseline of EUR 54 billion, leaving a wider gap than under the previous financing period, equivalent to EUR 19.7 billion. Germany expects to increase the investment for biodiversity and ecosystems. The investment gaps to achieve the remaining environmental objectives have widened. The annual investment gap is EUR 8.8 billion for pollution prevention and control, EUR 6.2 billion for the circular economy and waste, and close to EUR 5 billion for sustainable water management.

Table A6.1: **Indicators tracking progress on the European Green Deal from a macroeconomic perspective**

							Target	Distance	
		2005	2019	2020	2021	2022	2030	WEM	WAM
Progress to climate and energy policy targets									
Greenhouse gas emission reductions in effort sharing sectors [1]	Mt CO_{2eq}, %, pp	484,694.6	-7%	-15%	-17%	-19%	-50%	-15	n/a
Net greenhouse gas removals from LULUCF [2]	Kt CO2eq	8 865	-2 462	5 798	2 622	4 382	-30,840	n/a	n/a
Share of energy from renewable sources (1) [3]	%	7%	17%	19%	19%	21%	41%	-	-
Energy efficiency: primary energy consumption [3]	Mtoe	321.6	285.2	262.2	271.5	260.6	194.2		
Energy efficiency: final energy consumption [3]	Mtoe	219.7	214.7	202.3	207.9	202.8	155.5		
							EU-27		Projected
		2018	2019	2020	2021	2022	2021	2022	2030
Green transition: mobility									
Greenhouse gas emissions: road transport	Mt CO2e	-	-	-	146.0	146.8	769.0	786.6	108.9
Share of zero-emission vehicles in new registrations [4]	%	1	1.7	6.6	13.4	17.5	9	12.1	n/a
Number of publicly accessible AC/DC charging points		-	-	42048	57790	83560	299178	446956	n/a
Share of electrified railways	%	54.0%	54.0%	53.1%	53.0%	-	56.1%	-	n/a
Green transition: buildings									
Greenhouse gas emissions: buildings	Mt CO2e	-	-	-	123.8	117.5	537.0	486.7	73.5
Final energy consumption in buildings	2015=100	97.1%	97.7%	97.2%	100.5%	94.9%	104.0%	97.2%	
Climate adaptation									
Climate protection gap [5]	score 1-4	-	-	1.6	1.7	1.9	1.5	1.5	n/a
		2018	2019	2020	2021	2022	2020	2021	2022
State of the environment									
Water | Water exploitation index (WEI+) (1) [6]	% of renewable freshwater	5.7	2.6	-	-	-	3.6	-	-
Circular economy | Material footprint [7]	tonnes per person	16.1	15.7	14.8	14.8	14.5	14.2	14.8	14.9
Pollution | Years of life lost due to air pollution by PM2.5 [8]	per 100.000 inhabitants	617	439	356	400	-	545	584	-
Biodiversity | Habitats in good conservation status [9]	%	29.7					14.7		
Common farmland bird index [10]	2000=100	-	-	-	-	-	78	-	-
Green transition: agri-food sector									
Organic farming	% of total utilised agricultural area	7.34	7.75	9.59	9.65	-	9.1	-	-
Nitrates in groundwater	mg NO_3/litre	29.71	20.5	27.45	-	-	20.42	-	-
Food waste per capita	Kg per capita			131	-	-	130	131	-
Share of soil in poor health [11]	%					59			41
Soil organic matter in agricultural land [12]	Mt per ha	1004	-	-	-	-	7,904	-	-

Sources: (1) Member States' emission data for 2019 and 2020 are in global warming potential (GWP) values from the 4th Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC). Member States' 2005 base year emissions under Regulation (EU) 2018/842, emissions data for 2021 and 2022, and 2030 projections are in GWP values from the 5th Assessment Report (AR5) of the IPCC. 2021 data are based on the final inventory reports, 2022 data are based on approximated inventory reports and European Environmental Agency's calculation of effort sharing emissions. The final data for 2021 and 2022 will be established after a comprehensive review in 2027. The 2030 target is in percentage change of the 2005 base year emissions. Distance to target is the gap between the 2030 target and projected effort sharing emissions with existing measures (WEM) and with additional measures (WAM), in percentage change from the 2005 base year emissions. The measures included for the 2030 emission projections reflect the state of play as reported in Member States' draft updated national energy and climate plans or, if unavailable, as reported by 15 March 2023 as per Regulation 2018/1999. (2) Net removals are expressed in negative figures, net emissions in positive figures. Reported data are from the 2024 greenhouse gas inventory submission. 2030 value of net greenhouse gas removals as in Regulation (EU) 2023/839 – Annex IIa. (3) The 2030 national objectives for renewable energy and energy efficiency are indicative national contributions, in line with Regulation (EU) 2018/1999 (the Governance Regulation), the EU-level 2030 renewable energy target set out in Directive EU/2018/2001 amended by Directive EU/2023/2413 (the revised Renewable Energy Directive) – 42.5% of gross final energy consumption with the aspiration to reach 45% –, and the formula in Annex I to Directive (EU) 2023/1791 (the Energy Efficiency Directive). (4) Passenger battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV). (5) The climate protection gap refers to the share of non-insured economic losses caused by climate-related disasters, based on modelling of the risk from floods, wildfires, windstorms, and the insurance penetration rate. Scale: 0 (no protection gap) –4 (very high gap) (European Insurance and Occupational Pensions Authority, 2022). (6) Total water consumption in renewable freshwater resources available for a territory and period. (7) Material extractions for consumption and investment. (8) Years of potential life lost through premature death due to exposure to particulate matter with a diameter of less than 2.5 micrometres. (9) Share of habitats in good conservation status according to the records submitted under Art. 17 of the Habitats Directive (Directive 92/43/EEC) for 2013-2018. (10) Multi-species index measuring changes in population abundances of farmland bird species. (11) Source: annex 12 of the Commission's proposal for a soil monitoring law, SWD (2023) 417 final. (12) Estimates of organic carbon content in arable land.

ANNEX 7: ENERGY TRANSITION AND COMPETITIVENESS

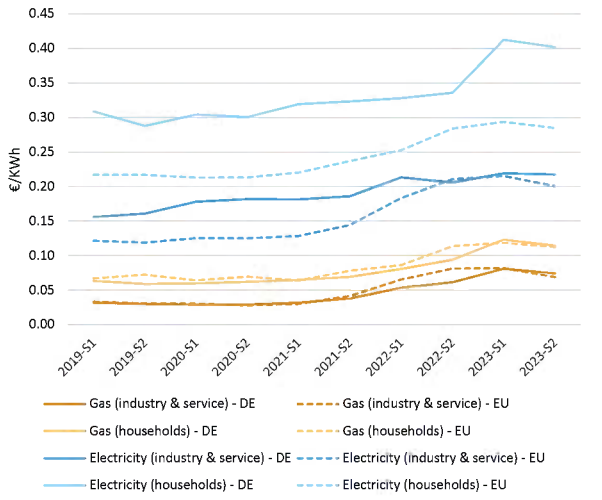
This Annex ([68]) sets out Germany's progress and challenges in accelerating the net-zero energy transition while bolstering the EU's competitiveness in the clean energy sector ([69]). It considers measures and targets put forward in the draft updated National Energy and Climate Plans (NECP) for 2030 ([70]).

Germany has made significant steps in implementing reforms to accelerate the deployment of renewables, particularly in solar photovoltaics, but this has not trickled down at consumer and industry prices level. Germany requires further grid expansion and reinforcements, to enable the integration of additional renewable energy capacity. In energy efficiency, Germany demonstrated progress but there is still untapped potential. In clean energy technologies manufacturing and their supply chains international competition is intensifying.

Retail energy prices in gas and electricity exhibited a decline in the second half of 2023 in Germany but were still above the levels recorded in the second semester of 2022. A significant difference remains between gas and electricity prices, despite the introduction of electricity and gas price brakes ('*Energiepreisbremse*') in January 2023. Gas prices aligned with the EU average, while levels in electricity prices were well above in the second half of 2023, by 41% and 8% for household and industrial consumers, respectively. In the industry and service sector, both gas and electricity average prices reached their peak in the first half of 2023, increasing respectively by 32% and 7% compared to the second semester of 2022. Average gas prices then decreased by 8% in the second half of the year while average electricity prices remained stable.

The direct energy support measures to final consumers implemented since the outset of the energy crisis have had the form of price and income support schemes and they were only partially targeted at the most vulnerable households. As a main energy measure introduced during the energy crisis, Germany applied the *Energiepreisbremse*, including transfers based on the price of district heating. This absorbed the sharply increased costs of energy for the whole population, including companies. The price brakes expired on 31 December 2023. However, for 2024 and 2025, the manufacturing industry will benefit from a substantial reduction in electricity taxes, as well as an extension of the existing electricity price compensation for five years.

Graph A7.1: **Germany's energy retail prices for households and industry & service**



(1) For industry, consumption bands are I3 for gas and IC for electricity, which refer to medium-sized consumers and provide an insight into affordability
(2) For households, the consumption bands are D2 for gas and DC for electricity
(3) Industry prices are shown without VAT and other recoverable taxes/levies/fees as non-household consumers are usually able to recover VAT and some other taxes
Source: Eurostat

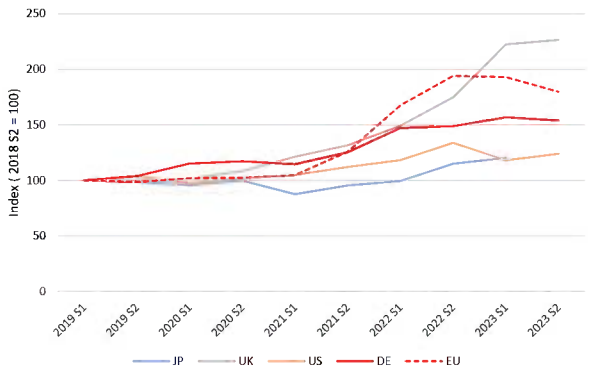
In relative terms, electricity prices for non-household consumers have registered a slight increase compared to the US and Japan until the first semester of 2023, thus potentially affecting the international competitiveness of energy-intensive industries in Germany.

([68]) It is complemented by Annex 6 as the European Green Deal focuses on the clean energy transition and by Annex 8 on the action taken to protect the most vulnerable groups, complementing ongoing efforts under the European Green Deal, REPowerEU and European Green Deal Industrial Plan.

([69]) In line with the Green Deal Industrial Plan and the Net-Zero Industry Act

([70]) Germany submitted its draft updated NECP in November 2023; the Commission issued an assessment and country specific recommendations on 18 December 2023.

Graph A7.2: **Trends in electricity prices for non-household consumers (EU and foreign partners)**



(1) For Eurostat data (EU and DE), the band consumption is ID referring to large-sized consumers with an annual consumption of between 2 000 MWh and 20 000 MWh, such as in electricity intensive manufacturing sectors, and gives an insight into international competitiveness
(2) JP = Japan
Source: Eurostat, IEA

Consumer empowerment in the electricity and gas markets is progressing. While installation and operation of smart meters is slowly advancing, energy communities are facing some implementation challenges. In 2022 almost 100% of contracts held by household consumers in Germany (for both electricity and gas) were fixed-price contracts. Dynamic tariffs were not introduced until 2023. Switching rates in gas were stably below 15% (no data for electricity), and quick switching procedures are in place. In 2023, the German government adopted a law to restart the digitalisation of the energy transition and accelerate the smart meter rollout, aiming for a rollout of 95% by 2030 for residential and small business consumers (with intermediate targets for 2025 and 2028). Implementation of renewable energy communities is slow, because the pertinent legislation is not yet transposed in its entirety. The rollout of smart meters has been slow ([71]). The amendment of the 2023 Renewable Energy Sources Act provides new incentives for establishing energy communities, such as exemption from tendering duties.

Germany continues to increase the security of its gas supply, having diversified away from Russian gas by increasing imports from Norway, the Netherlands and Belgium, as well as by commissioning its first LNG infrastructure in Wilhelmshaven, in December 2022, enabling LNG imports. Germany currently has three operational floating storage regasification units (FSRUs): Lubmin, Brunsbüttel and Wilhelmshaven, with a total annual capacity in 2023 of approximately 9 bcm. Another three FSRUs are planned and are expected to be operational by mid-2024. This infrastructure could benefit regional and European security of supply. Germany has the largest underground gas storage capacity of the EU, with almost 23 bcm spread across 44 facilities, representing around 26% of its annual gas consumption in 2022. Germany fulfilled its gas storage obligations last winter, reaching 99.77% by 1 November 2023, and ended the winter season with a storage filled at 66.38% by 1 April 2024.. Germany managed to reduce its gas demand between August 2022 and January 2024 by 16%. Annual gas consumption amounted to 79.3 bcm in 2022 (against 96.2 bcm in 2021).

In its draft updated NECP, Germany seems to be postponing its coal phase-out, compared to what is laid down in its territorial just transition plan (TJTP). The draft updated NECP is partially consistent with the adopted plan. While the plan states that Germany intends to phase out coal by 2038 at the latest, and to phase out lignite by 2030, it also envisages coal and lignite together covering about 6% of primary energy consumption by 2030 and still to be used in 2050. ([72]) The final updated NECP should ensure alignment with the timeline outlined in the TJTP.

Installed renewable capacity surged by 12% in 2023 ([73]), driven by the significant increase in solar, in particular photovoltaics. Looking forward, Germany has ambitious yearly development plans to cover at least 80% of gross electricity consumption with

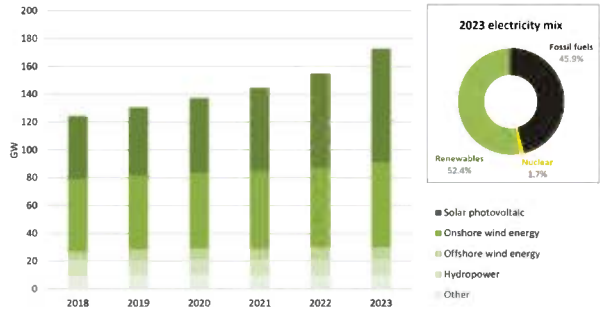
([71]) German Regulatory Framework, energycommunitieshub.com

([72]) European Commission, 2023: *Assessment of the draft updated NECP*, commission.europa.eu

([73]) IRENA, 2023, *Renewable Energy Statistics*, irena.org, the data might differ from the Eurostat data because a different methodology is used to calculate the capacity in AC and DC.

renewable energy sources by 2030, which equates to 10 GW in onshore wind and 22 GW from solar PV annually.

Graph A7.3: **Germany's installed renewable capacity (left) and electricity generation mix (right)**



(1) "Other" includes renewable municipal waste, solid biofuels, liquid biofuels, and biogas.
Source: IRENA, Ember

As regards the acceleration of solar deployment, total installed capacity in 2022 was 67 GW (an increase of 12%), almost exclusively from solar PVs. The total wind capacity in Germany for 2022 was 66 GW (an increase of 4%), of which 58 GW was onshore and 8 GW offshore ([74]). Germany wants to achieve 30 GW in total of offshore wind by 2030 and 40 GW by 2035. This goal aligns with Germany's non-binding agreement, defined by the non-binding goals in the EU Sea Basins agreement of January 2023.

Germany made significant steps in implementing reforms to accelerate the deployment of renewables. There is a clear visibility of the project pipeline for renewable energy projects in Germany, with clear targets for the coming years. Germany introduced legislation which qualifies all renewable energies as being in the overriding public interest, speeding up different procedural steps, setting goals for all regions for wind developments and creating uniform standards for the species protection assessment. Germany has created a single unified application process for the entire administrative permit application and granting process. Moreover, Germany made intensive use of Emergency Regulation 2022/2577 on renewables and, according to preliminary numbers, managed to strongly increase both the amount of wind capacity installed in 2023 and (even more) the number of projects receiving permits.

([74]) IRENA, 2023, *Renewable Energy Statistics*, irena.org

Germany requires further grid expansion and reinforcements, both at transmission and distribution level, to enable the integration of additional renewable energy capacity and to reduce the curtailment of renewable energy, which amounted to more than 8 TWh in 2022. National legislation was amended in 2023 to enable the accelerated expansion of the electricity networks, also making use of the rules under the EU Emergency Regulation to advance grid permitting. Besides the swift expansion of high-voltage transmission grids, including the on-going Projects of Common Interest, the reinforcement and digitalisation of the distribution grid will be critical for the electrification of the building sector (heat pumps) and the transport sector (e-mobility). Against this background, Germany introduced an obligation on distribution system operators to publish distribution network development plans every two years, as of 2024. The German government published a storage strategy at the end of 2023 which sets out key measures to increase the deployment and use of storage, to balance the grid.

Germany demonstrated progress but there is still untapped potential on energy efficiency. In 2022, Germany had a drop in primary energy consumption of 4.2% compared to 2021 and 13.6% compared to 2012. And it had a drop in final energy consumption of 2.4% compared to 2021 and 5.9% compared to 2012. In this last year, the best results came from the services sector which decreased its final energy consumption by 15.7%, and the worst from the transport sector which increased its final energy consumption by 6.3%. The German recovery and resilience plan supports measures addressing buildings, transport, and industry. Under cohesion policy, Germany implements energy efficiency investment, targeting deep renovations in companies, eco-friendly production processes and public buildings. Germany also offers many domestic support instruments for energy efficiency such as subsidy schemes for homeowners, municipalities, and companies. The focus is on grants, with some tax rebates and guarantees also offered.

In relation to buildings, Germany needs to step up its efforts in the residential sector to achieve a meaningful contribution to its 2030 reduction target for energy consumption in buildings. Residential final energy consumption increased by 4.12% ([75]) between 2018 and 2022, while the national Long-Term Renovation Strategy aims to reduce primary energy consumption in buildings by 39% between 2018 and 2030.

Germany's relatively low share of renewables in heating and cooling (17.5% in 2022; EU average: 24.9%) is covered by more than 80% biomass use (including biogenic waste incineration), with heat pumps covering almost 10%. Despite higher increases in heat pumps sales in 2022 (55% more than the previous year), Germany is among the countries with the lowest number of heat pumps per household. There is no explicit heating target stated in the draft updated NECP. Residential electricity in Germany is still 3.5 times more expensive than gas, meaning that end users save energy but pay more if they chose a heat pump for heating. In 2023, Germany passed the "Building Energy Act" (*Gebäudeenergiegesetz*) which requires that new buildings be equipped with a heating system powered at least 65% by renewable energy: as of January 2024, for newly constructed buildings in new development areas, as of July 2026/2028, for existing buildings and newly constructed buildings outside of new development areas.

A low number of market surveillance activities on products covered by ecodesign and energy labelling creates concerns about compliance levels. This generates concerns with respect to the level playing field among economic operators and uncertainty as to compliance levels by the products in question. This could mean missed energy and CO2 savings.

Germany expects a hydrogen demand of between 95 and 130 TWh by 2030, covered by domestic generation of 10 GW and hydrogen imports of between 45 and 90 TWh, reflected in their updated 2023 National Hydrogen Strategy. This requires the necessary hydrogen infrastructure to be in place. As per Germany's first EU list of Projects of Common Interest and Projects of Mutual Interest, those hydrogen infrastructure projects will allow Germany to import hydrogen from all neighbouring regions.

Germany has traditionally had a strong innovation performance and manufacturing base for clean energy technologies and their supply chains. But international competition is intensifying. The German PV sector, with its material producers, mechanical engineering, component manufacturers and R&D facilities still occupies a strong position in some segments of the value chain. Germany hosts the only solar-grade polysilicon supplier in Europe. In modules, Germany produces mainly for its domestic market, but lacks sufficient manufacturing capacity for PV ingots, wafers and cells. Germany has a number of manufacturing facilities for the main wind turbine components (nacelle, blades and tower). Additionally, other German companies are providing components to the main global manufacturers, such as bearings, gear boxes and transformers. In the battery sector, the leading cell producers in the EU are mostly the local subsidiaries of Far East (mainly Chinese) or US companies. EU owned companies, many of them German, are also active and/or are preparing a number of battery cell production facilities. Some of those are integrated into the value chain of German car manufacturers. In Europe, Germany is currently the country with the highest installed manufacturing electrolysis capacity, in polymer electrolyte membrane (PEM) and alkaline.

Germany ranks fifth in the world in the patenting of high-value inventions in solar PV. In connection to this, the EU having the highest share of the global market for clean energy technologies is notably driven by Germany, which accounted for 10% of the world market in 2019. Public and private funding for research and innovation (R&I) activities grew in parallel to economic growth between 2010 and 2019. In 2019, private R&I spending exceeded public funding by a factor of 14 (EUR 936.4 million vs EUR 13 391.2 million; see Annex 11). Germany's public spending for research and innovation in clean

([75]) Final energy consumption in households from Eurostat (data-tables of December 2023), climate-corrected by the Joint Research Centre with reference period 2005-2022 (FEC climate corrected = FEC/ (HDD/HDD reference period)

Table A7.1: **Key energy indicators**

		Germany				EU			
		2019	2020	2021	2022	2019	2020	2021	2022
ENERGY DEPENDNCE	**Import Dependency [%]**	**67.1%**	**63.7%**	**63.4%**	**68.6%**	**60.5%**	**57.5%**	**55.5%**	**62.5%**
	of Solid fossil fuels	47.2%	44.1%	47.8%	50.0%	43.3%	35.8%	37.3%	45.8%
	of Oil and petroleum products	97.3%	96.5%	95.6%	96.9%	96.7%	96.8%	91.7%	97.7%
	of Natural Gas	100.1%	89.1%	90.7%	105.9%	89.7%	83.6%	83.6%	97.6%
	Dependency from Russian Fossil Fuels [%]								
	of Natural Gas	48.8%	65.2%	65.4%	29.6%	39.7%	41.3%	41.1%	21.0%
	of Crude Oil	31.5%	34.0%	34.1%	25.4%	28.8%	26.7%	26.4%	19.5%
	of Hard Coal	46.7%	48.1%	52.6%	30.5%	43.5%	49.1%	47.4%	21.5%

		2016	2017	2018	2019	2020	2021	2022
DIVERSIFICATION OF GAS SUPPLIES	**Gas Consumption (in bcm)**	**87.9**	**95.0**	**94.7**	**95.6**	**92.9**	**99.0**	**89.6**
	Gas Consumption year-on-year change [%]	8.1%	8.1%	-0.3%	0.9%	-2.8%	6.5%	-9.4%
	Gas Imports - by type (in bcm)	**97.4**	**118.7**	**88.3**	**94.8**	**80.4**	**84.8**	**87.7**
	Gas imports - pipeline	97.4	118.7	88.3	94.8	80.4	84.8	87.7
	Gas imports - LNG	0.0	0.0	0.0	0.0	0.0	0.0	-
	Gas Imports - by main source supplier (in bcm) (1)							
	Norway	10.7	11.1	2.5	2.6	16.5	16.2	27.7
	Russia	58.7	62.1	43.1	46.2	52.5	55.4	25.9

		2019	2020	2021	2022	2023
	LNG Terminals - storage capacity m3 LNG					
	Number of LNG Terminals	0	0	0	1	3
	LNG Storage capacity (m3 LNG)	0	0	0	174,000	763,000
	Underground Storage					
	Number of storage facilities	57	57	60	60	44
	Technical Capacity (bcm)	22.2	21.8	21.8	22.0	22.0

		2016	2017	2018	2019	2020	2021	2022	2023
ELECTRICITY/ENERGY	**Gross Electricity Production (GWh) (2)**	**650,449**	**653,723**	**640,468**	**606,917**	**575,462**	**592,799**	**580,266**	-
	Combustible Fuels	419,596	404,286	385,445	334,214	302,330	332,188	335,279	-
	Nuclear	84,634	76,324	76,005	75,071	64,382	69,130	34,709	-
	Hydro	26,134	26,155	23,863	25,671	25,275	24,972	23,576	-
	Wind	79,924	105,693	109,951	125,894	132,102	114,169	124,816	-
	Solar	38,098	39,401	43,459	44,383	49,496	50,472	60,304	
	Geothermal	175	163	178	197	231	244	206	-
	Other Sources	1,888	1,701	1,567	1,487	1,646	1,624	1,376	-
	Gross Electricity Production [%]								
	Combustible Fuels	64.5%	61.8%	60.2%	55.1%	52.5%	56.0%	57.8%	-
	Nuclear	13.0%	11.7%	11.9%	12.4%	11.2%	11.7%	6.0%	-
	Hydro	4.0%	4.0%	3.7%	4.2%	4.4%	4.2%	4.1%	-
	Wind	12.3%	16.2%	17.2%	20.7%	23.0%	19.3%	21.5%	-
	Solar	5.9%	6.0%	6.8%	7.3%	8.6%	8.5%	10.4%	-
	Geothermal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-
	Other Sources	0.3%	0.3%	0.2%	0.2%	0.3%	0.3%	0.2%	-
	Net Imports of Electricity (GWh)	**- 50,525**	**- 52,459**	**- 48,736**	**- 32,667**	**- 19,029**	**- 18,575**	**- 27,256**	-
	As a % of electricity available for final consumption	-9.5%	-9.9%	-9.3%	-6.4%	-3.9%	-3.6%	-5.6%	-
	Electricity Interconnection [%]		**8.9%**	**10.5%**	**10.9%**	**11.4%**	**11.0%**	**11.5%**	**11.2%**
	Share of renewable energy consumption - by sector [%]								
	Electricity	32.3%	34.6%	37.6%	40.6%	44.2%	43.9%	47.6%	-
	Heating/cooling	13.0%	13.4%	14.2%	14.5%	14.5%	15.5%	17.5%	-
	Transport	7.0%	7.0%	7.9%	7.6%	10.0%	8.1%	9.9%	-
	Overall	14.9%	15.5%	16.7%	17.3%	19.1%	19.4%	20.8%	-

		2019	2020	2021	2022	2023
CLEAN ENERGY	**VC investments in climate tech start-ups and scale-ups (EUR Mln)**	**248.12**	**636.88**	**1,198.89**	**1,390.81**	**1,717.29**
	as a % of total VC investment (3) in Germany start-ups and scale-ups	4.0%	9.2%	7.6%	10.0%	20.9%
	Research & Innovation spending in Energy Union R&i priorites					
	Public R&I (EUR mln)	903.2	916.6	1,027.9	-	-
	Public R&I (% GDP)	0.03%	0.03%	0.03%	-	-
	Private R&I (EUR mln)	12,228.4	12,069.2	-	-	-
	Private R&I (% GDP)	0.35%	0.35%	-	-	-

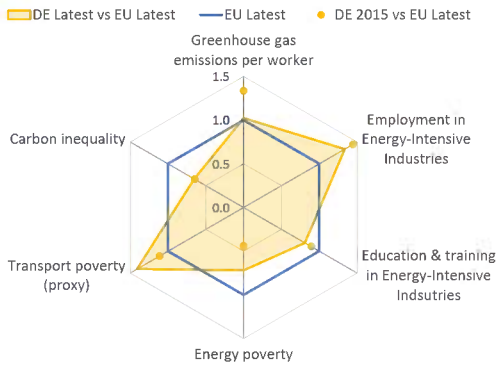
(1) The ranking of the main suppliers is based on the latest available figures (for 2022)
(2) Venture Capital investment includes Venture Capital deals (all stages), Small M&A deals and Private Equity (PE) growth deals (for companies that have previously been part of the portfolio of a VC investment firm or have received Angel or Seed funding).
Source: Eurostat, Gas Infrastructure Europe, JRC elaboration based on PitchBook data (03/2024), JRC SETIS (2024)

energy technologies grew steadily from 2014 to 2022, from around 800 million to over 1,400 million EUR.

This Annex monitors Germany's progress in ensuring a fair transition towards climate neutrality and environmental sustainability, particularly for workers and households in vulnerable situations. Germany's green economy is expanding. Between 2015 and 2021, total jobs in the environmental goods and services sector grew by 25.8% (to around 709 000) (EU: 18.2%), reaching 1.7% of total employment, but remaining below the EU average (2.7%). The greenhouse gas emission intensity of Germany's workforce (see Graph A8.1 and Table A8.1) declined from 19.1 to 14.6 tonnes per worker between 2015 and 2022, slightly above the EU average (14.3 tonnes per worker in 2022) ([76]), indicating a positive trend in the green transition. Labour and skills shortages pose an obstacle to a smooth transition, pointing to the need for up- and reskilling of workers in declining and transforming sectors. In line with the Council Recommendation on ensuring a fair transition towards climate neutrality ([77]), Germany's national recovery and resilience plan, as well as the territorial just transition plans and actions supported by the European Social Fund Plus (ESF+), outline crucial reforms and investments for a fair green transition.

While employment in Germany's energy-intensive industries declined in recent years, labour shortages remain a key challenge for a fair transition. In 2023, employment in Germany's energy-intensive industries ([78]) comprised 4.7% of total employment, above the EU average (3.5%) and an increase compared to 2022 (4%). Employment in mining and quarrying increased in 2023 (to around 71 900 workers), amounting to an overall decline by 12.5% since 2015. Labour shortages in transforming sectors remain an issue, as vacancy rates are rising (see Graph A8.2). The job vacancy rate in construction, a key sector for the green transition, is higher than the EU average (6.4% vs 3.6% in EU in 2023). This is in line with the perception of small and medium-sized enterprises (SMEs) in the sector, 68% of which agree that skills shortages are holding them back in general business activities ([79]). Germany receives around EUR 2.5 billion from the Just Transition Fund, out of which EUR 240 million is for measures focusing on employment, skills and social integration.

Graph A8.1: **Fair transition challenges in Germany**



Source: Eurostat, EU Labour Force Survey, EMPL-JRC GD-AMEDI/AMEDI+ and DISCO(H) projects (see Table A8.1).

Upskilling and reskilling in energy-intensive industries decreased, while skill shortages persist. While 42% of SMEs in Germany (equalling the EU average) reported that the skills required for greening business activities are becoming more important ([79]), in energy-intensive industries, workers' participation in education and training decreased from 9.7% in 2015 to 8.8% in 2023, below the EU average (10.9%). In line with the EU renewable energy target, by 2030 a further 36 578 additional skilled workers will be needed for the deployment of wind and solar energy, which may require an investment in skills of EUR 379.0-473.7 million ([80]). To address this challenge, out of the significant share (EUR 353 million) of the German ESF+ allocation dedicated to the green skills, jobs and economy, EUR 275 million address specifically green skills challenges.

([76]) Workforce-related calculations are based on the EU Labour Force Survey. Note, in the 2023 country report for Germany, such indicators were calculated based on employment statistics in the national accounts. This may result in limited comparability across the two reports.

([77]) The Council Recommendation of 16 June 2022 (2022/C 243/04) covers employment, skills, tax-benefit and social protection systems, essential services and housing.

([78]) Mining and quarrying (NACE B), chemicals (C20), minerals (C23), metals (C24) and automotive (C29).

([79]) Eurobarometer on skills shortages, recruitment, and retention strategies in small and medium-sized enterprises.

([80]) EMPL-JRC AMEDI+ project.

Table A8.1: **Key indicators for a fair transition in Germany**

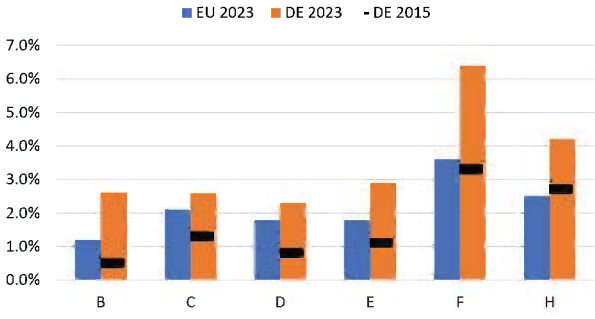
Indicator	Description	DE 2015	DE	EU
GHG per worker	Greenhouse gas emissions per worker – CO_2 equivalent tonnes	19.1	14.6 (2022)	14.3 (2022)
Employment EII	Employment share in energy-intensive industries, including mining and quarrying (NACE B), chemicals (C20), minerals (C23), metals (C24) automotive (C29)	5.1%	4.7% (2023)	3.5% (2023)
Education & training EII	Adult participation in education and training (last 4 weeks) in energy-intensive industries	9.7%	8.8% (2023)	10.9% (2023)
Energy poverty	Share of the total population living in a household unable to keep its home adequately warm	4.1%	6.7% (2022)	9.3% (2022)
Transport poverty (proxy)	Estimated share of the AROP population that spends over 6% of expenditure on fuels for personal transport	41.4%	52.3% (2023)	37.1% (2023)
Carbon inequality	Ratio between the consumption footprint of the top 20% vs bottom 20% of the income distribution	1.8	1.8 (2021)	2.7 (2021)

Source: Eurostat (env_ac_ainah_r2, lfsa_egan2d, ilc_mdes01), EU Labour Force Survey (break in time series in 2021), EMPL-JRC GD-AMEDI/AMEDI+ and DISCO(H) projects.

Energy poverty indicators have worsened recently due to the spike in energy prices. The share of the population unable to keep their homes adequately warm increased from 4.1% in 2015 to 6.6% in 2022, although it is still below the EU average (9.3%) ([81]). The indicator increased by 3.3 pps between 2021 and 2022 on the back of energy price increases due to supply constraints caused by the COVID-19 pandemic and Russia's war of aggression against Ukraine, despite the emergency measures implemented in Germany. In particular, 13.6% of the population at risk of poverty (AROP) (EU: 20.1%) and 7.2% of lower middle-income households (in deciles 4-5) (EU: 11.6%) were unable to keep their homes adequately warm in 2022. On the other hand, in January 2023, 52.3% of the population at risk of poverty spent a considerable proportion of their budget (more than 6%) on private transport fuels (EU: 37.1%) ([82]).

Despite being below the EU average, environmental inequalities remain an issue. In 2021, the consumption footprint for 20% of the population with the highest income was 1.8 times higher than the footprint of the poorest 20% ([83]) (EU: 1.8). Meanwhile, in 2021, the average levels of air pollution stood below the EU average (9.4 vs 11.4 µg/m^3 PM2.5) and went down from 12.5 µg/m^3 PM2.5 in 2015. The proportion of the population living in regions exposed to critical levels of air pollution ([84]) amounted to 28%, leading to a significant impact on health, affecting vulnerable groups in particular, and around 32 300 premature deaths annually ([85]).

Graph A8.2: **Job vacancy rate in transforming sectors and mining and quarrying**



B - Mining and quarrying
C - Manufacturing
D - Electricity, gas, steam and air conditioning supply
E - Water supply; sewerage, waste management and remediation activities
F - Construction
H - Transportation and storage
Source: Eurostat jvs_a_rate_r2.

Germany is making progress in the fair transition towards climate neutrality. Several ambitious measures to facilitate up- and reskilling and training for the green transition are being implemented, although more measures could be specifically designed to support job-to-job transitions towards green jobs for redundant workers. Women's participation in education and training in the green sectors and in science, technology, engineering and mathematics (STEM) could

([81]) Energy poverty is a multi-dimensional concept. The indicator used focuses on an outcome of energy poverty. Further indicators are available at the Energy Poverty Advisory Hub.

([82]) Affordability of private transport fuels is one key dimension of transport poverty. The indicator has been developed in the context of the EMPL-JRC GD-AMEDI/AMEDI+ projects. See EU Commission, 2021, Economic and distributional effects of higher energy prices on households in the EU, op.europa.eu.

([83]) Developed in the context of the EMPL-JRC DISCO(H) project. Methodology explained in Joint Research Centre, 2024. Carbon and environmental footprint inequality of household consumption in the EU. JRC137520. The EU average refers to EU27 without Italy (household income data not available for IT in the HBS).

([84]) Two times higher than the recommendations in the WHO Air Quality Guidelines (annual exposure of 5µg/m^3).

([85]) EEA, Air Quality Health Risk Assessment, eea.europa.eu.

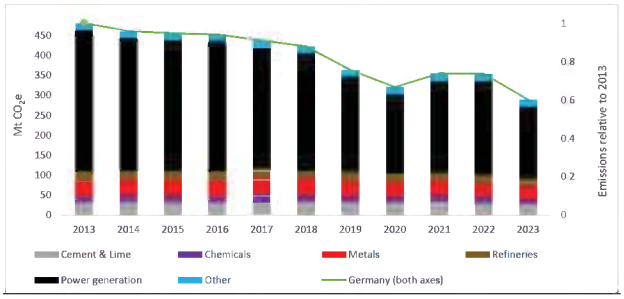
also be further improved, as well as the provision of care services for children ([86]).

([86]) Based on the monitoring review of the Council Recommendation on ensuring a fair transition towards climate neutrality, which took place in October 2023.

The green transition of industry and the built environment, in particular decarbonisation, resource efficiency and circularity, is essential to boost Germany's competitiveness. In this regard, the priority for Germany is to increase the use of circular materials in industry and construction ([87]).

Germany is on track to achieve the EU Circular Economy Action Plan goals thanks to its efficient waste management and competitive environmental goods industry. Between 2016 and 2022, the material footprint hovered slightly below the EU average, reaching 14.5 tonnes per capita. By contrast, Germany produces less waste per capita than the EU average – 4.8 tonnes per capita in 2020. However, waste production increased between 2014 and 2018.

Graph A9.1: **ETS emissions by sector since 2013**



Source: European Commission

In 2023, the sectors covered by the EU emissions trading system (ETS) in Germany ([88]) emitted 17% less greenhouse gases than in 2019. In 2023, 63% of the greenhouse gases emitted by Germany's ETS installations came from power generation, significantly more than the EU average (57%). Of the total emissions from all industry sectors, about 31% came from the metals industry, 22% from cement and lime production, 18% from refineries, and 22% from the chemical industry. Another 17% came from other industries. Since 2019, the power sector has registered a higher reduction (24%) ([89]) than the industry sectors (14%). Since 2013, greenhouse gas emissions have declined by 48% in power generation and by 16% in the industry sectors. Nearly all of this decline in the industry sectors has occurred since 2019.

Despite the overall positive trends, there is still room for boosting Germany's industrial efficiency. Circular material use is slightly above the EU average rate and measured 13% in 2022, far behind the EU leaders. Similarly, resource productivity stood above the EU average and reached 2.99 purchasing power standards per kilogram in 2022. Resource productivity expresses how efficiently the economy uses material resources to produce wealth. Improving resource productivity can help minimise negative impacts on the environment and reduce dependence on volatile raw material markets. Furthermore, Germany was dependent on imports for 36.5% of materials used in 2022, above the EU average of 22.4%, making the country comparatively more vulnerable to supply chain disruptions.

Strong eco-innovation performance has helped to develop a highly competitive environmental goods industry. Germany is an eco-innovation leader according to the 2022 Eco-Innovation Scoreboard, on which the country ranked sixth with a score of 141.2. As of 2023, Germany totalled 391 EU Ecolabel licences and 9 212 EU Ecolabel products, which makes Germany the second and fourth Member for EU Ecolabel licences and products, respectively. These numbers are higher than in previous years.

Germany is among the top performers regarding waste management but produces far more waste than the EU average. Germany ranked first in the EU for municipal waste recycling and reached a rate of 69.1% in 2022. The country is on track to meet the 2025 recycling and the 2035 landfilling targets. In 2021, the recycling rates of plastic packaging and e-waste were both above the EU average, at 48.4% and 86.1%, respectively. Germany is the country registering the highest number of patents on

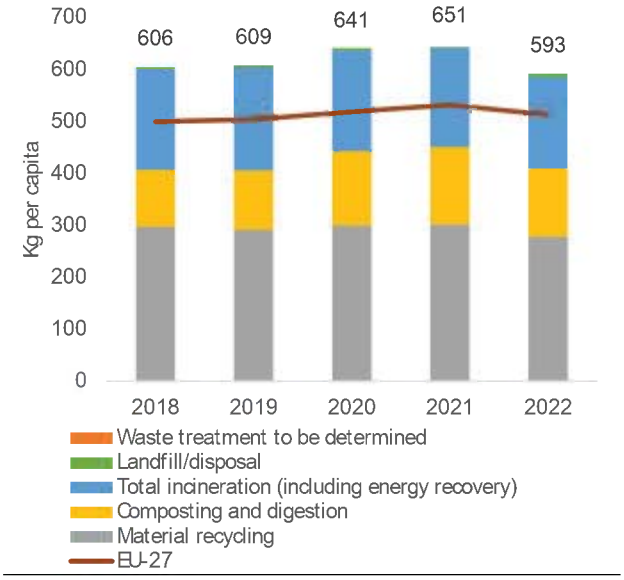
([87]) See also Annexes 6, 7 and 12.

([88]) This analysis excludes air travel. For more details and the data sources, see Weitzel, M; van der Vorst, C. (2024), Uneven progress in reducing emissions in the EU ETS, JRC Science for policy brief, JRC138215, Joint Research Centre.

([89]) This includes a steep decrease of 15% year-on-year in 2020, and a gradual rebound in the next 2 years.

waste recycling per year, totalling 46 new patents in 2020, almost a quarter of the EU total.

Graph A9.2: **Treatment of municipal waste**



Source: Eurostat

There is still room to make better use of the potential of the circular economy transition to make industry less polluting. The impact of particulate matter emissions from industry on air quality was lower than the EU average. Over the years, the grams of PM2.5 emitted per economic output (EUR'10) ([90]) have remained stable, reaching 0.02 in 2020, versus an EU average of 0.07. PM10 emissions show a similar trend, with 0.04 grams/EUR'10 versus an EU average of 0.1 grams/EUR'10 in 2020. Moreover, between 2010 and 2021, Germany's industrial sector decreased its emissions of main pollutants into the air and was among the top 5 performers for the reduction of heavy metals (cadmium, mercury, and lead). In 2020, Germany produced 282 kg of hazardous waste per capita – above the EU average of 214 kg per capita – and treated 91.1% of it.

There is still room to improve the waste performance of the construction sector. Waste generated from construction and demolition activities per capita is among the highest in the EU. It reached approximately 89 million tonnes in 2020, the highest amount in the EU. Backfilling has slightly decreased since 2018 and stood at 7.2% in 2020, below the EU average of 9.9%. The recovery rate remained stable at approximately 94%, meeting the Waste Framework Directive's target for 2020 and exceeding the EU average.

Land take is one of the main drivers of biodiversity loss in Germany. The soil sealing index's sealed area covers 5.1% of its territory, and sealed area per capita is above the EU average. Land take mostly occurs in cities and their commuting zones, where arable land is the most affected. Some German cities report good shares of land recycling and densification. For example, between 2006 and 2012, recycled or densified land accounted for 66% and 23% of total land consumption in Weimar and Berlin, respectively. There is room to make more efficient use of buildings. Germany's residential floor area per capita slightly increased from 52.8 to 53.9 m^2 between 2018 and 2020, which remains slightly below the EU average of 54.4 m^2. Furthermore, Germany presents the fourth-highest non-residential floor area per capita (27.6 m^2).

Table A9.1: **Circularity indicators**

	2018	2019	2020	2021	2022	2023	EU-27	Latest year
Industry								
Resource productivity (purchasing power standard (PPS) per kilogram)	2.5	2.6	2.7	2.7	3.0	-	2.5	2022
Circular material use rate (%)	12.1	12.5	12.9	12.7	13.0	-	11.5	2022
Eco-innovation index (2013=100)	123.2	128.4	130.9	135.8	141.2	-	121.5	2022
Recycling of plastic packaging (%)	46.4	43.3	46.2	48.4	-	-	40.7	2021
Cost of air emissions from industry (EUR bn)	110.2	92.1	84.7	94.6	-	-	352.7	2021
Built environment								
Recovery rate from construction and demolition waste (%)	-	-	-	-	-	-	89.0	2020
Soil sealing index (base year = 2006)	102.7	-	-	-	-	-	103.4	2018
~~Non-residential floor area (m^2 per capita)~~	27.1	27.3	27.6	-	-	-	18.0	2020
Waste backfilled (%)	7.7	-	7.2	-	6.0	-	9.9	2020

Source: Eurostat, European Environment Agency

Digital transformation is key to ensuring a resilient and competitive economy. In line with the Digital Decade policy programme, and in particular with its targets for digital transformation by 2030, this Annex describes Germany's performance on digital skills, digital infrastructure/connectivity and the digitalisation of businesses and public services. Where relevant, it makes reference to progress on implementing Germany's recovery and resilience plan (RRP). Germany allocates 48% of its total Recovery and Resilience Facility budget to digital (EUR 13.5 billion) ([91]). Under cohesion policy, an additional EUR 2.3 billion (12% of the country's total cohesion policy funding) is allocated to the country's digital transformation ([92]).

The Digital Decade policy programme sets out a pathway for the EU's successful digital transformation by 2030. Germany's national roadmap outlines the actions it intends to take to reach the objectives and targets at national level. The first report on the state of the Digital Decade highlighted the need to accelerate and deepen the collective efforts to reach the EU-wide targets and objectives ([93]). Through this, a digitally skilled population increases the development and adoption of digital technologies and leads to productivity gains and new business models. It also leads to higher inclusion and participation in an environment increasingly shaped by the digital transformation ([94]). Digital technologies, infrastructure and tools all play a role in addressing the current structural challenges, including strategic dependence in various areas, cybersecurity and climate change.

Germany has a mixed performance on digital skills. The country scores below the EU average on basic digital skills, but above average for the percentage of ICT specialists and it matches the EU average for female ICT specialists. The German RRP includes several measures that support digital skills and notably digital education, such as investment in digital devices for teachers, which is almost fully implemented in the Länder.

Very high capacity network (VHCN) coverage in rural areas and fibre coverage in general remain a challenge for Germany. Despite recent improvements, Germany is still much below the EU average for VHCN in rural areas (37.6% ([95]) compared to a 55.6% EU average in 2023). Fibre coverage overall (where Germany is second last in the EU), and in rural areas in particular, is increasing quickly, but it remains considerably below the EU average (29.8% vs 64% overall and 25.6% vs 52.7% in rural areas). Germany scored above the EU average in overall 5G coverage in 2023 (98% vs 89%). The German RRP does not include measures to support the deployment of fibre connections, but the Federal Government allocated EUR 12 billion ([96]) for this purpose. In July 2022, a gigabit strategy was adopted ([97]), which includes goals of 15 million new fibre to the premises (FTTP) connections by the end of 2025, and to make FTTP connections available for all German households by 2030. The strategy sets out measures that simplify, digitalise and speed up permit-granting procedures, and also support the use of alternative deployment methods. A revised funding programme came into effect in 2023. These measures are expected to accelerate fibre deployment in Germany.

Germany's performance on digitalisation of businesses is slightly above the EU average. Germany scores above the EU average for most indicators in this area, e.g. digital intensity for SMEs and the share of enterprises that have taken up at least one of

([91]) The share of financial allocations that contribute to digital objectives has been calculated using Annex VII to the Recovery and Resilience Facility Regulation.

([92]) This amount includes all investment specifically aimed at or substantially contributing to digital transformation in the 2021-2027 cohesion policy programming period. The source funds are the European Regional Development Fund, the Cohesion Fund, the European Social Fund Plus, and the Just Transition Fund.

([93]) European Commission, 2023, *Report on the state of the Digital Decade 2023*, ec.europa.eu.

([94]) See for example: OECD, 2019, *OECD Economic Outlook, Digitalisation and productivity: A story of complementarities*, oecd-ilibrary.org; OECD, 2019, *Going Digital: Shaping Policies, Improving Lives – Summary*, oecd.org.

([95]) European Commission, 2024, *Digital Decade DESI Visualisation Tool*, ec.europa.eu.

([96]) Bundesministerium für Digitales und Verkehr (BMDV), 2024, *Die Gigabitförderung 2.0*, bmdv.bund.de.

([97]) BMDV, 2022, *Gigabitstrategie der Bundesregierung verabschiedet*, bmdv.bund.de.

the following three technologies: artificial intelligence, cloud or big data ([98]). Only the uptake of cloud computing services is just below the EU average (38.5% vs 38.9% in 2023). The German RRP includes several measures to support the digitalisation of enterprises and the development and integration of advanced digital technologies. German cohesion policy funds also support total investments for digitalisation in enterprises with around EUR 500 m in 2021-2027. These measures include, as important projects of common European interest, Next Generation Cloud Infrastructure and Services, and Microelectronics and Communication Technologies. For the latter, the content design of the project was already set out. In 2022, 3.9% of enterprises in Germany reported ICT service outage due to cyberattacks (e.g. ransomware attacks, denial of service attacks). Over the same year, 23.9% of enterprises developed or reviewed their ICT security policy within the previous 12 months. Public administration, which should be the trigger of digitalisation, is lagging behind in this respect, which is a hindrance also for the digitalisation of businesses. ([99])

Germany is starting to improve in the digitalisation of public services, but implementation remains slow and a crucial reform issue. The country scores slightly below the EU average on the provision of digital public services for businesses and for citizens. Germany has three electronic identification (eID) schemes, at level of assurance 'high', that are notified under the eIDAS Regulation. Regarding access to electronic health records, Germany scores 87 out of 100, above the EU average. The National Regulatory Control Council acknowledges Germany's work on the digitalisation of its public administration but considers that the country is still lagging behind as regards quantifiable results ([100]). The German RRP includes several measures to support the implementation of digital public services, which are expected to improve performance in this area. These measures account for more than 50% of digital investments under the plan. The Digital Pension Overview Act entered into force and a pilot project for the European identity ecosystem was launched. The first target regarding go-live of online access act service bundles was achieved.

([98]) See the new 'AI or Cloud or Big data' indicator, which (as of this year) is used to measure the progress towards the respective Digital Decade target.

([99]) German Chamber of Commerce, Digitalisierungsumfrage 2023, dihk.de.

([100]) National Regulatory Control Council, 2021, *Monitor Digitale Verwaltung #6*, normenkontrollrat.bund.de.

Table A10.1:**Key Digital Decade targets monitored by the Digital Economy and Society Index indicators**

	Germany			EU	Digital Decade target by 2030 (EU)
	2022	2023	2024	2024	
Digital skills					
At least basic digital skills	**49%**	**49%**	**52%**	**56%**	**80%**
% individuals	2021	2021	2023	2023	2030
ICT specialists ([1])	**4.9%**	**5.0%**	**4.9%**	**4.8%**	**20 million**
% individuals in employment aged 15-74	2021	2022	2023	2023	2030
Digital infrastructure/connectivity					
Fixed very high capacity network (VHCN) coverage	**75%**	**70%**	**75%**	**79%**	**100%**
% households	2021	2022	2023	2023	2030
Fibre to the premises (FTTP) coverage ([2])	**15%**	**19%**	**30%**	**64%**	**-**
% households	2021	2022	2023	2023	
Overall 5G coverage	**87%**	**93%**	**98%**	**89%**	**100%**
% populated areas	2021	2022	2023	2023	2030
Digitalisation of businesses					
SMEs with at least a basic level of digital intensity	**59%**	**NA**	**61%**	**58%**	**90%**
% SMEs	2021		2023	2023	2030
Data analytics	**NA**	**NA**	**37%**	**33%**	**-**
% enterprises			2023	2023	
Cloud	**32%**	**32%**	**39%**	**39%**	**-**
% enterprises	2021	2021	2023	2023	
Artificial intelligence	**11%**	**11%**	**12%**	**8%**	**-**
% enterprises	2021	2021	2023	2023	
AI or cloud or data analytics ([3])	**NA**	**NA**	**58%**	**55%**	**75%**
% enterprises			2023	2023	2030
Digitalisation of public services					
Digital public services for citizens	**76**	**78**	**76**	**79**	**100**
Score (0 to 100)	2021	2022	2023	2023	2030
Digital public services for businesses	**80**	**81**	**79**	**85**	**100**
Score (0 to 100)	2021	2022	2023	2023	2030
Access to e-health records	**NA**	**70**	**87**	**79**	**100**
Score (0 to 100)		2022	2023	2023	2030

(1) The 20 million target represents about 10% of total employment.
(2) The fibre to the premises coverage indicator is included separately as its evolution will also be monitored separately and taken into consideration when interpreting VHCN coverage data in the Digital Decade.
(3) At least 75% of EU enterprises have taken up one or more of the following, in line with their business operations: (i) cloud computing services; (ii) big data; (iii) artificial intelligence.

Source: Digital Economy and Society Index

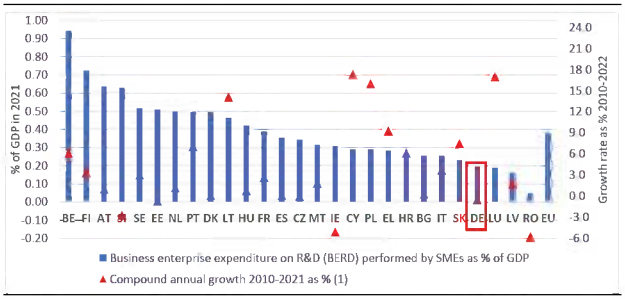
This Annex provides a general overview of the performance of Germany's research and innovation system, which is essential for delivering the twin transition and ensuring long-term competitiveness.

Germany is a 'strong innovator', but its performance decreased relative to the EU average. According to the 2023 edition of the European Innovation Scoreboard ([101]) its innovation performance increased by 7.6 percentage points since 2016, at a lower rate than the EU's (8.5pp). However, its overall performance remains above the EU average (117.8%).

In 2022, R&D intensity ([102]) in Germany reached 3.13% and is above the EU's target of 3%. Nevertheless, R&D intensity has stagnated below Germany's own target of 3.5% for 2025 ([103]). The commitment to this target, as well as sufficient funding for green and digital research, is key to continuously producing excellent research and innovation outputs, facilitating the industrial transformations ([104]). Although Germany has one of the world's most advanced R&I systems to address these challenges, a more agile and experimental approach to R&I policy is needed. Together with the recently adopted 'SPRIND-Freiheitsgesetz' ([105]), thorough implementation of the mission approach is important to ensure a holistic attitude to R&I governance ([106]).

German companies contribute significantly to R&D funding but R&D expenditure in SMEs is still subdued. While business enterprise expenditure on R&D as % of GDP is well above the EU average (2.11% vs 1.48%), SMEs' share of business R&D expenditure is very low (0.20% in 2021, compared to 0.45% EU average), with no growth in the last decade. This issue is exacerbated in small enterprises (up to 50 employees), which spend half as much on R&D as medium-sized enterprises (up to 250 employees) ([107]). Tax support for R&D expenditure was introduced in 2020 and is further strengthened with the Growth Opportunities Act providing higher subsidy rates for SMEs ([108]). Additionally, Germany's recovery and resilience plan (RRP) and cohesion policy programmes include several measures to support SME innovation to enhance digitalisation and the decarbonisation of industry.

Graph A11.1: **SMEs' share of R&D expenditure 2021 and development between 2010-2021**



(1) Compound annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period.
Source: Eurostat

The German venture capital market has been gradually expanding in recent years but remains small in international terms. The country's venture capital increased between 2020 and 2022 (from 0.054% to 0.087% of GDP), and is above the EU average (0.085% in 2022). Despite this positive trend, Germany lags behind international benchmarks, notably the UK and US, indicating market deficiencies in its venture capital sector ([109]). Addressing these issues requires continuous effort. In this regard, the 'INVEST –

([101]) European Commission, 2023, *European Innovation Scoreboard (EIS), country profile: Germany*, ec.europa.eu. The EIS provides a comparative analysis of innovation performance in EU countries (also compared to the EU average).

([102]) Defined as gross domestic expenditure on R&D as a percentage of GDP.

([103]) The 3.5% R&D intensity target has been reiterated in Germany's Future Research and Innovation Strategy (2023).

([104]) Expertenkommission Forschung und Innovation, 2022, *Gutachten zu Forschung, Innovation und Technologischer Leistungsfähigkeit Deutschlands 2022*, e-fi.de.

([105]) This new law aims at improving the framework conditions of the Federal Agency for Leap Innovations (SPRIND).

([106]) Expertenkommission Forschung und Innovation, 2024, *Gutachten zu Forschung, Innovation und Technologischer Leistungsfähigkeit Deutschlands 2024*, e-fi.de.

([107]) KfW Research, 2022, *KfW SME Innovation Report*, kfw.de.

([108]) Bundesregierung, 2024, *Growth Opportunities Act*, bundesregierung.de.

([109]) BMWK, 2024, *INVEST – Zuschuss für Wagniskapital*, bmwk.de.

Table A11.1:**Key innovation indicators**

Germany	2010	2015	2020	2021	2022	EU average (1)
Key indicators						
R&D intensity (GERD as % of GDP)	2.73	2.93	3.13	3.13	3.13	2.24
Public expenditure on R&D as % of GDP	0.9	0.92	1.04	1.03	0.95	0.73
Business enterprise expenditure on R&D (BERD) as % of GDP	1.83	2.01	2.09	2.09	2.11	1.48
Quality of the R&I system						
Scientific publications of the country within the top 10% most cited publications worldwide as % of total publications of the country	11.3	11.1	10.28	:	:	9.6
Patent Cooperation Treaty patent applications per billion GDP (in PPS)	7.7	6.5	5.77	:	:	3.4
Academia-business cooperation						
Public-private scientific co-publications as % of total publications	9.8	10.3	11.2	11.3	11.7	7.6
Public expenditure on R&D financed by business enterprise (national) as % of GDP	0.105	0.117	0.121	0.111	:	0.054
Human capital and skills availability						
New graduates in science & engineering per thousand pop. aged 25-34	15.1	17.1	17.6	18.5	:	16.9
Public support for business enterprise expenditure on R&D (BERD)						
Total public sector support for BERD as % of GDP	:	0.082	:	0.083	:	0.204
Green innovation						
Share of environment-related patents in total patent applications filed under Patent Cooperation Treaty (%)	17.1	14.3	15.5	:	:	14.7
Finance for innovation and economic renewal						
Venture capital (market statistics) as % of GDP	0.032	0.026	0.054	0.078	0.087	0.085
Employment share of high-growth enterprises measured in employment (%)	:	12.03	12.3	:	:	12.51

(1) EU average for the last available year or the year with the largest number of country data.
Source: Eurostat, OECD, DG JRC, Science-Metrix (Scopus database and EPO's Patent Statistical database), Invest EU

Grant for Venture Capital' programme plays a crucial role in assisting young and innovative companies by facilitating capital acquisition. The 'Future Fund', another instrument in support of SMEs ([110]), received EUR 10 billion to foster the venture capital market. However, the proportion of venture capital available for early-stage start-ups is significantly higher than the proportion for later-stage venture capital. This gap in growth and later-stage capital has prompted promising German start-ups to seek support from international investors ([111]).

The shortage of skilled workers impacts the country's innovation capacity. Companies affected by the shortage of skilled workers (see Annex 14) are finding it increasingly difficult to carry out innovative projects due to the lack of expertise and capacity, resulting in a loss of innovation strength ([112]). Women continue to be significantly underrepresented in R&I in Germany. The share of female researchers has remained crucially low and is one of the main structural weaknesses of Germany's R&I system ([113]). To overcome the shortage of skilled labour, the Federal Government, in its skilled labour strategy ([114]), plans to improve the quality of work and to facilitate the immigration of skilled workers by offering better conditions. Also, the German Bundestag adopted a draft law *on the further development of skilled immigration*. There remains further need to increase the transparency of academic career paths and to find a balance between predictability and flexibility (e.g. to work outside academia) for doctoral and post-doctoral researchers ([115]).

([110]) BMWK, 2022, *Future Fund*, bmwk.de.

([111]) OECD, 2022, *Innovation Review: Germany 2022*, oecd-ilibrary.org.

([112]) ZEW, 2022, *Innovationserhebung*, zew.de.

([113]) OECD, 2022, *Innovation Review: Germany 2022*, oecd-ilibrary.org.

([114]) BMAS, 2022, *Fachkraeftestrategie der Bundesregierung*, bmas.de.

([115]) Expertenkommission Forschung und Innovation, 2023, *Gutachten zu Forschung, Innovation und Technologischer Leistungsfähigkeit Deutschlands 2023*, e-fi.de.

The German economy has a strong industrial base, but external factors and structural weaknesses weigh on its growth and competitiveness. Germany has been gradually losing ground in international competitiveness rankings. For example, in the IMD World Competitiveness Ranking Germany has fallen from 6th to 22nd in less than a decade ([116]). In its latest annual report, the German Council of Economic Experts identifies as key obstacles in particular an ageing population, declining productivity growth and ageing capital stocks, which are expected to weigh significantly on competitiveness and growth in the coming decades and have not yet been sufficiently addressed. As a result, potential output growth in Germany is expected to sink to an all-time low, averaging 0.4% annually from 2023 to 2028 ([117]). Addressing Germany's structural challenges has become even more important for maintaining Germany's competitiveness.

Increased energy prices, which were already high compared with international peers, have put further pressure on energy-intensive sectors. The five most energy-consuming industrial sectors together accounted for 77% of total industrial energy consumption and about 17% of industrial gross value added in 2021. They are part of complex value chains and provide important intermediate goods for other industrial sectors. In January 2024, the production index was still about 17.6% lower than two years ago ([118]). Production in energy-intensive industries has declined considerably since the beginning of 2022, but seems to have stabilised, as energy costs have meanwhile returned to pre-crisis levels ([119]). The electricity price package adopted in December 2023 provided additional support to manufacturing companies, including in energy-intensive sectors, to support them in their green transition ([120]) (Annex 7).

Germany's largest industrial sector, the automotive industry, is facing fierce competition, particularly in electric and software-defined vehicles. German car manufacturers have been gradually shifting parts of their production to China as its importance as a sales market increases. Almost every third car worldwide is sold in China and it has also become the leading car-exporting country. In 2023, production increased by about 20% to almost 3.9 million cars, but despite the recovery, output is still below the pre-crisis level. Around 524 000 new battery-powered electric vehicles were registered in 2023, an increase of 11.4% ([121]). In 2022, the number of new registrations increased by 30%. An important factor was the government grant for electric cars. Since 2016, around EUR 10 billion has been disbursed under the environmental scheme for the purchase of about 2.1 million electric vehicles, including up to 560 000 electric vehicles supported by the German recovery and resilience plan (RRP). The funding programme has made a decisive contribution to electric mobility in Germany. However, the measure was phased out at the end of 2023, a year earlier than planned ([122]).

The construction industry is facing a considerable decline in new projects on the back of high construction costs and subdued investor and consumer confidence. The housebuilding industry in particular is under pressure due to lagging and cancelled new orders and high construction costs ([123]). In 2023, the number of building permits for homes decreased by 26.6% compared to the previous year. As a result, the federal government's objective of building 400 000 new homes a year has again been missed. In November 2023, the federal government and the regions agreed on a 'Pact

([116]) IMD International Institute for Management Development, 2023, *World Competitiveness Ranking*, imd.org.

([117]) German Council of Economic Experts, 2023, *Annual Report 2023/24*, sachverstaendigenrat-wirtschaft.de.

([118]) Statistisches Bundesamt, 2024, *Bedeutung der energieintensiven Industriezweige*, destatis.de.

([119]) Bundesverband der Energie- und Wasserwirtschaft, 2024, *Strompreis Entwicklung in Deutschland für Haushalte und Industrie*, bdew.de.

([120]) Bundesregierung, 2023, Strompreispaket für produzierende Unternehmen, bundesregierung.de.

([121]) Kraftfahrt Bundesamt, 2024, *Fahrzeugzulassungen im Dezember 2023 – Jahresbilanz*, kba.de.

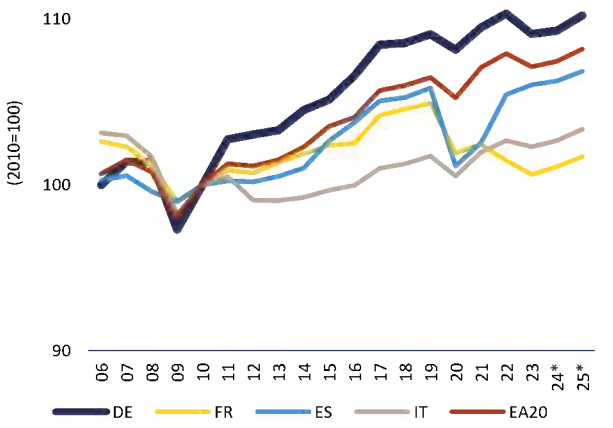
([122]) BMWK, 2023, *Umweltbonus endet mit Ablauf des 17. Dezember 2023*, bmwk.de.

([123]) Statistisches Bundesamt, 2024, *Branchen und Unternehmen: Bauen*, destatis.de.

for acceleration of planning, approval and implementation' ([124]). It aims to speed up and fully digitalise planning and authorisation procedures, and remove certain bureaucratic obstacles to construction. First results are expected in early 2024, but effective implementation at all levels of administration, including at regional and municipal level, remains a challenge.

The German industrial strategy actively supports the green transition of industry and the accelerated roll-out of renewable energies. Through a combination of strategic government intervention and collaboration with industry, Germany has been able to develop a leading position in several key industrial sectors, including automotive, engineering and chemicals production. Germany's updated industrial policy, published in October 2023, places a strong emphasis on sustainability by promoting the shift towards renewable energy sources, resource efficiency and clean technologies ([125]). The government has actively promoted the adoption of advanced technologies in the manufacturing sector. Subsidies for strategic investments, for example as part of important projects of common European interest (IPCEIs) in the field of microelectronics, battery cell manufacturing, cloud infrastructure and hydrogen or in chips manufacturing as part of the European Chips Act, aim to ensure that German industry has also a strong position in innovative transformation technologies.

Graph A12.1: **Total factor productivity**



Source: AMECO

Productivity growth could be strengthened by further progress in digitalisation, investing in new technologies and innovation, improving education and boosting entrepreneurship. While the level of labour productivity remains high, at 121.9% of the EU average in 2022, the growth rates for both labour productivity and total factor productivity have been slowing down in recent years (Graph A12.1). Productivity in manufacturing is still performing better than in services and construction (Graph A12.2). Germany scores high on many indicators related to innovation and technology diffusion, but R&D investment of small and medium-sized enterprises (SMEs) is comparatively low (Annex 11). The share of high-growth firms and the rate of new firms are below the EU aggregate and declining. Moreover, the recent economic slowdown is also holding back investment in digitalisation ([126]). Productivity growth could equally be strengthened through improved education outcomes, further progress in digitalisation and innovation and by facilitating the scale-up of young and innovative firms. The main long-term barriers to investment reported by German firms are the availability of skilled staff (92%), energy costs (89%) and uncertainty about the future (77%) ([127]). As in many other countries, the lack of skills and workforce has become a major bottleneck., but the situation is particularly pronounced in Germany and

([124]) Bundesregierung, 2023, *Agreement on migration and Pact for Germany*, bundesregierung.de.

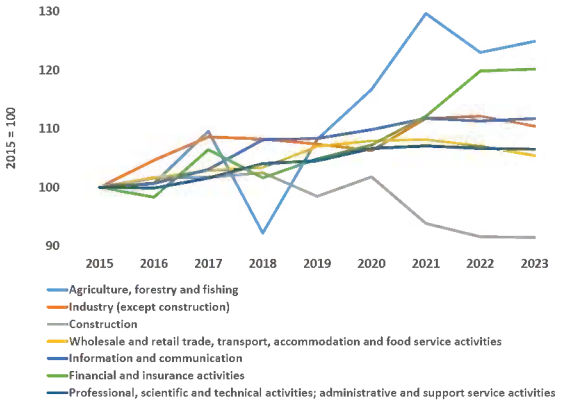
([125]) BMWK, 2023, *Industriepolitik in der Zeitenwende*, bmwk.de.

([126]) BMWK, 2023, *Digitalisierungsindex 2023*, de.digital.

([127]) EIB, 2023, *Investment Survey 2023: Germany*, eib.org.

affects the digital and green transition (Annexes 14 and 15).

Graph A12.2: **Productivity by sector**



Source: AMECO

Germany is among the front runners in patent applications, including those for net-zero technologies. Germany ranks fifth among EU Member States in terms of patent applications submitted to the European Patent Office. It shows its innovation and technological prowess in several key sectors such as environmental technology, electrical machinery, apparatus, energy, biotechnology or semiconductors ([128]). Germany is among the 17 Member States that became part of the unitary patent system launched in June 2023. The system enables simple patent protection in Europe, with a single procedure for the registration of patents and centralised litigation.

Overall, financing conditions for firms have tightened, and despite positive developments in the availability of venture capital, small and innovative companies often struggle to scale up. Companies report a tightening of credit conditions and more restrictive bank lending on the back of higher interest rates, increased uncertainty and the general macroeconomic situation ([129]). Despite positive developments, it still lags behind European and international peers on venture and growth capital (Annex 11). In July 2022, the German government adopted a comprehensive start-up strategy ([130]) to improve regulatory framework conditions, strengthen financing for start-ups and facilitate spin-offs from science and universities. In 2024, it plans to provide EUR 11 billion in support to SMEs from the ERP Special Fund ([131]) for low-interest financing and equity capital, which is 12% more than in the previous year ([132]). Insolvencies increased noticeably in 2023 and the first quarter of 2024, in particular in the real estate and construction sector. In March 2024, insolvencies were 35% higher than one year before and 30% above the average for the years 2016 to 2019 ([133]). The increase is partly due to special rules during the COVID-19 pandemic and particularly low levels of insolvencies in previous years, but also the increasingly challenging macroeconomic environment.

The federal government encourages industry to diversify and strengthen the resilience of strategic value chains. Recent supply disruptions have revealed Germany's vulnerability in global value chains. While material shortages have been easing gradually, significant dependencies persist for a broad range of raw materials and components, including critical raw materials necessary for the green and digital transition. For more than half of the critical raw materials, both Germany and Europe are dependent on imports of over 95% (including rare earth elements). However, there are also several raw materials for which Germany is more dependent on imports than the EU average (including lithium and silicon). ([134]) While the government encourages the de-risking and diversification of German industry, in particular for strategic value chains, the available data

([128]) European Patent Office, 2024, epo.org.

([129]) KfW, 2023, *KfW-ifo-Kredithürde*, kfw.de, ECB, 2023, *Survey on the access to finance of enterprises*, ecb.europa.eu.

([130]) BMWK, 2022, *Startup roadmap ready: Federal Cabinet adopts first comprehensive startup strategy*, bmwk.de.

([131]) BMWK, 2024, *ERP/Zukunftsfonds-Wachstumsfazilität*, foerderdatenbank.de.

([132]) BMWK, 2023, *Mittelstandsförderung erreicht 2024 Rekordhöhe*, bmwk.de.

([133]) Leibniz-Institut für Wirtschaftsforschung Halle (IWH), 2024, *Insolvenztrend*, iwh-halle.de.

([134]) DIW, 2022, *Deutschland kann seine Versorgungssicherheit bei mineralischen Rohstoffimporten erhöhen*, diw.de.

does not show any substantial progress yet on this ([135]).

Germany still has substantial scope to reduce administrative burden for SMEs, including through better digital public services. Further progress in digitalisation and digital public services could help reduce red tape for firms. Germany has taken several measures to improve the business environment and reduce the administrative burden for SMEs, including through measures under the RRP, such as the modernisation of registers and implementation of the Online Access Act. Overall, however, progress on the digitalisation of public services has been slow (see also Annexes 10 and 13). Federal and regional authorities agreed to streamline planning and permitting procedures, but effective implementation at all levels of administration, including at regional and communal level, remains a challenge (see also Annex 7). ([136]) In March 2024, the government presented the fourth bureaucracy relief act, which is expected to relieve citizens and firms by 944 million euros, i.a. by reducing the retention period for accounting documents and abolishing several written form requirements. It is part of the government's de-bureaucratisation package agreed in August 2023, which in total aims to reduce administrative burden by around five billion euros per year ([137]).

Germany has scope for further improvement in implementing and enforcing Single Market rules. While its trade integration in the Single Market for goods is above the EU average, it is relatively low for services. The Single Market Scoreboard ([138]) indicates scope for further improvement, for example regarding ongoing infringement cases. While the total number of infringements has decreased over the last years, Germany has still the fifth highest number of pending infringement cases in the EU, including in areas such as taxation, environment and transport, or the Professional Qualifications Directive and Proportionality Test Directive. Germany's SOLVIT centre, which helps citizens and businesses deal with potential breaches of EU rights in other EU countries, would benefit from additional staff. Germany solved 95.2% of the SOLVIT cases (208) it handled as lead centre, above the EU average of 88.3%. However, other indicators signal a less favourable picture, caused by the understaffing of the German SOLVIT centre ([139]).

Germany's performance in public procurement is in line with the EU average overall, but there is still room for further improvement, including on the strategic use of public procurement. Different policy tools and strategies support strategic procurement at national, sub-national and regional level. However, major barriers remain for their effective implementation, mainly the lack of knowledge and capacity at local procurer level. Better quality data gathering and monitoring could encourage a wider uptake of sustainable procurement practices and more effective policy implementation. The ongoing work on the transformation package of public procurement law aims to simplify, professionalise, digitalise and accelerate public procurement procedures. It aims at bringing them in line with obligations under the EU Directives, while further integrating sustainability criteria, and illustrates efforts to strengthen the strategic use of public procurement. In 2023, a national notification service for public contract awards was created ([140]). It centralises data on tenders from different platforms and improves the transparency of Germany's procurement processes by publishing data on awarded contracts using a standard format. This could finally lead to a progressive increase in competition on public procurement markets after a decreasing trend in recent years.

Reducing restrictive regulation in services could help boost competition and productivity growth. Restrictions on regulated

([135]) German Economic Institute, 2023, *Is the derisking beginning?*, iwkoeln.de.

([136]) BMWK, 2023, *Kabinett beschließt Beschleuniger für Wind- und Netzausbau*, bmwk.de.

([137]) BMJ, 2024, *Bürokratieentlastungsgesetz IV*, bmj.de.

([138]) European Commission, 2024, *Single Market Scoreboard, Performance Overview*, ec.europa.eu.

([139]) European Commission, 2024, *Single Market Scoreboard, Country data: Germany*, ec.europa.eu.

([140]) Der Beauftragte der Bundesregierung für Informationstechnik, 2024, cio.bund.de. Beschaffungsamt des BMI, 2024, bescha.bund.de

professions remain high compared to the EU average for architects, civil engineers, accountants, tax advisers, patent or trademark agents and lawyers, despite some recent reforms on company ownership and multidisciplinary partnerships in tax and legal professions. Exclusive rights to provide tax advice and legal services remain. Reducing restrictive regulation in services while safeguarding quality standards and consumer interests could also help boost competition and productivity ([141]).

Germany is in the production stage of implementing the components needed to connect to the Once-Only Technical System (OOTS) ([142]). As part of the Single Digital Gateway Regulation ([143]), the system will enable the automated cross-border exchange of evidence between competent authorities, improving online access to information, administrative procedures and assistance within the EU. The onboarding of German competent authorities is crucial for the system to function smoothly and to reduce administrative burden.

([141]) European Commission, 2021, *Communication on updating the reform recommendations for regulation in professional services,* COM(2021)385, eur-lex.europa.eu.

([142]) Implementing Regulation (EU) 2022/1463.

([143]) Regulation (EU) 2018/1724.

Table A12.1:**Industry and the Single Market**

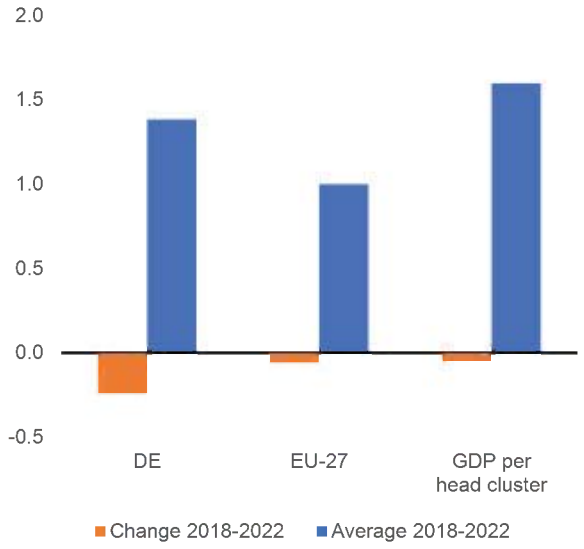
Germany							
POLICY AREA	**INDICATOR NAME**	**2019**	**2020**	**2021**	**2022**	**2023**	**EU27 average***
HEADLINE INDICATORS							
Economic Structure	Net Private investment, level of private capital stock, net of depreciation, % GDP[1]	2.8	1.9	1.7	1.7	1.4	**3.8**
	Net Public investment, level of public capital stock, net of depreciation, % GDP[1]	0.1	0.3	0.1	0	0	**1.2**
	Real labour productivity per person in industry (% yoy)[2]	-1.7	-4.8	8.8	-1	-2.1	**-1.24**
Cost competitiveness	Nominal unit labour cost in industry (% yoy)[2]	4.1	2.8	-5.2	4	8.4	**9.83**
SINGLE MARKET							
Single Market integration	EU Trade integration, % (Average intra-EU imports + average intra EU exports)/GDP[2]	22.9	21.0	23.3	25.5	23.5	**42.9**
Compliance	Transposition deficit, % of all directives not transposed[3]	0.6	0.6	0.4	1	1	**0.7**
	Conformity deficit, % of all directives transposed incorrectly[3]	1.6	1.8	2.2	1.9	1.8	**1.1**
	SOLVIT, % resolution rate per country[3]	87.5	87.8	88.6	84.9	95.0	**88.3**
	Number of pending infringement proceedings[3]	44	47	48	47	39	**25.9**
Restrictions	EEA Services Trade Restrictiveness Index[4]	0.06	0.06	0.04	0.04	0.04	**0.05**
Public procurement	Single bids, % of total contractors[3]	22	19	20	25	23	**28.6**
	Direct Awards, %[3]	4	6	6	6	5	**8.1**
ECONOMIC STRUCTURE							
Shortages	Material Shortage (industry), firms facing constraints, %[5]	14.8	13.4	55.9	77.2	37.5	**17.2**
	Labour Shortage using survey data (industry), firms facing constraints, %[5]	18.8	10.0	23.5	38.8	33.5	**23.3**
	Vacancy rate, % of vacant posts to all available ones (vacant + occupied)[2]	3.55	2.6	3.5	4.8	4.3	**2.5**
Strategic dependencies	Concentration in selected raw materials, Import concentration index based on a basket of critical raw materials[6]	0.18	0.15	0.17	0.19	0.2	**0.22**
	Installed renewables electricity capacity, % of total electricity produced[2]	0.3	0.3	0.6	0.6		**50**
BUSINESS ENVIRONMENT - SMEs							
Investment obstacles	Impact of regulation on long-term investment, % of firms reporting business regulation as major obstacle[7]	29.4	31.5	29.1	26.0	36.0	**22.2**
Business demography	Bankruptcies, Index (2015=100)[2]	81.1	68.5	60.5	63.3	76.2	**105.6**
	Business registrations, Index (2015=100)[2]	88.3	77.3	79.0	78.1	96.0	**120.2**
Late payments	Payment gap - corporates B2B, difference in days between offered and actual payment[8]	-	20	12	12	14	**15**
	Payment gap - public sector, difference in days between offered and actual payment[8]	-	24	11	13	15	**16**
	Share of SMEs experiencing late payments in past 6 months, %[9]	33.5	35.0	33.4	33.2	33.7	**48.7**
Access to finance	EIF Access to finance index - Loan, Composite: SME external financing over last 6 months, index values between 0 and 1[10]	0.63	0.60	0.71	0.70	-	**0.49**
	EIF Access to finance index - Equity, Composite: VC/GDP, IPO/GDP, SMEs using equity, index values between 0 and 1[10]	0.29	0.19	0.28	0.51	-	**0.17**

Source: (1) AMECO, (2) Eurostat, (3) Single Market Scoreboard, (4) OECD, (5) ECFIN BCS, (6) COMEXT and Commission calculations, (7) EIB Investment Survey, (8) Intrum Payment Report, (9) SAFE survey, (10) EIF SME Access to Finance Index.

* Own Commission calculations for the EU27 average

Germany's public administration is essential for the economy's competitiveness, especially in shaping the conditions for the twin transitions and creating a favourable business environment. The perceived effectiveness of Germany's government is high compared to the EU average, but it has declined since 2018 (Graph A13.1).

Graph A13.1: **Government effectiveness**



Average value over 2018-2022 and change over 2018-2022.
The GDP per head bar shows the mean value of the government effectiveness indicator for the group of EU countries belonging to the same GDP per head cluster as Germany (EU countries are ranked in terms of their GDP per head and grouped into three equally sized clusters).
Source: Worldwide Governance Indicators

Germany has taken small steps to reform its civil service management. The ratio of public administration employees aged 25 to 49 to those aged 50 to 64 is below the EU average (Table A13.1). The participation of German public administration employees in adult learning is also below the EU average as is gender parity in senior civil service management positions (Table A13.1). Considering these circumstances, the German government has made more opportunities available for continuous learning and career development and promoted a good work-life balance through flexible working hours to make the public administration a more attractive employer.

Progress in digitalisation of the public administration is slow, making the German public administration less digitally mature than the EU average. The German government is in the process of improving digital services through amendments to the national Online Access Act ([144]). The reform promotes user-centric digital services and simplifying interactions between the individuals, businesses, and the government. Germany has also improved the accessibility of online content with *Leichte Sprache* ([145]). Although individuals' use of government websites has increased in recent years, the average level of digital skills and overall maturity of e-government are lower than the EU average (Graph A13.2). Within the e-government indicator, the transparency and the key enablers dimension have the most room for improvement, relative to the EU-27 average (Graph A13.2b). The German regional and local public administrations are starting to simplify procedures and reduce administrative burden to encourage more investment.

To help address fiscal challenges, the Independent Fiscal Institution (IFI) could be strengthened. The Advisory Board (AB) has a narrow mandate, only formally assessing the government macroeconomic forecast without endorsing it, and limited budget. The policy dialogue with the government and the parliament could be improved by grounding it in law, which could also help improve its media presence. There is also room for improvement when it comes to access to information.

The justice system performs efficiently overall ([146]). The disposition time in civil and commercial litigious cases has slightly increased in recent years but is still low (241 days in 2022). The clearance rate remains high (104% in 2022). In administrative cases, the disposition time at first instance remains high (408 days in 2022, compared to 422 in 2021)

([144]) Bundesministerium des Inneren (BMI), n. d., *The Online Access Act*, digitale-verwaltung.de.

([145]) Bundesministerium des Inneren (BMI), n. d., Leichte Sprache, bmi.bund.de.

([146]) For more details, see: European Commission, 2024 (forthcoming), *EU Justice Scoreboard 2024*, commission.europa.eu; European Commission, 2024 (forthcoming), *2024 Rule of Law Report*, commission.europa.eu.

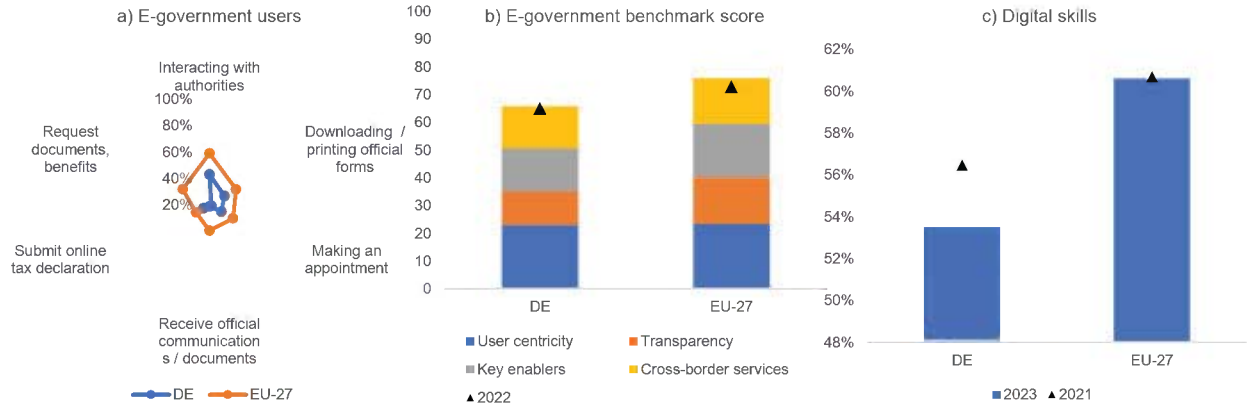
although the clearance rate continues to be very high (114% in 2022). The quality of the justice system is good overall. The level of digitalisation in the justice system is advanced. However, there are still some human resource challenges, particularly the level of judges' salaries. On judicial independence, no systemic deficiencies have been reported.

Table A13.1:**Public administration indicators**

DE	Indicator ([1])	2019	2020	2021	2022	2023	EU-27([2])
E-government and open government data							
1	Share of internet users within the last year that used a public authority website or app	n/a	n/a	n/a	55.1	62.2	75.0
2	E-government benchmark overall score ([3])	n/a	62.1	63.2	65.1	65.7	75.8
3	Open data and portal maturity index	0.7	0.9	0.9	0.8	0.9	0.8
Educational attainment level, adult learning, gender parity and ageing							
4	Share of public administration employees with higher education (levels 5-8, %)	41.9	42.7 (b)	44.2 (b)	45.1	45.7	52.9
5	Participation rate of public administration employees in adult learning (%)	9.3	8.0 (b)	8.2 (b)	9.5	9.3	17.9
6	Gender parity in senior civil service positions ([4])	36.6	39.0	39.6	38.2	23.0	9.2
7	Ratio of 25-49 to 50-64 year olds in NACE sector O	1.2	1.3 (b)	1.4 (b)	1.3	1.3	1.5
Public financial management							
8	Medium-term budgetary framework index	0.6	0.6	0.7	0.7	n/a	0.7
9	Strength of fiscal rules index	1.4	1.4	1.4	1.4	n/a	1.4
Evidence-based policy making							
10	Regulatory governance	n/a	n/a	2.27	n/a	n/a	1.7

(1) High values denote a good performance, except for indicator # 6. (2) 2023 value. If unavailable, the latest value available is shown. (3) Measures the user centricity (including for cross-border services) and transparency of digital public services as well as the existence of key enablers for the provision of those services. (4) Defined as the absolute value of the difference between the percentage of men and women in senior civil service positions.
Flags: (b) break in time series; (d) definition differs; (u) low reliability.
Source: E-government activities of individuals via websites, Eurostat (# 1); E-government benchmark report (# 2); Open data maturity report (# 3); Labour Force Survey, Eurostat (# 4, 5, 7); European Institute for Gender Equality (# 6); Fiscal Governance Database (# 8, 9); OECD Indicators of Regulatory Policy and Governance (# 10).

Graph A13.2: **a) Use of public authorities' websites or apps (left side); b) e-government maturity (centre); c) share of individuals with basic or above basic overall digital skills (right side)**



(1) 2023 data. Indicators a and c: % of people who used the internet in the last year.
Source: Eurostat and e-government benchmark report

ANNEX 14: EMPLOYMENT, SKILLS AND SOCIAL POLICY CHALLENGES IN LIGHT OF THE EUROPEAN PILLAR OF SOCIAL RIGHTS

The European Pillar of Social Rights is the compass for upward convergence towards better working and living conditions in the EU. This Annex provides an overview of Germany's progress in implementing the Pillar's 20 principles and the EU headline and national targets for 2030 on employment, skills and poverty reduction.

Table A14.1: **Social Scoreboard for Germany**

Policy area	Headline indicator	
Equal opportunities and access to the labour market	Adult participation in learning (during the last 12 months, excl. guided on the job training, % of the population aged 25-64, 2022)	53.7
	Early leavers from education and training (% of the population aged 18-24, 2023)	12.8
	Share of individuals who have basic or above basic overall digital skills (% of the population aged 16-74, 2023)	52.2
	Young people not in employment, education or training (% of the population aged 15-29, 2023)	8.8
	Gender employment gap (percentage points, population aged 20-64, 2023)	7.7
	Income quintile ratio (S80/S20, 2022)	4.4
Dynamic labour markets and fair working conditions	Employment rate (% of the population aged 20-64, 2023)	81.1
	Unemployment rate (% of the active population aged 15-74, 2023)	3.1
	Long term unemployment (% of the active population aged 15-74, 2023)	1
	Gross disposable household income (GDHI) per capita growth (index, 2008=100, 2022)	113.6
Social protection and inclusion	At risk of poverty or social exclusion (AROPE) rate (% of the total population, 2022)	21.1
	At risk of poverty or social exclusion (AROPE) rate for children (% of the population aged 0-17, 2022)	24.4
	Impact of social transfers (other than pensions) on poverty reduction (% reduction of AROP, 2022)	42.19
	Disability employment gap (percentage points, population aged 20-64, 2022)	24.2
	Housing cost overburden (% of the total population, 2022)	11.9
	Children aged less than 3 years in formal childcare (% of the under 3-years-old population, 2022)	24.6
	Self-reported unmet need for medical care (% of the population aged 16+, 2022)	0.3

Update of 25 April 2024. Members States are categorised based on the Social Scoreboard according to a methodology agreed with the EMCO and SPC Committees. Please consult the Annex of the Joint Employment Report 2024 for details on the methodology.
Source: Eurostat

While the German economy endured a slight contraction in 2023, the labour market remained robust. Even though the economy contracted by 0.3% in 2023, employment increased by 0.7% and unemployment remained at 3.0%. The share of young people not in employment, education or training (NEETs) was at 8.8% in 2023, below the EU average of 11.2%, while youth unemployment was at 5.8%, well below the EU average of 14.5%. There is, however, potential to further increase the employment rate of the low qualified (66.1% in 2023 vs 65.3% in 2022%) and of people born outside the EU (67.1% in 2023 vs 67.3% in 2022). There is also scope to reduce the gap in the employment rate of persons with disabilities (24.2 pps in 2022) and to increase the total number of hours worked to alleviate the current labour shortages.

Shortages of skilled labour pose obstacles to economic growth, competitiveness and the twin transition. While the rapidly ageing population limits the availability of labour, in the fourth quarter of 2023 there were around 1 711 000 job vacancies compared to only 1 362 000 unemployed people immediately available (ILO definition). Labour shortages create major obstacles to business activity, resulting in a loss estimated at 2% of GDP, with half of companies reporting that vacancies cannot be filled even in the long term ([147]). There is a shortage of applicants for jobs in the public administration, technology and IT, where gaps are expected to persist. To improve the conditions for labour migration, the German Parliament updated the Skilled Immigration Act in 2023. Germany also introduced an Education and Training Guarantee for young people. In contrast to the rest of the EU, Germany's rate of early school leavers was at 12.2% in 2022, substantially above the EU-level target of below 9% ([148]). By contrast, the country is one of the top performers in the EU in vocational education and training. Adult participation in learning in the previous 12 months was also above the EU average in 2022, at 53.7% vs 39.5% in the EU ([149]), but still far from Germany's national skills target of 65% by 2030. With 52.2% in 2023, Germany is below the EU average of 55.6% of adults with at least basic digital skills. It is especially young people who are lagging behind the EU average (55.7% vs 70.0 at EU level for 16-24 years old) (see Annex 10). The Recovery and Resilience Facility (RRF), the ESF+ and Just Transition Fund finance skills development for groups that are difficult to reach, and help them to adjust to the green and digital transitions.

([147]) Deutsche Industrie- und Handelskammer, 2023, *Fachkräfte-Report 2023/2024*, dihk.de.

([148]) European Commission, 2023, *Education and Training Monitor 2023*, ec.europa.eu.

([149]) Adult Education Survey, adults in learning in the past 12 months, excluding guided-on-the-job-training, ec.europa.eu.

Despite the increased labour demand, tax disincentives for second earners and insufficient childcare provision negatively affect women's working hours. Germany has one of the highest female employment rates in the EU (77.2% in 2023) but also some of the highest gender gaps in part-time employment (36.9 pps in 2023 vs EU 20.2 pps), in pay (17.7% vs EU 12.7% in 2022) and in pensions (27.6% vs EU 26% in 2022). The interplay of the tax and benefit system creates disincentives for second and low-wage earners – a considerable number of whom are women - to work more hours ([150]) (see Annex 19). Although the absolute number of children under 3 in formal childcare increased, its share remained stable over the last 7 years (at around 30%) ([151]). Socio-economic background has a strong impact on education outcomes, and the significant share of children with a migrant background (39% of children under 5 years old in 2022), underlines the importance of providing quality childcare and all-day schools, and of ensuring an inclusive and supportive education system (see Annex 15). The RRF complements national investments in creating 90 000 childcare places.

Germany has a strong social protection system but poverty risks, especially for children, remain high, while there are significant wealth inequalities. Almost one in four children was at risk of poverty or social exclusion in 2023 (23.6%), while the share of children affected by severe material and social deprivation rose from 5.5% in 2021 to 8.9% in 2023. With an increase of more than 1 million people living in households with very low work intensity from 2020 to 2023, Germany is still far from achieving its target of reducing this group by 1.2 million, including 300 000 children, by 2030 (see Table A14.2). Implementation of the European Child Guarantee is ongoing, even though most of the planned measures lack target values. The introduction of the Citizen's Benefit and the currently discussed Act for the Guaranteed Child Allowance aim to address poverty risks, while maintaining incentives for parents to participate in the labour market. Minimum wage updates also helped protect the purchasing power of low-wage earners. Low effective tax rates on inheritances and gifts maintain the high wealth inequality: 10% of the richest households owned 55.5% of net wealth in 2021, one of the highest rates in the EU ([152]). Recent research suggests that real estate in Germany is taxed at comparatively low rates, benefiting primarily affluent people ([153]) (see Annex 19).

Housing supply remains constrained in the face of an increasing need for affordable housing. According to a recent study ([154]) the estimated housing shortage in Germany increased to 800 000 dwellings at the end of 2023 (see Annex 12). The share of people living in households with housing costs above 40% of their total income increased to 13.6% in 2023, above the EU average of 8.7% in 2022. In January 2024, the new Building Energy Act entered into force, prescribing environment-friendlier residential heating.

([150]) Due to its deficiencies, the Federal Audit Office recommended abolishing entirely the factor method (*Faktorverfarhen*) aiming at countering those effects (Bundesrechnungshof, 2021, *Bemerkungen 2020 Ergänzungsband, Nr. 31*, bundesrechnungshof.de.

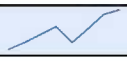
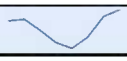
([151]) A sudden drop to 24.6% in 2022 might be a statistical outlier as data from the national register show a participation rate of 35.5% in 2022 (BMFSFJ, 2023, *Kindertagesbetreuung Kompakt*, bmfsfj.de.

([152]) See ECB, 2023, *Household Finance and Consumption Survey, Table J4: Net wealth inequality indicators*, ecb.europa.eu.

([153]) Bach and Eichfelder, 2021, Reform der Immobilienbesteuerung: Bodenwerte belasten und Privilegien streichen, *DIW Wochenbericht* 27/2021, diw.de; OECD, 2023, Economic Survey of Germany, oecd.org.

([154]) Eduard Pestel Institut, 2024, *Bauen und Wohnen 2024 in Deutschland*, mieterbund.de.

Table A14.2:**Situation of Germany on 2030 employment, skills and poverty reduction targets**

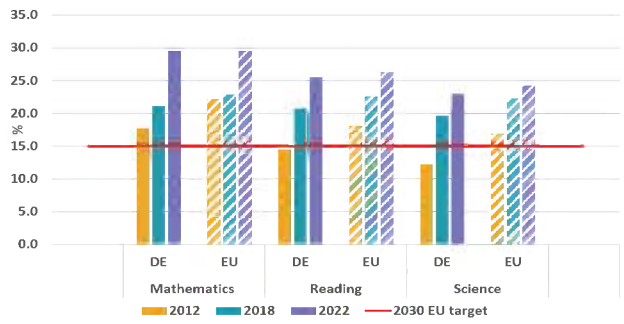
Indicators	Latest data	Trend (2016-2023)	2030 target	EU target
Employment (%)	81.1 (2023)		83	78
Adult learning[1] (%)	53.7 (2022)		65	60
Poverty reduction[2,3] (thousands)	1 066 (2023)		-1 200	-15 000

(1) Adult Education Survey, special extraction: adults in learning in the past 12 months, special extraction excluding guided on-the-job training. (2) The EU headline target set in terms of number of persons at risk of poverty or social exclusion (AROPE), reference year 2019. (3) Germany expresses its national target as a reduction in the number of persons living in households with very low work intensity (VLWI), reference year 2020. Break in series in 2020 for AROPE and VLWI.
Source: Eurostat, DG EMPL

This Annex outlines the main challenges of Germany's education and training system based on the 2023 Education and Training Monitor and the 2022 OECD Programme for International Student Assessment (PISA) results.

An increasing share of 15-years-old lack sufficient levels of basic skills with a negative impact on competitiveness. According to PISA 2022 the decline in mathematics, reading and science skills between 2018 and 2022, as measured in PISA 2022, continued a longer-term trend. The underachievement rate in mathematics (29.5%) in 2022 is around the EU average, whereas the share of underachievers is slightly below the EU average in science and reading. While the number of underachievers in mathematics increased particularly strongly between 2018 and 2022 (+8.4 pps vs EU 6.6 pps), underachievement in science and reading increased at a higher rate between 2012 and 2018. The significant decline in learning outcomes of 15-year-old students in all three fields tested in Germany and at EU level may further worsen existing labour and skills shortages.

Graph A15.1: **Underachievement rates by field, PISA 2012, 2018 and 2022**



Source: OECD (2023).

The influence of socio-economic and migrant background on educational outcomes increased even further. The underachievement rate of students from the lowest socio-economic quartile increased between 2018 and 2022 by nearly one third (+11 pps) reaching 46.6%, slightly below the EU average (48%). The rate, however, remained stable for students from the highest quartile. Foreign-born students underperform in mathematics three times more than native-born (64.0% vs 21.9%). The large gap (at 42.1 pps) shrinks to one third (12.6 pps) for native-born students whose parents were born abroad.

The share of top-performing students in PISA remains above the EU average but declined strongly in mathematics. The share of top-performing students in mathematics has decreased by 8.9 pps since 2012, effectively halving from 17.5% in 2012 to 8.6% in 2022. In reading, it dropped by 3.1 pps between 2018 and 2022 and now stands at 8.2%; while there was practically no change in science (- 0.3 p.p.) at 9.7% in 2022.

Targeted investments in education are needed. A new 10-year federal programme '*Startchancen*', implemented at the level of the federal states, targets mainly disadvantaged students. With an annual federal contribution of EUR 1 billion, it is expected to start in the school year 2024-2025, but has a limited scope. Federal states are expected to match federal funds, helping to target up to 4 000 schools (about 10% of all German schools) ([155]).

Germany faces serious teacher shortages, especially in science, technology, engineering and mathematics (STEM) subjects. Estimations indicate a 9.2% increase in student numbers ([156]) while a quarter of all schoolteachers are currently above 55 years of age ([157]) and will need to be replaced during the next 10 years. Although there is no comprehensive statistical data on teacher shortages, stakeholders agree that serious staff shortages exist ([158]), especially in STEM disciplines. The number of active teachers, including STEM teachers, is expected to fall by one third by 2030 ([159]).

The teaching profession in Germany lacks appeal, despite good wages. Expressed in purchasing power parity, initial statuary salaries for permanently employed teachers in Germany are the second highest in the

([155]) BMBF, 2024, *Startchancenprogramm*, bmbf.de.

([156]) KMK, 2023, *Einstellung von Lehrkräften*, kmk.org.

([157]) Eurostat, 2024, *educ_uoe_perpo1*, ec.europa.eu.

([158])Klemm, K.,2022, *Entwicklung von Lehrkräftebedarf und -angebot in Deutschland bis 2035*, estimates a gap of up to 150 000 teachers until 2035, vbe.de.

([159])ibidem FN 148

Table A15.1: **EU-level targets and other contextual indicators under the European Education Area strategic framework**

Indicator			Target	2012 Germany	2012 EU-27	2018 Germany	2018 EU-27	2023 Germany	2023 EU-27
[1]Participation in early childhood education (age 3+)			96%	95.8% 2013	91.8% 2013	94.2%	92.2%	93.1% 2021	92.5% 2021,d
[2]Low-achieving 15-year-olds in:		Reading	< 15%	14.5%	18.0%	20.7%	22.5%	25.5% 2022	26.2% 2022
		Mathematics	< 15%	17.7%	22.1%	21.1%	22.9%	29.5% 2022	29.5% 2022
		Science	< 15%	12.2%	16.8%	19.6%	22.3%	22.9% 2022	24.2% 2022
Early leavers from education and training (age 18-24)	[3]Total		< 9 %	10.5%	12.6%	10.3%	10.5%	12.8%	9.5%
	[3] By gender	Men		11.1%	14.5%	11.5%	12.1%	15.2%	11.3%
		Women		9.9%	10.6%	9.1%	8.7%	10.4%	7.7%
	[4] By degree of urbanisation	Cities		11.3% b	11.2%	10.5%	9.4%	12.4%	8.6%
		Rural areas		8.0% b	14.0%	8.3%	11.0%	10.5%	9.9%
	[5] By country of birth	Native		9.3%	11.3%	8.1%	9.2%	9.7%	8.2%
		EU-born		:	26.2%	26.0%	22.4%	33.5%	21.0%
		Non EU-born		:	30.1%	23.2%	23.0%	27.8%	21.6%
[6]Socio-economic gap (percentage points)				27.9	:	29.3	29.5	38.2 2022	37.2 2022
[7]Exposure of VET graduates to work-based learning			≥ 60% (2025)	:	:	:	:	94.1%	64.5%
Tertiary educational attainment (age 25-34)	[8]Total		45%	28.9%	34.1%	32.3%	38.7%	38.4%	43.1%
	[8] By gender	Men		26.8%	29.1%	31.1%	33.3%	36.1%	37.6%
		Women		31.0%	39.2%	33.6%	44.2%	41.0%	48.8%
	[9] By degree of urbanisation	Cities		35.8% b	43.5%	41.3%	49.0%	45.6%	53.3%
		Rural areas		21.9% b	24.8%	23.4%	27.7%	30.2%	31.7%
	[10] By country of birth	Native		29.8%	35.4%	32.4%	39.7%	39.3%	44.2%
		EU-born		:	29.3%	33.8%	36.7%	33.1%	40.2%
		Non EU-born		:	24.2%	31.2%	31.0%	36.9%	37.1%
[11]Participation in adult learning (age 25-64)			≥ 47% (2025)	:	:	46.4% 2016	37.4% 2016	53.7% 2022	39.5% 2022
[12]Share of school teachers (ISCED 1-3) who are 55 years or over				33.7% 2013	22.7% 2013	28.4%	23.8%	25.0% 2021	24.5% 2021

Notes: b = break in time series; d = definition differs; e = estimated; p = provisional; u = low reliability; : = data not available.
Source: 1,3,4,5,7,8,9,10,12=Eurostat; 11= Eurostat, Adult Education Survey; 2,6=OECD, PISA.

EU ([160]). Salary progression, however, remains low in comparison with the EU ([161]). While teachers generally like their work, nearly a third of teachers would not advise young people to enter the profession ([162]). A 14% drop in teacher education graduates over 10 years reflects the fall in attractiveness of the profession ([163]).

Germany still faces significant unmet demand for early childhood education and care (ECEC). In 2021, 93.1% of children between 3 and school age attended ECEC, below the EU-level target of 96%. In 2021, despite expanding capacity, 13% of demand for under-3-year-olds could not be satisfied in the west of the country, and 8% in the east. Municipalities may fulfil their legal obligation to provide an ECEC place for each child older than 1 year only by 2025 in the east and by 2028 in the west ([164]) with a 12–15-year delay. An acute shortage of staff triggered the lowering of requirements to enter ECEC professions while a lack of qualified staff hampers improving the quality of services. The 2022 ECEC quality law (‘*KiTa-Qualitätsgesetz*’) provides ([165]) federal funding of EUR 4 billion for quality and participation improvement.

Germany has the potential to increase tertiary education attainment. From 2012 to 2023, Germany increased its tertiary education attainment by 9.5 pps. However, at 38.4%, Germany is still 4.7 pps behind the EU average (43.1%) and significantly below the 45% EU-

([160]) European Commission, 2021, *Teachers in Europe: Careers, Development and Well-being (2021)*, ec.europa.eu.

([161]) European Commission, *Teachers' and School Heads' Salaries and Allowances in Europe 2020-2021*, ec.europa.eu.

([162]) Autor:innnengruppe Bildungsberichterstattung, 2022, *Bildung in Deutschland 2022*, https://bildungsbericht.de.

([163]) European Commission, 2023, Education and Training Monitor Germany, ec.europa.eu.

([164]) See footnote 152.

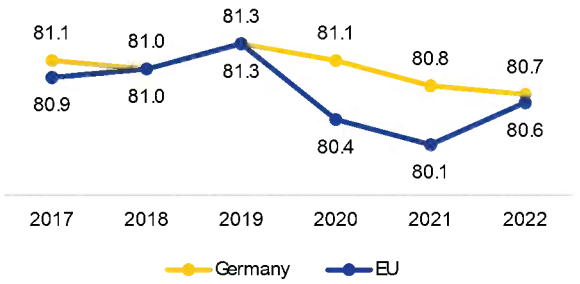
([165]) Following EUR 5.5 billion funding by the 2019 KiTa-Qualitätsgesetz (Good ECEC law).

level target for 2030. The relatively low attainment rate can partly be linked to the effective and important dual vocational education and training system (see Annex 14).

A healthy population and an effective, accessible and resilient health system are prerequisites for a sustainable economy and society. This Annex provides a snapshot of population health and the health system in Germany.

Life expectancy in Germany is marginally higher than in the EU overall, and fell in the 3 years following the start of the COVID-19 pandemic. The initial fall in life expectancy in 2020 was small in Germany compared to the EU as a whole. This gap closed as life expectancy in the rest of the EU rebounded in 2022. Germany fares comparatively well in avoiding deaths from treatable causes. The main mortality causes are cardiovascular diseases and cancer.

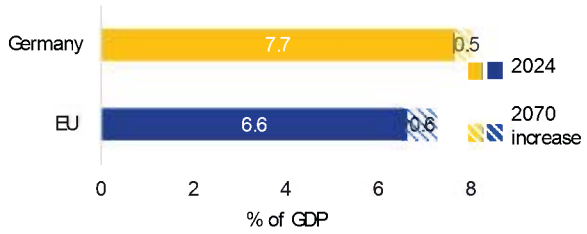
Graph A16.1: **Life expectancy at birth, years**



Source: Eurostat

Germany has the highest spending on healthcare in relation to GDP (12.9%) in the EU. Spending on healthcare increased from 2020 to 2021 (in relative and in absolute terms). Provisional data for 2022 indicate that spending on healthcare will fall back to 12.6% of GDP. Most health spending is publicly funded; out-of-pocket payments are comparatively low (12.0% of total health expenditure, compared to an EU average of 14.5% in 2021). Alongside the statutory health insurance system, there is a parallel private health insurance scheme for some population groups, such as civil servants, the self-employed and people with earnings above a certain threshold; they can opt out of the solidarity-based statutory health insurance scheme. Spending per capita is above the EU average on inpatient care, outpatient care, long-term care, disease prevention and pharmaceuticals and medical devices. Spending on long-term care has grown more strongly compared to other expenditure categories in recent years. Germany has a very large hospital inpatient sector, with 7.8 hospital beds per 1 000 population in 2021, among the highest rates in the EU. The high number of hospital beds poses questions about efficiency and overcapacity. To reduce the number of inpatient cases and encourage more outpatient services, as well as guaranteeing quality, a new government commission has proposed changing the financing system for hospitals and developing a new instrument for hospital planning based on quality criteria. Based on the age profile of the German population insured by social health insurance, public expenditure on health is projected to increase by 0.5 percentage points (pps) of GDP by 2070, compared to 0.6 pps for the EU overall (see Graph A16.2 and Annex 21).

Graph A16.2: **Projected increase in public expenditure on healthcare over 2024-2070**



Baseline scenario
Source: European Commission / EPC

Spending on prevention has doubled over the last decade reaching 6.5% of total healthcare spending in 2021, slightly above the EU average 6.0%. The increase relative to the 2019 level (3.4% of total healthcare spending) is pronounced, with spending increases driven by programmes for disease detection and immunisation, linked to COVID-19.

Numbers of doctors and nurses per capita are well above the EU average. Though the number of doctors in hospitals has been increasing since the introduction of the diagnosis-related group-based payment system in 2004, the number of nurses working in hospitals is not sufficient. To boost numbers, hospital payment rules have been changed, so that the costs of nursing staff are no longer included in the case-based payment system. Moreover, in addition to increasing the number of nursing graduates, the 'Nursing Training

Table A16.1:**Key health indicators**

	2018	2019	2020	2021	2022	EU average (latest year)
Treatable mortality per 100 000 population (mortality avoidable through optimal quality healthcare)	85,4	81,8	80,8	81,3	NA	93.3 (2021)
Cancer mortality per 100 000 population	246,0	243,8	240,3	235,7	NA	235.4 (2021)
Current expenditure on health, % GDP	11,5	11,7	12,7	12,9	12,6	10.9 (2021)
Public share of health expenditure, % of current health expenditure	84,1	84,0	85,1	85,5	NA	81.1 (2021)
Spending on prevention, % of current health expenditure	3,3	3,4	3,3	6,5	NA	6.0 (2021)
Available hospital beds per 100 000 population	798	791	782	776	NA	525 (2021)
Doctors per 1 000 population	4,3	4,4	4,5	4,5	NA	4.1 (2021)*
Nurses per 1 000 population	11,5	11,8	12,0	12,0	NA	7.9 (2021)
Total consumption of antibacterials for systemic use, daily defined dose per 1 000 inhabitants per day ***	NA	12.6****	NA	NA	NA	19.4 (2022)

Note: The EU average is weighted for all indicators except for doctors and nurses per 1 000 population, for which the EU simple average is used. Doctors' density data refer to practising doctors in all countries except Greece, Portugal (licensed to practise) and Slovakia (professionally active). Nurses' density data refer to practising nurses in all countries except Ireland, France, Portugal, Slovakia (professionally active) and Greece (hospital only).
Source: Eurostat Database; except: * OECD, ** Joint Questionnaire on non-monetary healthcare statistics, *** ECDC, **** Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach.

Initiative' contains several measures aimed at attracting more people into the profession.

Through its recovery and resilience plan, Germany plans to invest EUR 4.3 billion (15.26% of the plan's total value) in healthcare. Investments mainly focus on the digital transition of the healthcare system (IT-related investment in hospitals and public health services, including the related construction and refurbishment of buildings). Most of the milestones and targets have not been completed yet. In addition, complementary investments are planned under the cohesion policy funds from 2021 to 2027. Germany intends to invest around EUR 89 million mainly in e-health services and applications, further digitalisation of healthcare and various measures to improve the accessibility, effectiveness and resilience of the healthcare system ([166]). The digital transition in healthcare is an ongoing challenge in Germany. This is confirmed by recent indicators underscoring the low number of individuals accessing personal health records online in Germany. Moreover, EUROSTAT data for 2022 indicate a drop in Germany in the uptake of telemedicine since 2020, a pattern going contrary to the continued increase in telemedicine uptake seen in the EU overall. In order to drive forward the digitalisation of the health system, Germany has passed the 'Digital Act', which came into force in March 2024.

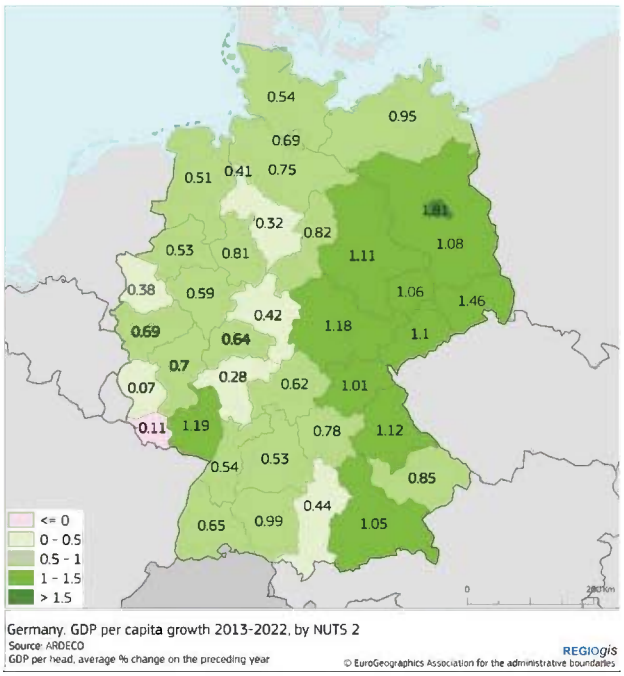
([166]) The EU cohesion policy data reflect the status as of 13 May 2024.

ANNEX 17: ECONOMIC AND SOCIAL PERFORMANCE AT REGIONAL LEVEL

Annex 17 showcases the economic and social regional dynamics in Germany. It provides an analysis of economic, social, and territorial cohesion in the German regions compared with the rest of the EU and assesses emerging investment and subnational reform needs to foster economic growth, social development and competitiveness in the country.

Overview of economic and social performance at regional level

Map A17.1: **Germany, NUTS2: GDP per capita growth 2013-2022**

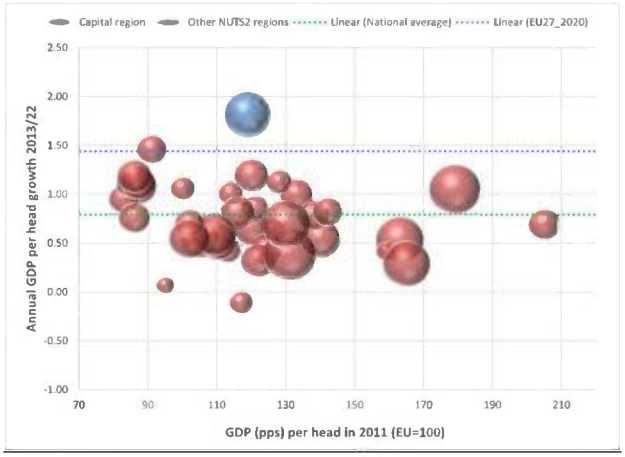


Source: Eurostat

Regional disparities in GDP per capita in Germany have been gradually declining since 2011 but remain significant between regions. In 2022, the Hamburg region's GDP per capita (in PPS) stood at 195% of the EU average while for the regions of Oberbayern, Stuttgart, and Darmstadt it stood at between 169 and 145% ([167]). Other regions lagged further behind, with the lowest GDP per capita standing at between 88 and 83% of the EU average in the seven least developed ([168]) regions in the country. Five of these regions are in the East of Germany (Thüringen, Sachsen-Anhalt, Chemnitz (a part of Sachsen), Brandenburg, Mecklenburg-Vorpommern) and two are in the West of Germany (Lüneburg and Trier). Furthermore, a gap in GDP per capita between urban and non-urban areas also remains. In 2022, the GDP per capita in predominantly urban areas stood at EUR 54 400 (current prices in 2022) while in predominantly non-urban areas it stood at EUR 38 610 (current prices in 2022).

Economic convergence between 2013 and 2022 was relatively modest. A sluggish national average GDP per capita growth of 0.8% (below the EU average of 1.4%) was accompanied by diverse growth patterns across regions. (Figures 1 and 2).

Graph A17.1: **Germany, NUTS2: GDP per capita (2011) and GDP growth (2013-2022)**



Source: DG REGIO calculations based on JRC (ARDECO) and Eurostat data

Disparities in GDP per capita mainly arise from differences in labour productivity between more and less developed regions in Germany. In 2022, labour productivity, measured as gross value added (GVA) per worker, stood at 103% of the EU average in PPS (purchasing power standards) terms. It reached between 118 and 134% in the more developed regions of Darmstadt, Stuttgart, Braunschweig, Hamburg and Oberbayern while varying between 80 and 84% in the less

([167]) Statistics in Annex 17 are presented at NUTS1 and NUTS2 level and based on Eurostat and ARDECO datasets.

([168]) For Annex 17, 'less/least developed regions' are defined as having a GDP per capita (PPS) in 2021 lower than the EU average (100); 'developed regions': 101 to 125; 'more/most developed' regions; 126 or higher. These terms should not be confused with the classification used for EU cohesion policy.

Table A17.1: **Selected indicators at regional level - Germany**

Region name	GDP per head (purchasing power standard/PPS)	GDP per head growth	Productivity (GVA, PPS) per person employed	Real productivity growth	Population growth	Total population aged >65	Unemployment rate	R&D expenditure	Regional competitiveness
	EU27 = 100 2022	Average % change on the preceding year 2013-2022	EU27 = 100 2022	Average % change on the preceding year 2013-2022	Average annual change per 1000 residents 2013-2021	% of total population 2023	% of labour force 2023	% of GDP 2021	EU27 = 100 2022
European Union (27 MS)	100	1.44	100	0.7	1.9	21.3	6.1	2.3	100
Germany	117	0.79	102.8	0.4	3.7	22.1	3.1	3.1	117.3
Baden-Württemberg	129	0.62	108.6	0.4	5.7	20.9	2.7	5.6	121
Bayern	136	0.92	111.4	0.5	5.7	20.9	2.2	3.4	118.3
Berlin	122	1.81	103	0.7	9.5	18.9	5.2	3.4	121.5
Brandenburg	88	1.08	93.7	0.9	3.9	25.5	3.3	1.8	121.5
Bremen	144	0.41	106.5	0.2	3.6	21.1	4.5	3.2	109
Hamburg	195	0.69	133.8	0.4	7.4	17.9	4	2.2	129.7
Hessen	130	0.39	110.8	0.1	5	21.1	3	3.1	120.9
Mecklenburg-Vorpommern	83	0.95	84.1	0.6	0.7	26.4	4.3	1.8	101.9
Niedersachsen	106	0.56	98.2	0.2	3.5	22.5	2.8	2.7	108.2
Nordrhein-Westfalen	112	0.58	99.2	0.1	2.3	21.5	3.4	2.2	122.7
Rheinland-Pfalz	105	0.91	101.2	0.7	3.2	22.6	3	2.8	116.3
Saarland	99	-0.11	88.5	-0.2	-1.3	24.8	3.3	2	107.5
Sachsen	91	1.26	85.2	0.9	-0.2	26.6	3.3	3.1	111.2
Sachsen-Anhalt	87	1.11	90.4	0.9	-4.5	27.6	3.8	1.6	101.8
Schleswig-Holstein	97	0.54	93.5	0.1	4.5	23.5	3.1	1.7	108
Thüringen	85	1.18	83.4	1.1	-3.2	27.1	3	2.8	107.3

Source: Eurostat, EDGAR database

developed Eastern regions of Chemnitz, Thüringen and Mecklenburg-Vorpommern.

Productivity convergence has been gradual and in line with the convergence in economic output. In 2013-2022, annual real productivity growth was highest in Thüringen (1.1%) and Rheinhessen-Pfalz (1%) followed by various less developed regions. Growth ranged from 1.1% in Thüringen to a moderate 0.5% in Freiburg, Mittelfranken and Braunschweig and overall ranged above the EU average (0.7%). Some Western regions experienced a decline in real productivity, notably in Saarland (-0.2%).

There is a marked difference in regional innovation performance ([169]). In 2023, the 'Innovation Leaders', comprising some of the most developed regions (e.g. Hamburg, Karlsruhe, Oberbayern) and Berlin showed a regional innovation performance around 1.7 times higher than the least performing regions (Mecklenburg-Vorpommern, Sachsen-Anhalt, Trier). Most less developed regions were classed 'Moderate Innovators', except for Dresden, Leipzig, Thüringen, and Brandenburg, which were classed as 'Strong Innovators'.

There are some variations in terms of competitiveness across regions. All German regions ranked above the EU average in terms of competitiveness in 2022 ([170]). However, there were sizeable disparities between regions, with Oberbayern and Hamburg leading the ranking amongst German regions (130) and Sachsen-Anhalt and Mecklenburg-Vorpommern (102) featuring last in the ranking.

Expenditure in R&D is concentrated in the more developed Southern regions. It is highest in Stuttgart (6.8% of GDP in 2021) and above 3.4% in many more developed regions (except Hamburg), Rheinhessen-Pfalz, Berlin, and Dresden. R&D investment was lowest (less than 1.0% of GDP) in the Western regions of Trier, Koblenz and Lüneburg.

There are significant disparities in terms of investment. In 2020, the investment rate (gross fixed capital formation as a share of GDP) was lowest in Bremen and Düsseldorf (15%) as well as in several other developed and more developed regions. However, four less developed regions ranked very high – Trier, Lüneburg (30%), Mecklenburg-Vorpommern and Brandenburg (25%), exceeding the German average (22%) which stood around the EU average.

Labour market conditions remained among the strongest in the EU, although some disparities persist. All German regions have an unemployment rate below the EU average (6.1%). Unemployment ranged between 2.2%

([169]) Based on the methodology of the 2023 European Innovation Scoreboard, which ranks countries' and regions' innovation performance by indicator groups: framework conditions, innovation activities, investments, and impacts. They classify 'Emerging Innovators', 'Moderate Innovators', 'Strong Innovators', and 'Innovation Leaders'.

([170]) 2022 Regional Competitiveness Index, EU-27 = 100.

and 5.2% across the German regions. The decline in the unemployment rate over the past decade was strongest in the eastern regions, which had higher unemployment rates, and therefore more scope to reduce it. All the regions recovered from the temporary surge in unemployment during the COVID-19 pandemic. A high job vacancy rate (over 4% ([171]) in Germany) coupled with low unemployment point to the presence of labour shortages in many regions (Annex 14) ([172]).

Germany is undergoing substantial demographic shifts, which create regional variations linked to the level of development. Germany's population has grown at an annual rate of 3.7 per 1 000 residents between 2013 and 2022, with the highest growth in Leipzig and Berlin at 8.6 and 9.5 per 1 000 per year respectively. However, certain regions, particularly the less developed regions in the East, like Thüringen, Sachsen-Anhalt, and Chemnitz have witnessed significant decline in population (-3.2 to -4.5 per 1 000 per year). This reflects broader trends in shifts between non-urban and urban areas across Germany, which result in growing urban populations and expanding large cities.

Population expansion is mainly driven by positive net migration (+5.8 per 1 000 residents per year between 2012 and 2021). Increases in net migration were significant in most southern regions but particularly strong in Brandenburg and Leipzig (9.0 and 11.2 per 1 000 residents per year).

Population ageing poses a real challenge. The population over 65 grew by 10.5 per 1 000 residents per year between 2012 and 2021, and their share increased to 22%, one of the highest in the EU. Five less developed eastern regions fall into a talent development trap ([173]). Chemnitz, Sachsen-Anhalt, Thüringen, Mecklenburg-Vorpommern, and Dresden are experiencing depopulation (average annual change lower than -7.5 per 1 000 residents) in the working age population and at the same time are below the EU average in terms of tertiary education attainment.

Demographic evolution is putting pressure on the labour market and a strain on the service sector, especially in some (less developed) regions in the short term. In the medium to long term, this could stifle their economic growth and limit their capacity to deal with the challenges posed by an ageing population.

Investment and subnational reform needs ahead

Investment priorities in the context of cohesion policy are mainly focused on supporting the country's green and digital transition. The priorities set out in the programmes adopted in 2022 therefore remain valid under the current economic and social circumstances.

Germany would benefit from continuing to use cohesion policy to increase investment in research, development and innovation (especially in SMEs and in eastern regions) as well as in education and training in view of the green and digital transition challenges, and step-up investment in business development and support for enterprises. Further areas of high priority include promoting energy efficiency and renewable energies, tackling climate change adaptation as well as reducing the carbon footprint, including through facilitating investments in net-zero technologies manufacturing. For regions with high-performing sectors (growth locomotives), it would be beneficial to continue receiving cohesion policy funding to support the green and digital transition.

In order to maintain its administrative capacity, it would be beneficial for Germany to address staff shortages, particularly in

([171]) Job vacancy rate in selected NACE sectors, average in the first half of 2023: 6.6% in Construction (F); 4.6% in Transportation and storage (H); 5.8% in Accommodation and food service activities (I); 4.3% in Information and communication (J); 5.2% in Professional, scientific and technical activities (M); 8.2% in Administrative and support service activities (N); 4.5% in Human health and social work activities (Q).

([172]) The recent data of Eurofound show an increase in online jobs advertisements in nearly all regions between 2022Q2 and 2023Q3, ranging from -1.2% in Luneburg to +75% in Munster. See also: cedefop.europa.eu.

([173]) European Commission, 2023, *Communication from the Commission: Harnessing talent in Europe's regions, COM(2023) 32 final*, eur-lex.europa.eu.

regions lagging behind in the implementation of cohesion policy programmes, including the Just Transition Fund.

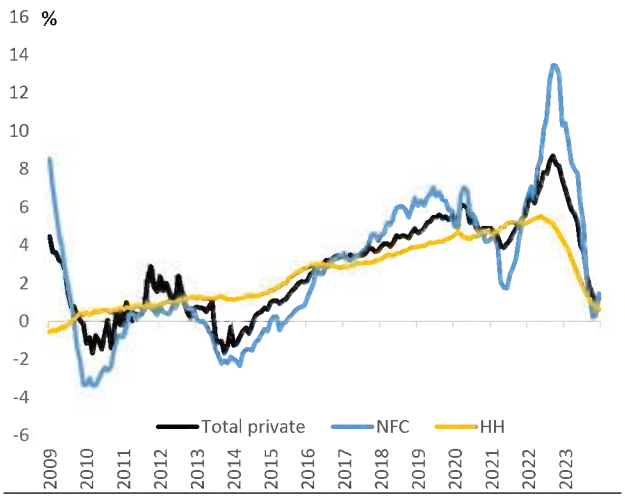
Germany could also benefit from investment opportunities under the Strategic Technologies for Europe Platform (STEP) initiative to boost investments in critical technologies to support industry's transition.

Germany hosts the EU's second-largest banking sector in terms of assets, characterised by a notable abundance of institutions. At the end of 2022, there were 1 458 banks in Germany, accounting for 34% of the total number of banks in the euro area. Most of these banks are very small institutions: only eight Germany-headquartered banks are deemed systemically important by the EBA. There have been mergers of small banks recently, in particular in the savings-bank (Sparkassen) sector and cooperative-bank sector, leading to a 4.1% decline in the number of institutions in 2023. German banks are organised into three main 'pillars'. The first pillar is composed of 247 commercial banks, while the second pillar is composed of public-sector banks, including 362 saving banks and 6 regional banks (Landesbanken). The third pillar consists of 736 cooperative banks. There are a further 107 banks outside the three-pillar category.

German banks are among the least profitable in Europe, given their high-cost base, overcapacity and intense competition. Due to their size, many small banks are not able to achieve economies of scale. Profitability was especially weak for German banks during the extended period of low interest rates. Starting with the lift off in rates in the second half of 2022, their profitability improved. Return on equity rose from 4.3% in 2022 to 7.2% in the year to July 2023, but it was still the lowest in the EU. This subdued profitability could drive further consolidation among credit institutions to reduce costs. However, the three-pillars model, with its distinct ownership structures and limited geographic reach, poses challenges to the ongoing consolidation of banks in Germany. Additionally, German banks maintain lower liquidity levels than their EU counterparts, particularly smaller banks (so-called less significant institutions), with a liquidity coverage ratio of 146%, contrasting with the EU average of 205% as of Q3-2023. All the same, these levels are still well above the legal minimum levels.

Asset quality remains remarkably high and banks have strengthened their solvency. German banks' non-performing loans (NPLs) ratio stood at 1.2% in September 2023, significantly lower than the EU average of 1.8%. However, weaker economic performance and high interest rates combined with the phase-out of pandemic rules led to a rise in business insolvencies in 2023, which are up by 22.2% compared with 2022, albeit still 4.9% below the pre-pandemic level of 2019. This increase in insolvencies could result in a significant deterioration in the risk profile of loan portfolios in 2024. Credit risk has increased particularly sharply in the commercial real-estate (CRE) sector. A pick-up in earnings has helped the banks to bolster their capital cushions, although their capital adequacy ratio (19.3%) remains slightly below the EU average (19.6%). In view of the greater systemic risk, Germany's Federal Financial Supervisory Authority (BaFin) has maintained a countercyclical capital buffer requirement of 0.75% and a sectoral systemic risk buffer of 2.0% on loans secured by residential property since February 2023.

Graph A18.1: **Evolution of credit activity**



Source: ECB

Household and business lending slowed in 2023, but both sectors remain resilient. Households expanded their borrowing in the low-interest-rate environment which prevailed until mid-2022 causing aggregate household debt to reach 100% of disposable income. Since then, household borrowing has declined to 97% of disposable income as credit creation slowed in the face of higher interest rates. German households are to some extent shielded from the interest rate rises thanks to the long fixed-interest-rate periods in effect for most mortgage loans, which account for about 75% of household debt. The Bundesbank,

Table A18.1:**Financial Soundness Indicators**

	2017	2018	2019	2020	2021	2022	2023	EU	Median
Total assets of the banking sector (% of GDP)	236.0	231.1	239.2	262.8	253.6	271.3	251.2	257.0	184.6
Share (total assets) of the five largest banks (%)	29.7	29.1	31.2	34.0	31.8	35.0	-	-	69.6
Share (total assets) of domestic credit institutions (%)[1]	93.1	89.0	87.1	83.7	81.8	79.3	78.5	-	62.9
NFC credit growth (year-on-year % change)	4.2	6.5	5.8	4.2	6.1	10.3	1.4	-	2.4
HH credit growth (year-on-year % change)	3.2	3.9	4.4	4.8	5.1	4.3	0.6	-	1.4
Financial soundness indicators:[1]									
- non-performing loans (% of total loans)	1.8	1.4	1.2	1.2	1.1	1.1	1.2	1.8	1.8
- capital adequacy ratio (%)	18.8	18.4	18.1	18.8	18.5	18.8	19.3	19.6	20.1
- return on equity (%)[2]	2.9	2.4	2.1	2.2	4.0	4.3	7.2	9.9	13.2
Cost-to-income ratio (%)[1]	74.0	76.8	75.5	70.7	68.8	69.9	57.7	52.8	44.9
Loan-to-deposit ratio (%)[1]	89.4	90.2	87.7	80.8	81.0	83.9	85.6	93.3	80.2
Central bank liquidity as % of liabilities	1.6	1.4	1.2	4.7	5.5	3.1	1.0	-	0.7
Private sector debt (% of GDP)	106.6	109.1	112.2	120.9	120.4	118.4	-	133.0	118.4
Long-term interest rate spread versus Bund (basis points)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.7	104.2
Market funding ratio (%)	54.1	53.6	52.0	50.7	51.0	49.9	-	50.8	39.8
Green bonds outstanding to all bonds (%)[3]	-	-	-	2.4	3.0	4.3	5.2	4.0	2.7

1-3 | 4-10 | 11-17 | 18-24 | 24-27 — Colours indicate performance ranking among 27 EU Member States.

([1]) Last data: Q3 2023.
([2]) Data are annualised.
([3]) Data available for EA countries only, EU average refers to EA area.(1)
Source: ECB, Eurostat

Germany's Central Bank, thinks that only a very small subset of households could see their debt-service capacity deteriorate in the future ([174]). After having risen for more than a decade, house prices started to decline in 2022. This could pose a risk if collateral values were not sufficient to cover for losses in the event of default. However, the scarcity of living space in major cities may prevent property valuations from falling too far. Businesses, on the other hand, have faced much steeper increases in their interest burden, as 27% of outstanding non-financial corporation loans have variable rates and are fixed for shorter periods. The sector is still considered in solid shape as company profitability has now recovered to pre-pandemic levels.

Loans for CRE pose a significant risk for a small subset of German banks. The CRE lending segment has come under pressure due to structural factors (such as changes in work and trade patterns which have led to an oversupply of office space) and cyclical factors (in particular the rise in interest rates). German banks have moderately high exposure to the CRE sector, with loans worth EUR 285 billion in September 2023, corresponding to 116.7% of their aggregate Tier 1 capital. While the overall loan amount for CRE grew slightly over the past 10 years as real-estate valuations increased, the share of CRE in NFC loans has remained, with small fluctuations, largely unchanged at around 32% over the past 10 years. However, the aggregate numbers hide significant differences among banks. A handful of banks that specialise in real-estate lending have exposures exceeding many multiples of their capital. Notably, these banks not only lend in Germany, but have a large part of their exposure spread across Europe and the United States. Therefore, their solvency hinges not only on the German property market, but property markets across the world. BaFin highlighted the risks from CRE in its publication on major risks for 2024 ([175]), saying that it expected this loan segment to reduce banks' asset quality and possibly lead to some defaults. Indeed, NPLs in the CRE segment have already risen. For the group of significant institutions, which includes 4 out of 6 *Landesbanken*, the CRE NPL ratio climbed to 3.4% in September 2023, up from 2.0% at the beginning of the year. The risks are mitigated by conservative underwriting standards and solid loan-to-value buffers.

Germany is the second-largest participant in the EU insurance market, with insurance companies holding assets of EUR 2.1 trillion in 2023. In recent years, German insurance companies have strengthened their solvency profiles, surpassing the EU average in financial robustness. A notable trend in recent years has

([174]) Deutsche Bundesbank, November 2023, *Financial Stability Review*, bundesbank.de.

([175]) BaFin, 2024, *Risiken im Fokus der BaFin*, BaFin.de.

been a shift in the exposure of German insurance companies to different asset categories. Traditionally, German insurers predominantly invested in fixed-income assets. However, German insurance companies have significantly increased their investments in equity in recent years. Currently, their 21% share in equity investments is considerably larger than the average 15% seen among EU insurance companies. The market is also characterised by low concentration and intense competition, where the top three insurance companies have a relatively small share of premium income. Insurance intermediaries play a notable role in distributing life insurance products in Germany, as they are responsible for approximately 80% of the gross written premium.

The Frankfurt Stock Exchange, operated by Deutsche Börse, is the largest stock exchange in Germany, and its performance in 2023 has been in line with global stock markets, showing positive results. However, a persistent concern has been the notable absence of initial public offerings throughout the year. Even some large German companies chose to list on US stock markets rather than in Germany. The financial drought facing German start-ups, especially for scale-up financing, has become more pronounced in recent years. In 2023, these emerging businesses secured EUR 6 billion in venture capital, reflecting a significant 39% decrease compared with the previous year's figure of EUR 9.9 billion. The recently enacted German Future Financing Act aims to address this issue, with one of its main goals being to facilitate access to public equity for start-ups and small-to-mid-sized companies. Additionally, various EU initiatives, such as the proposed Listing Act, are anticipated to help reverse this trend in 2024. Finally, investments in private equity in Germany relative to nominal GDP lag well behind the EU average (EC DG FISMA Overview of CMU Indicators – 2023; indicator 11). Moreover, private equity investments have been on a downward trend since 2021, falling below 2017 levels by the end of 2023, albeit this was in line with global trends.

This annex provides an indicator-based overview of Germany's tax system. It includes information on the tax structure (the types of tax that Germany derives most of its revenue from), the tax burden on workers, and the progressivity and the redistributive impact of the tax system. It also provides information on tax collection and compliance.

Germany's tax revenues in relation to GDP continue to remain close to the EU average. Table A19.1shows that tax revenues (including social security contributions) slightly increased as a percentage of GDP from 39.6% in 2020 to 40.8% in 2022. The EU average was 40.2% in 2022. Germany relies substantially more than the EU average on labour taxation as a part of the overall structure of tax revenues. The lion's share of this consists of social security contributions.

Looking at capital taxes, these tax types have been underrepresented in the overall tax mix in recent years. It should be noted, however, that income from corporate taxation is at the EU aggregate level.

Moreover, property and environmental taxes are used to a lesser extent than in the EU as a whole. As in previous years, Germany's property taxes as a percentage of GDP are persistently lower than the EU aggregate. Recurrent taxes on immovable property were 0.4% of GDP in 2022 (the EU aggregate for 2022 was 1%). Environmental taxes made up 1.6% of GDP in 2022 in Germany and were therefore below the EU aggregate of 2% in the same year. Importantly, they decreased by 0.6pp from 2.2% in 2010. Moreover, there is scope to better align the 'polluter pays' principle in environmental taxation. While Germany has implemented levies on landfilling, waste loadings to water and plastic products there remains scope to expand waste disposal levies (including incineration) and implement further levies such as on NOx emissions, fertilisers and pesticides. The highest contribution in tax revenues persistently comes from labour taxation (including social security contributions), which makes up more than half of the overall tax mix. Moreover, apart from the introduction of a CO_2 price, excise duties on energy products have remained virtually unchanged during the past decade (see also Annex 6).

Germany continues to grant substantial environmentally harmful subsidies. Fossil fuel subsidies amounted to EUR 21 billion in 2022. In the same vein, company cars, which represent more than 60% of all new passenger cars, continue to benefit from a low taxation rate for private usage (1%), which represents an estimated EUR 3.1 billion of forgone tax revenue in 2018 ([176]).

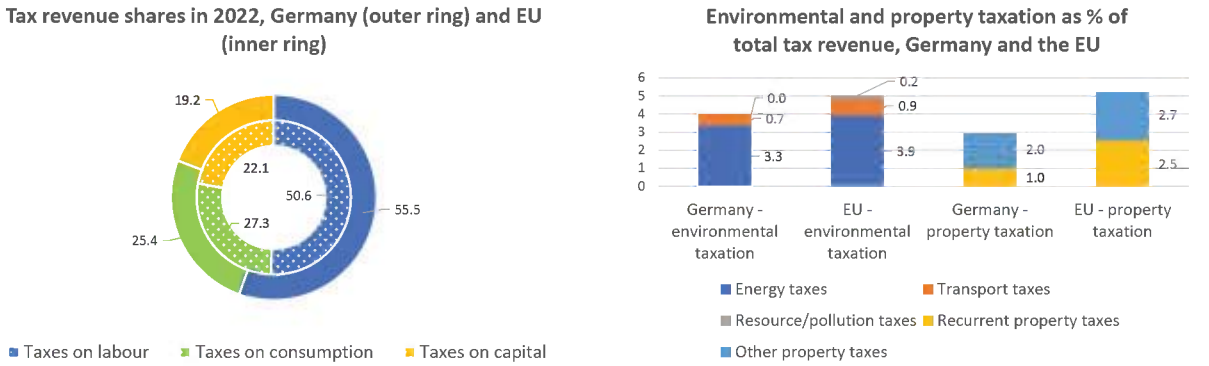
Similarly, rather than providing targeted government support for developing viable alternatives, the commuter allowance encourages users to pursue regular long-distance travel. This allowance resulted in fiscal costs of EUR 6 billion in 2018 (UBA, 2021). Both subsidies, which have been in place for over a decade, mainly benefited medium- and higher-income groups and people who drive to work. From both the social and the environmental points of view, the subsidies remain insufficiently targeted and

Table A19.1:**Taxation indicators**

		Germany					EU-27				
		2010	2020	2021	2022	2023	2010	2020	2021	2022	2023
Tax structure	Total taxes (including compulsory actual social contributions) (% of GDP)	37.3	39.6	40.9	40.8		37.9	40.0	40.4	40.2	
	Labour taxes (as % of GDP)	21.0	23.2	22.8	22.6		20.0	21.3	20.7	20.3	
	Consumption taxes (as % of GDP)	10.7	9.6	10.3	10.3		10.8	10.7	11.2	11.0	
	Capital taxes (as % of GDP)	5.6	6.8	7.7	7.8		7.1	8.0	8.6	8.9	
	Of which, on income of corporations (as % of GDP)	2.0	2.2	3.1	3.2		2.4	2.5	3.0	3.4	
	Total property taxes (as % of GDP)	0.8	1.3	1.3	1.2		1.9	2.3	2.2	2.1	
	Recurrent taxes on immovable property (as % of GDP)	0.4	0.4	0.4	0.4		1.1	1.2	1.1	1.0	
	Environmental taxes as % of GDP	2.2	1.7	1.8	1.6		2.4	2.2	2.3	2.0	
Progressivity & fairness	Tax wedge at 50% of average wage (Single person) (*)	41.7	41.6	41.3	41.1	40.5	33.9	31.7	32.1	31.8	31.7
	Tax wedge at 100% of average wage (Single person) (*)	49.0	48.8	48.1	48.3	47.9	41.0	40.1	39.9	40.0	40.2
	Corporate income tax - effective average tax rates (1) (*)		28.0	26.4	26.4			19.5	19.0	19.0	
	Difference in Gini coefficient before and after taxes and cash social transfers (pensions excluded from social transfers) (2) (*)	9.5	10.3	9.9	11.2		8.6	8.1	8.2	7.9	
Tax administration & compliance	Outstanding tax arrears: total year-end tax debt (including debt considered not collectable) / total revenue (in %) (*)		1.6	2.6				40.9	35.5		
	VAT Gap (% of VAT total tax liability, VTTL)(**)	9.2	5.6	2.8	3.3			9.7	5.4		

Source:

Graph A19.1: **Tax revenues including social security contributions from different tax types, % of total revenue**



Note: values for EU are GDP-weighted EU averages (EU aggregates)
Source: European Commission

there is considerable scope to shift away from harmful subsidies, replacing them with more targeted support for citizens in need, thereby privileging public transport.

In terms of tax reforms passed in line with the RRP commitments, the German parliament adopted the Seventh Motor Vehicle Tax Amendment Act, which sets tax incentives by extending the period for starting a 10-year tax exemption for purely electric vehicles.

Moreover, the upper house of the parliament ('Bundesrat') approved the Growth Opportunities Act end of March 2024. This law aims to accelerate economic growth and boost competitiveness. The focus of this package is (i) to increase investment and innovation by companies, (ii) simplify the tax system and (iii) reduce the bureaucratic burden on businesses. Its measures include tax allowances, including depreciation allowances for investment and increased R&D allowances. In terms of relieving bureaucratic burden, it includes mandatory electronic invoicing. While the initially proposed version of this law included measures worth of EUR6.3 billion of tax relief, the approved version's budget envelope is worth EUR 3.2 billion.

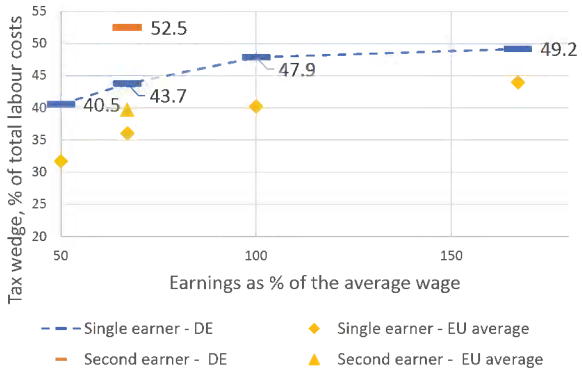
Germany is addressing the energy crisis by applying a range of tax-related and other measures. The government has implemented specific tax measures in order to lessen the impact of high energy prices on consumers and businesses. It nonetheless does not seem that most of these initiatives are specifically targeting the most vulnerable businesses and households. The main energy measures are a natural gas and heat price brake and an electricity price brake that cap energy prices for households, SMEs, and industrial companies. These price brakes were initially intended to last until April 2024 but expired on 31 December 2023 after the federal government reached an agreement on the 2024 budget. For the supply of gas and heat through natural gas and heating networks, the VAT rate will revert from the reduced rate to the standard rate of 19% from 1 April 2024.

Germany's labour tax burden is considerably higher and less progressive than the EU average. Graph A19.2 shows that the labour tax wedge ([177]) for Germany in 2023 was much higher than the EU average not only for single people at the average wage level, but also for those earning low wages (50% and 67% of the average wage) and high wages (167% of the average wage). The tax wedge for second earners at 67% of the average wage was clearly above the EU average. In addition, the difference between the tax wedge for second earners at 67% of the average wage and for single persons at the same wage level was particularly high in Germany, which is indicative of the important role that the joint taxation system for couples plays in reducing work incentives for second earners. The difference between the tax wedge for high- and low-wage earners (167% and 50% of the average wage) is considerably lower for

([177]) The tax wedge is defined as the sum of personal income taxes and employee and employer social security contributions net of family allowances, expressed as a percentage of total labour costs (the sum of the gross wage and social security contributions paid by the employer).

Germany than for the EU as a whole, indicating the low progressivity of the labour tax system. The tax-benefit system helped reduce inequality (as measured by the Gini coefficient) by more than the EU average in 2022 (see Table A19.1).

Graph A19.2: **Tax wedge for single and second earners as a % of total labour costs, 2023**



Note: second earners are members of a family with the primary earner earning 100% of the average wage and no children. For the methodology of the tax wedge for second earners, see OECD, 2016, *Taxing Wages 2014-2015.*
Source: European Commission

Germany performs relatively well on tax compliance. According to the VAT gap in the EU 2023 report, Germany - together with Italy – accounted for over 50% of the decline in the EU-wide compliance gap between 2019 and 2021. Tax compliance has steadily improved in Germany. The VAT gap (an indicator of the effectiveness of VAT enforcement and compliance where a low gap indicates high effectiveness) fell from 5.6% to 2.8% between 2020 and 2021, which is considerably below the EU-27 median gap of 4.9% in 2021 (see also Annex 14). A reason for this decrease may also be the fact that Germany was one of the EU countries with the largest decline in VAT burden as a result of COVID measures which may also have helped to increase compliance. Further post-COVID years will be necessary to establish clearer findings. Preliminary estimates show that the compliance gap in 2022 remained stable.

ANNEX 20: TABLE WITH ECONOMIC AND FINANCIAL INDICATORS

Table A20.1:**Key economic and financial indicators**

	2004-07	2008-12	2013-20	2021	2022	2023	forecast 2024	forecast 2025
Real GDP (y-o-y)	2.2	0.7	1.0	3.2	1.8	-0.3	0.1	1.0
Potential growth (y-o-y)	.	1.0	1.3	0.6	0.7	0.8	0.6	0.6
Private consumption (y-o-y)	0.6	0.9	0.5	1.5	3.9	-0.7	0.6	0.9
Public consumption (y-o-y)	0.7	2.1	2.5	3.1	1.6	-1.5	1.5	1.2
Gross fixed capital formation (y-o-y)	2.9	0.7	2.0	-0.2	0.1	-0.7	-1.0	1.0
Exports of goods and services (y-o-y)	9.8	2.2	1.7	9.7	3.3	-2.2	-1.0	2.7
Imports of goods and services (y-o-y)	7.8	2.3	2.5	8.9	6.6	-3.4	-0.8	2.8
Contribution to GDP growth:								
Domestic demand (y-o-y)	1.0	1.0	1.2	1.4	2.3	-0.8	0.4	0.9
Inventories (y-o-y)	0.0	-0.4	-0.1	0.9	0.7	0.0	-0.2	0.0
Net exports (y-o-y)	1.1	0.1	-0.2	0.9	-1.2	0.6	-0.1	0.1
Contribution to potential GDP growth:								
Total Labour (hours) (y-o-y)	.	0.2	0.3	-0.1	0.1	0.3	0.1	0.1
Capital accumulation (y-o-y)	.	0.2	0.3	0.2	0.2	0.2	0.1	0.1
Total factor productivity (y-o-y)	.	0.6	0.7	0.4	0.4	0.3	0.3	0.4
Output gap	-0.3	-0.7	0.1	-0.8	0.3	-0.8	-1.2	-0.8
Unemployment rate	9.6	6.3	3.8	3.7	3.1	3.1	3.1	3.1
GDP deflator (y-o-y)	0.9	1.2	1.8	3.0	5.3	6.6	3.6	2.1
Harmonised index of consumer prices (HICP, y-o-y)	1.9	1.7	1.0	3.2	8.7	6.0	2.4	2.0
HICP excluding energy and unprocessed food (y-o-y)	1.4	1.3	1.3	2.3	5.0	6.3	2.6	1.9
Nominal compensation per employee (y-o-y)	0.7	2.2	2.5	3.1	3.9	5.8	4.9	3.6
Labour productivity (real, hours worked, y-o-y)	1.3	0.5	1.0	0.6	0.5	-0.7	-0.2	0.7
Unit labour costs (ULC, whole economy, y-o-y)	-0.8	2.3	2.4	0.1	3.4	6.9	5.2	2.7
Real unit labour costs (y-o-y)	-1.7	1.1	0.5	-2.8	-1.8	0.2	1.5	0.6
Real effective exchange rate (ULC, y-o-y)	-2.9	0.3	1.0	0.0	-0.4	-0.3	0.5	0.3
Real effective exchange rate (HICP, y-o-y)	0.4	-1.2	0.1	1.1	-1.7	1.8	.	.
Net savings rate of households (net saving as percentage of net disposable income)	10.6	10.3	11.3	14.9	11.1	11.4	.	.
Private credit flow, consolidated (% of GDP)	0.2	1.2	4.5	6.8	6.7	.	.	.
Private sector debt, consolidated (% of GDP)	125.9	119.0	109.9	120.4	118.4	.	.	.
of which household debt, consolidated (% of GDP)	65.9	59.0	53.9	56.5	55.0	.	.	.
of which non-financial corporate debt, consolidated (% of GDP)	60.1	60.0	56.0	64.0	63.4	.	.	.
Gross non-performing debt (% of total debt instruments and total loans and advances) (1)	.	2.1	1.6	1.0	1.0	.	.	.
Corporations, net lending (+) or net borrowing (-) (% of GDP)	1.6	2.4	1.5	3.3	0.6	2.5	1.6	1.6
Corporations, gross operating surplus (% of GDP)	26.4	25.1	23.8	25.1	24.7	24.9	23.8	23.5
Households, net lending (+) or net borrowing (-) (% of GDP)	5.9	5.4	5.9	7.8	5.6	6.0	6.2	5.9
Deflated house price index (y-o-y)	-2.0	0.7	4.9	8.3	-1.3	-13.9	.	.
Residential investment (% of GDP)	5.2	5.4	6.2	7.0	7.3	7.2	.	.
Current account balance (% of GDP), balance of payments	5.5	6.1	7.8	7.3	4.2	5.9	6.2	6.3
Trade balance (% of GDP), balance of payments	5.6	5.5	6.6	5.5	2.3	4.0	.	.
Terms of trade of goods and services (y-o-y)	-0.7	-0.5	0.9	-2.9	-4.9	4.1	0.4	0.0
Capital account balance (% of GDP)	-0.1	0.0	0.0	-0.1	-0.6	-0.7	.	.
Net international investment position (% of GDP)	14.1	23.0	46.2	68.3	69.5	70.4	.	.
NENDI - NIIP excluding non-defaultable instruments (% of GDP) (2)	9.6	19.1	43.2	54.7	49.4	51.5	.	.
IIP liabilities excluding non-defaultable instruments (% of GDP) (2)	125.9	164.2	150.1	164.4	169.5	159.3	.	.
Export performance vs. advanced countries (% change over 5 years)	.	.	-0.2	-1.5	-8.6	-8.3	.	.
Export market share, goods and services (y-o-y)	-0.4	-3.6	0.6	-4.4	-8.7	-3.2	-4.3	-0.9
Net FDI flows (% of GDP)	1.7	1.2	1.3	2.3	2.9	1.4	.	.
General government balance (% of GDP)	-2.0	-1.7	0.5	-3.6	-2.5	-2.5	-1.6	-1.2
Structural budget balance (% of GDP)	.	.	0.5	-3.1	-2.4	-2.1	-0.9	-0.7
General government gross debt (% of GDP)	65.9	76.2	67.4	69.0	66.1	63.6	62.9	62.2

(1) domestic banking groups and stand-alone banks, EU and non-EU foreign-controlled subsidiaries and EU and non-EU foreign-controlled branches.
(2) NIIP excluding direct investment and portfolio equity shares.
Source: Eurostat and ECB as of 2024-5-17, where available; European Commission for forecast figures (Spring forecast 2024).

This annex assesses fiscal sustainability risks for Germany over the short, medium and long term. It follows the multi-dimensional approach of the European Commission's 2023 Debt Sustainability Monitor, updated based on the Commission 2024 spring forecast.

1 – Short-term risks to fiscal sustainability are low. The Commission's early-detection indicator (S0) does not point to any major short-term fiscal risks (Table A21.2) ([178]). Government gross financing needs are expected to remain broadly constant at 15% of GDP on average over 2024-2025 (Table A21.1, Graph1). Financial markets' perceptions of sovereign risk are investment grade, as confirmed by the main rating agencies.

2 – Medium-term fiscal sustainability risks appear medium.

The DSA baseline shows that the government debt ratio is expected to remain broadly stable in the medium term, reaching around 63% of GDP in 2034 (Graph 1, Table 1) ([179]). The debt dynamics can be explained by the assumed structural primary balance (excluding changes in cost of ageing) of 0.0% of GDP as of 2024. Compared to historical data, this appears plausible as around 75% of past fiscal positions were more stringent than the one assumed in the baseline (Table A21.2) ([180]). The debt dynamics also benefit from a still favourable but declining snowball effect of around -0.6 pp. of GDP annually on average over 2025-2034.

The baseline projections are stress-tested against four alternative deterministic scenarios to assess the impact of changes in key assumptions relative to the baseline (Graph 1). Under the *historical structural primary balance (SPB) scenario* (i.e. the SPB returns to its historical 15-year average of 1.1% of GDP) the debt ratio would be lower than under the baseline by about 9 pps. in 2034. However, under the *adverse interest-growth rate differential scenario* (i.e. the interest-growth rate differential deteriorates by 1 pp. compared with the baseline), the debt ratio would be higher than under the baseline by around 5 pps. in 2034. Under the *financial stress scenario* (i.e. interest rates temporarily increase by 1 pp. compared with the baseline), the government debt ratio would be higher by around 1 pp. in 2034. Finally, under the *lower structural primary balance scenario* (i.e. the projected cumulative improvement in the SPB over 2023-2024 is halved) the debt ratio would be higher than under the baseline by about 6 pps. in 2034.

The stochastic projections indicate low risk, pointing to the moderate sensitivity of these projections to plausible unforeseen events ([181]). These stochastic simulations indicate a 39% probability that the debt ratio will be higher in 2028 than in 2023, implying medium risks given the high debt level. In addition, the uncertainty surrounding the baseline debt projections (as measured by the difference between the 10th and 90th debt distribution percentiles) is low, reaching around 16 pps. of GDP in five years' time) (Graph 2).

([178]) The S0 is a composite indicator of short-term risk of fiscal stress. It is based on a wide range of fiscal and financial-competitiveness indicators that have proven to be a good predictor of emerging fiscal stress in the past.

([179]) The assumptions underlying the Commission's 'no-fiscal policy change' baseline include in particular: (i) a structural primary surplus, before changes in ageing costs, of 0.0% of GDP from 2024 onwards; (ii) inflation converging linearly towards the 10-year forward inflation-linked swap rate 10 years ahead (which refers to the 10-year inflation expectations 10 years ahead); (iii) the nominal short- and long-term interest rates on new and rolled over debt converging linearly from current values to market-based forward nominal rates by T+10; (iv) real GDP growth rates from the Commission 2024 spring forecast, followed by the EPC/OGWG 'T+10 methodology projections between T+3 and T+10 (average of 0.7%); (v) ageing costs in line with the 2024 Ageing Report (European Commission, Institutional Paper 279, April 2024). For information on the methodology, see the 2023 Debt Sustainability Monitor (European Commission, Institutional Paper 271, March 2024).

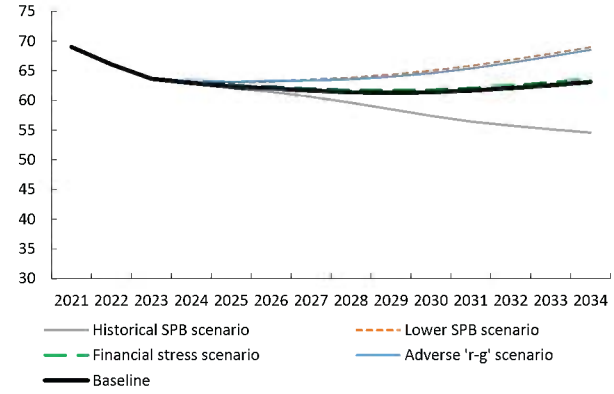
([180]) This assessment is based on the consolidation space indicator, which measures the frequency with which a tighter fiscal position than assumed in a given scenario has been observed in the past. Technically, this consists of looking at the percentile rank of the projected SPB within the distribution of SPBs observed in the past in the country, taking into account all available data from 1980 to 2022.

([181]) The stochastic projections show the joint impact on debt of 10000 different shocks affecting the government's budgetary position, economic growth, interest rates and exchange rates. This covers 80% of all the simulated debt paths and therefore excludes tail events.

Table A21.1:**Debt sustainability analysis - Germany**

Table 1. Baseline debt projections	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Gross debt ratio (% of GDP)	**69.0**	**66.1**	**63.6**	**62.9**	**62.3**	**62.0**	**61.6**	**61.4**	**61.3**	**61.4**	**61.6**	**62.1**	**62.6**	**63.1**
Changes in the ratio	0.2	-2.9	-2.4	-0.7	-0.6	-0.3	-0.4	-0.3	-0.1	0.1	0.3	0.4	0.5	0.5
of which														
Primary deficit	3.0	1.8	1.6	0.6	0.5	0.4	0.4	0.4	0.5	0.6	0.7	0.9	1.0	1.1
Snowball effect	-3.5	-3.9	-3.0	-1.3	-1.1	-0.7	-0.8	-0.7	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5
Stock-flow adjustments	0.7	-0.8	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross financing needs (% of GDP)	18.5	15.6	15.4	14.9	14.7	14.7	14.7	14.8	14.9	15.1	15.3	15.6	15.8	16.1

Graph 1. Deterministic debt projections



Graph 2. Stochastic debt projections 2024-2028

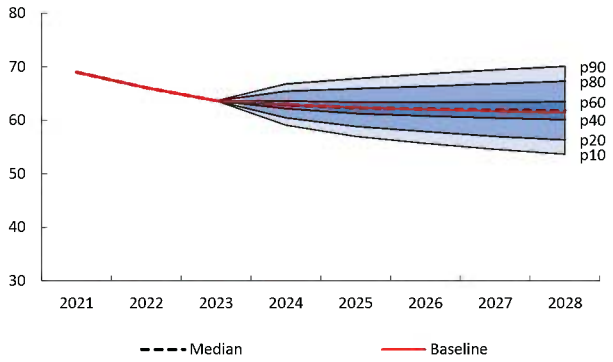


Table 2. Breakdown of the S1 and S2 sustainability gap indicators

		S1	S2
Overall index (pps. of GDP)		**1.0**	**1.8**
of which			
Initial budgetary position		-0.2	0.2
Debt requirement		0.1	
Ageing costs		1.2	1.5
of which	*Pensions*	0.3	0.5
	Health care	0.3	0.5
	Long-term care	0.4	0.4
	Education	0.1	0.2

Source: Commission services.

3 – Long-term fiscal sustainability risks appear overall low. This assessment is based on the combination of two fiscal gap indicators, capturing the required fiscal effort to stabilise debt (S2 indicator) and bring debt to 60% of GDP (S1 indicator) over the long term ([182]). This assessment is driven by the favourable initial budgetary position and the moderate increase in ageing costs. These results are conditional on the country maintaining a sizeable SPB over the long term.

The S2 indicator points to low fiscal sustainability risks. The indicator shows that, relative to the baseline, the SPB would need to improve by 1.8 pps. in 2025 to ensure debt stabilisation over the long term. This result is underpinned by the projected increase in ageing-related costs (contribution of 1.5 pps.) and a favourable initial budgetary position (0.2 pp.). Ageing costs' developments are primarily driven by a projected increase in public pension expenditure (0.5 pp.), health care (0.5 pp.) and long-term care spending (0.4 pp.) (Table 2).

([182]) The S2 fiscal sustainability indicator measures the permanent SPB adjustment in 2025 that would be required to stabilise public debt over an infinite horizon. It is complemented by the S1 indicator, which measures the permanent SPB adjustment in 2025 to bring the debt ratio to 60% by 2070. The impact of the drivers of S1 and S2 may differ due to the infinite horizon component considered in the S2 indicator. For both the S1 and S2 indicators, the risk assessment depends on the amount of fiscal consolidation needed: 'high risk' if the required effort exceeds 6 % of GDP, 'medium risk' if it is between 2% and 6% of GDP, and 'low risk' if the effort is negative or below 2% of GDP. The overall long-term risk classification combines the risk categories derived from S1 and S2. S1 may notch up the risk category derived from S2 if it signals a higher risk than S2. See the 2023 Debt Sustainability Monitor for further details.

Table A21.2:**Heat map of fiscal sustainability risks - Germany**

Short term	Medium term - Debt sustainability analysis (DSA)								Long term		
			Deterministic scenarios								
Overall (S0)	Overall		Baseline	Historical SPB	Lower SPB	Adverse 'r-g'	Financial stress	Stochastic projections			Overall (S1 + S2)
LOW	MEDIUM	Overall	MEDIUM	LOW	MEDIUM	MEDIUM	MEDIUM				
		Debt level (2034), % GDP	63.1	54.6	69.0	68.5	63.6				
		Debt peak year	2034	2024	2034	2034	2034				
		Fiscal consolidation space	75%	51%	85%	75%	75%				
		Probability of debt ratio exceeding in 2028 its 2023 level						39%			
		Difference between 90th and 10th percentiles (pps. GDP)						16.4			

(1) Debt level in 2034. Green: below 60% of GDP. Yellow: between 60% and 90%. Red: above 90%. (2) The debt peak year indicates whether debt is projected to increase overall over the next decade. Green: debt peaks early. Yellow: peak towards the middle of the projection period. Red: late peak. (3) Fiscal consolidation space measures the share of past fiscal positions in the country that were more stringent than the one assumed in the baseline. Green: high value, i.e. the assumed fiscal position is plausible by historical standards and leaves room for corrective measures if needed. Yellow: intermediate. Red: low. (4) Probability of debt ratio exceeding in 2028 its 2023 level. Green: low probability. Yellow: intermediate. Red: high (also reflecting the initial debt level). (5) the difference between the 90th and 10th percentiles measures uncertainty, based on the debt distribution under 10000 different shocks. Green, yellow and red cells indicate increasing uncertainty. (For further details on the Commission's multidimensional approach, see the 2023 Debt Sustainability Monitor)

Source: European Commission (for further details on the Commission's multidimensional approach, see the 2023 Debt Sustainability Monitor)

Source: Commission services.

The S1 indicator points to low fiscal sustainability risks. The indicator shows that the country would need to improve its fiscal position by 1 pp. to reduce its debt to 60% of GDP by 2070. This result is mainly driven by the projected increase in age-related public spending (contribution of 1.2 pps.) and the favourable initial budgetary position (-0.2 pp.) (Table 2).

4 – Finally, several additional risk factors need to be considered in the assessment. On the one hand, risk-increasing factors are related to the recent increase of interest rates and a relatively high share of short-term government debt. On the other-hand, risk-mitigating factors include the lengthening of debt maturity in recent years, relatively stable financing sources (with a diversified and large investor base), a low share of public debt held in foreign currency and Germany's positive net international investment position.