European Commission

ISSN 2443-8014 (online)

2023 Country Report

Germany

INSTITUTIONAL PAPER 229 | JUNE 2023

EUROPEAN ECONOMY

Economic and Financial Affairs

Secretariat-General Recovery and Resilience Task Force

European Economy Institutional Papers are important reports analysing the economic situation and economic developments prepared by the European Commission's Directorate-General for Economic and Financial Affairs, which serve to underpin economic policy-making by the European Commission, the Council of the European Union and the European Parliament.

This paper has also been published as Staff Working Document SWD(2023) 605.

This specific report was prepared in cooperation with the Secretariat-General Recovery and Resilience Task Force, with valuable contributions from Eurostat, Directorate-General for Employment, Social Affairs and Inclusion, Directorate-General for Climate Action, Directorate-General for Environment, Directorate-General for Regional and Urban Policy, Directorate-General for Structural Reform Support, Joint Research Centre, Directorate-General for Energy, Directorate-General for Mobility and Transport, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Directorate-General for Communications Networks, Content and Technology, Directorate-General for Research and Innovation, Directorate-General for Education, Youth, Sport and Culture, Directorate-General for Migration and Home Affairs, Directorate-General for Health and Food Safety, Directorate-General for Financial Stability, Financial Services and Capital Markets Union, Directorate-General for Taxation and Customs Union, Directorate-General for Justice and Consumers, and Directorate-General for Translation.

Luxembourg: Publications Office of the European Union, 2023

PDF ISBN 978-92-68-03196-4 ISSN 2443-8014 doi:10.2765/317863 KC-BC-23-036-EN-N

European Commission

Directorate-General for Economic and Financial Affairs

Secretariat-General
Recovery and Resilience Task Force

2023 Country Report

Germany

EUROPEAN ECONOMY

Institutional Paper 229

EUROPEAN
COMMISSION

Brussels, 24.5.2023
SWD(2023) 605 final

COMMISSION STAFF WORKING DOCUMENT

2023 Country Report - Germany

Accompanying the document

Recommendation for a COUNCIL RECOMMENDATION

on the 2023 National Reform Programme of Germany and delivering a Council opinion on the 2023 Stability Programme of Germany

{COM(2023) 605 final}

ECONOMIC AND EMPLOYMENT SNAPSHOT

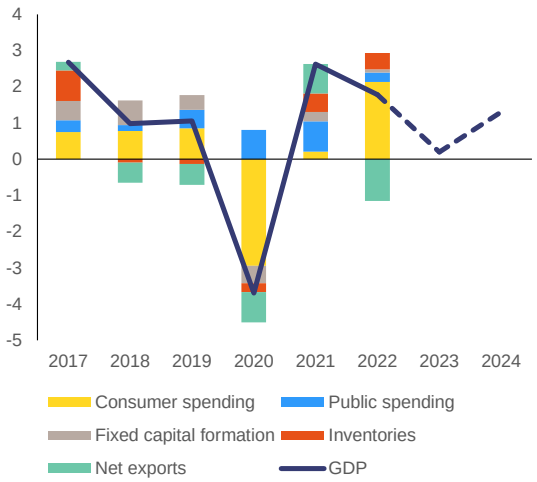
Germany's economy is adjusting to a new and shifting environment

GDP has now recovered beyond pre-pandemic levels, but the economy is still feeling the impact of Russia's war of aggression against Ukraine. As services reopened and households started using the savings built up during the pandemic, consumer spending rebounded strongly in 2022. However, Russia's war of aggression against Ukraine caused significant disruptions to energy deliveries and to supply chains. This had an impact on the economy and fuelled inflation, reining in the recovery both in terms of consumer spending and investment.

High inflation is eroding purchasing power and putting pressure on firms. Consumer price inflation peaked at 11.6% in October 2022 – a rate unseen since the oil crisis in the 1970s. Since then it has gradually fallen to 7.6% in April 2023. The rise in inflation was mainly driven by energy prices, which drove up the cost of products and services.

Services are likely to keep inflation high over the coming years. The rise in consumer prices has dented purchasing power, particularly for less affluent households. The high energy prices also had a significant effect on Germany's large manufacturing base, increasing the cost of production and posing a particular challenge for small and medium enterprises and firms in energy-intensive sectors. The government adopted temporary support measures to provide financial relief to households and businesses (see Box 1a).

Graph 1.1: **Components of GDP growth**



(1) Contribution to GDP growth in percentage points
Source: Eurostat, European Commission

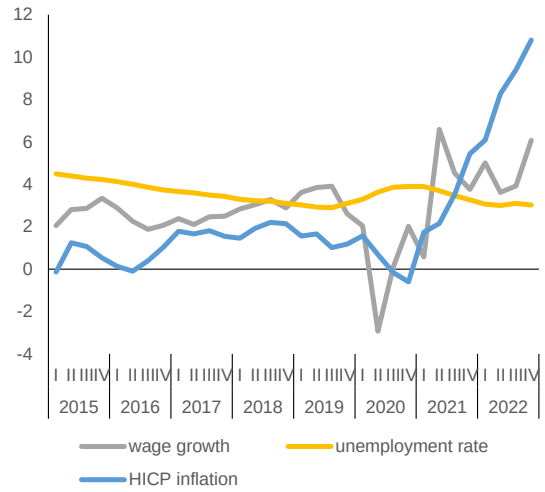
The labour market is tight, with firms experiencing major labour shortages. At around 80%, the employment rate for 2022 remained robust and one of the highest in the EU. The unemployment rate has been at historically low levels at around 3%, significantly below the EU average of 6%. However, there are significant regional disparities, with some regions having an unemployment rate close to the EU average (see Annex 17).

Job growth has remained strong, especially in services, leading to a vacancy rate that is higher than the unemployment rate. Reported labour shortages have been more acute in services (the IT sector, engineering, logistics, the care sector) and in manufacturing, and they remain significant in construction. Due to ageing and the decline in the working age population by 3.7 million in the 2020s, [1] a net migration balance at around 400 000 people a year would be needed to offset a

[1] The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070).

decreasing level of potential labour force ([2]). Meanwhile, the number of hours worked per employed person have continued to fall relative to pre-pandemic years. This reflects untapped potential, particularly of part-time workers. The share of part-time workers is particularly high among women and Germany is among the Member States with the highest share of women in part-time work.

Graph 1.2: **Unemployment, wages and prices**



(1) Unemployment in %
(2) Wage growth and inflation in % year-on-year
Source: Eurostat

Overall business profitability has remained robust as firms passed on the higher costs to prices. Nominal wages increased markedly in 2022 (4.7%), though the increase is still below inflation (Graph 1.2). High inflation is set to continue to be a drag on consumer spending in 2023 until real wages grow again. So far, companies have been able to pass on the increases in labour and input costs to customers, helping them maintain profitability.

The country's macroeconomic vulnerabilities relating to the persistent current account surplus have been gradually reduced, as assessed in the *In-depth Review for Germany* ([3]). The current account balance fell from 7.7% in 2021 to 4.2% of GDP in 2022. Though the key factor was a surge in energy prices, the decrease was also the result of a stronger rise in imports of non-energy goods and services. At the same time, the investment ratio increased while savings came down towards their pre-pandemic level. The current account surplus is expected to increase towards 6% yet remaining below pre-pandemic levels for the next few years and stay below the MIP threshold. While in the past decade house prices have become increasingly overvalued, since the second half of 2022 house price increases receded, reflecting increasing interest rates and the reduced purchasing power of buyers. At the same time, housing supply remains constrained and house completions have been declining further below government targets.

Productivity has stalled for the last five years. Aggregate labour productivity has largely recovered to its pre-pandemic level, but productivity is set to remain sluggish. The German economy has structural weaknesses such as low investments in intangible assets (including research and innovation), shortages of skilled labour and a decline in business dynamism. Regulatory restrictions in the access to and exercise of certain business services are higher than in the EU on average, resulting in less competition, higher average costs and lower competitiveness. Dismissals are avoided as businesses anticipate a recovery and attempt to mitigate the shortage of skilled labour.

Some sectoral trends can partly explain the sluggish productivity growth. Manufacturing activity remains below its peak in 2018, as the transition to decarbonisation and adjustments to supply chains to mitigate the impact of high energy costs and other disruptions still constrain the level of output. The growth in construction has been hindered by shortages of material and labour, rising costs of material and administrative restrictions. Job growth in

([2]) Research Institute of the Federal Employment Agency (IAB) (2021), Projektion des Erwerbspersonenpotenzials bis 2060 - Demografische Entwicklung lässt das Arbeitskräfteangebot stark schrumpfen.

([3]) European Commission (2023), In-Depth Review for Germany, Commission staff working document, (COM(2023) 629 final).

labour-intensive public-sector employment such as healthcare, social services, education and public administration has also slowed productivity growth. Regional differences in labour productivity have decreased as Germany has seen its less developed regions gradually catch up. However, significant disparities still remain (see Annex 17).

The energy crisis highlights the urgency of the green and digital transitions for sustainable growth

Germany's energy mix made it highly exposed to the ongoing energy crisis, leading to dramatic adjustments. Before Russia's war of aggression against Ukraine, Germany had a very high level of exposure to Russian gas and oil, at 65% and 34% respectively in 2021 ([4]). Over the past years, it has reduced this reliance significantly, to zero for gas and to below 25% for oil ([5]). However, more action is warranted on electricity and digital networks, digital public services, permitting, green and digital skills, energy efficiency, natural carbon sinks and the circular economy.

Decarbonisation, energy security, digitalisation and skills are key to competitiveness, raising productivity, and to achieving a fair transition. Germany could use the green and digital transitions as an opportunity to boost productivity, competitiveness and job creation in the medium-to-long term. The green transition offers unique opportunities to help shape the economy for competitive sustainability. To this end, Germany has carried out a series of energy-related investments and reforms. This includes new legislation to accelerate the rollout of renewable energy, wind energy in particular, and to accelerate work on expanding the grid. Germany has also achieved a high level of gas supply security.

Germany performs relatively well on implementing the European Pillar of Social Rights, but challenges remain related to inequalities in education and training, employment and housing (Annex 14). In stark contrast to the EU-wide trend, the early school leaving rate from education and training deteriorated significantly in Germany over the past decade (12.2% against the EU average of 9.6% in 2022). For non-EU born people, the rate is 28.8%, also reflecting the challenge of integrating large inflows of newcomers in recent years. The impact of a person's socio-economic background on their educational outcome has increased, and about one-fifth of 10-year-olds do not meet basic standards in German and mathematics, which risks aggravating skills shortages (Annex 15).

Access to early childhood education and care for children below the age of 3 remains low (31.4% against the EU average of 36.2%). At 49% in 2021, Germany is below the EU average of 54% of individuals aged 16-74 with at least basic digital skills, hampering the digital transition. A large gap remains between the employment rate of people with and without disabilities (30.5pps in 2021). Reflecting the challenge of affordable housing, the share of people living in households with housing costs above 40% of their total income (11% in 2021) is above the EU average (8.3%) and rising (up from 9% in 2020).

([4]) Eurostat (2021)

([5]) BMWK

Box 1a:

Energy policy response in Germany – Part 1

Germany adopted several support measures to cushion the impact of energy price inflation on households and businesses. The Commission's 2023 spring forecast projects the gross budgetary costs of these measures to amount to 2.0% of GDP in 2023. ([6]) Most measures maintain the price incentive to consume less energy, although they are insufficiently targeted to the most vulnerable. In 2022, the government adopted a bundle of one-off measures, but from 2023 onwards, the main energy measures are energy price brakes set to last until April 2024. Depending on price developments, this can be funded by a dedicated fund of up to EUR 200 billion (worth 4.9% of GDP).

Notable measures in 2022 included one-off lump-sum payments of EUR 300 to employed persons and pensioners and EUR 200 to other groups, such as people receiving social assistance. The government paid heating allowances and covered the December 2022 bill for natural gas and heat consumers. For three months, taxes on petrol and diesel were reduced. A EUR 9 monthly ticket was offered for local public transport. In 2023, the main energy measures are a natural gas and heat price brake and an electricity price brake that cap energy prices for households, small and medium-sized enterprises and for industrial companies.

The price brakes are based on consumption levels over the previous year, and cover 80% of past consumption by households and small and medium enterprises and 70% for industrial companies. For these quantities, energy retail prices are capped for households at 12 cents/kWh for gas, at 9.5 cents/kWh for district heating and at 40 cents/kWh for electricity. Industrial companies qualify for a price cap on the wholesale energy price without network and distributions costs of 7 cents/kWh for gas, 7.5 cents/kWh for district heating and 13 cents/kWh for electricity.

The government also reduced VAT on gas and district heating from the normal rate of 19% to 7% for the period October 2022 to March 2024.

([6]) For 2022, gross budgetary costs of measures amounted to 1.2% of GDP.

Box 1b:

Energy policy response in Germany – Part 2

An analysis of the consequences of high inflation on income distributions shows that the expenditure burden rose particularly sharply for people on the lowest income decile, by around 14% of household disposable income, compared to only 5% at the top decile. Government measures such as the electricity and gas price breaks are of greater benefit to lower-income households by stabilising their relative disposable income and reducing the expenditure burden by up to 2 pps in the bottom decile. But they are not enough to compensate for the negative consequences of high inflation. Overall, Germany's price brake measures have not been very targeted to support vulnerable households, are insufficient to tackle inequality and add to fiscal cost. (Source: European Commission's Joint Research Centre, calculations based on the EUROMOD model, version I5.0+ and its Indirect Tax Tool extension (ITTv4).)

Germany applies the EU solidarity contribution under Council Regulation (EU) 2022/1854 for the fiscal years 2022 and 2023, with a defined rate of 33%. ([7])

Germany took several measures to improve the security of its energy supply. This included energy savings in buildings and industry, bringing in changes to an existing scheme for building renovation, and adopting two energy conservation ordinances mandating measures in public buildings and obliging companies to take energy efficiency measures. Germany decided to nationalize a former subsidiary of Russia's Gazprom and bailed out energy suppliers in financial trouble such as Uniper to secure Germany's energy supply. The German government initially planned to phase out nuclear energy by the end of 2022 but agreed to keep its three active nuclear power plants in operation until April 2023. It also granted the temporary reactivation of hard coal and lignite power plans to save gas.

Although overall Germany performs well on the UN's Sustainable Development Goals (SDGs), challenges remain related to inequality, quality education and environmental sustainability (Annex 1). Germany performs above the EU average and made further progress on decent work and economic growth (SDG 8), on macroeconomic stability (SDG 16, 17) and productivity (SDG 9). It also performs well on many SDG indicators related to fairness (SDG 1, 3, 8), but it is moving away from SDG 5 (Gender equality). Further, Germany is moving away from the targets and needs to catch up with the EU average on reducing inequalities (SDG 10) and on delivering quality education (SDG 4). On environmental sustainability, Germany performs well (SDG 2, 9, 11) or is improving on underperforming indicators (SDG 7, 12). However, it is moving away and needs to catch up with the EU average on climate action (SDG 13).

Although it expects to run a deficit in the coming years, Germany's public finances remain healthy

Public finances provided fiscal space for the government to react decisively to the recent crises. In 2023, the pandemic support measures are expected to be phased out, with the cost going down to 0.2% of GDP from 3.0% in 2020, 4.9% in 2021 and 1.8% of GDP in 2022. With the increase in energy prices in

([7]) I.e. applying a mandatory temporary solidarity contribution at a rate of at least 33% to the extraordinary and unexpected profits of businesses active in the extraction of crude petroleum, natural gas, coal, and refinery sectors. It is calculated on taxable profits, as calculated under national tax rules in the fiscal year starting in 2022 and/or in 2023, which are above a 20% increase in the average yearly taxable profits in 2018-2021.

2022, the government took several support measures amounting to around 1.2% of GDP. The size of the energy measures for 2023, notably the gas and electricity price brakes, will depend on the evolution of energy market prices ([8]).

Extra-budgetary funds are set to increase government spending and deficits over the coming years. The budgetary surpluses seen between 2014 and 2019, before the pandemic, are not expected to return soon for several reasons. First, rising interest rates will entail higher interest costs in the future. Second, the extra-budgetary funds ([9]) adopted in 2021/2022 will increase the deficit over the coming years. These include for the coming years an extra EUR 100 billion (2.4% of GDP) for defence and an increase in the Climate and Transition Fund of EUR 60 billion (1.5% of GDP).

The government also created a EUR 200 billion fund (4.9% of GDP) to help households and businesses cover the higher energy costs (see Box 1b). Overall, these extra-budgetary funds allow to increase public investment and spending, but they tend to limit the transparency of the budgetary framework and the associated expenditure will count in the deficit from an EU perspective.

Despite recent measures, public finances remain sustainable in the medium-term. The level of government debt increased by around 10 percentage points during the pandemic and peaked in 2021 at 69.3% of GDP. In 2022, debt started to fall again, aided by increasing inflation, which generated extra revenue and fuelled nominal GDP growth. Despite the additional spending items, Germany has declared that it will reapply its national debt brake ([10]) already in 2023. As nominal GDP growth is expected to exceed yearly deficits, the debt-to-GDP ratio is expected to continue to fall.

The tax mix in Germany is based heavily on labour taxes, while the share of environmental taxes is below the EU aggregate and Germany continues to grant environmentally harmful subsidies. Labour taxes in Germany are among the highest in the EU, providing weak incentives in the tax and transfer system for low-wage and second earners to increase hours worked. The low rate of environmental taxation in Germany is driven by energy and transport taxes, both below the EU average. ([11]) Environmentally harmful subsidies remain substantial and hamper the green transition (Chapter 3).

Ageing and early retirement put pressure on the sustainability of the pension system. The working age population is expected to fall substantially in the 2020s due to the retirement of the baby-boom generation. This will considerably increase the financing needs of the first pillar mandatory pay-as-you-go system and require action to ensure pensions remain adequate, particularly for low-income workers. The statutory retirement age is gradually increasing and due to reach 67 years in 2031. Although the employment rate of workers aged 55-64 was among the highest in the EU (at 73.3% against the EU average of 62.3%), the increase in the effective retirement age has slowed over time, and employment in the age group of over 65 lags behind EU top performers. The state-subsidised private pension schemes (third-pillar personal pension schemes, *Riester Rente*) have so far been underused, proving less attractive for low-income earners and people with unstable employment. Despite efforts to increase the use of occupational pensions

([8]) Falling energy prices in recent months make it likely that the take-up of this fund will fall; the Commission is predicting support amounting to 2.0% of GDP in 2023 and 0.3% of GDP in 2024.

([9]) Extra-budgetary funds (*Sondervermögen, Extrahaushalte)* lie outside of the core budget (*Kernhaushalt*) though they still count towards the federal government level. Since 2022, they already count for the national debt brake when funded from the core budget and no longer only when actually spent.

([10]) The national debt brake limits new net debt to 0.35% of GDP at federal government level and prohibits it at *Länder* level.

([11]) Germany applies carbon prices in the transport and heating sectors through a national emissions trading system.

(second pillar), the rate of coverage remains at about 56%.

THE RECOVERY AND RESILIENCE PLAN IS UNDERWAY

Germany's recovery and resilience plan aims to tackle the key challenges related to the green and digital transition, to improving its education system, healthcare and public administration. It consists of 15 reforms and 25 investments funded by EUR 26.4 billion in grants, representing 0.8% of GDP (see Annex 3 for more details).

The implementation of Germany's recovery and resilience plan is underway, however with significant delays. Limited resources attached to the plan implementation and insufficient prioritisation have led Germany to fall behind regarding the implementation process. Germany still needs to sign its operational arrangements and submit its first payment request. This request would cover 36 milestones and targets that track progress across all components of the recovery and resilience plan, potentially leading to a disbursement of up to EUR 4 billion.

Germany's recovery and resilience plan was already amended once in February 2023, adjusting two investment measures that could not be fully completed due to objective circumstances ([12]). The plan is expected to be revised again in 2023, to cover among others additional reforms and investments in the REPowerEU chapter, with the overall aim to increase the value of its plan to over EUR 30.3 billion, making full use of the grants available. However, negotiations on the REPowerEU chapter and to accommodate the increase of non-repayable support are still ongoing.

The following, more detailed review of measures being implemented under the RRP in no way implies formal Commission approval or rejection of any payment requests.

Germany is rolling out measures to decarbonise the economy, in particular industry and transport, with a special focus on hydrogen. Together with action to increase energy efficiency, the measures contribute to reaching the green target set under the plan and to the REPowerEU objective of diversifying away from imported fossil fuels. On hydrogen, Germany carried out an expression of interest procedure for Important Projects of Common European Interest. Part of the projects are currently being assessed by the Commission for state aid considerations. Some projects receive additional grants for research and innovation under the National Hydrogen Strategy, and its implementing programmes such as the national innovation programme hydrogen and fuel cell technology, and will tackle the challenges of producing water electrolysers, offshore production and transport technologies.

Germany is also promoting sustainable transport and energy efficiency. Recipients can receive support to purchase 560 000 electric vehicles, alongside an extension of tax exemptions for e-vehicles that also applies to businesses. It plans to improve charging infrastructure by funding both public and residential recharging points. Funding is also planned to accelerate the uptake of buses fuelled by greener alternatives to diesel. Projects in the building sector are underway with energy-efficient renovation schemes and the start of 23 network projects on climate-friendly timber construction.

Reforms of the public administration have progressed. A first set of laws to accelerate planning and approval procedures in the transport sector have entered into force and resulted in simpler, more transparent and digital procedures. Further efforts are

([12]) Council Implementing Decision amending Council Implementing Decision of 13 July 2021 on the approval of the assessment of the recovery and resilience plan for Germany, Brussels, 14 February 2023, 5536/23.

underway to shorten administrative planning and approval procedures, standardise the requirements for requesting financing subsidies, accelerate housing construction and increase the number of successful transfers of business ownership to the next generation, and these efforts require diligent implementation. The public consulting agency *PD – Berater der öffentlichen Hand* provides technical assistance to public authorities to stimulate investment at municipal level, including digitalising schools.

Progress is being made on numerous digitalisation projects, including proposals for microelectronics and communication technologies. The aim of the microelectronics Important Project of Common European Interest (EUR 1.5 billion) is to boost the EU's capabilities in electronics design and roll out the next generation of low power trusted processors and other electronic components. A call for expressions of interest was launched to identify potential participants. Several pilot projects contributing to the digitalisation of the railway under the 'Digital Rail Germany' initiative and the 'fast track' programme are due to be completed, which should help develop standardised, interoperable modules for the digitalisation of the railway.

Vehicle manufacturers and their suppliers have received support to manage the digital and ecological transition. The federal programme 'Building continuing education and training networks (CET networks)' promotes training activities, especially for employees of small and medium enterprises. The recovery and resilience plan has funded research, development, and innovation led by the Digitalisation and Technology Research Centre of the German armed forces (*dtec.bw*). This has funded research and innovation in strategic technological areas, strengthening German and European digital and technological sovereignty.

Germany has also advanced on measures to improve education, social and health outcomes. During the COVID-19 pandemic, the plan funded grants for at least 70 000 apprentices, provided learning support for pupils and provided teachers with digital devices when an increasing share of educational activities had to be organised online. The commitment that the total social security contribution rate would stay below 40% in 2021 was a reassurance at a time of high insecurity. Funding for research into COVID-19 vaccines helped BioNTech develop and produce life-saving vaccines.

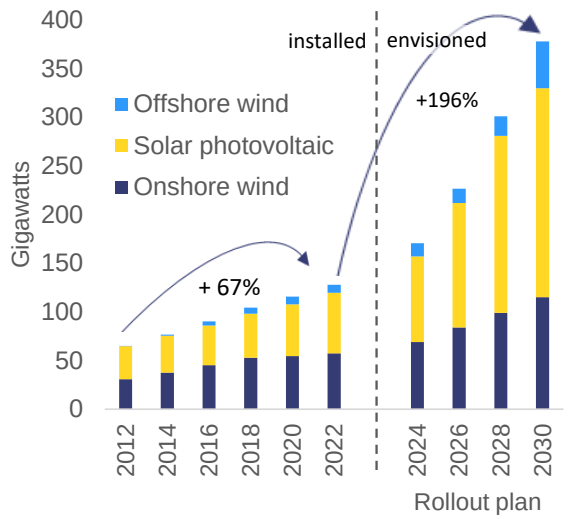
Germany is preparing additional social measures requiring longer-term planning. These include a pension information portal (*Digitale Rentenübersicht*) informing citizens about their individual pension rights from all three pension pillars (statutory, company and private pensions), the first national education platform (*Nationale Bildungsplattform*) providing easy access to multiple education offers, the digitalisation of public health offices and the modernisation of hospitals, including action on digitalisation (*Zukunftsprogramm Krankenhäuser).*

Box 2:

Key deliverables under the recovery and resilience plan in 2023-24

- Funding at least 400 000 recharging points in residential buildings
- Launching the beta version of the national education website (*Nationale Bildungsplattform*)
- Launching the Digital Pension Overview (*Digitale Rentenübersicht*), a web portal that informs citizens about their individual pension rights
- Completing energy-efficient renovations of 10 000 housing units
- Increasing the digitalisation of hospitals and public health offices
- Modernising 60 educational institutions of the armed forces (*Bundeswehr*)
- Completing pilot registers and a technical architecture ready to be connected with priority registers

Graph 3.1: **Total installed capacity of the main renewable energy sources and the national expansion goals in Germany**



Source: Bundesnetzagentur (2023), Council of Economic Experts (2022), EEG 2023, Flächenentwicklungsplan 2023

Germany faces challenges additional to those tackled in the recovery and resilience plan. The government has recently put in place important reforms (see Annex 2 on progress on country-specific recommendations). Further action will be required to make progress on numerous priority challenges. They include accelerating the green and digital transitions by swiftly and smoothly implementing permitting procedures, rolling out fibre optic networks, promoting the skills needed for the green and digital transitions, boosting productivity and competitiveness, improving the tax mix, improving education and training, and readying the pension system for population ageing.

Tackling these additional challenges will also help Germany make further progress in achieving the UN Sustainable Development Goals (SDGs), where Germany currently has room for further improvement, namely on climate action (SDG 13), quality education (SDG 4) and reduced inequalities (SDG 10).

Removing bottlenecks to investment and boosting the green transition

Streamlining and speeding up permitting procedures would help accelerate the roll-out of renewable energy sources and additional net-zero technologies. Renewable electricity is vital for the successful roll-out of Germany's green transition plans (renewable hydrogen production, electric vehicles, heat pumps, etc.) and for achieving energy security in the medium term due to the high dependence on imported fossil fuels.

Graph 3.1 shows the total (planned) installed capacity of the main renewable energy sources. A three-fold acceleration is needed to meet the national targets (from a +67% expansion over the past 8 years to a +196% over the coming 8 years). While 41% of electricity is currently generated by renewable energy, further progress is achievable. This is particularly important since otherwise fossil fuels will continue to be used to offset the phase-out of nuclear, especially coal and lignite-fired power plants.

In addition to the energy-related investments and reforms made by Germany (see Economic Snapshot), further improvements could be made to digitalise the related administrative processes, develop related skills, speed up consultations and procedures in administrative courts, provide incentives to roll out hydrogen infrastructure, and provide support to understaffed authorities ([13]).

Cross-border collaboration, such as the initiatives to accelerate the roll-out of offshore

([13]) In particular, local municipalities and administrative districts depend on adequate support from the Länder.

wind energy, including cross-border infrastructure, in the North and Baltic Seas helps address implementation challenges (Annexes 7 and 12).

Expanding and upgrading the electricity networks would help meet the needs for the green transition. Germany has taken steps to stimulate flexible solutions for the electricity system and to expand the power grid. However, more effort seems warranted to remove the remaining bottlenecks to grid flexibility, including storage, and to accelerate the expansion of high voltage transmission grids. This could include realising projects of common interest and streamlining the related court and consultation procedures.

In addition, Germany's distribution grids would benefit from being digitalised and upgraded further to accommodate new producers and consumers of electric vehicles, solar photovoltaic systems and heat pumps. Electricity storage is likely to become increasingly important to smoothen out fluctuations and peak demand, help integrate renewable energy, reduce congestion and grid investment costs, and increase the resilience and reliability of the energy system.

Accelerating action on energy efficiency, including in transport, domestic heating and industry can help maintain Germany's competitiveness while continuing the transition to a green economy. Despite several relief and protection measures, including voluntary energy demand reduction measures, transport and industry need to structurally reduce their energy intensity to manage the persistently high energy costs. While energy prices have decreased, they remain historically high and uncertainty remains regarding next winter, which requires continued efforts to structurally reduce gas demand. Targeted energy efficiency measures, including the electrification of transport and industry, are an opportunity for Germany to boost competitiveness and job creation, including in the clean tech sector. The current recovery and resilience plan includes investments in decarbonising industry, carbon contract-type schemes, and energy renovation in buildings. Greening the heating network and accelerating the roll-out of heat pumps in an affordable way would help reduce Germany's reliance on fossil fuels. Municipal heat planning would help facilitate the progressive decarbonisation of Germany's heating system.

New gas terminals can improve the EU's security of supply, **if installed without delay**. Germany has planned and started implementing natural gas infrastructure ([14]) that would replace Russian gas imports completely in the medium term. Germany fulfilled its gas storage obligations last winter, reaching 90.1% by 31 December 2022.

Due to interconnected gas markets, liquified natural gas imported to Germany can also be transmitted to other European countries and help boost Europe's security of supply. Notably, the floating storage regasification units in Lubmin could contribute to secure gas supply for other Member States. It is essential to continue the energy diversification efforts and stick to the envisaged timeline in order to improve the security of supply within and beyond national borders. However, new gas-related infrastructure should not create lock-ins; instead, it should pave the way for the green transition. Land-based liquified natural gas terminals should be compatible with hydrogen or ammonia in the medium term.

Reaching Germany's climate and energy targets requires further action to decarbonise the transport and building sectors and protect carbon sinks. The climate policy measures set out in the recovery and resilience plan and other government measures to date, such as introducing a national carbon price to bring down emissions in the transport and building sectors, were not sufficient to enable Germany to reach its sectoral national emission targets in 2022 ([15]): While progress was made on energy and industry-related emissions, the

([14]) Six floating storage regasification units, one floating regasification unit and two stationary liquefied natural gas terminals.

([15]) Federal Environmental Agency (2023) press release No 11/2023 from 15.03.2023.

transport and building sectors have failed again to meet national sector-specific emission targets for 2022.

More progress is needed in the transport sector in particular to help Germany meet its 2030 target under the Effort Sharing Regulation. Action is also needed to achieve net carbon removal targets in land use, land use change and forestry (LULUCF). The trend seen since 2017 of falling net carbon removals needs to be reversed ([16]). There is significant potential to boost the capacity of the LULUCF sector to act as a carbon sink by rewetting peatlands.

Environmental protection, climate adaptation and the circular economy can boost Germany's resilience. Adapting forests to climate change and improving the LULUCF sector would yield added co-benefits for biodiversity ([17]). This would also be beneficial in view of unprecedented levels of water scarcity, which affects water quality, energy management and agriculture ([18]). Urgent action is needed to minimise the growing risks of extreme heat, drought and flooding events and their impacts on human health, biodiversity, agriculture, forestry, transport and infrastructure ([19]).

Lastly, as Germany strengthens its strategic supply chains for the green transition, shifting to circular economy business models and increasing the circularity of critical components and materials will help boost the resilience of supply chains, while reducing emission-intensive production procedures.

([16]) This value is indicative and does not prejudge the legally binding 2030 national target on LULUCF that will be set in 2025, according to revised Regulation (EU) 2018/841

([17]) 92% of Germany's peat soils are currently drained, releasing greenhouse gases of around 53 Mt CO_2eq, about 7.5% of Germany's total emissions in 2020. See also *Umweltbundesamt (ed.) Emissionen der Landnutzung, -änderung und Forstwirtschaft*.

([18]) Federal Environmental Agency (2019), Monitoringbericht 2019 zur Deutschen Anpassungsstrategie an den Klimawandel.

([19]) Umweltbundesamt (Eds.). Klimawirkungs- und Risikoanalyse 2021 für Deutschland.

Tackling labour shortages and boosting productivity by strengthening skills, digitalisation, research and innovation

Structural reforms and further investments are needed to boost productivity and business dynamism, with a particular focus on skills, digitalisation and innovation. Sluggish productivity growth in Germany reflects an investment gap in intangible assets, such as research and development, software and databases, digitalisation, digital skills, fibre coverage and skilled labour, which are all barriers to investment. The risk is that these barriers have a lasting negative effect on Germany's long-term competitiveness, in particular for regions in which productivity is already below the EU average.

Germany is one of the EU's Eco-Innovation Leaders ([20]), performing strongly both in absolute numbers and in the share of green patents, thereby supporting the Green Deal Industrial Plan ([21]). However, the share of business R&D expenditure by small and medium enterprises has stalled at below the EU average (Annex 11). Firms' access to growth and later-stage capital remains a major challenge. The lack of skilled workers is a considerable barrier to investment, undermining the innovation performance of small and medium-sized enterprises in particular. The slow take-up rate of technology and weaknesses in eGovernment affect the business environment, leading to an overall drop in business dynamism ([22]).

Reducing restrictive regulation in business services could boost competition and productivity. Business services are essential to manufacturing and other service

([20]) Eco-innovation index, Eco-Innovation (europa.eu).

([21]) Overall Strategic Analysis of Clean Energy Technology in the European Union, JRC (2022).

([22]) OECD, *OECD Economic Surveys: Germany 2020*, OECD Publishing, Paris (2020).

sectors. However, barriers to competition in several important regulated professions remain high in Germany, in comparison to the EU average, including for tax advisers, lawyers and architects (Annex 12). For example, exclusive rights to exercise tax advice and legal advisory services stifle competition. These restrictions contribute to an overall decline in business dynamism and competition, as indicated by below average business churn rates and shares of high growth enterprises as well as above average markups in certain business services.

Despite significant improvements in the coverage of very-high-capacity networks, fibre coverage remains low. Germany is at risk of missing the target of connecting 50% of households and businesses to the network via fibre optics by 2025 and of achieving nationwide uninterrupted mobile (voice and data) communication by 2026 (and 100% by 2030). Despite significant improvements in the overall coverage of very-high-capacity networks, rural areas still lag behind. Only 19.3% of households have access to a fibre connection, making Germany one of the Member States with the lowest fibre coverage (second lowest in the EU; the top five having a fibre coverage of at least 85%). ([23])

Improving framework conditions is crucial to accelerate fibre coverage. It is particularly important to increase capacity in local administrations for permit-granting and the number of qualified experts employed. Meeting the network targets will also require improvements to the administrative procedures for permit application and granting and the standardisation of alternative, less time-consuming installation techniques.

Digitalising public services and administrative procedures can improve business dynamism and productivity. The COVID-19 pandemic and the energy crisis have shown that a strong digital base is important for effective crisis response measures, including digitally-run compensation schemes. To significantly reduce the burden on users – businesses and citizens – and on the public authorities, digital, user-friendly services could be set up, at least to the extent originally planned under German legislation.

The Online Access Act mandates digitalising user-facing services beyond requirements of the related measure in Germany's recovery and resilience plan to full geographical and comprehensive thematical coverage. Germany could make significant progress at all stages of this process by swiftly modernising the registers, as envisioned in the recovery and resilience plan, and taking significant additional steps to digitalise and inter-operationalise service handling within and between public authorities ([24]). This would free up resources and increase agility, raising the efficiency and efficacy of public service delivery. To reach these goals, it is essential to secure commitment and coordination between all levels of the public administration. Increasing transparency on service design and delivery may also enhance user buy-in ([25]).

Germany's working age population is shrinking. The working age population is expected to fall by 3.7 million in the 2020s, and the lack of qualified workers is a significant factor hampering economic growth. Demographic ageing and the need for skills linked to the digital and green transitions are expected to exacerbate labour shortages. The Research Institute of the Federal Employment Agency estimates that a net migration balance at around 400 000 people a year would be needed to offset a decreasing level of potential labour force. The lack of skilled workers is a considerable barrier to investment, especially for small and medium-sized enterprises ([26]).

([23]) Key Indicators — Digital Scoreboard - Data & Indicators (digital-agenda-data.eu)

([24]) The eGovernment Benchmark (2022) suggests Germany is one of nine Member States with non-consolidated eGovernments that need to digitalise both front and back offices of public-service providers.

([25]) Germany underperforms on transparency in the eGovernment Benchmark (2022).

([26]) In 2021, over 350 000 people worked in Germany in renewable energy jobs, but around 40% of businesses in clean-energy-relevant manufacturing experience

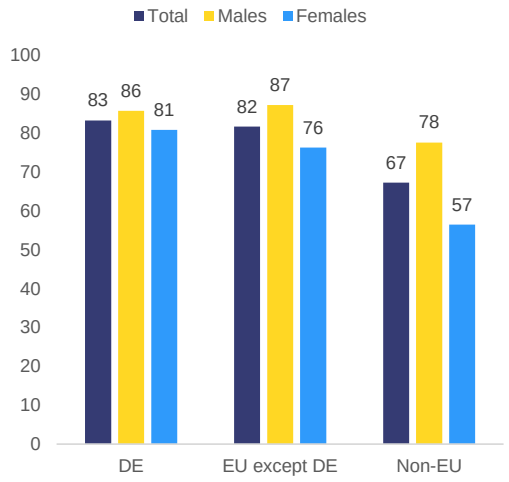
To alleviate these labour shortages, more could be done to tap the potential of women as well as of low-qualified people, people with disabilities and migrants. Germany has one of the highest employment rates for women in the EU (76.8% in 2022) and a relatively small gender employment gap. Nevertheless, the high share of women working part-time and the low number of hours paid contributes to a substantial unadjusted gender pay gap (17.6% in 2021) and to the pension gap (31.6% in 2021).

There is potential to increase the employment of low-qualified people, which was 15.4 percentage points (pps) lower than overall employment in 2022 (for the age group 20-64). In addition, considerable employment gaps remain for people born outside the EU, and the employment gender gap is especially wide for non-EU-born women (see Graph 3.2).

Although skilled immigration can alleviate shortages of skilled labour, measures for labour market and social integration with implications for schools and social services are a precondition to better tap this potential. Targeted labour market inclusion measures for people with disabilities and improving basic skills of disadvantaged groups could also contribute to tackling labour shortages and to raising the employment rate to Germany's national target of 83% by 2030.

labour shortages that have limited their production between Q4 2021 and Q1 2023.

Graph 3.2: **Employment rate of people aged 20-64 by country of birth**



Source: Eurostat

Skills policies are key for the green and digital transition and can also alleviate labour shortages. Adult learning is essential to tackle persistent skills shortages, but over the last 10 years, the participation rate of adults in learning over the past four weeks was roughly stable and below the EU average (8.1% in 2022; EU average 11.9%) and only 4.0% for low-qualified workers. Improving digital, entrepreneurial and STEM ([27]) skills can contribute to automation, to modernising the economy and to tackling labour shortages across the economy. However, only 49% of the population in Germany aged 16-74 had at least basic digital skills, below the EU average of 54%.

It is crucial to develop skills for the green transition (to install heat pumps and solar panels, and make energy efficiency upgrades, for example) to achieve Germany's energy and climate goals ([28]). Promoting participation in initial and continuous vocational education and learning programmes to support the green transition would be in line with Germany's target of having 65% of adults in learning

([27]) Science, technology, engineering and mathematics.

([28]) In 2022, labour shortages were reported in Germany for 20 occupations that required specific skills or knowledge for the green transition, including incinerator and civil engineering technicians, civil engineers, and plumbers and pipe fitters.

every year by 2030. Despite the shortages on the labour market, the share of students following a STEM course in their first semester fell from 40.5% in 2015 to 37.7% in 2021.

The educational outcomes of young people are strongly influenced by their migrant and socio-economic status. Inequalities in education outcomes have worsened during the pandemic. Children of parents with a higher secondary education are more likely to succeed in school. The share of early leavers from education and training increased slightly in 2022 to 12.2%, above the EU average of 9.6% and well above the EU target of 9% by 2030. The rate was more than double (28.8%) for non-EU born (Annexes 1 and 14).

Further assistance to young people from disadvantaged backgrounds, especially those with a migrant background, and an increase in qualified teachers may improve education outcomes and help tackle staff shortages in schools. Improving teachers' digital and pedagogical skills also remains a priority.

Improving early childhood education and care and all-day schooling could enhance both educational outcomes and the share of parents working full-time. Around 30% of children under 3 are enrolled in early childhood education and care, below the new Barcelona target of 40.4% by 2030. This low participation rate is key to explaining why the employment rate of women aged 25-49 with children younger than 6 is much lower (18.6pps) than for women of the same age without children. Since 2013, all children under the age of 3 have the legal right to a place in early childhood education and care, but in 2021, the places available were still 12.4 pps behind the needs identified in some regions and issues with service quality remain ([29]).

A tax mix for inclusive and sustainable growth, incentivising labour supply for the green and digital transitions

The tax mix in Germany is skewed to taxing labour, hampering labour supply. Labour taxes in Germany are among the highest in the EU and the interplay of the tax and transfer system result in weak incentives for low-wage and second earners to increase their working hours. Women are particularly affected by the high tax wedge for low-wage and second earners (see Annexes 18 and 12).

The measures taken, such as adjusting the tax schedule and tax-free allowances to account for inflation (*kalte Progression* – bracket creep) benefit low-income earners more than others, but this group is also the hardest hit by inflation ([30]). Increasing the earning thresholds for *mini-jobs* and *midi-jobs* ([31]) above which full employee social contributions gradually apply is only a partial remedy to this long-standing challenge. It increases the take-home pay for low-income earners but does not significantly raise the incentives to increase hours worked beyond the thresholds, compounding the part-time work trap.

The government does not plan to carry out a major reform of the joint income taxation and the current option to allocate the tax benefit more equally (*Faktorverfahren*) has been used by less than 1% of married couples, due to a complex application process. At the same time, tax bases that are less harmful to inclusive and sustainable growth remain underused.

Germany's share of environmental taxes is below the EU aggregate. This applies to both the share of GDP and the share of total

([29]) BMFSFJ, Kindertagesbetreuung Kompakt Ausbaustand und Bedarf 2021 (2021).

([30]) An analysis of the consequences of high inflation for the income distribution carried out by DG JRC based on EUROMOD shows that low-income earners face a particularly pronounced increase in spending. Government measures such as price caps on electricity and gas benefit lower-income households more by stabilising their relative disposable income but they are not enough to compensate for the negative consequences of high inflation.

([31]) These are labour contracts where employee social security contributions are lower than for regular contracts.

tax revenues. The low rate of environmental taxation in Germany relative to the EU aggregate is the result of low scores on all types of environmental taxes: both energy and transport taxation are below the EU average. Unlike many other Member States, Germany does not levy resource or pollution taxes. Vehicle taxation does not promote more environmentally friendly transport.

Environmentally harmful subsidies are hampering the green transition. Germany continues to grant substantial environmentally harmful subsidies (Annex 6) such as fossil fuel subsidies ([32]) ([33]). Implementing the coalition government's commitment to reduce these subsidies would generate revenue to invest in the green transition and help achieve emission targets under the German climate law, especially in the transport sector.

Safeguarding the pension system to prepare for population ageing and raising the employment rates of older workers

An ageing population puts social security systems under financial pressure. The working age population is expected to fall substantially over the coming decade due to the retirement of the baby-boom generation and the old-age dependency ratio is expected to increase by over 12 pps to 46.4% in 2030 ([34]). This will considerably increase the financing needs of the first pillar mandatory pay-as-you-go system.

In recent years, an increasing share of financing needed to come from the federal budget, in 2022 amounting to EUR 101 billion (2.6% of GDP). ([35]) This share has increased over time and is a drag on public finances. By European standards, Germany faces a sustainability risk for the pension system. The move to reactivate the catch-up factor (*Nachholfaktor*) from 2022 that prevents pensions from outpacing wage developments improves pension system sustainability, but the challenges are broader. The government's plan for a long-term commitment that pensions do not fall below 48% of previous income is expected to have a positive impact on the adequacy of pensions. However, it is expected to result in further fiscal transfers, unless accompanied by a major shift in how the statutory pension system is financed.

Early retirement puts pressure on the sustainability of the pension system and compounds the labour shortages. The statutory retirement age is gradually increasing to reach 67 years in 2031, while adjustments after 2031 will need further responses following increasing life expectancy. Although Germany continues to be one of the top performers in the EU in the employment of older workers, the increase in the effective retirement age has slowed over time, and employment in the age group of over 65 lags behind EU top performers. After at least 35 years of work, workers can retire early with relatively small reductions in their pension benefits ([36]). Since 2014, workers can retire after at least 45 years of work without a loss of pension entitlements (*Rente mit 63*),

([32]) Such as company car tax benefits, the excise tax refund for diesel fuel used in agriculture, the lower energy tax rate for light fuel oil used in mobile machinery, the fuel tax refund for agriculture, the excise tax exemption and tax relief for natural gas for industrial consumers or the reduced carbon tax rate on diesel used in agriculture.

([33]) According to the German Federal Environmental Agency, these subsidies amount to EUR 65 billion. The German Finance Ministry uses a narrower definition.

([34]) *The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070).* The old-age dependency ratio shows the ratio between the number of people aged 65 and over and the number of people aged between 20 and 64.

([35]) Rentenversicherungsbericht (2022).

([36]) If retiring before the statutory retirement age, benefits in Germany are reduced by 3.6% for each year under the statutory retirement age. This is low by international standards, as the reduction for each early retirement year is about 5% in France, Finland and Austria, 6% in Greece, 6.5% in Slovakia, and 6% to 8% in Spain depending on contribution years. It is not possible at all to retire early under the basic old-age scheme in Denmark, Poland and in the Netherlands.

accounting now for about one-third of people retiring, or 260 000 people a year ([37]).

Second and third-pillar pensions remain underdeveloped. Germany would need to scale up plans to strengthen the funded elements of the pension system to have a noticeable positive effect both for individuals and for public finances. The current state-subsidised private pension schemes (third-pillar personal pension schemes, *Riester Rente*) have been underused, with the coverage rate stalling at around 34% over the past ten years. They invest in low-yielding safe debt, suffer from high commissions, resulting in low rates of return and limited uptake. As a result, the system has failed to provide sufficient incentives for private retirement savings, especially for low-income earners.

The government plans to bring in a standardised investment product by the state for the *Riester Rente* which could lower costs and raise returns and the take-up of funded personal pension schemes. The planned *Aktienrente* (a debt-financed fund of EUR 10 billion which will transfer its investment returns to the public pension system in the 2030s) is limited compared to the annual contribution made by the federal government to the pension system. The latter already exceeds EUR 100 billion (2.6% of GDP) per year, accounting for one-third of overall pension expenditure. Despite efforts to increase the use of second-pillar occupational pensions (*Betriebliche Altersvorsorge*), coverage remains at about 56%. The increasing share of volatile employment careers is likely to be a barrier to significantly scaling up this coverage. Pensions from the second pillar can be boosted by facilitating agreements between social partners.

([37]) Taking the average pension at EUR 1 500, the additional pension expenditure is around EUR 4.7 billion for each year of retirement before the statutory age.

KEY FINDINGS

Germany's recovery and resilience plan includes important measures to tackle a series of its structural challenges:

- investments in building renovations, clean mobility, industry decarbonisation and the hydrogen value chain;
- investments in key advanced technologies and in the digital transformation of the automotive industry, healthcare, education, and public administration; and
- action to tackle the learning disparities exacerbated by the COVID-19 pandemic, and to provide additional childcare places.

Germany should significantly accelerate the implementation of its amended 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.

In addition to the reforms and investments set out in the recovery and resilience plan, Germany would benefit from:

- boosting investment and swiftly implementing permitting procedures to roll out renewable energy sources and electricity networks;
- boosting the labour supply and promoting the skills needed for the green transition;
- reducing further its reliance on fossil fuels and strengthening competitiveness, by reforming environmentally harmful subsidies, improving energy efficiency and incentivising energy savings, accelerating decarbonisation in industry, transport, building and heating networks and strengthening the circular economy and the capacity of the land use sector for carbon removals;
- boosting productivity and competitiveness by promoting digital skills and digital administration, accelerating the roll-out of very-high-capacity digital networks, especially fibre optics, including by improving administrative framework conditions, and stimulating investment in research and innovation, in particular in small and medium enterprises;
- tackling inequalities in educational outcomes, particularly to improve the educational outcomes of disadvantaged groups;
- improving the tax mix to provide incentives to increase hours worked and promote environmental sustainability; and
- ensuring the pension system is sustainable, given the ageing population, and raising the employment rates of older workers by reducing the incentives for early retirement.

ANNEXES

LIST OF ANNEXES

LIST OF TABLES

LIST OF GRAPHS

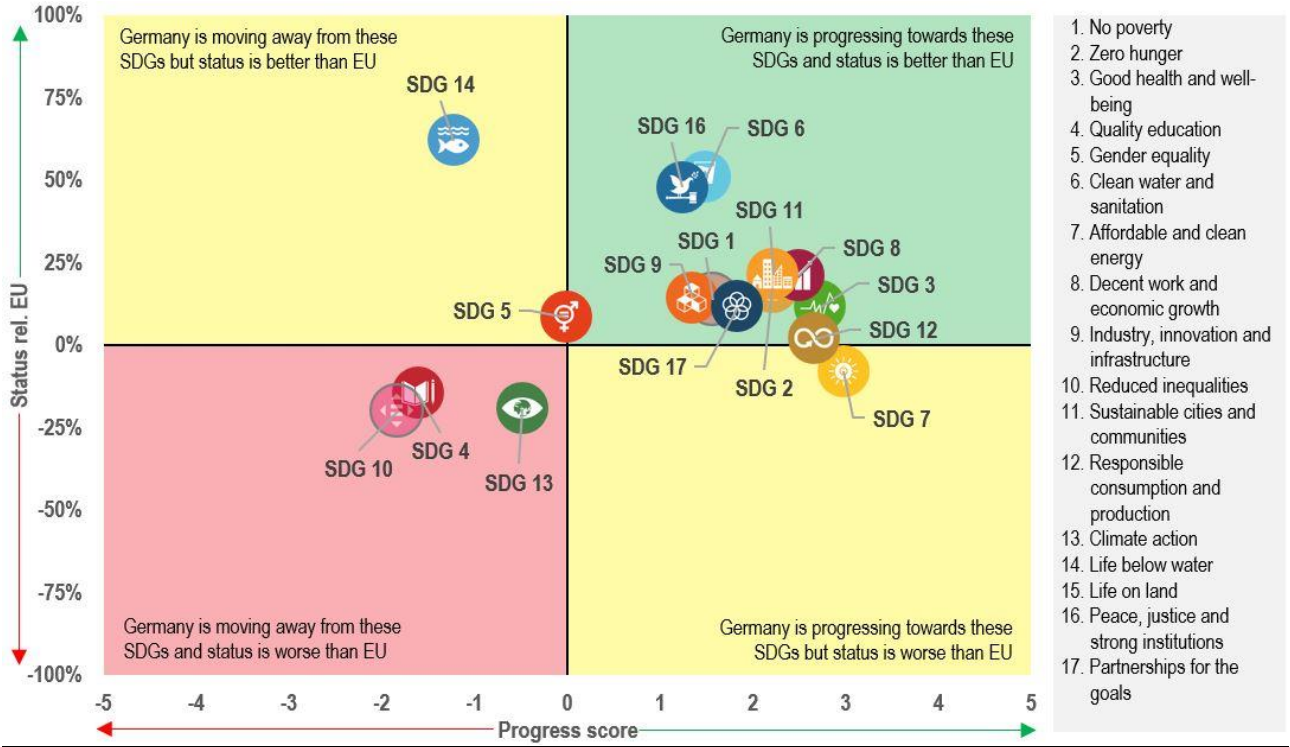
ANNEX 1: SUSTAINABLE DEVELOPMENT GOALS

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 (SDGs 2, 9, 11) or is improving (SDGs 7, 12) on most of the SDG indicators related to *environmental sustainability*, it is moving away from SDG 14 and needs to catch up with the EU average on climate action (SDG 13). The country has made some progress on energy consumption indicators, including the share of renewable energy in gross final energy consumption (SDG 7; from 14.9% in 2016 to 19.2% in 2021). Nevertheless, it remains below the EU average (21.8%). On SDG 13 (Climate action), net greenhouse gas emissions decreased from 11 tonnes per capita in 2016 to 9.2 tonnes per capita in 2021. Similarly, average CO2 emissions per km from new passenger cars have fallen considerably over the last 5 years (126.9 g in 2016 vs 113.6 g in 2021). However, on both indicators Germany is still performing worse than the EU average (7.4 tonnes per capita and 116.3 g respectively). 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

Graph A1.1: **Progress towards the SDGs in Germany in the last 5 years**



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 – Eurostat (europa.eu). The status of each SDG in a country is the aggregation of all indicators for the specific goal compared to the EU average. 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 early April 2023, except for the EU Labour Force Survey (LFS) indicators released on 27 April 2023. Data mainly refer to 2016-2021 or 2017-2022.

indicators related to *fairness* (SDGs 1, 3, 8), but it is moving away from SDG 5 (Gender equality). Further, it is moving away and needs to catch up with the EU average on reducing inequalities (SDG 10) and delivering quality education (SDG 4). The country generally performs better than the EU average in domains linked to poverty, health and decent jobs and growth. The unadjusted gender pay gap (SDG 5), however, is particularly high in Germany (17.6% vs 12.7% in the EU in 2021). While the overall share of people at risk of poverty or social exclusion (SDG 1) is slightly below the EU average (21% vs 21.7% in the EU in 2021), the urban-rural gap for people at risk of poverty or social exclusion (SDG 10) is more than ten times the EU average and increasing (7.8 percentage points (pps) in 2021 vs 6.5 pps in 2016 and 0.6 pps in the EU in 2021). Furthermore, there is room for improvement in integrating non-EU citizens into education and training as well as into the labour market (SDG 10). Germany performs worse than the EU average on EU/non-EU citizenship gaps for both young people not in education, employment or training (14.8 pps vs 11.4 pps in the EU in 2022) and the employment rate (21.9 pps vs 13.5 pps in the EU in 2022). On quality education, the share of early leavers from education and training (SDG 4) amounts to 12.2%, higher than the EU average (9.6% in 2022), and even higher among students with a migrant background (SDG 10). Tertiary educational attainment (SDG 4), though improving, remained below the EU average in 2022 (37.1% vs EU 42%). The German RRP will help improve educational outcomes for students with a learning backlog, often from disadvantaged backgrounds, and promote apprenticeships. This will help young people enter the labour market.

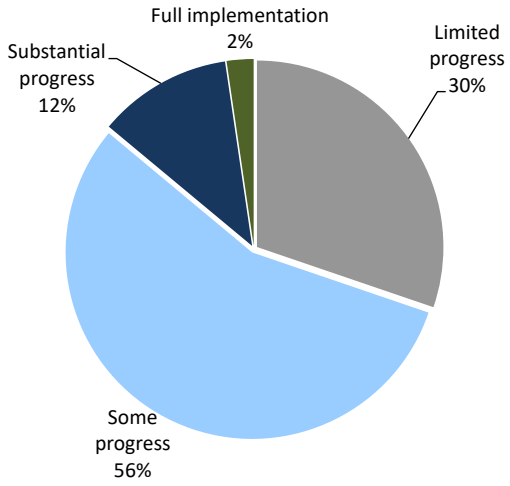
Germany performs well and is further improving on SDGs on *productivity* (SDGs 8 and 9), but is moving away from SDG 4 (quality education). The country performs above the EU average on SDG 8 (Decent work and economic growth) and on SDG 9 (Industry, innovation and infrastructure). With 3.13% of GDP allocated to R&D in 2021, Germany has some of the highest R&D spending in the EU. The share of R&D personnel in the active population rose from 1.59% in 2016 to 1.8% in 2021 (EU: 1.5% in 2021). However, adult participation in learning is below the EU average (11.9% in 2022) and has further decreased over the last 5 years (8.4% in 2017 vs 8.1% in 2022). This is also reflected in the low share of adults with at least basic digital skills ((SDG 4); 48.9% vs 53.9% in the EU in 2021). The German RRP targets bottlenecks related to the digitalisation of administration and the economy, for instance by interconnecting business registers to reduce the administrative burden for businesses and individuals. It 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. The country 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 78.2% in 2017 to 80.7% in 2022, which is very high compared to the EU average (74.6% in 2022). The share of young people not in education, employment or training reached 8.6% in 2022, below the EU average (11.7%), and long-term unemployment is low (1% vs EU 2.4% in 2022). On the other hand, though improving, Germany's investment share, at 22.6% of GDP, remained below the EU average of 23.2% of GDP in 2022. The RRP includes a package of reforms to speed up public investment and tackle investment bottlenecks in order 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.

The Commission has assessed the 2019-2022 country-specific recommendations (CSRs) ([75]) 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 ([76]) and the commitments in its recovery and resilience plan (RRP) ([77]). At this stage of RRP implementation, 70% of the CSRs focusing on structural issues from 2019-2022 have recorded at least 'some progress', while 30% 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 2019-2022 CSRs (2023 European Semester)**



Source: European Commission.

([75]) 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)

([76]) 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).

([77]) Member States were asked to effectively address all or a significant subset of the relevant country-specific recommendations issued by the Council in 2019 and 2020 in their RRPs. 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 2019-2022 CSRs**

Germany	Assessment in May 2023*	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 planned as of 2020, 2021, 2022, 2023.	SDG 8, 9, 16
Focus investment-related economic policy on education;	Limited Progress	Relevant RRP measures planned as of 2020, 2021 and 2022.	SDG 4, 10, 11
research and innovation;	Some Progress	Relevant RRP measures planned as of 2020, 2021, 2022 and 2023.	SDG 9, 10, 11
digitalisation and very-high capacity broadband;	Some Progress	Relevant RRP measures planned as of 2020, 2021 and 2022.	SDG 9, 10, 11
sustainable transport	Some Progress	Relevant RRP measures planned as of 2020 and 2021.	SDG 10, 11
as well as energy networks	Some Progress	Relevant RRP measures planned as of 2020, 2021 and 2023.	SDG 7, 9, 10, 11, 13
and affordable housing, taking into account regional disparities.	Limited Progress	Relevant RRP measures planned as of 2021.	SDG 1, 2, 8, 10, 11
Shift taxes away from labour to sources less detrimental to inclusive and sustainable growth.	Some Progress	Relevant RRP measures planned as of 2021.	SDG 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 planned as of 2021.	SDG 8, 10, 12
including the high tax wedge, in particular for low-wage	Some Progress	Relevant RRP measures planned as of 2020, 2021.	SDG 8, 10, 12
and second earners.	Limited Progress	Relevant RRP measures planned as of 2020, 2021.	SDG 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 planned as of 2021.	SDG 8
Improve educational outcomes and skills levels of disadvantaged groups.	Limited Progress	Relevant RRP measures planned as of 2020, 2021, 2022.	SDG 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	SDG 8, 16
Mobilise adequate resources and strengthen the resilience of the health system, including by deploying e-health services.	Some Progress	Relevant RRP measures planned as of 2020, 2021 and 2022.	SDG 3
2020 CSR 2	**Some Progress**		
Front-load mature public investment projects	Some Progress	Relevant RRP measures planned as of 2020, 2021, 2022.	SDG 8, 16
and promote private investment to foster the economic recovery.	Some Progress	Relevant RRP measures planned as of 2020, 2021, 2022.	SDG 8, 9
Focus investment on the green and digital transition, in particular on sustainable transport,	Some Progress	Relevant RRP measures planned as of 2020 and 2021.	SDG 11
clean, efficient and integrated energy systems,	Some Progress	Relevant RRP measures planned as of 2020, 2021 and 2023.	SDG 7, 9, 13
digital infrastructure and skills,	Some Progress	Relevant RRP measures planned as of 2020, 2021 and 2022.	SDG 4, 9
housing,	Limited Progress	Relevant RRP measures planned as of 2021.	SDG 1, 2, 8, 10
education	Limited Progress	Relevant RRP measures planned as of 2020, 2021 and 2022.	SDG 4
and research and innovation.	Some Progress	Relevant RRP measures planned as of 2020, 2021, 2022 and 2023.	SDG 9
Improve digital public services across all levels	Limited Progress	Relevant RRP measures planned as of 2021 and 2022.	SDG 9, 16
and foster the digitalisation in SMEs.	Some Progress	Relevant RRP measures planned as of 2020 and 2021.	SDG 8, 9
Reduce the regulatory and administrative burden for businesses.	Some Progress	Relevant RRP measures planned as of 2020, 2021, 2022.	SDG 8, 9
2021 CSR 1	**Some Progress**		
In 2022, maintain a supportive fiscal stance, including the impulse provided by the Recovery and Resilience Facility, and preserve nationally financed investment.	Full Implementation	Not applicable	SDG 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.	Substantial Progress	Not applicable	SDG 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.	Some Progress	Not applicable	SDG 8, 16

(Continued on the next page)

Table (continued)

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.	Limited Progress	Not applicable	SDG 8, 16
2022 CSR 1	**Some 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	SDG 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	SDG 8, 16
For the period beyond 2023, pursue a fiscal policy aimed at achieving prudent medium-term fiscal positions.	Substantial Progress	Not applicable	SDG 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 being planned as of 2021.	SDG 8, 10, 12
Safeguard the long-term sustainability of the pension system.	Limited Progress	Relevant RRP measure being planned 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	**Limited Progress**		
Remove investment obstacles	Limited Progress	Relevant RRP measure being planned as of 2021.	SDG 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.	SDG 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,	Some Progress	Rekevant RRP measures being planned as of 2020, 2021 and 2023.	SDG 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.	SDG 7, 8, 9, 13
and further advancing participation in energy-related cross-border cooperation.	Limited Progress	Relevant RRP measures being planned as of 2021.	SDG 7, 9, 13

Note:

* See footnote ([77]).

** 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

The Recovery and Resilience Facility (RRF) is the centrepiece of the EU's efforts to help it recover from the COVID-19 pandemic, speed up the twin transition and strengthen resilience against future shocks. The RRF also contributes to implementation of the SDGs and helps to address the Country Specific Recommendations (see Annex 4). Germany submitted its initial recovery and resilience plan (RRP) on 28 April 2021. The Commission's positive assessment on 22 June 2021 and Council's approval on 13 July 2021 paved the way for disbursing 25.6 billion in grants under the RRF over the 2021-2026 period.

Table A3.1:**Key elements of the German RRP('s)**

	Current RRP
Scope	Revised plan (article 21)
CID adoption date	14 February 2023
Total allocation	EUR 26.4 billion in grants (0.7% of 2021 GDP)
Investments and reforms	25 investments and 15 reforms
Total number of milestones and targets	129

Source: RRF Scoreboard

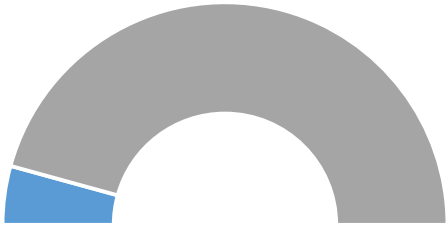
Since the entry into force of the RRF Regulation and the assessment of the national recovery and resilience plans, geopolitical and economic developments have caused major disruptions across the EU. In order to effectively address these disruptions, the (adjusted) RRF Regulation allows Member States to amend their recovery and resilience plan for a variety of reasons. In line with article 11(2) of the RRF, the maximum financial contribution for Germany was moreover updated on 30 June 2022 to an amount of EUR 28 billion in grants.

In this context, **Germany submitted an amended RRP to the Commission on 9 December 2022** due to objective circumstances that make it no longer possible to achieve certain milestones and targets in the RRP in line with Article 21 of the RRF Regulation. The update to Germany's plan is of a technical nature. It concerns two measures in Germany's plan, one related to the digitalisation of rail (due to exceptional delays in construction its completion date needed to be postponed), and the other to research and development of vaccines against SARS-CoV-2 (amendment of milestones due to uncertainty in R&D outcomes). The Revised RRP was approved by the Council on 14 February 2023 for a total allocation of EUR 26.4 billion.

Germany's progress in implementing its plan is published in the Recovery and Resilience Scoreboard ([41]). The Scoreboard also gives an overview of the progress made in implementing the RRF as a whole, in a transparent manner. The graphs below show the current state of play of the milestones and targets to be reached by Germany and subsequently assessed as satisfactorily fulfilled by the Commission.

Under the RRF, EUR 2.25 billion has so far been disbursed to Germany. It received this amount in pre-financing on 26 August 2021, equivalent to 9% of the (initial) financial allocation.

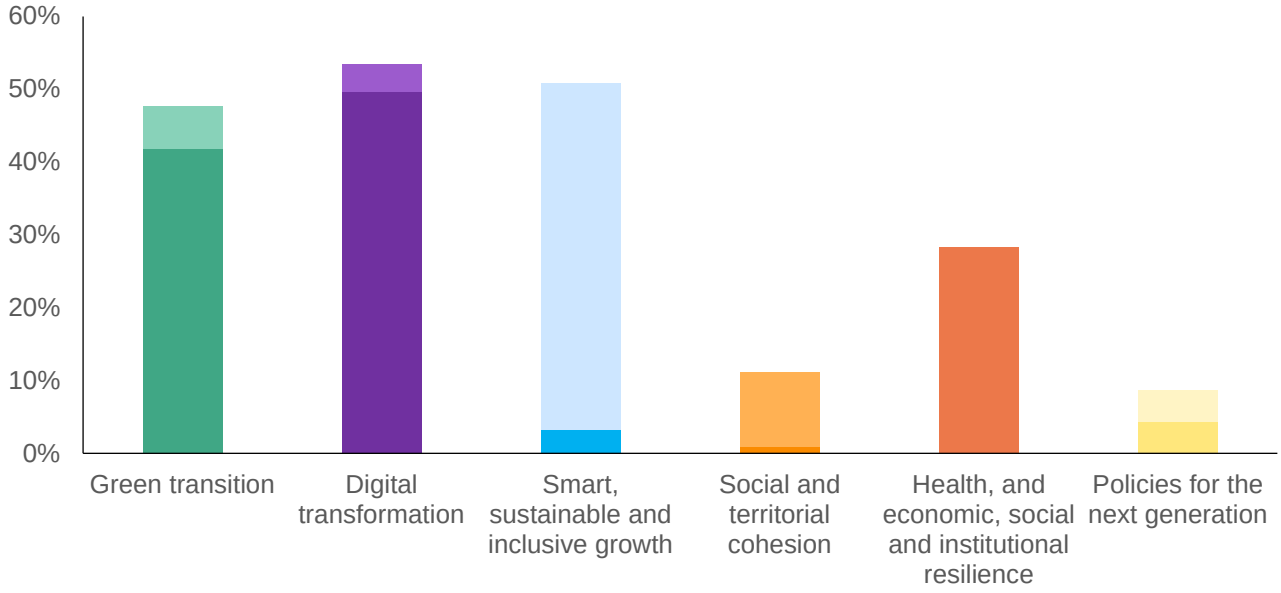
Graph A3.1: **Total grants disbursed under the RRF**



Note: This graph displays the amount of grants 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

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

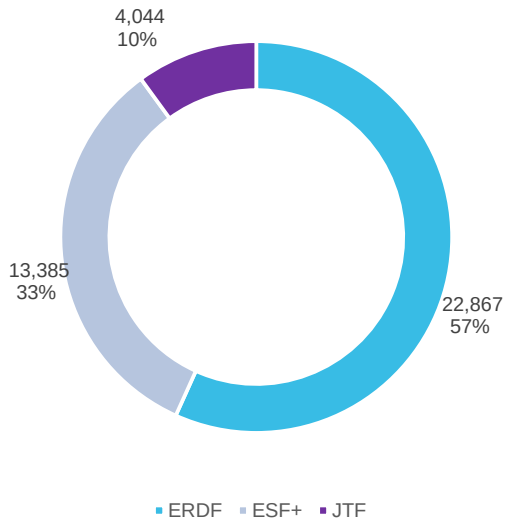
Graph A3.2: **Share of RRF funds contribution to each policy pillar**



Note: Each measure contributes towards two policy areas of the six pillars, therefore the total contribution to all pillars displayed on this chart amounts to 200% of the estimated cost of the RRP. The bottom part represents the amount of the primary pillar, the top part the amount of the secondary pillar.
Source: RRF Scoreboard

The EU budget of over EUR 1.2 trillion for 2021-2027 is geared towards implementing the EU's main priorities. Cohesion policy investment amounts to EUR 392 billion across the EU and represents almost a third of the overall EU budget, including around EUR 48 billion invested in line with REPowerEU objectives.

Graph A4.1: **Cohesion policy funds 2021-2027 in Germany: budget by fund**

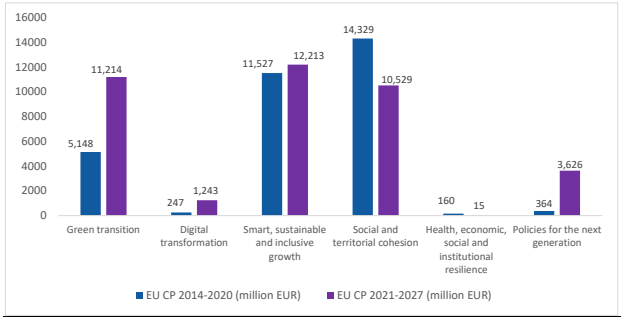


(1) million EUR in current prices, % of total; (total amount including EU and national co-financing)
Source: European Commission, Cohesion Open Data

In 2021-2027, in Germany, cohesion policy funds ([42]) **will invest EUR 11.2 billion in the green transition and EUR 1.2 billion in the digital transformation as part of the country's total allocation of EUR 40.3 billion.** In particular, the European Regional Development Fund (ERDF) will help to reduce greenhouse gas emissions by about 1.3 million tonnes CO_2 eq./year through investments in private companies and public buildings. Around 18.2 million inhabitants are to benefit from protection and adaptation measures against climate-related natural disasters, including floods. The ERDF will also support more than 112 000 companies, with a particular focus on small and medium enterprises (SMEs) and in line with the regional smart innovation strategies. A key challenge will be the implementation of ambitious climate-related measures, despite major supply chain risks and the growing shortage of skilled labour. The Just Transition Fund will boost innovation, deliver economic diversification and counteract deindustrialisation in the four German regions (North Rhine-Westphalia, Saxony, Saxony-Anhalt and Brandenburg), where the phase-out of fossil fuel extraction and related activities are expected to have the strongest impacts. Under the European Social Fund Plus (ESF+), Germany allocates notably EUR 1.3 billion to improving educational outcomes of disadvantaged young people, and EUR 627 million to improving lifelong learning and career transition. This funding will strengthen green and digital skills with a focus on vulnerable groups, in particular people with a migrant background and refugees.

Of the investments mentioned above, EUR 4.1 billion will be invested in line with the REPowerEU objectives. This is on top of the EUR 1.7 billion dedicated to REPowerEU under the 2014-2020 budget**.** EUR 3.5 billion (2021-2027) and EUR 1.5 billion (2014-2020) is for improving energy efficiency; EUR 47 million (2021-2027) and EUR 206 million (2014-2020) for renewable energy and low-carbon R&I; and EUR 590 million (2021-2027) for smart energy systems.

Graph A4.2: **Synergies between Cohesion policy funds and RRF six pillar in Germany**



(1) million EUR in current prices (total amount, including EU and national co-financing)
Source: European Commission

In 2014-2020, cohesion policy funds made EUR 20.7 billion available to Germany ([43]),

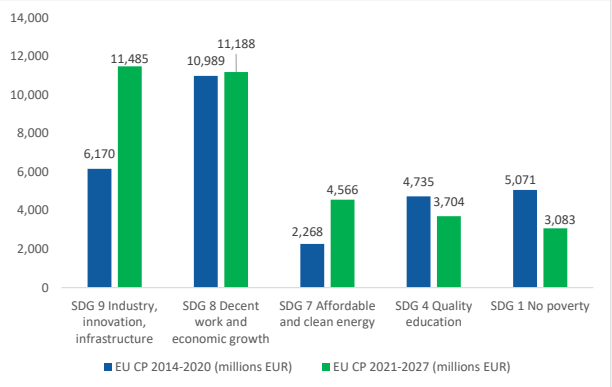
([42]) European Regional Development Fund (ERDF), European Social Fund+ (ESF+), Just Transition Fund (JTF), excluding Interreg programmes. Total amount includes national and EU contributions. Data source: Cohesion Open Data.

([43]) Cohesion policy funds include the ERDF, ESF and the Youth Employment Initiative (YEI). ETC programmes are excluded here. According to the 'N+3 rule', the funds committed for 2014-2020 must be spent by 2023. REACT-EU is included in all figures. Data source: Cohesion Open Data.

with an absorption of 73% ([44]). Including national financing, the total investment amounts to EUR 33 billion - around 0.1% of GDP for 2014-2020.

Germany continues to benefit from cohesion policy flexibility to support economic recovery, step up convergence and provide vital support to regions following the COVID-19 pandemic. The Recovery Assistance for Cohesion and the Territories of Europe instrument (REACT-EU) ([45]) under NextGenerationEU provides EUR 2.4 billion on top of the 2014-2020 cohesion policy allocation for Germany. Notable investments include the purchase of medical equipment worth close to EUR 80 million. REACT-EU provides support to SMEs particularly affected by the pandemic, including for working capital, pandemic-related research, digitalisation of schools, cultural centres, and vocational education and training premises, and energy efficiency measures. In addition, EUR 647 million was provisionally allocated to Germany through the Brexit Adjustment Reserve (BAR), and Cohesion's Action for Refugees in Europe (CARE) supports Germany and its regions in providing emergency assistance to people fleeing from Russia's invasion of Ukraine. With SAFE (Supporting Affordable Energy), the 2014-2020 cohesion policy funds may also be mobilised by Germany to support vulnerable households, jobs and companies particularly affected by high energy prices.

Graph A4.3: **Cohesion policy funds contribution to the SDGs in 2014-2020 and 2021-2027 in Germany**



(1) 5 largest contributions to SDGs in million (EUR) current prices
Source: European Commission

In both 2014-2020 and 2021-2027, cohesion policy funds have contributed substantially to the Sustainable Development Goals (SDGs). These funds support 11 of the 17 SDGs, notably SDG 9 'Industry, innovation and infrastructure' and SDG 8 'Decent work and economic growth' ([46]).

Other EU funds provide significant support to Germany. The common agricultural policy (CAP) made available EUR 55.1 billion in 2014-2022 and will keep supporting Germany with EUR 30.7 billion in 2023-2027. The two CAP Funds (European Agricultural Guarantee Fund and European Agricultural Fund for Rural Development) contribute to the European Green Deal while ensuring long-term food security. They promote social, environmental and economic sustainability, and innovation in agriculture and rural areas, in coordination with other EU Funds. The European Maritime and Fisheries Fund made EUR 220 million available to Germany in 2014-2020 and the European Maritime, Fisheries and Aquaculture Fund allocates EUR 212 million in 2021-2027.

Germany also benefits from other EU programmes, notably the Connecting Europe Facility, which under CEF 2 (2021-2027) has so far allocated EU funding of EUR 492.1 million to 31 specific projects on strategic transport

([44]) 2014-2020 Cohesion policy EU payments by MS is updated daily on Cohesion Open Data.

([45]) REACT-EU allocation on Cohesion Open Data.

([46]) Other EU funds contribute to the implementation of the SDGs. In 2014-2022, this includes both the European Agricultural Fund for Rural Development (EARDF) and the European Maritime and Fisheries Fund (EMFF).

networks. Similarly, Horizon Europe has so far allocated more than EUR 1.7 billion for German R&I on top of the EUR 10.1 billion earmarked under the previous programme (Horizon 2020). The Public Sector Loan Facility set up under the Just Transition Mechanism makes EUR 188 million of grant support from the Commission available for projects located in Germany for 2021-2027, which will be combined with loans by the EIB, to support investments by public sector entities in just transition regions.

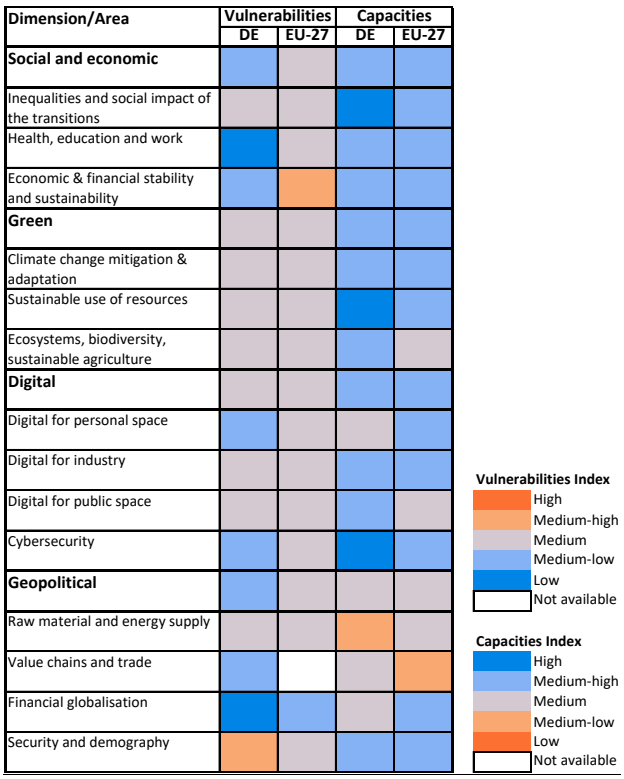
The Technical Support Instrument (TSI) supports Germany in designing and implementing growth-enhancing reforms, including those set out in its recovery and resilience plan (RRP). Germany has received significant support since 2018. Examples ([47]) include support to mainstream gender into public policy and budget processes, and to develop anti-money laundering risk analysis and supervision in the area of correspondent banking.

([47]) Country factsheets on reform support are available here.

This Annex illustrates Germany's relative resilience capacities and vulnerabilities using the Commission's resilience dashboards (RDB) ([48]). Comprising a set of 124 quantitative indicators, the RDB provide broad indications of Member States' ability to make progress across four interrelated dimensions: social and economic, green, digital, and geopolitical. The indicators show vulnerabilities ([49]) and capacities ([50]) that can become increasingly relevant, both to navigate ongoing transitions and to cope with potential future shocks. To this end, the RDB help to identify areas that need further efforts to build stronger and more resilient economies and societies. They are summarised in Table A5.1 as synthetic resilience indices, which illustrate the overall relative situation for each of the four dimensions and their underlying areas for Germany and the EU-27 ([51]).

According to the set of resilience indicators under the RDB, Germany generally displays similar but slightly lower levels of vulnerabilities compared to the EU average. Germany exhibits medium-low vulnerabilities in the social and economic and the geopolitical dimensions of the RDB, and medium vulnerabilities in the green and the digital dimensions. Compared to the EU level, Germany has higher vulnerabilities in the area 'security and demography', due in part to high employment gaps between EU and non-EU citizens. It shows relatively low vulnerabilities in relation to 'health, education and work', 'digitalisation for personal space' and 'financial globalisation' ([52]).

Table A5.1: **Resilience indices aggregating the country situation across RDB dimensions and areas**



(1) Data are for 2021, and EU-27 refers to the value for the EU as a whole. Data underlying EU-27 vulnerabilities in the area 'value chains and trade' are not available as they comprise partner concentration measures that are not comparable with MS level values.
Source: JRC Resilience Dashboards - European Commission

Compared to the EU average, Germany shows an overall similar level of capacities across all RDB indicators. It displays overall medium-high resilience capacities in the social and economic, the digital and the green dimensions, and medium capacities in the geopolitical dimension. Germany shows stronger capacities than the EU average in the area 'inequalities and social impact of the transitions' but also in 'cybersecurity', 'public space digitalisation', 'value chains and trade', and most areas of the green dimension ([53]). There is room for improving capacities when it comes to 'raw material and energy supply', 'financial globalisation' and the digitalisation of personal space (especially concerning the digital skills of adults and young people).

([48]) For details see: https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2020-strategic-foresight-report/resilience-dashboards_en; see also 2020 Strategic Foresight Report (COM(2020) 493).

([49]) 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.

([50]) Capacities refer to enablers or abilities to cope with crises and structural changes and to manage the transitions.

([51]) 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.

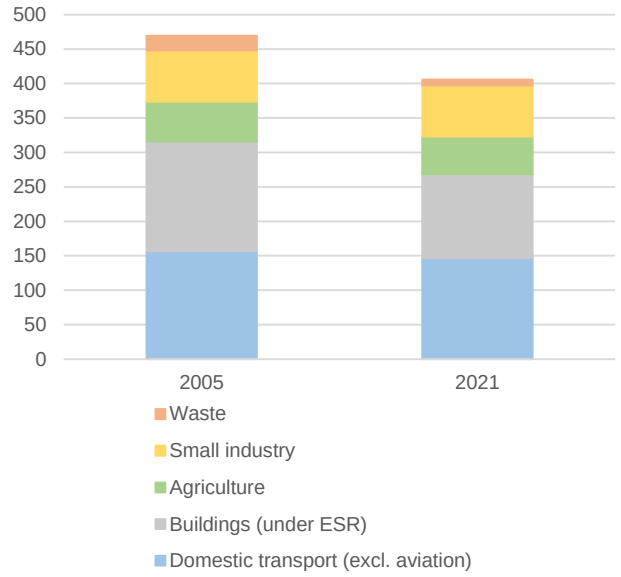
([52]) For example, German self-reported unmet need for medical care, long-term unemployment rate and NIIP fall into the lowest vulnerability category.

([53]) Inequality considerations here are different from SDG 10 (Annex 1); results are driven by a high household saving rate. Germany displays high capacities also in relation to resource productivity, terrestrial protected areas and organic farming.

Germany's green transition requires continued action on several aspects including greening electricity generation, transport, heating networks, buildings, sustainable water management, and improving its carbon sinks. Implementation of the European Green Deal is underway in Germany; this Annex provides a snapshot of the key areas involved ([54]).

Germany has not yet defined all the climate policy measures it needs to reach its 2030 climate target for the effort sharing sectors ([55])**.** Data for 2021 on greenhouse gas emissions in these sectors are expected to show the country generated less than its annual emission allocations ([56]). Current policies in Germany are projected to reduce these emissions by -29% relative to 2005 levels in 2030, not a sufficient reduction to reach the effort sharing target even before the target was raised in line with the EU's 55% objective, let alone Germany's new target, -50% ([57]). In its recovery and resilience plan, Germany has allocated at least 42% of its Recovery and Resilience Facility grants to key reforms and investments to attain climate objectives ([58]). Germany's climate law ([59]) aims to reduce economy-wide greenhouse gas emissions by at least -65% by 2030 and by -88% by 2040, compared to 1990, to reach climate neutrality by 2045. This could generate greenhouse gas emission reductions in the effort sharing sectors that exceed Germany's (new) effort sharing target ([60]).

Graph A6.1: **Thematic – greenhouse gas emissions from the effort sharing sectors in Mt CO2eq, 2005-2021**



Source: European Environmental Agency.

Germany's net carbon removals from the land use sector have become emissions in recent years, with a growing distance to the 2030 target. Germany's forests contribute a major share of carbon removals. The conservation and restoration of peatlands, other forms of carbon farming and forest adaptation measures in particular have significant mitigation potential and would yield added co-benefits for biodiversity ([61]).

([54]) The overview in this Annex is complemented by the information provided in Annex 7 on energy security and affordability, Annex 8 on the fair transition to climate neutrality and environmental sustainability, Annex 9 on resource productivity, efficiency and circularity, Annex 11 on innovation, and Annex 19 on taxation.

([55]) Member States' greenhouse gas emission targets for 2030 ('effort sharing targets') were increased by Regulation (EU) 2023/857 (the Effort Sharing Regulation) amending Regulation (EU) 2018/842, aligning the action in the concerned sectors with the objective to reach EU-level, economy-wide greenhouse gas emission reductions of at least 55% relative to 1990 levels. The Regulation sets national targets for sectors outside the current EU Emissions Trading System, notably: buildings (heating and cooling), road transport, agriculture, waste, and small industry. Emissions covered by the EU ETS and the Effort Sharing Regulation are complemented by net removals in the land use sector, regulated by Regulation (EU) 2018/841 (the Land Use, Land Use Change and Forestry (LULUCF) Regulation) amended by Regulation (EU) 2023/839.

([56]) Germany's annual emission allocations for 2021 were some 428.8 Mt CO_2eq, and its approximated 2021 emissions were 405.7 Mt. See European Commission, *Accelerating the transition to climate neutrality for Europe's security and prosperity: EU Climate Action Progress Report 2022*, SWD(2022)343.

([57]) See the information on the distance to the 2030 climate policy target in Table A6.1. Existing and additional measures as of 15 March 2021.

([58]) For example, investments in green hydrogen, support for electric cars, and energy efficiency renovations in residential buildings.

([59]) Bundesklimaschutzgesetz (KSG); 2021.

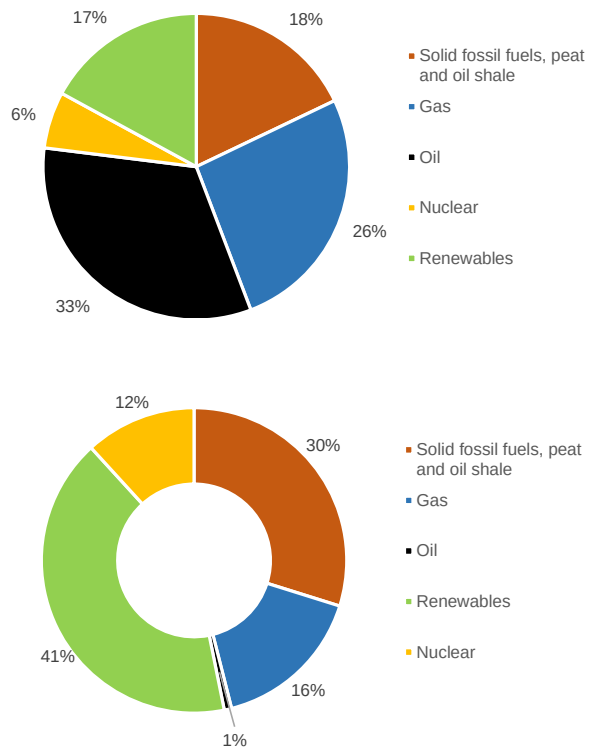
([60]) Under Germany's national climate law and energy and climate plan. An update of the plan, mandated by Regulation (EU) 2018/1999 (the Governance Regulation), is underway.

([61]) 92% of Germany's peat soils are currently drained, releasing greenhouse gases of around 53 Mt CO_2eq, about 7.5% of Germany's total emissions in 2020. See also Umweltbundesamt (ed.) *Emissionen der Landnutzung, -änderung und Forstwirtschaft*.

For 2030, Germany's target for the land use, land use change and forestry (LULUCF) sector implies the removal of 30 840 kt CO_2eq (see Table A6.1) ([62]).

In 2021, Germany's energy mix was still dominated by fossil fuels. The energy carriers with the highest share in the energy mix were oil and oil products (excluding biofuels) (33% % of total energy consumption) and natural gas (26%), followed by solid fuels (mainly coal and lignite) (18%) and renewable energy and biofuels (17%). The share of nuclear energy was almost halved in the last decade, to 6% in 2021.

Graph A6.2: **Energy mix (top) and electricity mix (bottom), 2021**



The energy mix is based on gross inland consumption, and excludes heat and electricity. The share of renewables includes biofuels and non-renewable waste.
Source: Eurostat.

Germany needs to step up efforts to increase electricity generation from renewable sources. There was a decrease in the share of renewable energy in Germany's electricity mix in 2021. Renewables accounted for 41% of the electricity mix in 2021, compared to 46% in 2020. Wind and solar energy provided 20% and 8% of the total electricity mix respectively. Germany national energy and climate plan (NECP) sets a 30% target of renewable sources in gross final energy consumption by 2030, which was considered as adequate. Germany will need to increase its renewable energy target in the updated NECP, to reflect the more ambitious EU climate and energy targets in the Fit for 55 Package and in the REPowerEU Plan.

Germany needs to step up energy efficiency improvements. NECP targets for final and primary energy consumption were (FEC and PEC) considered modest and as of sufficient ambition, respectively in the 2020 Commission assessment. Based on the energy consumption trajectory for 2018-2021, Germany is expected to be on track to meet its 2030 target for FEC and for PEC, as these were notified in its NECP. But Germany achieved only 88 % of the energy savings required under Art. 7 of the Energy Efficiency Directive ([63]).

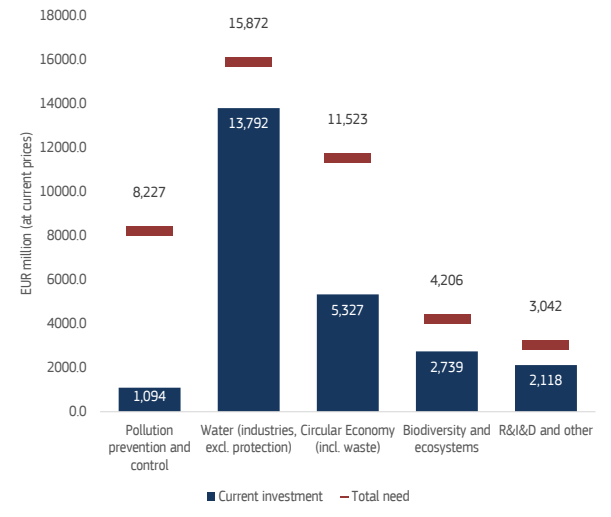
More action is needed to decarbonise transport. Germany aims to reach 15 million electric vehicles registered by 2030, and the share of electric passenger cars on its roads is rising fast. More action is needed to expand the charging infrastructure, increase the use of sustainable public transport and promote a modal shift, in particular towards rail, for both passenger and freight transport. Given the success of the EUR 9/month ticket for regional and local public transportation in summer 2022, Germany brought in the Deutschlandticket, which aims to offer an attractive alternative to more polluting transport modes. Digitalising the railway system is a challenge ahead, including improvements to the security of rail communications. Over half of Germany's railway network is electrified, but this is below the EU average. Improving the quality and service of rail operations should stimulate demand for public transport. This would ease road congestion, on which Germany scores worse than the EU average and reduce fossil fuel dependence. Despite significant improvements in recent years,

([62]) This value is indicative and will be updated in 2025 (as mandated by Regulation (EU) 2023/839).

([63]) After the conclusion of the negotiations for a recast EED, including REPowerEU, the ambition of both the EU and national targets as well as of the national measures for energy efficiency to meet these targets is expected to increase.

air quality in Germany remains a cause for concern ([64]). In 2021, three air quality zones registered exceedances of the EU air quality limits for NO2.

Graph A6.3: **Thematic- Environmental investment needs and current investment, p.a. 2014-2020**



Source: European Commission.

Germany would benefit from investing more in meeting its environmental targets and objectives. Between 2014 and 2020, the annual environmental investment needs ([65]) were estimated to be at least EUR 42.9 billion while investment was at about EUR 25.1 billion, leaving a gap of at least EUR 17.8 billion per year (see Graph A6.3) ([66]). Germany's land Natura 2000 network covers 15.5% of its land ([67]), but it has not yet allocated sufficient resources to protect and manage these areas. The resources needed to implement the 2030 EU biodiversity strategy are estimated at EUR 4 billion per year ([68]).

Climate change has physical risks and impacts in Germany in several areas, including forest management, water management and agriculture ([69]). Since 2018, extreme weather events have caused damages of at least EUR 80 billion in Germany, including losses of EUR 25.6 billion in forestry and agriculture ([70]). Climate monitoring shows an increase in the impacts of heatwaves, droughts, floods, heavy rain, and flash floods in urban areas on human health, vegetation, and ecosystems ([71]). Some areas in the north-west and the east in particular experienced unprecedented levels of water scarcity, with negative impacts on water supply and quality, energy management and agriculture ([72]). Urgent action is needed to minimise the growing risks of extreme heat, drought and flood events and their impacts on human health, biodiversity, agriculture, forestry, transport, and infrastructure ([73]). Sustainable water management will be key to improving climate adaptation and resilience ([74]). Additional efforts are required to reach the government's target of 30% of utilised agricultural area under organic farming by 2030. Concerning water, problems with eutrophication in the Baltic and North Seas and with groundwater persist. Livestock density has decreased slightly in Germany but varies strongly between regions – West Germany belongs to the cluster of regions with the highest livestock density in Europe ([75]), which exerts pressure on sustainable water management. Germany has the potential to rely more on environmental taxes to

([64]) See the data in table A6.5 below. For details on the methodology, see European Environment Agency, Air quality in Europe –2021 report, p.106.

([65]) Environmental objectives include pollution prevention and control, water management and industries, circular economy and waste, biodiversity and ecosystems (European Commission, 2022, Environmental Implementation Review, country report Germany).

([66]) When also accounting for needs estimated at EU level only (e.g., water protection, higher circularity, biodiversity strategy).

([67]) In 2021, Germany had 37.4% terrestrial protected areas (Natura 2000 and nationally designated areas), against the EU average of 26.4% (European Environment Agency, 2023, Natura 2000 Barometer).

([68]) European Commission, Biodiversity financing and tracking, 2022.

([69]) European Environmental Agency, *Advancing towards climate resilience in Europe*, forthcoming.

([70]) https://www.prognos.com/de/folgen-klimakrise

([71]) Dürremonitor Deutschland - Helmholtz-Zentrum für Umweltforschung UFZ. Germany monitors climate change impacts and publishes a 4-year-cycle adaptation strategy.

([72]) Monitoringbericht 2019 zur Deutschen Anpassungsstrategie an den Klimawandel (umweltbundesamt.de)

([73]) Umweltbundesamt (Eds.). Klimawirkungs- und Risikoanalyse 2021 für Deutschland.

([74]) Konferenz Klimawandel und Wasser, Abschlussbericht, 2021

([75]) Eurostat, Livestock density in 2020.

further internalise the cost of air pollution and to promote waste reduction ([76])(see Annex 19).

Germany provides fossil fuel and other environmentally harmful subsidies that could be considered for reform, while ensuring food and energy security and mitigating social effects. In 2021, it spent EUR 11.8 billion on fossil fuel subsidies (cf. Table A6.1.), which puts low-carbon alternatives at a disadvantage. Environmentally harmful subsidies have been identified, via an initial assessment, in the agriculture, forestry and fishing, electricity, gas, steam and air conditioning, transportation and storage, manufacturing and services sectors. Examples of such subsidies include company car tax benefits, the excise tax refund for diesel fuel used in agriculture, the reduced energy tax rate for light fuel oil used in mobile machinery, the excise tax exemption and tax relief for natural gas for industrial consumers or the reduced CO2 tax rate on diesel used in agriculture ([77]). The coalition agreement acknowledges the need to address such subsidies, but the timeline and practical follow-up is unclear.

([76]) European Commission, 2021, Green taxation and other economic instruments – Internalising environmental costs to make the polluter pay, Ensuring that polluters pay (europa.eu)

([77]) Fossil fuel figures in EUR of 2021 from the 2022 State of the Energy Union report. Initial assessment of environmentally harmful subsidies done by the Commission in the 2022 toolbox for reforming environmentally harmful subsidies in Europe, using OECD definitions, and based on the following datasets: OECD Agriculture Policy Monitoring and Evaluations; OECD Policy Instruments for the Environment (PINE) Database; OECD Statistical Database for Fossil Fuels Support; IMF country-level energy subsidy estimates. Annex 4 of the toolbox contains detailed examples of subsidies on the candidates for reform.

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

									'Fit for 55'		
			2005	2017	2018	2019	2020	2021	2030 target/value	Distance WEM	Distance WAM
Progress to policy targets	Greenhouse gas emission reductions in effort sharing sectors [1]	Mt CO2eq; %; pp	477.8	-2%	-9%	-7%	-15%	-	-50%	-21	-21
	Net carbon removals from LULUCF [2]	kt CO2eq	7,832	-10,705	-7,657	-6,822	4,197	3,998	-30840	n/a	n/a
			2005	2017	2018	2019	2020	2021	National contribution to 2030 EU target		
	Share of energy from renewable sources in gross final consumption of energy [3]	%	7%	15%	17%	17%	19%	19%	30%		
	Energy efficiency: primary energy consumption [3]	Mtoe	321.6	298.1	292.0	285.2	262.1	267.0	216.0		
	Energy efficiency: final energy consumption [3]	Mtoe	219.7	218.6	215.2	214.7	201.9	209.7	185.0		

			Germany						EU		
			2016	2017	2018	2019	2020	2021	2019	2020	2021
Fiscal and financial indicators	Environmental taxes (% of GDP)	% of GDP	1.9	1.8	1.8	1.8	1.7	1.8	2.4	2.2	2.2
	Environmental taxes (% of total taxation) [4]	% of taxation	4.8	4.6	4.5	4.4	4.3	4.4	5.9	5.6	5.5
	Government expenditure on environmental protection	% of total exp.	1.3	1.2	1.3	1.3	1.3	1.1	1.7	1.6	1.6
	Investment in environmental protection [5]	% of GDP	0.4	0.4	0.4	0.4	-	-	0.4	0.4	0.4
	Fossil fuel subsidies [6]	EUR2021bn	15.3	15.0	14.5	13.4	13.8	11.8	53.0	50.0	-
	Climate protection gap [7]	score 1-4					1.6	1.7			1.5
Climate	Net greenhouse gas emissions	1990 = 100	73.0	73.0	70.0	67.0	60.0	62.0	76.0	69.0	72.0
	Greenhouse gas emission intensity of the economy	kg/EUR'10	0.34	0.33	0.31	0.29	0.28	-	0.31	0.30	0.26
	Energy intensity of the economy	kgoe/EUR'10	0.11	0.11	0.11	0.10	0.10	-	0.11	0.11	-
Energy	Final energy consumption (FEC)	2015=100	101.9	102.8	101.1	100.9	91.9	95.5	102.9	94.6	-
	FEC in residential building sector	2015=100	103.6	103.3	101.6	105.1	105.5	106.9	101.3	101.3	106.8
	FEC in services building sector	2015=100	98.7	98.6	89.5	85.3	83.1	89.3	100.1	94.3	100.7
Pollution	Smog-precursor emission intensity (to GDP) [8]	tonne/EUR'10	0.77	0.77	0.76	0.69	0.61	-	0.93	0.86	-
	Years of life lost due to air pollution by PM2.5	per 100.000 inh.	588.9	576.6	617.0	439.6	356.3	-	581.6	544.5	-
	Years of life lost due to air pollution by NO_2	per 100.000 inh.	231.7	209.5	205.1	171.6	123.5	-	309.6	218.8	-
	Nitrates in ground water	mg NO3/litre	27.9	27.3	27.1	26.3	25.1	-	21.0	20.8	-
Biodiversity	Land protected areas	% of total	30.6	37.7	-	37.6	37.6	37.4	26.2	26.4	26.4
	Marine protected areas	% of total	45.9	-	-	45.9	-	45.4	10.7	-	12.1
	Organic farming	% of total utilised agricultural area	6.8	6.8	7.3	7.8	9.6	9.7	8.5	9.1	-

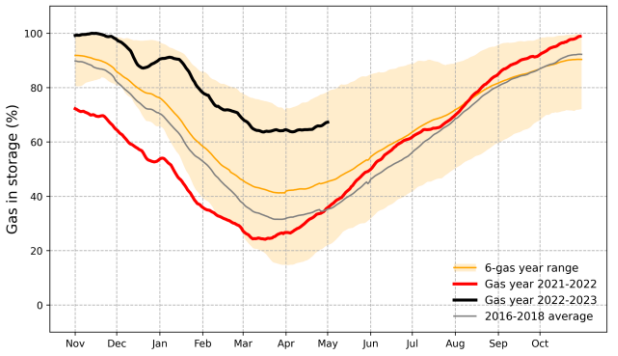
			2017	2018	2019	2020	2021	2022	2020	2021	2022
Mobility	Share of zero-emission vehicles [9]	% in new registrations	0.7	1.0	1.7	6.6	13.4	14.7	5.4	8.9	10.7
	Number of AC/DC recharging points (AFIR categorisation)		-	-	-	43719	62223	82084	188626	330028	432518
	Share of electrified railways	%	52.9	52.9	53.1	53.1	53.1	53.2	56.6	n/a	56.6
	Hours of congestion per commuting driver per year		29.9	29.3	29.4	29.2	n/a	n/a	28.7	n/a	n/a

Sources: (1) Historical and projected emissions, as well as Member States' climate policy targets and 2005 base year emissions under the Effort Sharing Decision (for 2020) are measured in global warming potential (GWP) values from the 4th Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC). Member States' climate policy targets and 2005 base year emissions under the Effort Sharing Regulation (for 2030) are in GWP values from the 5th Assessment Report (AR5). The table above shows the base year emissions 2005 under the Effort Sharing Decision, using AR4 GWP values. Emissions for 2017-2021 are expressed in percentage change from 2005 base year emissions, with AR4 GWP values. 2021 data are preliminary. The table shows the 2030 target under Regulation (EU) 2023/857 that aligns it with the EU's 55% objective, in percentage change from 2005 base year emissions (AR5 GWP). Distance to target is the gap between Member States' 2030 target (with AR5 GWP values) and projected emissions with existing measures (WEM) and with additional measures (WAM) (with AR4 GWP values), in percentage change from the 2005 base year emissions. Due to the difference in global warming potential values, the distance to target is only illustrative. The measures included reflect the state of play as of 15 March 2021.
(2) Net removals are expressed in negative figures, net emissions in positive figures. Reported data are from the 2023 greenhouse gas inventory submission. 2030 value of net greenhouse gas removals as in Regulation (EU) 2023/839 amending Regulation (EU) 2018/841 (LULUCF Regulation) – Annex IIa, kilotons of CO2 equivalent, based on 2020 submissions.
(3) Renewable energy and energy efficiency targets and national contributions are in line with the methodology established under Regulation (EU) 2018/1999 (Governance Regulation).
(4) Percentage of total revenue from taxes and social contributions (excluding imputed social contributions). Revenue from the EU Emissions Trading System is included in environmental tax revenue.
(5) Expenditure on gross fixed capital formation for the production of environmental protection services (abatement and prevention of pollution) covering government, industry, and specialised providers.
(6) European Commission, Study on energy subsidies and other government interventions in the European Union, 2022 edition.
(7) The climate protection gap refers to the share of non-insured economic losses caused by climate-related disasters. This indicator is based on modelling of the current risk from floods, wildfires and windstorms as well as earthquakes, and an estimation of the current insurance penetration rate. The indicator does not provide information on the split between the private/public costs of climate-related disasters. A score of 0 means no protection gap, while a score of 4 corresponds to a very high gap (EIOPA, 2022).
(8) Sulphur oxides (SO2 equivalent), ammonia, particulates < 10 µm, nitrogen oxides in total economy (divided by GDP).
(9) Battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV).

Germany managed to reduce its heavy dependence on Russian oil and gas effectively through a variety of measures, but more remains to be done. Before Russia invaded Ukraine, Germany was already heavily exposed to Russian gas and oil, notably 65% and 34% respectively in 2021 and thus well above the EU average ([78]). However, it managed to reduce its reliance on Russian oil to below 25% ([79]) and gas to nearly zero, after Russia stopped delivering gas in August 2022. Still, Germany is highly dependent on imported fossil fuels in general. This makes its economy particularly sensitive to global price developments, requiring it to step up efforts on the energy transition. This Annex ([80]) sets out actions carried out by Germany to achieve the REPowerEU objectives, including through the implementation of its recovery and resilience plan, in order to improve energy security and affordability while accelerating the clean energy transition, and contributing to enhancing the EU's competitiveness in the clean energy sector ([81]).

Germany has achieved a high level of gas supply security in the face of challenging circumstances. Its planned natural gas infrastructure, six floating storage regasification units (FSRUs), one floating regasification unit (FRU) and two stationary liquefied natural gas (LNG) terminals will replace Russian gas imports completely in the medium term. It will also help protect the security of supply in Europe, e.g. the FSRUs in Lubmin could contribute to the supply in other Member States. Germany fulfilled its gas storage obligations last winter, reaching 99.21% by 1 November 2022 (almost 20 percentage points above its legal obligation), and ended the heating season with a storage filled at 64.51% by 15 April 2023 ([82]). Germany operates around 40 underground storage facilities managed by 27 storage operators, with a total capacity of around 25.2 billion cubic metres, representing around 25% of its total yearly demand. Before Russia stopped exporting gas to Germany in August 2022, it was its main gas supplier, covering half of its gas consumption. The main natural gas suppliers are currently Norway, the Netherlands, Belgium, Switzerland and France. The latter started supplying gas in October 2022, with a maximum handover capacity of 100 GWh/day.

Graph A7.1: **Underground storage levels in Germany**



Source: JRC calculation based on AGSI+ Transparency Platform, 2022 (Last update 2 May 2023)

Germany is implementing energy efficiency measures to contribute to energy security further, including on the demand side. Almost half of the electricity mix in Germany still relies on a combination of fossil fuels (46%), with the other half coming mainly from renewables (see Annex 6). The German government initially planned to phase out nuclear energy by the end of 2022 but agreed to keep its three active nuclear power plants in operation until April 2023 in order to secure the power supply for winter 2022/2023. Germany also allowed for the temporary reactivation of hard coal and lignite power plans to save gas. Germany adopted several energy efficiency measures, including two energy conservation ordinances ([83]) which contribute to

([78]) Eurostat (2021)

([79]) BMWK (2022)

([80]) This annex is complemented by Annex 6 as the European Green Deal focuses on the clean energy transition, by Annex 8 on the actions taken to mitigate energy poverty and protect the most vulnerable ones, by Annex 9 as the transition to a circular economy will unlock significant energy and resource savings, further strengthening energy security and affordability, and by Annex 12 on industry and single market complementing ongoing efforts under the European Green Deal and REPowerEU.

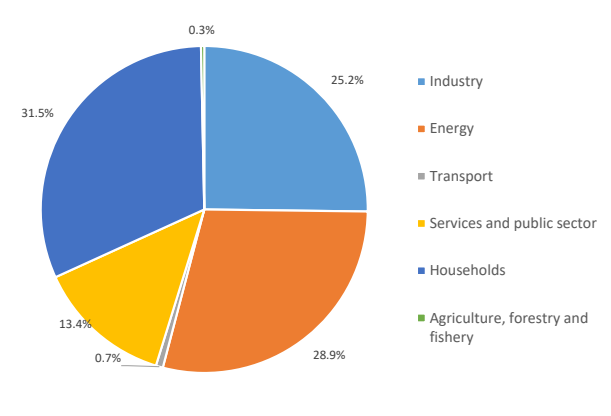
([81]) In line with the Green Deal Industrial Plan COM(2023) 62 final, and the proposed Net-Zero Industry Act COM(2023) 161 final

([82]) Regulation of the European Parliament and of the Council amending Regulations (EU) 2017/1938 and (EC) No 715/2009 on gas storage and Implementing Regulation (EU) 2022/2301 of 23 November 2022 set the filling trajectory with intermediary targets for 2023 for each Member State with underground gas storage facilities on its territory and directly interconnected to its market area.

([83]) EnsikuMaV: Energy savings in buildings in the public arena; EnsimiMaV: Optimisation of heating systems in buildings.

energy security and are targeted to industry and households, among the biggest gas consumers in Germany in 2021 (Graph A7.2). These prescribe measures in public buildings (valid until 28 February 2023, with an extension until 15 April 2023, in preparation), the optimisation of heating in buildings and an obligation for companies to implement energy efficiency measures (valid until 30 September 2024). At the same time, gas and heating suppliers launched awareness-raising campaigns for customers. Over the period August 2022 – March 2023, 16% of gas consumption has been saved in Germany compared to the previous 5-year average.

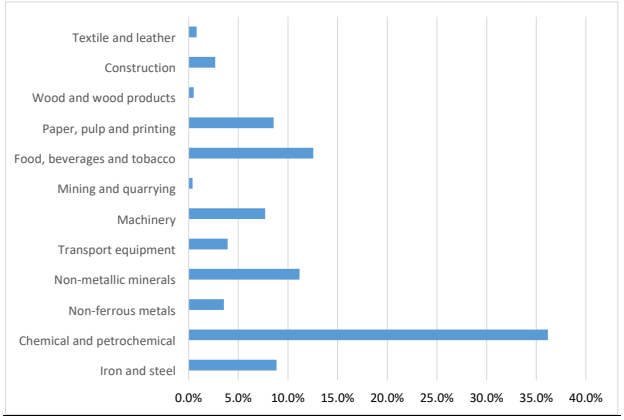
Graph A7.2: **Share of gas consumption per sector, 2021**



Source: Eurostat

The expansion of the grid infrastructure would allow to further accommodate a higher share of renewable electricity and improve interconnection for cross-border energy flows. Germany adopted a series of energy action investments and reforms (formerly known as 'Easter', 'Spring' and 'Summer' packages) in July 2022, including legislation on renewable energy sources and specific laws on on- and offshore wind energy and grid expansion acceleration. These measures and further action are expected to speed up and simplify planning and permitting (see Annex 12) procedures for renewable energy generation and electricity networks. Germany plans to cover at least 80% of gross electricity consumption with renewable energy by 2030. It could accelerate the expansion of high-voltage transmission grids, including through the swift implementation of Projects of Common Interest. In addition, distribution grids could be upgraded to accommodate new producers and millions of owners of solar panels, heat pumps and electric vehicles as well as to prepare for the transition to smart grids. Storage plays a significant role in the electricity system. Short-term storage helps to balance the grid. A relevant and increasing share of new household PV installations comes with a battery storage. Long-term storage to bridge unfavourable meteorological conditions is also expected to play a key role in a renewables-based electricity system. Hydrogen infrastructure will become increasingly important.

Graph A7.3: **Gas consumption per industrial sector, 2021 (% of total gas consumption in industry)**

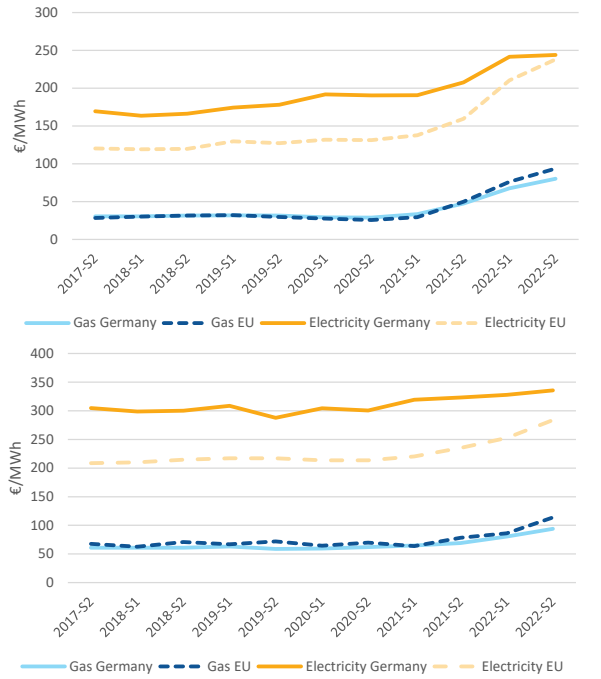


Source: Eurostat

In 2022, Germany adopted several relief instruments to support consumers, suppliers and small and medium sized companies in financial trouble. In addition to three relief packages (from a total of EUR 95 billion), Germany implemented a 'protective shield' of up to EUR 200 billion to finance temporary relief instruments, including 'price brakes', for natural gas, heat and electricity consumers, small and medium-sized enterprises, and gas suppliers. The corporate sector, including energy-intensive industries (see Annex 12), was generally hit by the increase in energy prices before households. It has been introducing different measures to counteract the high energy prices while trying to remain competitive. This includes reducing production (especially energy-intensive industry), implementing energy efficiency measures (e.g. efficient lighting, heating and cooling technology or behavioural changes), and fuel switching. Still, energy prices stagnating at higher levels raises the question of how long German industry will remain competitive as it is experiencing growing pressure to either raise prices to safeguard margins or reduce production due to the high share of energy consumption. Large gas consumers and households benefit from the natural gas and heat

price brake as they receive support based on the difference between the price agreed in their contracts and the guaranteed maximum price by the federal government.

Graph A7.4: **Germany´s retail energy prices for industry (top) and households (bottom)**



(1) For industry: the band consumption is ID for electricity and I4 for gas
(2) For households, the band consumption is DC for electricity and D2 for gas
Source: Eurostat

Germany has high ambitions to transform its energy system, and more effective policy implementation could accelerate the decarbonisation of the economy. Its overall deployment of renewable energy reached 17% in 2021. In 2022, renewables growth was fastest in the electricity sector. Most of this growth was in solar panels (67 GW in total, up 7 GW in 2022) and onshore wind (58 GW, up 2 GW in 2022). According to the German Ministry of Economic Affairs and Climate Action, there was an increase of around 5% in renewable energy in the electricity mix in 2022, reaching 46.2% in the electricity mix. However, Germany needs to install at least 10 GW per year in wind and 22 GW per year in solar to reach at least 80% by 2030. To integrate renewable electricity, including Germany's ambitious goals for offshore renewables, the government has significantly increased planned auction volumes for electricity from renewable sources, especially from wind and solar. However, recent auctions have been greatly undersubscribed, mainly due to an increase in the action value combined with low remunerations. For 2023, the remunerations are expected to increase in order to make auctions more attractive. The impact of the energy action packages adopted in July 2022 are still to be seen. The national energy and climate plan contains a comprehensive set of measures to address building renovation. These mainly comprise fiscal support measures, information campaigns and support mechanisms from energy service companies. The recovery and resilience plan includes EUR 2.5 billion for a large-scale renovation programme to increase the energy efficiency of residential buildings. Germany is carrying out a number of checks on products covered by eco-design and energy labelling that may be too low. This generates concerns with respect to the level playing field among economic operators and uncertainty as to the compliance levels of the concerned products, and therefore possible missed energy and CO_2 savings ([84]).

Germany has a traditionally strong manufacturing base of low-carbon technologies and clean energy components. These include wind, solar thermal, solar PV, energy-efficient appliances and energy-efficient construction and renovation. The competitiveness of high-quality products is sensitive to import prices of many raw materials and energy costs. Circularity of critical components could enhance the resilience of sensitive supply chains. In the last two years (Q4 2021 to Q1 2023), around 40% of businesses in clean energy-relevant manufacturing have had labour shortages that limit their production. In 2021, over 344 000 persons worked in Germany in renewable energy jobs ([85]). Enhancing workers' skills and appropriate vocational training can address the recruitment challenges. In order provide the manufacturing capacity for the clean energy technologies, in line with Net Zero Industry Act, the acceleration of planning and permitting processes is an important factor.

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,

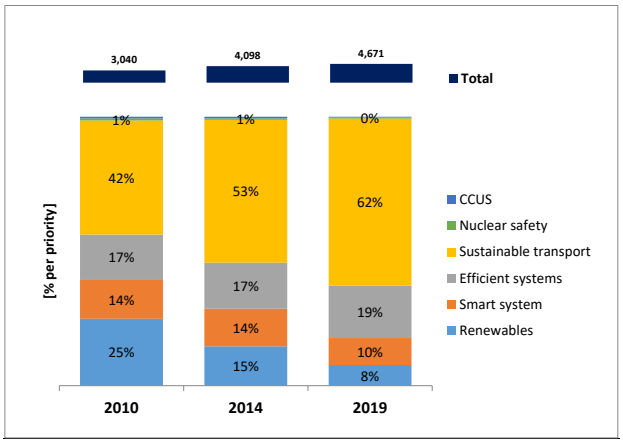
([84]) The internet-supported information and communication system for the pan-European market surveillance

([85]) Source: DIW/DLR/GWS (2022)

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). The German federal government is providing EUR 10 billion for an equity fund for technologies of the future, the "future fund" (*Zukunftsfonds*). The fund will primarily benefit start-ups in the growth phase with high capital requirements. Together with further private and public partners, the fund is projected to mobilise at least EUR 30 billion in venture capital for start-ups in Germany, and combined with existing financial instruments, over EUR 50 billion in venture capital are expected to be mobilised for start-ups in energy technologies in the next few years, together with private investors. (Federal Ministry of Finance, 2021).

Since 2014, half of the EU Member States have increased their patenting activity in line with the Energy Union R&I priorities, with green innovation champions such as Germany performing strongly both in absolute numbers and in the share of green patents in its overall innovation portfolio. On hydrogen technologies, in 2011-2020, patenting is led by the EU (28%) and Japan (24%), with the US (20%) the only major innovation centre to lose ground in the past decade. Germany (11%) ranks first in Europe for patenting hydrogen technologies, and Europe is gaining an edge in electrolyser manufacturing capacity.

Graph A7.5: **Patent families in Energy Union R&I priorities**



Source: JRC SETIS (2022)

Table A7.1:**Key Energy Indicators**

		GERMANY				EU			
		2018	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
ENERGY DEPENDENCE	**Import Dependency [%]**	63%	67%	64%	63%	58%	61%	57%	56%
	of Solid fossil fuels	42%	47%	44%	48%	44%	44%	36%	37%
	of Oil and petroleum products	95%	97%	97%	96%	95%	97%	97%	92%
	of Natural Gas	96%	100%	89%	90%	83%	90%	84%	83%
	Dependency from Russian Fossil Fuels [%]								
	of Hard Coal	42%	47%	48%	53%	40%	44%	49%	47%
	of Crude Oil	36%	32%	34%	34%	30%	27%	26%	25%
	of Natural Gas	49%	49%	65%	65%	40%	40%	38%	41%

		2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
ELECTRICITY	**Gross Electricity Production (GWh)**	648,309	650,449	653,723	640,468	606,917	575,462	588,343	-
	Combustible Fuels	410,318	419,596	404,286	385,445	334,214	302,330	328,342	-
	Nuclear	91,786	84,634	76,324	76,005	75,071	64,382	69,130	-
	Hydro	24,898	26,134	26,155	23,863	25,671	25,275	24,973	-
	Wind	80,624	79,924	105,693	109,951	125,894	132,102	114,647	-
	Solar	38,726	38,098	39,401	43,459	44,383	49,496	49,340	-
	Geothermal	133	175	163	178	197	231	244	-
	Other Sources	1,824	1,888	1,701	1,567	1,487	1,646	1,667	-
	Net Imports of Electricity (GWh)	- 48,282	- 50,525	- 52,459	- 48,736	- 32,667	- 19,029	- 18,575	-
	As a % of electricity available for final consumption	-9.1%	-9.5%	-9.9%	-9.3%	-6.4%	-3.9%	-3.7%	-
	Electricity Interconnection (%)			8.9%	10.5%	10.9%	11.4%	11.0%	11.5%

		2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
DIVERSIFICATION OF GAS SUPPLIES	**Gas Consumption (in bcm)**	**81.3**	**89.1**	**92.5**	**85.3**	**91.8**	**89.3**	**93.6**	**79.3**
	Gas Imports - by type (in bcm)	**102.5**	**97.4**	**118.7**	**88.3**	**94.8**	**80.4**	**84.8**	**n.a.**
	Gas imports - pipeline	102.5	97.4	118.7	88.3	94.8	80.4	84.8	n.a.
	Gas imports - LNG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.
	Gas Imports - by main source supplier (in bcm) (1)								
	Russia	43.6	58.7	62.1	43.1	46.2	52.5	55.4	n.a.
	Norway	22.0	10.7	11.1	2.5	2.6	16.5	16.2	n.a.
	Not specified	3.0	28.0	45.5	42.8	45.9	1.3	13.2	n.a.
	Netherlands	33.9	0.0	0.0	0.0	0.0	10.2	0.0	n.a.

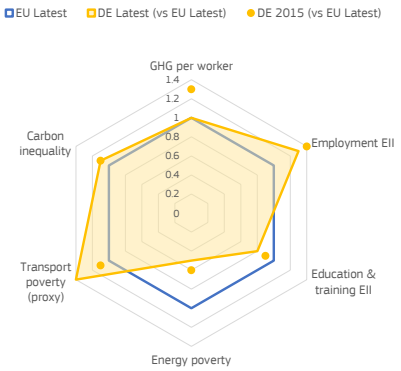
		2019	**2020**	**2021**	**2022**
	LNG Terminals				
	Number of LNG Terminals (2)	0	0	0	1
	LNG Storage capacity (m3 LNG)	0	0	0	174,000
	Underground Storage				
	Number of storage facilities	57	57	60	60
	Operational Storage Capacity (bcm)	24.9	24.9	25.2	25.2

		2019	**2020**	**2021**	**2022**
CLEAN ENERGY	**VC investments in climate tech start-ups and scale-ups (EUR Mln) (3)**	**327.4**	**1120.0**	**1255.5**	**n.a.**
	as a % of total VC investments in Germany	5.7%	16.4%	8.0%	n.a.
	Research & Innovation spending in Energy Union R&i priorites				
	Public R&I (EUR mln)	946.5	945.5	1027.9	n.a.
	Public R&I (% GDP)	0.027%	0.028%	0.029%	n.a.
	Private R&I (EUR mln)	13391.2	n.a.	n.a.	n.a.
	Private R&I (% GDP)	0.39%	n.a.	n.a.	n.a.

(1) The ranking of the main suppliers is based on the latest available figures (for 2021)
(2) FSRU included
(3) Venture Capital investments include Venture Capital deals (all stages) and Private Equity Growth/Expansion deals (for companies that have previously been part of the portfolio of a VC investment firm).
Source: Eurostat, Gas Infrastructure Europe (Storage and LNG Transparency Platform), JRC SETIS (2022), JRC elaboration based on PitchBook data (06/2022)

This Annex monitors Germany's progress in ensuring a fair transition towards climate neutrality and environmental sustainability, notably for workers and households in vulnerable situations. In Germany, the number of jobs in the green economy has quickly risen in recent years. To ensure a fair green transition in line with the Council Recommendation ([86]), the European Social Fund Plus (ESF+), Germany's recovery and resilience plan (RRP) ([87]) and the Just Transition Mechanism (see Annex 4) are providing crucial support in promoting skills for the green transition. The latter notably finances measures for skills development meant to prevent job losses and facilitate job-to-job transitions as part of decarbonisation.

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



Source: Eurostat, EMPL-JRC GD-AMEDI/AMEDI+ projects and World Inequality Database (see table A8.1)

While the green economy is expanding, employment in Germany's energy-intensive industries remains stable, but workers in declining activities need active support. The greenhouse gas (GHG) emissions intensity of Germany's workforce declined from 17.8 to 13.7 tonnes per worker between 2015 and 2021 and is now at the EU average (see Graph A8.1 and Table A8.1). Employment in Germany's energy-intensive industries (EII) represented a slightly declining share of 4.0% of total employment in 2020 (EU average: 3.0%). Employment in mining and quarrying decreased by 30.5% since 2015 to around 41 000 workers in 2021, while 19 430 people were directly employed in the lignite mining sector alone in 2020. Along with the decline of coal and lignite mining, the number of jobs in the environmental goods and services sector grew by 16.6% (to 657 035) in 2015-19 (EU-27: +8.3%), reaching 1.5% of total employment, close to the EU average (2.2%) (see Annex 9 for circular jobs specifically). A significant share of ESF+ funding contributes to fostering green skills. The federal programme *„Berufsbildung für nachhaltige Entwicklung befördern"* ([88]), co-financed by the ESF, provides training and guidance to promote climate and resource-saving awareness and action in daily work.

Upskilling and reskilling in declining and transforming sectors has the potential for further improvement, while labour shortages are prevalent. In energy-intensive industries, workers' participation in education and training declined from 9.8% in 2015 to 7.9% in 2022 and is below the EU average (10.4%), while 38% of German citizens believe they do not have the necessary skills to contribute to the green transition ([89]). Furthermore, the job vacancy rate is relatively high, including in construction which is key for the green transition (7.4% vs 4.0% in the EU-27, 2022) ([90]). To address this challenge, the Just Transition Mechanism provides training for workers in regions affected by the transition, together with a broader training offer at national and Länder levels to encourage re- and upskilling. A significant share of the ESF+ for Germany also aims to improve green skills.

Energy poverty indicators have overall declined in recent years. The share of the population unable to keep their homes adequately warm decreased from 4.1% in 2015 to 2.5% in 2019 ([91]). Between 2020 and 2021, it declined by

([86]) Council Recommendation of 16 June 2022 on ensuring a fair transition towards climate neutrality, 2022/C 243/04 covers employment, skills, tax-benefit and social protection systems, essential services and housing.

([87]) See 2022 Country Report (Annex 6) and Annex 3 for an overview.

([88]) Link to project by ESF Bund (2019-22): https://www.esf.de/portal/SharedDocs/PDFs/DE/Programme-2014-2020/BMU/bbne_rl_2017.pdf?__blob=publicationFile&v=6

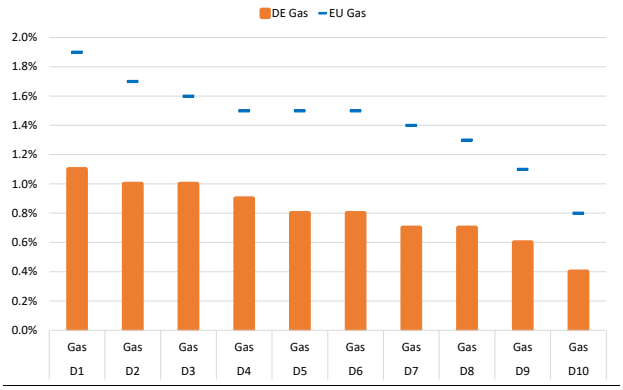
([89]) Special Eurobarometer 527. Fairness perceptions of the green transition (May – June 2022).

([90]) Eurostat (JVS_A_RATE_R2)

([91]) 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.

3.8 percentage points (pps), reaching 3.2% ([92]). In 2021, compared to the EU average, only 7.7% of the at-risk-of-poverty (AROP) population (EU: 16.4%) and 3% of lower-middle income households (in deciles 4-5) (EU: 8.2%) were considered to be affected. Before the energy price hikes, 23.6% of the total population and 49.4% of the (expenditure-based) AROP population had residential expenditure budget shares on electricity, gas, and other fuels ([93]) above 10% of their household budget (EU average: 26.9% and 48.2%, respectively).

Graph A8.2: **Distributional impacts of energy prices due to rising energy expenditure (2021-2023)**



Mean change of energy expenditure as a percentage (%) of total expenditure per income decile (D) due to observed price changes (August 2021 – January 2023 relative to the 18 months prior), excl. policy support and behavioural responses.
Source: EMPL-JRC GD-AMEDI/AMEDI+ projects, based on Household Budget Survey 2015 and Eurostat inflation data for CP0451 and CP045

The increased energy prices in 2021-2023 negatively affected households' budgets, with a particularly hard situation for low-income groups. As a result of energy price changes during the August 2021 to January 2023 period relative to the 18 months prior (cf. Annex 7), in the absence of policy support and behavioural responses, the portion of individuals living in households which spend more than 10% of their budget on energy would have increased by 14.7 pps for the whole population and by 14.9 pps among the (expenditure-based) AROP population, less than the EU-level increases (16.4 pps and 19.1 pps, respectively) ([94]). Expenditure shares of low and lower-middle income groups for gas would have increased the most ([95]), as shown in Graph A8.2. Among the (expenditure-based) AROP population, the share of individuals living in households with budget shares for private transport fuels above 6% ([96]) would have increased more than the EU average (11.0 pps vs 5.3 pps) to 52.3% in January 2023 due to the increase in transport fuel prices. The RRP includes measures to increase energy efficiency via renovation of the building stock.

Access to public transport shows an urban-rural divide, among the worst perceptions of affordability in the EU. Citizens have mixed perceptions concerning public transport being available (51% vs 55% in the EU), affordable (43% vs 54% in the EU) and of good quality (57% vs 60% in the EU). As regards these perceptions, rural areas in Germany perform worse than urban areas, and worse when compared to rural areas in the EU overall ([97]). The average carbon footprint of the top 10% of emitters among the population in Germany is about 5.4 times higher than that of the bottom 50% (see Graph A8.1), i.e. slightly more pronounced than the EU average (5.0 times). Germany's RRP includes support for sustainable transport as well as a tax exemption for e-vehicles. In Germany, the average levels of air pollution in 2020 stood below the EU average (9.1 vs 11.2 µg/m PM2.5), with 15% of the population living in regions exposed to critical levels of air pollution ([98]), leading to significant health impacts, in particular on vulnerable groups, and 28 910 premature deaths annually. ([99])

([92]) A break in the time series hinders comparison of the levels before 2019 (inclusive) with the levels from 2020 onwards.

([93]) Products defined according to the European Classification of Individual Consumption according to Purpose (ECOICOP): CP045.

([94]) EMPL-JRC GD-AMEDI/AMEDI+ ; see details in the related technical brief.

([95]) For Germany, the disaggregated expenditure data for CP0451, CP0453 and CP0455 are missing in the HBS-2015.

([96]) ECOICOP: CP0722.

([97]) EU (rural): 46%, 48%, 56% respectively. Special Eurobarometer 527.

([98]) Two times higher than the recommendations in the WHO Air Quality Guidelines (annual exposure of 5µg/m3)

([99]) EEA- Air Quality Health Risk Assessment

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

Indicator	Description	DE 2015	DE Latest	EU Latest
GHG per worker	Greenhouse gas emissions per worker - CO2 equivalent tonnes	17.8	13.7 (2021)	13.7 (2021)
Employment EII	Employment share in energy-intensive industries, including mining and quarrying (NACE B), chemicals (C20), minerals (C23), metals (C24), automotive (C29) - %	4.2	4 (2020)	3 (2020)
Education & training EII	Adult participation in education and training (last 4 weeks) in energy-intensive industries - %	9.8	7.9 (2022)	10.4 (2022)
Energy poverty	Share of the total population living in a household unable to keep its home adequately warm - %	4.1	3.3 (2021)	6.9 (2021)
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	Average emissions per capita of top 10% of emitters vs bottom 50% of emitters	5.5	5.4 (2020)	5 (2020)

Source: Eurostat (env_ac_ainah_r2, nama_10_a64_e, ilc_mdes01), EU Labour Force Survey (break in time series in 2021), EMPL-JRC GD-AMEDI/AMEDI+ projects and World Inequality Database (WID).

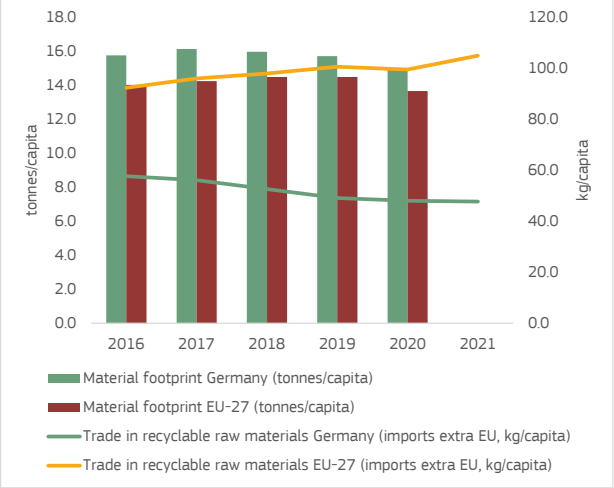
The circular economy transition is key to delivering on the EU's climate and environmental goals and provides large socio-economic benefits. It spurs job growth, innovation and competitiveness and fosters resilience and resource security. The circularity transition of industry, the built environment and agri-food can generate significant environmental improvements (see Annex 6), as they rank among the most resource-intensive systems.

Germany is on track to meet the EU's circular economy goals, although there are still areas where improvement is needed. The EU's 2020 circular economy action plan (CEAP) aims at doubling the circular material use rate between 2020 and 2030. Germany's use of circular materials rose from 11.8% in 2017 to 12.7% in 2021, compared to the EU average of 11.7%. This shows a steady increase in recent years, but Germany needs to make additional efforts to catch up with EU leaders, for example to promote not only circular construction materials, but also the re-use of materials in the built environment. The CEAP also aims to significantly decrease the EU's material footprint. Although on a slight downward trend, Germany's material footprint (15 tonnes per head) was above the EU-27 average (13.7 tonnes per head) in 2020. The reduction path is not constant, and the footprint increased in 2017. The labour market benefits of the circular transition remain limited, with no growth in 2019.

Germany recently adopted new policies to address circular economy challenges, and more measures are planned. For example, in 2020, Germany – as the first EU Member State – introduced a new general 'duty of care' in its Circular Economy Act (*Kreislaufwirtschaftsgesetz*), obliging producers and distributors to prevent goods from becoming waste by introducing certain measures, for example selling goods at a reduced rate or donating goods. Germany will finally develop a comprehensive circular economy strategy, work on which began in December 2022. It will be key that this strategy contains concrete and measurable targets, including for the different sectors, and monitoring and control mechanisms.

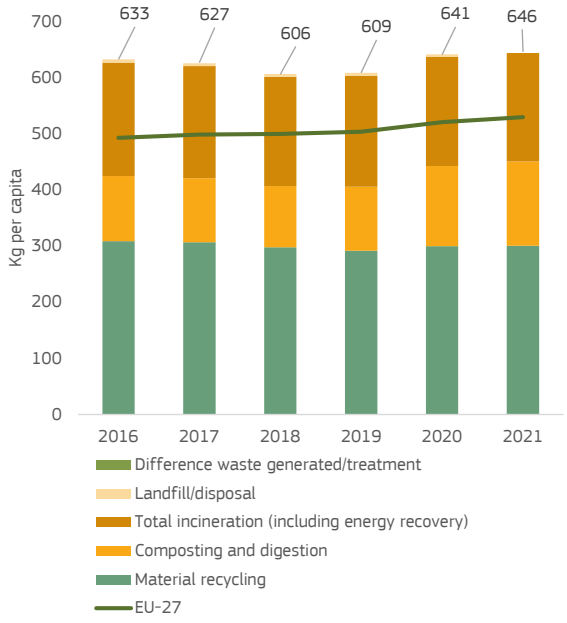
Germany was the top recycler of municipal waste in 2020, but the share of incineration, including with energy recovery, has remained unchanged, as has the amount of waste generated. It has the highest recycling rate across the EU. In 2021 Germany recycled 71.1 % of its municipal waste, which is well above the EU 2020 recycling target of 50% of municipal waste. Given the overall high level of municipal waste of 646 kg per head, waste prevention measures taken so far have not been impactful enough or have yet to show their impact.

Graph A9.1: **Trend in material use**



Source: Eurostat

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



Source: Eurostat

Further accelerating the circular economy transition of the industrial system is important for Germany's strategic

Table A9.1: **Overall and systemic indicators on circularity**

AREA	2016	2017	2018	2019	2020	2021	EU-27	Latest year EU-27
Overall state of the circular economy								
Material footprint (tonnes/capita)	15.7	16.1	16.0	15.7	15.0	-	13.7	2020
YoY growth in persons employed in the circular economy (%)[1]	2.8	1.4	2.0	0.0	-	-	2.9	2019
Water exploitation index plus (WEI+) (%)	6.2	4.8	5.7	2.6	-	-	3.6	2019
Industry								
Resource productivity (purchasing power standard (PPS) per kilogram)	2.3	2.4	2.5	2.7	2.7	2.7	2.3	2021
Circular material use rate (%)[2]	12.2	11.8	12.4	12.9	12.9	12.7	11.7	2021
Recycling rate (% of municipal waste)	67.1	67.2	67.1	66.7	70.3	71.1	49.6	2021
Built environment								
Recovery rate from construction and demolition waste (%)[3]	-	-	93.0	-	94.0	-	89.0	2020
Soil sealing index (base year = 2006)[4]	103.2	-	106.0	-	-	-	108.3	2018
Agri-food								
Food waste (kg per capita)[5]	-	-	-	-	131.0	-	131.0	2020
Composting and digestion (kg per capita)	116.0	114.0	109.0	114.0	143.0	150.0	100.0	2021

(1) Persons employed in the circular economy only tracks direct jobs in selected sub-sectors of NACE codes E, C, G and S; (2) the circular material use rate measures the share of material recovered and fed back into the economy in overall material use; (3) the recovery rate of construction and demolition waste includes waste which is prepared for reuse, recycled or subject to material recovery, including through backfilling operations; (4) soil sealing: 2016 column refers to 2015 data; (5) food waste includes primary production, processing and manufacturing, retail and distribution, restaurants and food services, and households.
Source: Eurostat, European Environment Agency

independence and resilience. Currently, Germany's material import dependency stands at 40.6% compared to 22.9 % for the EU, however the economy, particularly industry, is more efficient at using materials to produce wealth than the EU average, with a resource productivity of 2.7 purchasing power standard per kilogram vs. 2.3 for the EU average (see Annex 5). Making better use of the potential of circularity, including strengthening secondary raw material use in industry will help reduce resource dependency, in particular on fossil fuel-based raw materials.

The built environment system continues to exacerbate the depletion of resources despite recent improvements. At 94%, the recovery rate of construction and demolition waste is well above the EU average of 89%. But the use of re-used and recycled building materials is still hampered by building regulations. Germany ranks above the EU average with a net land take ([100]) of 119.9 m^2/km^2 (EU-27 average: 83.8 m^2/km^2) ([101]). Germany will need to take more measures to meet its national target of restricting daily land-take to under 30 ha by 2030. Daily land take for the period 2017-2020 was 54 ha.

The agri-food system needs to be adapted to reduce pollution and food waste, but Germany is advanced as regards composting and digestion. In 2020, food waste per person was 131 kg – at EU average. Intense agriculture continues to exert high pressure on the environment: groundwater quality improved only marginally, and water pollution caused by nitrates remains a serious concern. There are continuing acute problems with excess plant and algae growth due to high concentrations of nutrients in the Baltic and North Seas. Still, Germany is well above the EU average as regards anaerobic digestion: 150 kg per head compared to 100 kg in 2021. Anaerobic digestion can help Germany's strategic autonomy by generating biomethane and/or producing organic fertilisers. Germany is advanced on the recovery of phosphorus from sewage sludge.

There remains a financing gap in the circular economy, including waste management. Additional investments will be required to address growing needs. The financing gap was estimated at EUR 6 billion per year between 2014 and 2020, while investment needs were estimated to be at least EUR 11.5 billion per year, and investment baselines were EUR 5.5 billion per year (see Annex 6). Additional investments are necessary to upgrade plastic recycling and digitalise waste treatment infrastructure.

([100]) The net land take concept combines land take with land return to non-artificial land categories (re-cultivation).

([101]) European Environment Agency, 2023, Land take in Europe.

Digital transformation is key to ensuring a resilient and competitive economy. In line with the Digital Decade Policy Programme, and in particular with the targets in that Programme 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 the Recovery and Resilience Plan (RRP). As of May 2023, Germany allocates more than 51% of its total RRP budget to digital (EUR 13.5 billion) ([102]).

The Digital Decade Policy Programme sets out a pathway for Europe's successful digital transformation by 2030. The Programme provides a framework for assessing the EU's and Member States' digital transformation, notably via the Digital Economy and Society Index (DESI). It also provides a way for the EU and its Member States to work together, including via multi-country projects, to accelerate progress towards the Digital Decade digital targets and general objectives ([103]). More generally, several aspects of digital transformation are particularly relevant in the current context. In 2023, the European Year of Skills, building the appropriate skillset to make full use of the opportunities that digital transformation offers is a priority. A digitally skilled population increases the development and adoption of digital technologies and leads to productivity gains ([104]). Digital technologies, infrastructure and tools all play a role in the fundamental transformation needed to adapt the energy system to the current structural challenges ([105]).

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 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 (as part of the broader infrastructure measure Digital Pact for Schools (DigitalPakt Schule)), an education platform and educational centres of excellence. Moreover, Germany is implementing some measures to support the up- and reskilling of its workforce, including in the context of measures that focus on the digitalisation of businesses (e.g. European Digital Innovation Hubs or the Digital Now (*Digital Jetzt)* investment support scheme).

Very high capacity network (VHCN) coverage in rural areas and fibre coverage in general remain a key challenge for Germany. Despite recent improvements, Germany is still below the EU average for VHCN in rural areas (30% ([106]) compared to 45% in 2022). Fibre coverage and take-up, overall and in rural areas in particular, are increasing very slowly and remain considerably below the EU average (19% overall and 17% rural). However, Germany scores above the EU average in overall 5G coverage in 2022 (93% vs the EU average of 81%). 5G coverage on the 3.4-3.8 GHz spectrum band, which is essential for enabling advanced applications requiring large spectrum bandwidth, is 36% in Germany, below the EU average of 41%. The German RRP does not include measures to support the deployment of fibre connections, but the Federal Government allocated EUR 12 billion ([107]) for this purpose. In July 2022, a gigabit strategy was adopted ([108]), which includes goals of 15 million new fibre to the premises (FTTP) connections by the end of 2025 and on the availability of FTTP connections for all German households by 2030. A revised funding programme came into effect in 2023. These measures are expected to accelerate fibre deployment in Germany.

The country has a mixed performance on digitalisation of businesses. Germany scores above the EU average for most indicators in this area, e.g. digital intensity for SMEs and the

([102]) The share of financial allocations that contribute to digital objectives has been calculated using Annex VII of the RRF Regulation.

([103]) The Digital Decade targets as measured by DESI indicators and complementary data sources are integrated to the extent currently available and/or considered particularly relevant in the MS-specific context.

([104]) See for example OECD (2019): OECD Economic Outlook, Digitalisation and productivity: A story of complementarities, OECD Economic Outlook, Volume 2019 Issue 1 | OECD iLibrary (oecd-ilibrary.org).

([105]) The need and possible actions for a digitalisation of the energy system are laid out in the Communication 'Digitalisation the energy system – EU action plan' (COM(2022)552.

([106]) Key Indicators — Digital Scoreboard - Data & Indicators (digital-agenda-data.eu)

([107]) BMDV - Die Gigabitförderung 2.0 (bund.de)

([108]) BMDV - Gigabitstrategie der Bundesregierung verabschiedet

adoption of advanced digital technologies like big data and artificial intelligence, except for uptake of cloud computing services, which is slightly below the EU average. The performance of SMEs is around the EU average for several indicators. The proportion of SMEs selling online is 19% (in line with the EU average), their e-commerce turnover is 12% (just above the EU average of 11%) and the share of SMEs selling online cross-border is at 10% (slightly above the EU average of 9%). There are several initiatives in Germany that support SMEs in their digital transformation, such as the Digital Hub initiative, the national SME strategy (*Mittelstandsstrategie*), and the 'Mittelstand-Digital' (SMEs Digital) programme - which itself consists of the three pillars: (i) the 'Mittelstand Digital Innovation Hubs' network; (ii) the Digital Now (Digital Jetzt) investment support scheme; and (iii) the 'Cybersecurity for SMEs Initiative', (*IT-Sicherheit-in-der-Wirtschaft*). The German RRP includes several measures to support the digitalisation of enterprises and the development and integration of advanced digital technologies. These measures include the Important Project for Common European Interest (IPCEI) on Next Generation Cloud Infrastructure and Services and the IPCEI on Microelectronics and Communication Technologies, as well as a vehicle manufacturer and supplier investment programme.

Germany is starting to improve in the digitalisation of public services, but implementation remains slow and a crucial reform issue in Germany (see Annex 13 for more details on structural challenges). The country scores slightly below the EU average on the provision of digital public services for businesses and slightly above the EU average 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 71 out of 100, in line with 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 ([109]). The German RRP includes several measures to support the implementation of digital public services, which are expected to improve performance in this area if implemented timely and effectively. These measures account for more than 50% of digital investments under the plan.

([109]) Source: National Regulatory Control Council: Monitor Digital Administration, Number 6

Table A10.1:**Key Digital Decade targets monitored by DESI indicators**

	Germany			EU	Digital Decade target by 2030 (EU)
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	
Digital skills					
At least basic digital skills	**NA**	**49%**	**49%**	**54%**	**80%**
% individuals		2021	2021	2021	2030
ICT specialists ([1])	**4.7%**	**4.9%**	**4.9%**	**4.5%**	**20 million**
% individuals in employment aged 15-74	2020	2021	2021	2021	2030
Digital infrastructure/connectivity					
Fixed Very High Capacity Network (VHCN) coverage	**56%**	**75%**	**70%**	**73%**	**100%**
% households	2020	2021	2022	2022	2030
Fibre to the Premises (FTTP) coverage ([2])	**14%**	**15%**	**19%**	**56%**	**-**
% households	2020	2021	2022	2022	2030
Overall 5G coverage	**18%**	**87%**	**93%**	**81%**	**100%**
% populated areas	2020	2021	2022	2022	2030
5G coverage on the 3.4-3.8 GHz spectrum band	**NA**	**NA**	**36%**	**41%**	**-**
% populated areas			2022	2022	2030
Digitalisation of businesses					
SMEs with at least a basic level of digital intensity	**NA**	**NA**	**77%**	**69%**	**90%**
% SMEs			2022	2022	2030
Big data ([3])	**18%**	**18%**	**18%**	**14%**	**75%**
% enterprises	2020	2020	2020	2020	2030
Cloud ([3])	**NA**	**32%**	**32%**	**34%**	**75%**
% enterprises		2021	2021	2021	2030
Artificial Intelligence ([3])	**NA**	**11%**	**11%**	**8%**	**75%**
% enterprises		2021	2021	2021	2030
Digitalisation of public services					
Digital public services for citizens	**NA**	**76**	**78**	**77**	**100**
Score (0 to 100)		2021	2022	2022	2030
Digital public services for businesses	**NA**	**80**	**81**	**84**	**100**
Score (0 to 100)		2021	2022	2022	2030
Access to e-health records	**NA**	**NA**	**71**	**71**	**100**
Score (0 to 100)			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 evaluation will also be monitored separately and taken into consideration when interpreting VHCN coverage data in the Digital Decade.
(3) At least 75 % of Union 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 green and digital transition.

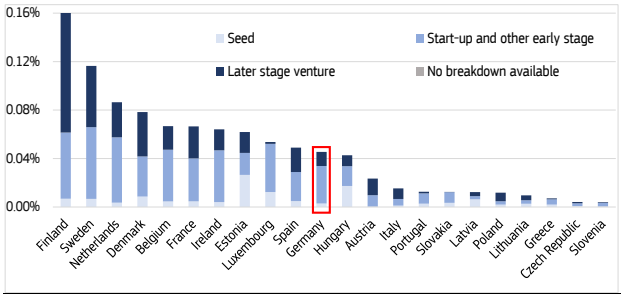
Germany is a 'strong innovator', but its performance is increasing at a lower rate than the EU's. According to the 2022 edition of the European Innovation Scoreboard ([110]) the country's performance stands at 117.5% of the EU average and is above the average of the strong innovators (114.5%). However, its performance lead over the EU is shrinking. Amongst the main reasons are weakness related to human resources, in particular for small and medium-sized enterprises (SMEs), and the relatively low level of venture and growth capital.

Total R&D intensity ([111]) was 3.13% in 2021, above the EU target of 3%. However, it is still below Germany's own target of 3.5% for 2025, set in 2018 ([112]), and it has been declining compared to its 2019 value (3.17%). The latest report by the Expert Commission on Research and Innovation welcomed the pursuit of the 3.5% target and highlighted the need to allocate more resources to green and digital research and innovation, particularly in support of radical innovations ([113]).

While the private sector contributes significantly to R&D spending, innovation activity in SMEs continues to decline. SMEs' share of business R&D expenditure (as % of GDP) in Germany has stagnated at a low level over the last decade and remains significantly below the EU average (Germany: 0.19% in 2019, EU: 0.34%). Innovation expenditure remains concentrated in relatively few and mainly large businesses (see Annex 12). To improve the situation, Germany introduced a R&D tax incentive system in 2020, the effect of which has still to materialise ([114]). Furthermore, Germany's recovery and resilience plan (RRP) contains various measures to support SME innovation for green technologies, e.g., linked to renewable hydrogen and climate-friendly construction and innovation.

Germany accounts for the largest share of unicorns (privately owned company reaching a valuation of $ 1 billion or more) in the EU ([115]), but the available venture capital market remains small in international comparison. While the country's venture capital increased between 2020 and 2021 (from 0.054% to 0.076% of GDP), it remains just above the EU average (0.074% in 2021). Particularly in international comparison, the availability of venture capital remains low ([116]). The government has put in place support programmes for start-ups, e.g. the Future Fund ([117]), but the majority of the funds focus on start-ups at an early stage of their development. Therefore, firms' access to growth and later-stage capital remains a major challenge and has led many high-potential German start-ups to turn to foreign investors ([118]).

Graph A11.1: **Venture Capital in Germany (2022) as % of GDP**



Source: OECD (2022), 'Venture capital investments', Structural and Demographic Business Statistics (database), accessed on 10/01/2023

The lack of skilled workers is hampering investment in innovation and digitalisation.

([110])2022 European Innovation Scoreboard, Country profile: Germany https://ec.europa.eu/assets/rtd/eis/2022/ec_rtd_eis-country-profile-de.pdf The EIS provides a comparative analysis of innovation performance in EU countries, including the relative strengths and weaknesses of their national innovation systems (also compared to the EU average).

([111])defined as gross domestic expenditure on R&D as a percentage of GDP

([112])The target was reiterated in the Coalition Agreement of the new German government in 2021.

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

([114])Bundesbericht Forschung und Innovation 2022 - Hauptband (bundesbericht-forschung-innovation.de)

([115])SRIP report (europa.eu)

([116])https://soet-pdf.s3.eu-west-2.amazonaws.com/State_of_European_Tech_2021.pdf

([117])BMWK - Future Fund

([118])OECD Innovation Review 2022, *50b32331-en.pdf (oecd-ilibrary.org).

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

Germany	2010	2015	2019	2020	2021	EU average (1)
Key indicators						
R&D intensity (GERD as % of GDP)	2.73	2.93	3.17	3.13	3.13	2.26
Public expenditure on R&D as % of GDP	0.9	0.92	0.98	1.04	1.05	0.76
Business enterprise expenditure on R&D (BERD) as % of GDP	1.83	2.01	2.18	2.09	2.09	1.49
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	11.2	11.2	10.47	:	:	9.8
Patent Cooperation Treaty patent applications per billion GDP (in PPS)	7.7	6.5	5.9	:	:	3.3
Academia-business cooperation						
Public-private scientific co-publications as % of total publications	9.4	9.9	10.8	10.9	10.8	7.1
Public expenditure on R&D financed by business enterprise (national) as % of GDP	0.105	0.117	0.117	:	:	0.054
Human capital and skills availability						
New graduates in science & engineering per thousand pop. aged 25-34	15.1	17.1	19.7	17.6	:	16.0
Public support for business enterprise expenditure on R&D (BERD)						
Total public sector support for BERD as % of GDP	:	0.082	0.084	:	:	0.194
Green innovation						
Share of environment-related patents in total patent applications filed under Patent Cooperation Treaty (%)	17.1	14.2	13.5	:	:	13.3
Finance for innovation and economic renewal						
Venture capital (market statistics) as % of GDP	0.032	0.026	0.049	0.054	0.076	0.074
Employment in fast-growing enterprises in 50% most innovative sectors	5.9	4.6	6.1	:	:	5.5

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

High-growth firms in Germany account for a lower share of employment than the EU average (Germany: 13.54%, EU: 15.90% in 2019). This is underlined by a recent OECD study pointing to shortages of highly skilled staff in 7 out of 10 high-skilled occupations, one of the highest rates in the OECD ([119]) (see Annex 14). To overcome the shortage of skilled labour, the RRP includes various measures to encourage skills-upgrading and address labour shortages, such as the Digital Education Platform and Educational Centres of Excellence. Furthermore, the Federal Government is focusing more on skilled migration and, in 2020, introduced the Skilled Immigration Act, which aims to ease administrative burdens and simplify requirements for the recognition of qualifications in the information and communications technology sector, where skill shortages are particularly severe ([120]). Reforms under the Act are currently underway and, in November 2022, the Federal government decided on key points for improving and modernising immigration law, aimed at increasing the immigration of skilled workers ([121]). In its 2023 report ([122]), the Commission of Experts for Research and Innovation, reiterated the need to secure the skilled labour base and underlined the necessity to make better use of the existing skilled labour base and to attract foreign skilled workers.

([119])OECD Innovation Review 2022: *50b32331-en.pdf (oecd-ilibrary.org).

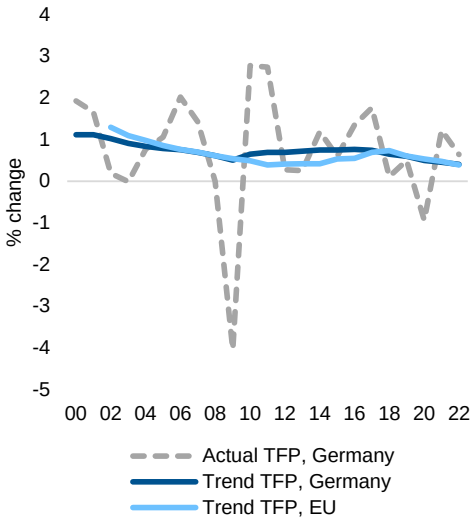
([120])https://www.deutschland.de/en/topic/business/the-skilled-labour-immigration-act-working-in-germany.

([121])https://www.bmi.bund.de/SharedDocs/pressemitteilungen/DE/2022/11/eckpunkte-fachkraefte.html.

([122])https://www.e-fi.de/fileadmin/Assets/Gutachten/2023/EFI_Summary_2023.pdf

Productivity in Germany has recovered from the disruptions caused by the pandemic but growth remains subdued. The World Competitiveness Ranking by the International Institute for Management Development (IMD) places Germany as the 15th most competitive economy in the world, partly due to its economic strength, stable and predictable framework conditions, skilled workforce and effective legal environment. ([123]) At 122% of the EU average in 2022, labour productivity is high in Germany (GDP per hour worked). Productivity was strongly affected by the COVID-19 pandemic, causing significant fluctuations in 2020 and 2021 (see Graph A12.1). Per capita labour productivity declined by 2.7% in 2020, but recovered the year after, increasing by 2.5% in 2021. In 2022, the soaring costs for energy and other inputs caused further disruption, but productivity is expected to recover in 2023-2024 in line with the EU average. Cumulated total factor productivity gains remain above the EU average, driven in particular by manufacturing and ICT, though growth has slowed over the last years.

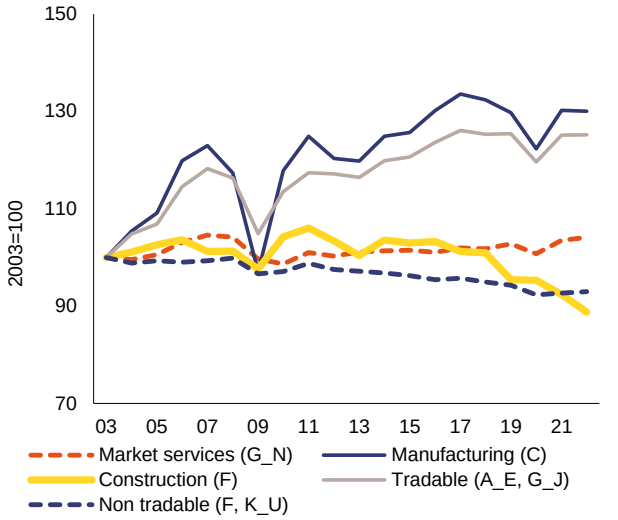
Graph A12.1: **Total factor productivity**



Source: European Commission.

The German National Productivity Board sees the future competitiveness of the German economy as depending largely on its ability to provide the right framework conditions for using innovations and new technologies to increase productivity and keep employment levels high. ([124]) While the long-term slowdown in productivity is a global phenomenon, productivity growth in Germany is also hampered by country-specific structural weaknesses, including in respect to digitalisation (see Annex 10), research and innovation (see Annex 11) as well as skills shortages and mismatches (see Annex 14). Entrepreneurship can also further contribute to boosting innovation and productivity. In July 2022, the German government adopted a comprehensive start-up strategy ([125]) aimed at improving regulatory framework conditions, strengthening financing for start-ups and facilitating spin-offs from science and universities.

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



Source: European Commission.

Germany has been hit particularly hard by the energy crisis because of its large manufacturing base. The soaring prices imposed new challenges in particular for energy-intensive sectors, such as metals processing, chemicals, paper, and non-metal mineral products, where production declined by 10% in 2022. ([126]) Industry contributed noticeably to the overall gas savings. In the last quarter of 2022, its gas consumption was 23% below the average of the last four

([123]) Institute for Management Development, World competitiveness ranking 2022.

([124]) German Council of Economic Experts, Annual Report 2022/23 "Managing the Energy Crisis in Solidarity and Shaping the New Reality", 9 November 2022, https://www.sachverstaendigenrat-wirtschaft.de

([125]) BMWK, 27.7.2022 BMWK - Startup roadmap ready: Federal Cabinet adopts first comprehensive startup strategy

([126]) Federal Statistical Office of Germany, *Produktionsentwicklung in energieintensiven Industriezweigen*, https://www.destatis.de/

years. ([127]) Large firms which produce globally find it easier to balance out fluctuations in energy and raw material prices and to pass on the higher costs to their customers, while for many SMEs the recent cost increases pose a major. ([128]) Insolvency cases increased towards the end of 2022, though the numbers were still relatively low in a long-term comparison. ([129]) The German government has adopted substantial measures to help private households and firms cope with the soaring costs for gas, heat and electricity (see Annex 7). In October 2022, producer prices started to decline for the first time in two and a half years, but price levels are set to remain elevated.

High energy costs are increasing the pressure on firms to reduce their energy intensity and accelerate structural change. The soaring energy prices strongly affected the business environment and bear the risk that firms in energy-intensive industries, which are in particularly strong competition with companies outside the EU, may shift at least parts of their production abroad. ([130]) The German Council of Economic Experts sees the following sectors particularly concerned, as they have the highest gas consumption per euro of sales: the metal production and processing industries, the manufacture of glass and glassware, ceramics, processing of stone and earth, as well as energy-intensive products in the basic chemical industry. ([131])

Germany's industry would benefit from strengthening the resilience of strategic value chains. The supply disruptions caused by the pandemic and Russia's war against Ukraine have affected large parts of the German economy and revealed its sensitivity to disruptions in global value chains. Studies estimated that from the beginning of 2021 to mid-2022, goods worth almost EUR 64 billion could not be manufactured due to supply bottlenecks and that German GDP could have been 1.2% higher in 2021 and 1.5% higher in mid-2022 if all new orders had been processed. ([132]) Dependencies exist for a broad range of raw materials and components, including critical raw materials necessary for the green and digital transition. While supply disruptions have started to ease, in the last quarter of 2022 77% of firms were still affected by shortages of important materials and primary products, considerably above the EU average (48%). The automotive and mechanical engineering industries have been particularly affected.

Barriers to private and public investment include skills shortages, capacity constraints, bureaucratic burden and slow progress in digitalisation. According to the EIB Investment Survey 2022, firms cite as most important impediments the availability of skilled staff (93%), energy costs (83%) and uncertainty about the future (74%). The lack of skills and workforce (see also Annex 14) has become a major bottleneck particularly for SMEs and risks delaying the digital and green transition. ([133]) However, other obstacles also hamper investment: Capacity constraints and lack of digitalisation in public administration (see also Annex 13), especially at municipal level, also affect private investment. Moreover, innovation expenditure is increasingly concentrated in large companies and few sectors, whereas SMEs' innovation activity is modest (see also Annex 11).

Germany still has scope to further improve the business environment by reducing the administrative burden for SMEs and streamlining planning and permitting procedures. Germany still has substantial scope to reduce the administrative burden for SMEs, including by modernising registers and digitalising public services in the context of the Online Access Act and beyond. However, progress in this respect has been slow and the related measures in the

([127])Bundesnetzagentur, 6.1.2023, *Gasversorgung 2022,* https://www.bundesnetzagentur.de/

([128])*DIHK Konjunkturumfrage*, February 2023, https://www.dihk.de/

([129])Statistisches Bundesamt, 11.1.20203, https://www.destatis.de/DE/Presse/Pressemitteilungen/

([130])Leibniz-Institut für Wirtschaftsforschung Halle, Pressemitteilung 10 November 2022, https://www.iwh-halle.de/presse/pressemitteilungen/

([131])German Council of Economic Experts, Annual Report 2022/23 "Managing the Energy Crisis in Solidarity and Shaping the New Reality", 9 November 2022, https://www.sachverstaendigenrat-wirtschaft.de

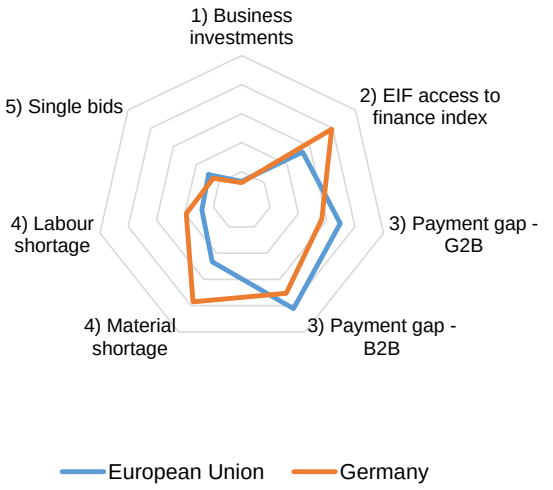
([132])Institut für Makroökonomie und Konjunkturforschung (IMK), https://www.imk-boeckler.de/de/pressemitteilungen-15992-lieferengpasse-kosteten-deutsche-industrie-bis-mitte-2022-knapp-64-milliarden-euro-44984.htm

([133])SME Performance Review 2021/2022 and country fact sheet for Germany, 20.6.2022, https://single-market-economy.ec.europa.eu/smes/sme-strategy/sme-performance-review_en

German recovery and resilience plan do not encompass the full scope of the Online Access Act (see also Annex 10). Germany plays an important role in Europe's transition to climate neutrality, in line with the Green Deal Industrial Plan ([134]) and Europe's ambitious climate targets, in respect to both supply of and demand for clean technologies. However, lengthy planning and permitting procedures for investment projects risk compromising progress in respect to the green transition, in particular regarding wind power, energy infrastructure and clean tech projects (see also Annexes 6 and 7). Federal and regional authorities have already taken a number of steps to streamline planning and permitting procedures ([135]), including in the context of an ongoing project by the Single Market Enforcement Taskforce. However, efficient implementation and adequate resources will be needed at all levels of administration.

Germany has scope for further improvement in enforcing Single Market rules. While Germany's trade integration in the Single Market for goods is above the EU average, it is relatively low for services. The Single Market Scoreboard ([136]) indicates scope for further improvement, for example with respect to ongoing infringement cases. While the number of infringements has decreased slightly, Germany has the second highest number of pending cases in the EU (up from the 4th place in 2020). Problematic areas include taxation, environment and transport, as well as compliance with the Professional Qualifications Directive ([137]) and Proportionality Test Directive. ([138]) Germany's SOLVIT centre, designed to help citizens and businesses deal with potential breaches of EU rights in other EU countries, would benefit from additional human resources. As regards public procurement, Germany's performance is in line with the EU average, but there still seems room for improvement, for example regarding the number of procurements advertised on Tenders Electronic Daily (TED) and the quality of information provided. Reducing administrative burden could also promote competition in public procurement, where the percentage of single bids has increased from 19% to 25% in the last two years. ([139])

Graph A12.3: **Business environment and productivity drivers**



Source: 1) % of GDP, 2021 Eurostat;
2) composite indicator, 2021 European Investment Fund access to finance index;
3) average payment delay in number of days, 2022 Intrum;
4) % of firms in manufacturing facing constraints, 2022 European Commission business consumer survey;
5) proportion of contracts awarded with a single bidder, 2022 Single Market Scoreboard.

Reducing restrictive regulation in services could boost competition and productivity. Restrictions on regulated professions remain high in comparison to the EU average for architects, civil engineers, accountants/tax advisers, patent/trademark agents and lawyers, despite some recent reforms, mostly concerning restrictions on company ownership and multidisciplinary partnerships in 2021 in tax and legal professions. Exclusive rights to exercise tax advice and legal services remain very broad, preventing development of innovative services and the up-take of modern IT solutions ("LegalTech" in legal services). Significant requirements remain for accountants on shareholding and joint exercise of activities, and for architects in relation to restrictions on shareholding and company

([134])Green Deal Industrial Plan for the Net-Zero Age. COM(2023) 62 final

([135])*Übersicht über wichtige umgesetzte Beschleunigungsmaßnahmen des BMWK zum Erneuerbaren-Ausbau und zum Stromnetzausbau*, 8.2.2023 beschleunigungsmassnahmen-des-bmwk-zum-erneuerbaren-ausbau.pdf

([136])Single Market Scoreboard, https://single-market-scoreboard.ec.europa.eu/performance-overview_en

([137])2005/36/EC

([138])2018/935/EU

([139])https://single-market-scoreboard.ec.europa.eu/business-framework-conditions/public-procurement_en

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

	POLICY AREA	INDICATOR NAME	2018	2019	2020	2021	2022	EU27 average (*)
HEADLINE INDICATORS	Economic Structure	Net private investment, level of private capital stock, net of depreciation, % GDP (1)	2.8	2.8	1.9	2	2	**3.7**
		Net public investment, level of public capital stock, net of depreciation, % GDP (1)	0.1	0.1	0.3	0.2	0	**0.4**
		Real labour productivity per person in industry (% yoy)(2)	-0.9	-1.8	-5	5.7	-0.4	**1.4**
	Cost competitive-ness	Nominal unit labour cost in industry (% yoy)(2)	3	4.2	3.1	-2.5	3.9	**2.9**
RESILIENCE	Shortages	Material shortage (industry), firms facing constraints, % (3)	21	15	13	56	77	**47**
		Labour shortage using survey data (industry), firms facing constraints, % (3)	25	19	10	23	39	**28**
		Vacancy rate (business economy)(4)	3.3	3.5	2.6	3.5	4.8	**3.1**
	Strategic dependencies	Concentration in selected raw materials, Import concentration index based on a basket of critical raw materials (5)	0.21	0.18	0.15	0.17	0.19	**0.18**
		Installed renewables electricity capacity, % of total electricity produced (6)	52.8	54.6	56.9	58.1	n.a.	**50.9**
SINGLE MARKET	Single Market integration	EU trade integration, % (7)	22.9	23.0	21.0	23.4	25.6	**45.8**
	Restrictions	EEA Services Trade Restrictiveness Index (8)	0.05	0.05	0.05	0.05	0.05	**0.05**
	Public procurement	Single bids, % of total contractors (9)	20	22	19	20	25	**29**
BUSINESS ENVIRONMENT - SMEs	Investment obstacles	Impact of regulation on long-term investment, % of firms reporting business regulation as major obstacle (10)	37.1	29.4	31.5	29.1	31.8	**29.6**
	Business demography	Bankruptcies, Index (2015=100)(11)	83.5	81.1	68.6	60.5	63.2	**86.8**
		Business registrations, Index (2015=100) (11)	90	88.5	77.5	79	78.1	**121.2**
	Late payments	Payment gap - corporates B2B, difference in days between offered and actual payment (12)	-5	1	20	12	12	**13**
		Payment gap - public sector, difference in days between offered and actual payment (12)	4	2	24	11	13	**15**
		Share of SMEs experiencing late payments in past 6 months, % (13)	n.a.	33.5	35	33.4	33.2	**43**
	Access to finance	EIF Access to finance index - Loan, Composite: SME external financing over last 6 months, index values between 0 and 1 (14)	0.63	0.72	0.71	n.a.	n.a.	**0.46**
		EIF Access to finance index - Equity, Composite: VC/GDP, IPO/GDP, SMEs using equity, index values between 0 and 1 (14)	0.4	0.3	0.2	n.a.	n.a.	**0.23**

(*) Last available year

Source: (1) AMECO, (2) Eurostat: NAMA_10_LP_A21, (3) ECFIN BCS, (4) Eurostat: jvs_a_rate_r2, (5) COMEXT, (6) Eurostat: nrg_inf_epc, (7) Eurostat: BOP_C6_A, (8) OECD, (9) Single Market Scoreboard, (10) EIB survey, (11) Eurostat: sts_rb_a, (12) Intrum, (13) SAFE Survey, (14) EIF SME Access to Finance Index.

form. ([140]) Restrictiveness also remains comparatively high in retail, in particular for establishment of shops, where Germanys is among the most restrictive Member States. ([141]) Reducing restrictive regulation in regulated professions and retail, while safeguarding quality standards and consumer interests, could boost competition and productivity.

([140]) European Commission, Communication on updating the reform recommendations for regulation in professional services, COM(2021)385.

([141]) European Commission, Retail Restrictiveness Indicator (2022 update), forthcoming.

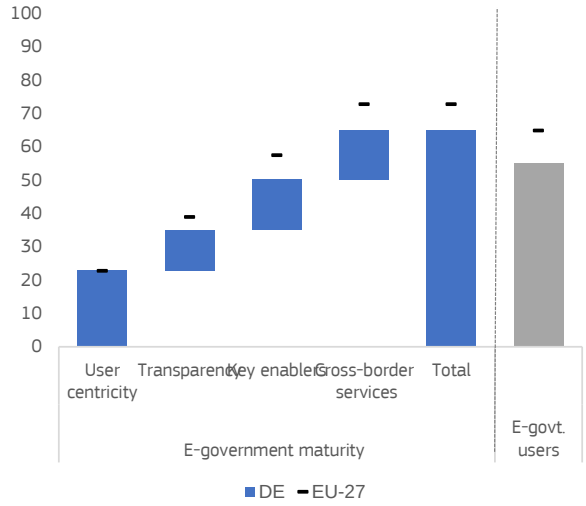
This Annex outlines the performance of Germany's public administration, which is essential for providing services and carrying out reforms. Overall, Germany's government effectiveness ranks above the EU average ([142]). The country has a long-standing tradition of high quality and professional public administration, with a strong commitment to delivering services well.

The digitalisation of the public administration remains a crucial reform issue in Germany. Digital public services can reduce burdens for businesses and citizens. The recovery and resilience plan (RRP) includes significant measures on the digital transformation of the public administration. Germany still scores below the EU average in terms of the proportion of people using e-Government services and in various aspects of the e-Government benchmark indicators, such as transparency, the existence of key enablers and the accessibility of digital public services to citizens from abroad (Graph A13.1 and Annex 10). The benchmark also shows that Germany is behind the EU average on digitalising both front and back offices of public service providers. Moreover, the objectives of the Online Access Act were only partially achieved by the target date of end-2022. Due to Germany's federal system, many public administration tasks and their digitalisation are handled at the Länder and municipal levels. Against this backdrop, the Federal Government and the Länder are stepping up their collaboration and have prioritised the nationwide delivery of digital public services.

The ageing of public sector staff in Germany presents a risk. The ratio of 25- to 49-year-olds to 50- to 64-year-olds is lower than the EU average, which could have a potential negative effect on the delivery of public services (Table A13.1). The reduced attractiveness of the civil service as a place to work is reflected in a decreasing proportion of young employees.

The participation of public administration employees in adult learning is below the EU average, as is the share of employees with higher education (Graph A13.2a). Germany has launched upskilling and reskilling programmes. Gender parity in senior management positions in the public administration was the sixth lowest in the EU-27 in 2022 (Graph A13.2).

Graph A13.1: **Germany. E-government maturity and e-government users**



(1) 2022 data for the e-government maturity indicator and 2021 data for the e-government users' indicator.
Source: E-government benchmark report and Eurostat

The justice system performs efficiently overall. The new Federal Government's agenda includes the improvement of planning and approval processes, and a reform for the acceleration of administrative court procedures. However, challenges remain in administrative cases, with the time it takes to hand down a decision (422 days in first instance in 2021) and the high number of pending cases (0.9 per 100 inhabitants in 2021). The clearance rate, however, has also remained high (110% in 2021). The overall quality of the justice system is good. The level of digitalisation is advancing and digital tools are widely used in courts and prosecution services, including an electronic case management system, technology for secure remote working by judges and staff and for remote communication, and an electronic case allocation system. However, there are some challenges concerning human resources in the justice system. For example, the effects of the ageing of the work population and the declining attractiveness of the government as employer. No systemic deficiencies in judicial independence have been reported ([143]).

([142]) Worldwide Governance Indicators, 2021 data

([143]) For a more detailed analysis of the performance of the justice system in Germany, see the 2023 EU Justice Scoreboard (forthcoming) and the country chapter for Germany in the 2023 Rule of Law Report (forthcoming).

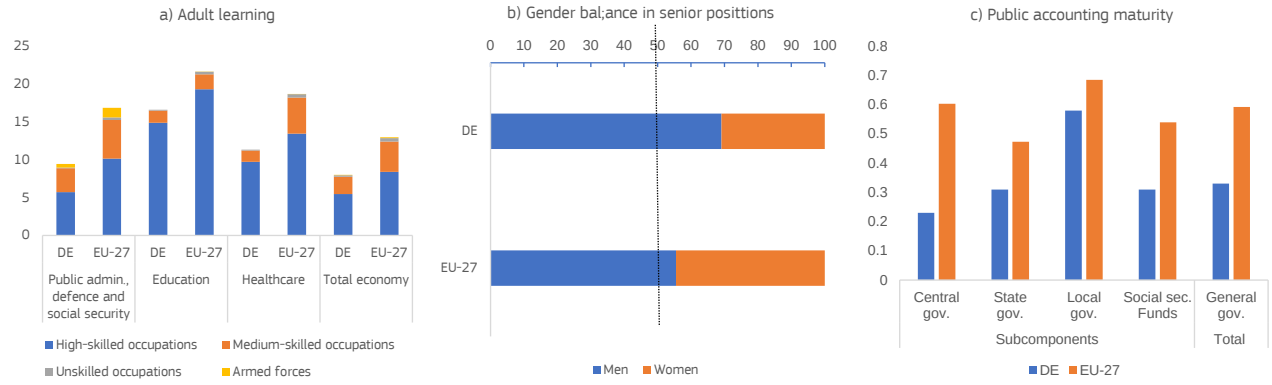
Table A13.1: **Public administration indicators**

DE	Indicator ([1])	2017	2018	2019	2020	2021	2022	EU-27([2])
E-government and open government data								
1	Share of individuals who used the internet within the last year to interact with public authorities (%)	58.5	60.8	62.9	69.3	54.5 (b)	n/a	64.8
2	E-government benchmark overall score ([3])	n/a	n/a	n/a	62.1	63.2	65.1	72.9
3	Open data and portal maturity index	n/a	0.6	0.7	0.9	0.9	0.8	0.8
Educational attainment level, adult learning, gender parity and ageing								
4	Share of public administration employees with tertiary education (levels 5-8, %)	41.0	41.5	41.9	42.7 (b)	44.2 (b)	45.1	52.0
5	Participation rate of public administration employees in adult learning (%)	9.6	9.4	9.3	8.0 (b)	8.2 (b)	9.5	16.9
6	Gender parity in senior civil service positions ([4])	47.2	45.0	36.6	39.0	39.6	38.2	11.0
7	Ratio of 25-49 to 50-64 year olds in NACE sector O	1.3	1.2	1.2	1.3 (b)	1.4 (b)	1.3	1.5
Public financial management								
8	Medium term budgetary framework index	0.5	0.6	0.6	0.6	0.7	n/a	0.7
9	Strength of fiscal rules index	1.4	1.4	1.4	1.4	1.5	n/a	1.5
Evidence-based policy making								
10	Regulatory governance	2.31	n/a	n/a	n/a	2.27	n/a	1.7

([1]) High values denote a good performance, except for indicator # 6. ([2]) 2022 value. If not available, the 2021 value 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: ICT use survey, 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).

Overall, Germany is less advanced in implementing accrual accounting for government government relative to the EU average (Graph A13.2c). This applies in particular at the federal and state levels of government. Accrual accounting as a public accounting standard provides a comprehensive and transparent overview of a public body's financial position and performance and can support sustainability and intergenerational equity.

Graph A13.2: **Germany. a) Participation rate of 25-64 year olds in adult learning (%) by sector and occupation; b) Share of women and men in senior positions and c) Accounting maturity by government sector**



Source: Source: a) Eurostat; b) European Institute for Gender Equality; c) table 3 at Updated accounting maturities of EU governments and EPSAS implementation cost

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 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	Early leavers from education and training (% of population aged 18-24, 2022)	12.2
	Share of individuals who have basic or above basic overall digital skills (% of population aged 16-74, 2021)	48.92
	Youth NEET rate (% of population aged 15-29, 2022)	8.6
	Gender employment gap (percentage points, 2022)	7.8
	Income quintile ratio (S80/S20, 2021)	4.98
Dynamic labour markets and fair working conditions	Employment rate (% of population aged 20-64, 2022)	80.7
	Unemployment rate (% of active population aged 15-74, 2022)	3.1
	Long term unemployment (% of active population aged 15-74, 2022)	1
	GDHI per capita growth (2008=100, 2021)	113.41
Social protection and inclusion	At risk of poverty or social exclusion rate (% of total population, 2021)	21
	At risk of poverty or social exclusion rate for children (% of population aged 0-17, 2021)	23.7
	Impact of social transfers (other than pensions) on poverty reduction (% reduction of AROP, 2021)	40.3
	Disability employment gap (percentage points, 2021)	30.5
	Housing cost overburden (% of total population, 2021)	11
	Children aged less than 3 years in formal childcare (% of population under 3-years-old, 2021)	31.4
	Self-reported unmet need for medical care (% of population 16+, 2021)	0.1

Critical situation | To watch | Weak but improving | Good but to monitor | On average | Better than average | Best performers

Update of 27 April 2023. Members States are classified on the Social Scoreboard according to a statistical methodology agreed with the EMCO and SPC Committees. It looks jointly at levels and changes of the indicators in comparison with the respective EU averages and classifies Member States in seven categories. For methodological details, please consult the Joint Employment Report 2023. Due to changes in the definition of the individuals' level of digital skills in 2021, exceptionally only levels are used in the assessment of this indicator; NEET: neither in employment nor in education and training; GDHI: gross disposable household income.
Source: Eurostat

The German economy and labour market made a robust recovery in 2022, despite the uncertainties over the impact of Russia's war of aggression against Ukraine. Employment remained robust at 80.9% in Q4-2022. The unemployment rate remained low at 3% (January 2023). By Q4-2022, the growth in nominal compensation per employee reached 5% on an annual basis, in line with the growth rate in 2022. However, according to the Commission's 2022 Autumn Economic Forecast, wage growth is set to increase, reaching 5% in 2022 reflecting also a tight labour market and sizeable increases in the minimum wage. Real wages were set to decrease by 2% and 1.2% in 2022 and 2023 respectively. Recently reached wage agreements have confirmed these trends.

The overall labour market situation is good, but some groups still face challenges. Germany has one of the highest employment rates of women in the EU, with 76.8% in 2022 (vs the EU average of 69.3%). However, the gender gap in part-time employment remains one of the highest in the EU at 36.7 percentage points (pps). The unadjusted gender pay gap is wide at 17.6pps compared to the EU average of 12.7pps in 2021, which also reflects the lower number of hours worked by women. In 2022, the employment rate of women aged 25-49 with children aged less than 6 years was 18.6pps lower than the rate of those of the same age without children. Although taxation opportunities for couples have been adjusted within the *Faktorverfahren* ([144]), there is still a significant disincentive for second earners, many of whom are women, to work more hours. This, together with high taxes on labour and insufficient availability of childcare and all-day school facilities, is a major factor in women's lower participation in the labour market. Access to childcare for children aged less than 3 years is steadily increasing and was 31.4% in 2021 (vs 36.2% for the EU, see also Annex 15). Germany's RRP contributes to addressing this challenge by providing for 90 000 additional childcare places. However, this is still below the supply gap of 347 600 estimated in 2020. Furthermore, Germany's employment gap of persons with disabilities was one of the highest in 2021 at 30.5pps vs 23.1pps in the EU. More than 300 000 persons with disabilities are employed in sheltered workshops, and there is a very low transition rate to the primary labour market. Addressing those challenges would help Germany reach its 2030 employment target of 83%.

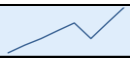
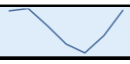
([144]) The *Faktorverfahren* is a tax deduction feature within the joint income tax method for spouses or life partners (*Ehegattensplitting*).

The impact of socio-economic and migrant backgrounds on educational outcomes remains a challenge. Early school leaving has deteriorated significantly in the past decade and was significantly above the EU average in 2022 (12.2% vs 9.6%); for non-EU born people, the rate is as high as 28.8%. The impact of socio-economic background on educational outcome has increased, and about one fifth of 10-year-olds do not meet basic standards in German and mathematics (see Annex 15). Moreover, at 49% in 2021, Germany is below the EU average of 54% of individuals aged 16-74 with at least basic digital skills (see Annex 10). The Work of Tomorrow Act expanded the funding of qualifications in continuing education and training to respond to the digital transformation, while the Training Assistance Act (BAföG) was amended to provide more financial help to students.

It is crucial to boost the availability of adult learning and provide stronger incentives for up- and reskilling to tackle skills shortages. Skills shortages increased, during the recovery from the pandemic, particularly for engineers or programmers, crafts, science, technology, engineering and mathematics specialists, logistics, care and health professions, as well as social workers. At the same time the employment rate of low-educated adults was 15.4pps lower than the overall employment rate (of the 20-64 age group). Population ageing and an increasing need for skills related to the digital and green transitions are expected to exacerbate labour and skills shortages. The Public Employment Service (*Bundesagentur für Arbeit*) estimates that the country needs a net migration balance at around 400 000 per year in order to offset the decreasing level in the potential labour force. Although upskilling and reskilling are essential in this context, adult participation in learning activities (over the past 4 weeks) has remained stable in Germany for the last 10 years and below the EU average (8.1% vs 11.9% in 2022). The rate is as low as 4% for low qualified people (vs 4.7% for the EU). The funding of the Upgrading Training Assistance Act (AFBG) was increased in 2022. EU cohesion policy funds support upskilling and reskilling to address labour shortages and skills gaps and help meet the needs of the labour market. They are key to reaching Germany's 2030 national target of at least 65% of adults in training per year.

Social indicators still point to challenges in Germany. In 2021, the share of people at risk of poverty or social exclusion remained broadly stable at 21%, compared to 20.4% in 2020, below the EU average (21.7%). The share of children at risk of poverty and social exclusion increased from 22.3% in 2020 to 23.7% in 2021, although this remained below the EU average (24.4%). The share of persons with disabilities in the same situation (30.1%) continued to be higher than the EU average (28.8%). To address these challenges, Germany is allocating a considerable share of funding under the European Social Fund Plus (ESF+) to programmes that foster social inclusion in general (32.8%) and for children specifically (5.9%). Moreover, the percentage of people living in households with housing costs above 40% of their total income is higher than the EU average (11% vs 8.3%). According to a recent study ([145]), the estimated housing shortage, including social and affordable housing, has increased to 700 000 dwellings. In 2021, 21 000 new social rental apartments were built with government subsidies. More efforts are therefore needed to meet the federal government's revised annual targets for the 2021-2025 legislative period of 400 000 new housing units, including 100 000 social housing units. Overall, a more targeted approach could better reach the different groups concerned and help achieve Germany's target on poverty reduction.

Table A14.2:**2030 National targets for Germany**

Indicators	Latest data	Trend (2015-2022)	National target by 2030	EU target by 2030
Employment (%)	81.0 (2022)		83	78
Adult learning[1] (%)	46.4 (2016)		65	60
Poverty reduction[2,3] (thousands)	+623 (2021)		-1 200	-15 000

(1) Adult Education Survey, adults in learning in the past 12 months. (2) The EU target is expressed 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

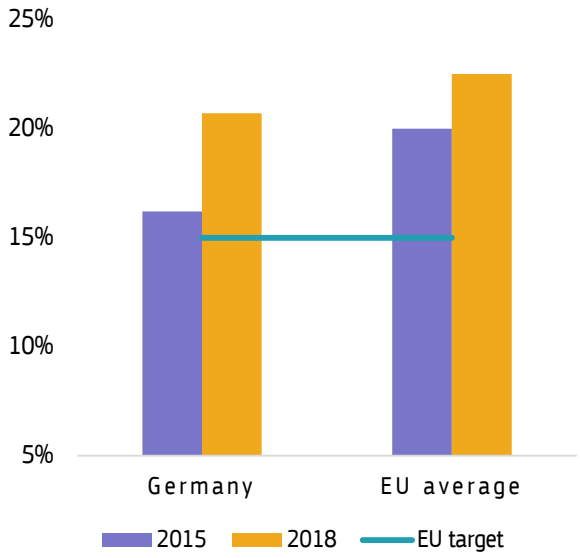
([145])Pestel Institut, Arbeitsgemeinschaft fuer zeitgemaesses Bauen e.V. Kiel (2023). https://bauen-und-wohnen-in-deutschland.de/wp-content/uploads/2023/01/Studie-Bauen-und-Wohnen-in-der-Krise.pdf.

This Annex outlines the main challenges for Germany's education and training system in light of the EU-level targets and other contextual indicators under the European Education Area strategic framework, based on the 2022 Education and Training Monitor.

Attracting, training and recruiting enough teachers will remain a challenge in the coming years. At the start of school year 2022/23, between 32 000 and 40 000 teachers were lacking ([146]). Several factors - such as more pupils, expanding all-day school places, and replacing retiring teachers - could aggravate teacher shortages, to varying degrees depending on the Laender and school level. Around 39% of German teachers in primary and secondary education (ISCED 1-3) are aged 50 or older. Lower secondary schools are especially affected, being able to recruit only 72% of required staff ([147]). Shortages emerge predominantly in science, technology, engineering and mathematics (STEM) subjects. Comparing the number of teachers needed in the future with the expected supply of teachers points at a gap of over 150 000 by 2035 ([148]).

Early childhood education and care (ECEC) in Germany continues to lack available places and qualified staff, but there is potential to improve quality. In 2022, 93.7% of children between 3 and school age attended ECEC – around the EU average (93%), but still below the EU-level target of 96%. In 2021, even though Germany expanded capacity by 84 000 places compared with the previous year, 13% of demand for under-3-year-olds could not be satisfied in the west of the country, and 8% in the east. Municipalities have a legal obligation to provide an ECEC place for children above the age of one, which they are expected to fulfil only by 2025 in the east and by 2028 in the west ([149]). An acute shortage of staff triggered lowering the requirements to enter ECEC professions. According to forecasts (Good Kita report 2021), up to 266 300 additional qualified educators will be needed in early childhood education and care by 2030 ([150]). Lack of qualified staff is a key obstacle to improving the quality of services. The ECEC quality law 2022 continues ([151]) to provide federal funding of EUR 4 billion for quality and participation improvement.

Graph A15.1: **Low-achieving 15-year-olds in reading in 2015 and 2018 (PISA)**



Source: OECD (PISA 2018).

Educational outcomes and choices remain heavily influenced by socio-economic and migrant background. According to the 2018 PISA (Programme for International Student Assessment), overall performance is above the EU average, but has weakened over time (see Graph A15.1). The share of young people not reaching level 2 in PISA increased between 2015 and 2018 to about 20% in all three areas tested. In 2018, it remained just below the EU average, but far above the EU-level target (15%). Socio-economically disadvantaged students (often but not only students with a migrant background) lag behind: by 1 year in mathematics and even up to 2 years in science ([152]). This is reflected in a slightly higher equity indicator value in Germany compared to the EU average. National testing in 2021 shows declining outcomes for fourth grade pupils in

([146]) Schuljahr 2022/23 - Lehrermangel verschärft sich weiter (deutsches-schulportal.de)

([147]) Autor:innengruppe Bildungsberichterstattung, (2022).

([148]) Expertise Lehrkräftebedarf & Angebot bis 2035

([149]) Autor:innengruppe Bildungsberichterstattung, (2022).

([150]) BMFSFJ - Gute-KiTa-Bericht 2021

([151]) The Good ECEC law (2019) provided funding of EUR 5.5 billion.

([152]) European Commission, Education and Training Monitor 2021.

German and mathematics ([153]). In addition, about one fifth of these 10-year-olds do not reach minimum standards in German and mathematics. Education policy is the responsibility of the federal states; however, a federal programme provides EUR 3.5 billion for the expansion of all-day schooling and care services at primary school level ([154]).

Germany is promoting digital education. Of all 16-19-year-olds, only 50% had at least basic digital skills in 2021, 19 pps below the EU average. The Digital Pact for Schools provides EUR 6.5 billion in federal support to a programme to digitise schools. Just under 80% of the original EUR 5 billion had been allocated by end-2022. EUR 1.5 billion was added due to the pandemic, with one third earmarked to support IT administrators in schools and to provide laptops both to students and to teachers. The latter is supported by the Recovery and Resilience Facility in addition to a meta platform on digital learning that encompasses existing platforms in Germany and a quality training programme for teacher education.

Tertiary education attainment is increasing, but remains low. Tertiary education attainment continues to increase but, at 37.1% in 2022 lags behind the 45% EU-level target and the 42% EU average. While 29% of men choose STEM subjects at bachelor's level, only 9% of women do so. The share at master's level is 24% and 12% respectively, an imbalance also identified by OECD (2021).

While overall participation in vocational education and training (VET) is significant, participation in adult learning remains weak (see Annex 14).

([153])Testing shows an overall decline in average skills compared with 2011 and 2016 and an increased impact of socio-economic and migrant background (Stanat, P. et al (2022).

([154])German National Reform Programme 2022.

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

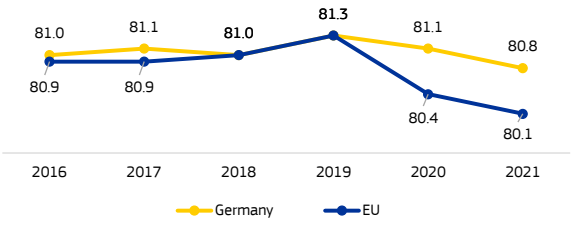
				2015		2022	
Indicator			**Target**	**Germany**	**EU27**	**Germany**	**EU27**
[1]Participation in early childhood education (age 3+)			**96%**	**96.0%**	**91.9%**	**93.7%** [2020]	**93.0%** [2020]
[2]Low achieving 15-year-olds in:		**Reading**	**< 15%**	**16.2%**	**20.0%**	**20.7%** [2018]	**22.5%** [2018]
		Mathematics	**< 15%**	**17.2%**	**22.3%**	**21.1%** [2018]	**22.9%** [2018]
		Science	**< 15%**	**17.0%**	**21.1%**	**19.6%** [2018]	**22.3%** [2018]
Early leavers from education and training (age 18-24)	**[3]Total**		**< 9 %**	**10.1%**	**11.0%**	**12.2%**	**9.6%**
	[3] By gender	*Men*		10.4%	12.5%	13.7%	11.1%
		Women		9.8%	9.4%	10.7%	8.0%
	[4] By degree of urbanisation	*Cities*		10.3%	9.6%	12.3%	8.6%
		Rural areas		8.3%	12.2%	9.8%	10.0%
	[5] By country of birth	*Native*		8.6%	10.0%	9.4%	8.3%
		EU-born		:	20.7%	30.7%	20.3%
		Non EU-born		:	23.4%	28.0%	22.1%
[6]Equity indicator (percentage points)				**:**	**:**	**20.1** [2018]	**19.3** [2018]
[7]Exposure of VET graduates to work based learning	**Total**		**≥ 60% (2025)**	**:**	**:**	**94.9%** [u]	**60.1%**
Tertiary educational attainment (age 25-34)	**[8]Total**		**45%**	**29.6%**	**36.5%**	**37.1%**	**42.0%**
	[8] By gender	*Men*		28.6%	31.2%	34.9%	36.5%
		Women		30.6%	41.8%	39.5%	47.6%
	[9] By degree of urbanisation	*Cities*		37.5%	46.2%	44.5%	52.2%
		Rural areas		21.7%	26.9%	28.9%	30.2%
	[10] By country of birth	*Native*		29.9%	37.7%	38.2%	43.0%
		EU-born		:	32.7%	32.5%	39.5%
		Non EU-born		:	27.0%	34.5%	35.7%
[11]Share of school teachers (ISCED 1-3) who are 50 years or over				44.6%	38.3%	38.8% [2020]	39.2% [2020]

Source: (1,3,4,5,7,8,9,10,11) = Eurostat; 2 = OECD (PISA); 6 = European Commission (Joint Research Centre). Notes: Data are not yet available for the remaining EU-level targets under the European Education Area strategic framework, covering underachievement in digital skills and participation of adults in learning. The equity indicator shows the gap in the share of underachievement in reading, mathematics and science (combined) among 15-year-olds between the lowest and highest quarters of socio-economic status.

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 above the EU average, but started to fall in the first year of the COVID-19 pandemic. The further decrease in life expectancy in 2021 is linked to an increased number of COVID-19 deaths ([155]). 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**



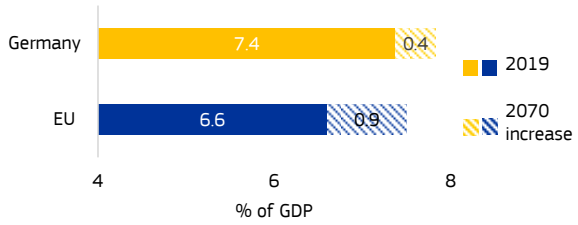
Source: Eurostat

Germany has the highest spending on healthcare in relation to GDP in the EU. Spending on healthcare increased from 2019 to 2020 (in relative and in absolute terms). Most health spending is publicly funded; out-of-pocket payments are comparatively low (12.4% of total health expenditure, compared to an EU average of 14.4% in 2020). Next to the statutory health insurance system, there is a substitutive private health insurance scheme for certain population groups, such as civil servants, self-employed and people with earnings above a certain threshold, meaning they can opt out from the solidarity-based statutory health insurance.

Spending on outpatient care (in relation to total healthcare spending) is below the EU average, while spending on inpatient care is slightly above the EU average, with an ongoing separation / lack of coordination between these sectors. This tallies with the fact that Germany has one of the highest numbers of hospital beds per population in the EU. The high number of beds is coupled, however, with a low staff-to-bed ratio. In response, the current government set up a commission of experts to develop recommendations to reform the financing of the German hospital sector. The government aims to develop a draft proposal taking into account these recommendations by summer 2023 ([156]).

Spending on preventive care remained quite stable during the pandemic, while most other countries raised this expenditure drastically. Spending on prevention in Germany amounts to 3.2% of total spending on healthcare (compared to 3.4% for the EU overall in 2020). Public expenditure on health is projected to increase by 0.4 percentage points (pps) of GDP by 2070 (compared to 0.9 pps for the EU overall).

Graph A16.2: **Projected increase in public expenditure on healthcare over 2019-2070**



AWG reference scenario
Source: European Commission / EPC (2021)

Numbers of doctors and nurses per population are well above the EU average. However, workforce and skills shortages in combination with demographic change are a concern, also in terms of long-term accessibility of health services. More than 44% of active physicians in Germany were over 55 years old in 2020. Several reforms and laws have aimed to increase the number of nurses in hospitals and the attractiveness of the profession. This concerns for instance higher salary levels, improved working conditions and the planned implementation of a staffing measurement tool. Since 2020, the costs of nursing personnel are excluded from the hospital payment system based on diagnosis-

([155])Based on data provided directly by Member States to ECDC under the European Surveillance System (data current as of 13 April 2023)

([156])See: https://www.bundesgesundheitsministerium.de/themen/gesundheitswesen/krankenhausreform.html

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

	2017	2018	2019	2020	2021	EU average (latest year)
Treatable mortality per 100 000 population (mortality avoidable through optimal quality healthcare)	85.5	85.3	81.7	80.8	NA	91.7 (2020)
Cancer mortality per 100 000 population	246.6	245.9	243.7	240.3	NA	242.2 (2020)
Current expenditure on health, % GDP	11.3	11.5	11.7	12.8	NA	10.9 (2020)
Public share of health expenditure, % of current health expenditure	84.4	84.1	84.0	85.1	NA	81.2 (2020)
Spending on prevention, % of current health expenditure	3.2	3.2	3.3	3.2	NA	3.4 (2020)
Acute care beds per 100 000 population	602	601	595	587	NA	387.4 (2019)
Doctors per 1 000 population *	4.2	4.3	4.4	4.5	4.5	3.9 (2020)
Nurses per 1 000 population *	11.1	11.5	11.8	12.1	NA	8.3 (2020)
Consumption of antibacterials for systemic use in the community, daily defined dose per 1 000 inhabitants per day (total consumption for CY and CZ) **	12.6	11.7	11.4	8.9	8.1	14.5 (2021)

Note: The EU average is weighted for all indicators, except for (*) and (**), for which the EU simple average is used. The simple average for (*) uses data for 2020 or most recent year if former not available. Doctors' density data refer to practising doctors in all countries except EL, PT (licensed to practice) and SK (professionally active). Nurses' density data refer to practising nurses in all countries except FR, PT, SK (professionally active) and EL (nurses working in hospitals only).
Source: Eurostat; except: ** ECDC

related groups. This is expected to remediate the current low staff-to-bed ratio over time.

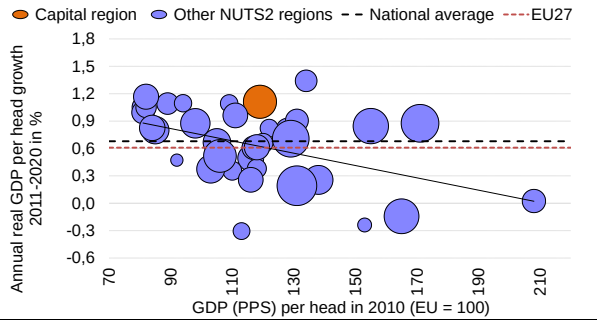
Through its recovery and resilience plan, Germany plans to invest EUR 4.3 billion (16.2% of the plan's total value) in healthcare. Investments mainly focus on the digital transition of the healthcare system (IT-related investments in hospitals and public health services, including the related construction and refurbishment of buildings). Most of the milestones and targets have not been completed yet. The digital transition of the healthcare system is an ongoing challenge in Germany.

This Annex showcases the economic and social regional dynamics in Germany, providing an update on economic, social and territorial cohesion in and among the German regions compared with the rest of the EU and the main regional economic recovery challenges.

Regional disparities have steadily decreased since reunification, in 1990, but remain high. In 2021, Hamburg's GDP per capita (in purchasing power standard, PPS) was 191% of the EU average, followed by Oberbayern (174%) and Stuttgart (153%). Some regions continued to score below the EU average, however, with GDP per capita at 86% or lower in the eastern regions of Brandenburg, Chemnitz, Sachsen-Anhalt and Mecklenburg-Vorpommern, as well as in Lüneburg. Gaps between urban and rural areas also persist.

Convergence was relatively modest in 2011-2020 due to uneven regional growth (Graph A17.1). However, annual GDP per capita growth in Germany's less developed regions ([157]) slightly exceeded both the national (0.7%) and EU (0.6%) averages.

Graph A17.1: **GDP per capita (2010) and real GDP growth (2011-2020) in Germany**



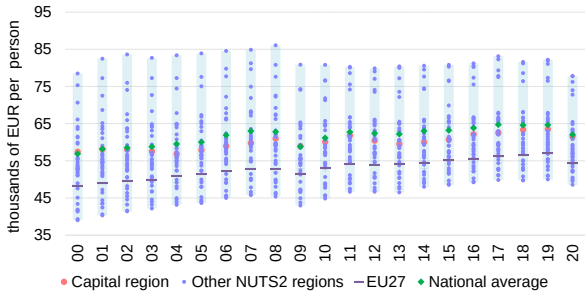
(1) Bubble sizes correspond to population size.
Source: EUROSTAT

The COVID-19 pandemic caused the first economic decline since the financial crisis in 2007. In 2020, GDP per capita fell in all regions, though with varying degrees. The impact of the pandemic and ensuing supply chain disruptions was particularly severe in the most populated, prosperous and southern regions – such as Braunschweig (-6.9%) and Schwaben (-6.0%) – as well as in Bremen (-6.7%) but milder in less developed eastern regions and Berlin, where the fall in GDP per capita ranged from -3.0% to -3.7%.

Disparities in GDP per capita are strongly driven by labour productivity gaps between the more and less developed regions. Average labour productivity, measured as gross value added per person employed, stood at 105% of the EU average (in PPS) in 2021. It ranged from 126% or more in Oberbayern, Hamburg and Braunschweig to 87% or less in Mecklenburg-Vorpommern, Chemnitz and Thüringen.

Labour productivity gaps have been decreasing, contributing to the convergence of economic output. Annual real productivity growth was highest in the least developed regions in 2011-2020, ranging from a moderate 0.4% in Dresden and Lüneburg to 0.9% in Leipzig and Mecklenburg-Vorpommern and 1.0% in Thüringen. Annual real productivity fell in some regions, notably Darmstadt, Bremen and Saarland (-0.5%).

Graph A17.2: **Evolution of labour productivity in Germany (2000-2020)**



(1) Unit: real gross value added (GVA) in million EUR (2015 prices) by employment in thousands of persons.
Source: EUROSTAT

All regions rank above the EU average for competitiveness ([158]). This is the case, in particular, for the western and southern regions, Hamburg and Berlin. However, there are significant differences in regional innovation performance. Many of the most developed regions are innovation leaders ([159]), while less developed regions are mostly classified as moderate

([157])For this Annex, 'less/least developed regions' are defined as having a GDP per capita (PPS) in 2020 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.

([158])2022 regional competitiveness index.

([159])The 2021 regional innovation scoreboard methodology defines innovation leaders as regions with a relative performance of more than 125% of the EU average (strong innovators: 100-125%; moderate innovators (70-100%).

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

NUTS 1 Region	GDP per head (PPS)	GDP per head growth	Productivity (GVA, PPS) per person employed	Population growth	Total population aged >65	Unemployment rate	R&D expenditure
	EU-27 = 100, 2021	*⌀ change p.a. in %, 2011-20*	*EU-27=100, 2020*	*⌀ change p.a. in ‰, 2011-20*	*Increase in %, 2011-19*	*% of active population, 2021*	*% of GDP, 2019*
European Union	100	0,6	100	1,7	17.6	7,0	2,3
Germany	120	0,7	106	3,6	9.7	3,6	3,2
Baden-Württemberg	136	0,6	113	5,8	11.5	3,1	5,7
Bayern	141	0,8	113	5,9	11.9	2,7	3,4
Berlin	124	1,1	106	11,1	9.9	5,7	3,3
Brandenburg	86	0,8	94	2,8	13.3	3,0	1,8
Bremen	141	-0,2	104	4,3	4.3	6,8	3,0
Hamburg	191	0,0	130	8,3	3.1	4,4	2,2
Hessen	135	0,1	114	5,3	10.8	3,8	3,1
Mecklenburg-Vorpommern	85	1,1	87	-0,3	14.8	3,8	1,8
Niedersachsen	110	0,9	103	2,8	9.9	3,2	3,1
Nordrhein-Westfalen	115	0,5	103	2,1	7.2	4,1	2,1
Rheinland-Pfalz	111	0,5	100	2,6	11.3	3,7	2,6
Saarland	102	-0,3	91	-1,8	8.3	2,9	1,9
Sachsen	93	1,1	87	-0,2	6.5	3,3	3,0
Sachsen-Anhalt	86	0,8	90	-5,2	6.5	4,4	1,5
Schleswig-Holstein	100	0,9	97	3,9	11.4	3,4	1,7
Thüringen	87	1,2	85	-3,5	10.4	3,2	2,3

Source: EUROSTAT

innovators (except Dresden, Thüringen, Trier and Chemnitz, which are strong innovators).

There are considerable differences in R&D expenditure between the regions. R&D expenditure was particularly high in Braunschweig (representing 7.8% of 2019 GDP, largely because it hosts the Volkswagen Group's headquarters) and Stuttgart (7.3%) and was overall above 3.2% in many southern regions, Dresden and Berlin. R&D expenditure was lowest (less than 1.5% of GDP) in many western regions and was below 1% in the less developed western regions of Weser-Ems, Lüneburg, Trier and Koblenz.

Labour market conditions are among the strongest in the EU, but disparities remain. In 2021, the unemployment rate fell to 1.8 and 2.0% in Niederbayern and Trier and reached 5.7 and 6.8% in Berlin and Bremen (3.6% for Germany as a whole and 7.0% for the EU-27). The employment rate reached 83% in Chemnitz and several southern regions but was as low as 75% in the western regions of Bremen and Düsseldorf (Germany as a whole: 79.6%; EU-27: 73.1%).

The labour market's initial recovery from the pandemic was quicker in eastern regions than in more developed ones. By 2021, unemployment returned to below 2019 levels in 10 eastern regions out of the 38 NUTS 2 regions, while the rate was still higher elsewhere, notably in Mittelfranken and Bremen (1.5-1.8 percentage points above pre-COVID-19 levels). The employment rate declined severely in some of the less developed western regions (Trier, Gießen and Lüneburg). Employment in the eastern regions of Mecklenburg-Vorpommern, Sachsen-Anhalt and Chemnitz actually increased, even if at a slower pace than in the previous decade.

Major demographic changes may reinforce existing regional differences. Nationally, the population grew by 3.6% in 2011-2020, with significant increases in the western regions of Hamburg (8.3%) and Oberbayern (9.0%) as well as in the metropolitan areas of Leipzig (8.6%) and Berlin (11.1%). Certain regions, especially less developed eastern regions Thüringen (-3.5%), Sachsen-Anhalt (-5.2%) and Chemnitz (-6.3%), experienced a demographic decline. This change reflects rural-urban shifts across Germany, which result in rising urban populations and in declining rural areas.

The population expanded primarily due to the impact of positive net migration (+5.7% in 2011-2020). Increases in net migration were significant in most western regions and especially strong in Leipzig (11%) and Berlin (10%). Other regions, especially the less developed eastern regions Chemnitz, Sachsen-Anhalt and Thüringen, registered little net migration.

Population ageing is a challenge with clear regional disparities and contributing to increasing labour shortages. The number of people above 65 increased by 9.7% in 2011-2020 and their share of the population rose to 22%, slightly above the EU-27 average (21%). Increases in the population aged over 65 amounted to less than 5.5% in Hamburg, Bremen, Düsseldorf and Braunschweig, around 6% in Dresden, Chemnitz and Sachsen-Anhalt, but more than 12% in many

southern regions and 13-14% in Lüneburg, Brandenburg and Mecklenburg-Vorpommern.

Germany hosts the second largest banking sector by assets in the EU. A distinguishing feature of this banking sector is the large number of institutions. These institutions are organised along three "pillars": In October 2022 (i) the first pillar comprised 244 commercial banks (47% of assets); (ii) the second pillar comprised public-sector banks, among which were 362 saving banks (*Sparkassen*) and 5 regional banks (*Landesbanken*) (22% of assets); and (iii) the third pillar comprised 738 cooperative banks (10% of assets). Mergers and acquisitions reduced the number of banks in Germany from more than 3 000 in 1999 to 1 386 in December 2022. These mergers typically occurred within and not across pillars because of the quite different ownership structure. With banking-sector assets equivalent to 258% of Germany's GDP, the size of the banking sector is below the EU average of 277%. German banks' international presence is also relatively modest and largely confined to other EU Member States, although an increasing number of foreign banks has entered the German market in recent years, especially in the investment-banking sector.

German banks have loan books of outstanding quality and are well capitalised. Despite some deterioration in asset quality as a result of the pandemic and the energy crisis ([160]), German banks still have one of the lowest ratios of non-performing exposures in the EU at 1.0% in Q3-2022, even slightly down from pre-pandemic times (1.2% in 2019). Moreover, German banks have maintained stable capital ratios. The average Common Equity Tier 1 (CET1) ratio stood at 15.3% in Q3-2022.

On the other hand, German banks have continuously underperformed in their profitability. The banks' return-on-equity of 1.9% is considerably below the EU average of 6.1% and barely sufficient to cover their cost of capital. This has been compounded by heavy reliance on interest income in what was until recently a low-interest-rate environment. Furthermore, banks face high administrative costs and net interest expenses compared to income. The cost-to-income ratio stands at 77.3% in 2022 compared to the EU average of 60.6%.

Rising interest rates will improve net interest margins and boost banks' profits, but the swift increase in rates may create temporary challenges. As in other countries, rising interest rates create valuation losses in the short term on the security portfolios held in German banks' trading books. Loans with a long interest fixation period are subject to interest rate risk as refinancing costs on short duration liabilities increase. The share of mortgage loans with a fixation period of 5 years or more increased in recent years to more than 80% of new lending business. Still the banks' susceptibility to interest-rate risk related to 'maturity transformation appears manageable.

As in other countries, risks in the banks' loan books are increasing as businesses are impacted by higher interest rates and inflation. Falling corporate income in a low-growth environment interlocking with greater expenditure on interest could increase the risk of default in the business sector. At the end of 2021, 73% of business loans were to companies with an above-average debt-overhang ratio, while 70% of loans had a below-average interest-coverage ratio. Insolvencies began to increase towards the end of 2022 but are still below their long-term average. Although experts expect insolvencies to continue rising further in the coming months, they don't expect them to go above long-term averages. The banks themselves consider the risks of company defaults to be low. The energy-intensive sector could be especially at risk of default, but this sector accounts for only 6% of total corporate loans.

Even though the household sector remains largely resilient, risks have increased. With the cost of living going up and real incomes being squeezed, the most vulnerable households may struggle to service their debt. In this context, the overvalued housing market is of concern. House prices declined by 3.6% y-o-y in Q4-2022 for the first time since 2010, Still, the Bundesbank reckons that home prices in urban areas are overvalued by 25%-40% relative to what economic fundamentals would historically warrant. Commission calculations also show that house prices appear overvalued by 20-40%. The buoyant

([160]) The deterioration in asset quality is visible in the rise of the share of loans that are classified as increased risk (stage 2) according to International Financial Reporting Standards, 10.% in Q3-2022, up from 5.6% in Q1-2020, (EBA Risk Dashboard).

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

	2017	2018	2019	2020	2021	2022	EU	Median
Total assets of the banking sector (% of GDP)	236.0	231.1	239.3	262.6	254.7	273.0	276.8	207.9
Share (total assets) of the five largest banks (%)	29.7	29.1	31.2	34.0	31.8	-	-	68.7
Share (total assets) of domestic credit institutions (%)[1]	93.1	89.0	87.1	83.7	81.8	78.1	-	60.2
NFC credit growth (year-on-year % change)	4.2	6.5	5.8	4.2	6.1	10.2	-	9.1
HH credit growth (year-on-year % change)	3.2	3.9	4.4	4.8	5.1	4.3	-	5.4
Financial soundness indicators:[1]								
- non-performing loans (% of total loans)	1.8	1.4	1.2	1.2	1.1	1.0	1.8	1.8
- capital adequacy ratio (%)	18.8	18.4	18.1	18.8	18.5	18.1	18.6	19.8
- return on equity (%)[2]	2.9	2.4	2.1	2.2	4.0	1.9	6.1	6.6
Cost-to-income ratio (%)[1]	74.0	76.8	75.5	70.7	68.8	77.3	60.6	51.8
Loan-to-deposit ratio (%)[1]	89.4	90.2	87.7	80.8	81.0	83.1	88.6	78.0
Central bank liquidity as % of liabilities	1.6	1.4	1.2	4.7	5.5	3.1	-	2.9
Private sector debt (% of GDP)	107.1	109.6	112.7	121.2	120.4	-	-	120.7
Long-term interest rate spread versus Bund (basis points)	0.0	0.0	0.0	0.0	0.0	0.0	-	93.3
Market funding ratio (%)	54.1	53.6	52.0	50.7	51.0	-	50.8	40.0
Green bonds issued to all bonds (%)	0.3	0.5	1.0	1.9	3.5	4.9	3.9	2.3

1-3 **4-10** **11-17** **18-24** **25-27** Colours indicate performance ranking among 27 EU Member States.

(1) Last data: Q3 2022.
(2) Data is annualized.
Source: ECB, Eurostat, S&P Global Capital IQ Pro.

housing market has supported mortgage lending, which expanded to 40.7% of GDP in September 2022 from 36.4% of GDP in December 2011. As a result, loan-to-value ratios declined while debt-to-income and debt-service-to-income (DSTI) ratios went up. The aggregate DSTI ratio climbed to 31% in the first half of 2022 from 28% a year earlier, while the share of new loans with a high DSTI ratio (i.e. above 40%) increased. There are no loan-to-value limits in place, even though the Federal Financial Supervisory Authority (BaFin) has the authority to set such limits, and the ESRB recommended authorities to limit the loan-to-value ratio ([161]). To contain the risks from the housing market, BaFin introduced a countercyclical capital buffer of 0.75% and a sectoral-systemic risk buffer specifically for the housing market of 2% on German mortgages. These measures were announced in January 2022, and banks must comply with them as of 1 February 2023.

Immediate financial risks stemming from the Russian military aggression against Ukraine appear manageable. German banks have a relatively small exposure to Russian clients. Their credit exposure to Russian counterparts was EUR 6.0 bn in September 2022.

In addition to banks, German companies also turn to financial markets for funding. The market-funding ratio for non-financial corporations is 51%, in line with the EU average. Germany has 10 regulated stock markets, the largest of which is the Frankfurt stock exchange, operated by Deutsche Börse. Nevertheless, the market capitalisation of all companies listed on the Frankfurt stock exchange is quite modest relative to Germany's GDP.

Germany has the second largest insurance market in the EU. Life and non-life insurers wrote premiums of EUR 252 bn in 2021. The market exhibits low concentration and is highly competitive, with the three biggest insurers taking a share of only 27% of premium income, and the top 10 insurance groups generating just 65% of premium income. German insurers have the highest solvency ratios in the EU. Solvency improved further to 325% in September 2022, up from 312% at the end of 2021, as Solvency II total assets declined. Meanwhile the rise in interest rates caused a decline in the value of liabilities and would have further strengthened the own-funds of German insurers, but this was offset by higher risk premiums. However, rising rates may entail liquidity risks especially for life insurers. The Bundesbank reckons that a wave of policy lapses could occur should ten-year *bund* yields rise to exceed 3%. In such a scenario, insurers would also need additional liquidity to meet margin calls on the hedges that they often use to protect themselves from interest-rate and exchange-rate risks.

([161]) Recommendation of the European Systemic Risk Board of 2 December 2021 on medium-term vulnerabilities in the residential real estate sector in Germany (ESRB/2021/10).

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

Germany's tax revenues in relation to GDP are almost the same as for the EU aggregate, with the highest contribution coming from labour taxation. Table A19.1 shows that Germany's tax revenues as a percentage of GDP remained fairly stable between 2020 and 2021. The share of labour taxes of total tax revenues was substantially above the EU aggregate (by 4.7 percentage points (pps) in 2021), but revenues from consumption and capital taxes as share of total taxation were considerably lower than the EU aggregate. Property taxes were significantly below the EU aggregate, in particular because recurrent property taxes were considerably lower in Germany (see Graph A19.1). Income from selling or renting real estate remains subject to far-reaching tax exemptions in Germany.

In addition, environmental taxes have been consistently below the EU aggregate in recent years. Germany's share of environmental taxes is below the EU aggregate, both as a share of GDP and as a share of total tax revenues. As the right-hand panel of Graph A19.1 illustrates, the low rate of environmental taxation in Germany relative to the EU aggregate is driven by all types of environmental taxes: both energy and transport taxation are below the EU average in Germany. Germany applies carbon prices in the transport and heating sectors through a national emissions trading system. Unlike many other Member States, Germany does not levy resource or pollution taxes. Furthermore, Germany has some environmentally harmful subsidies, such as fossil fuel subsidies and the company car privilege (see also Annex 6). Phasing out these subsidies could – along with addressing the issue of low environmental taxation – improve the tax mix and promote more sustainable and inclusive growth. Concerning its national emissions trading system, Germany agreed in 2022 to postpone the increase of target prices by one year in the context of the energy crisis. Also, a broadening of the scope of the system to include coals- and waste-derived fuels was adopted. Overall, tax bases that are less harmful to inclusive and sustainable growth remain underused.

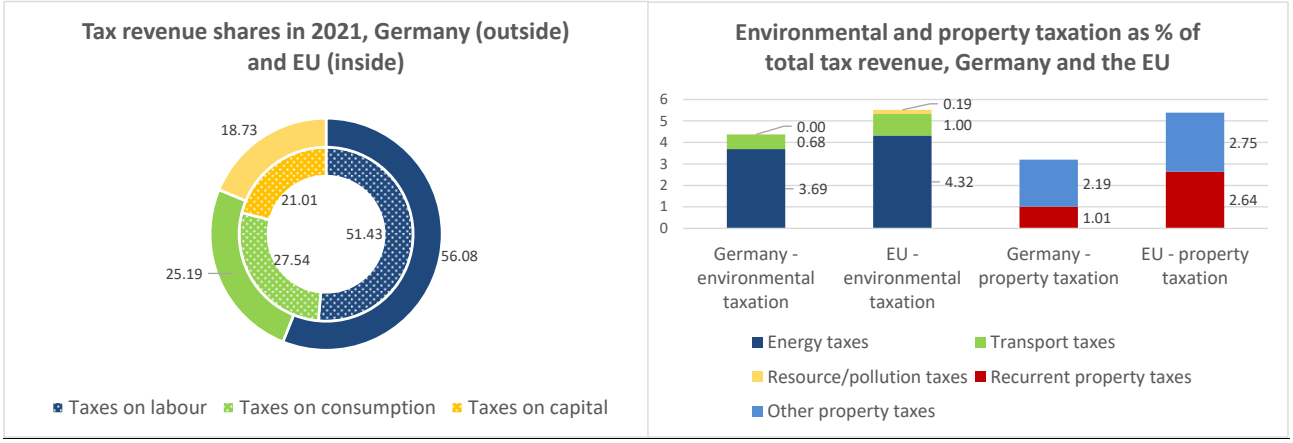
Germany has introduced a variety of tax-related measures to address the effects of the energy crisis. The performance of the tax system should be viewed in the context of high

Table A19.1: **Taxation indicators**

		Germany					EU-27				
		2010	2019	2020	2021	2022	2010	2019	2020	2021	2022
Tax structure	Total taxes (including compulsory actual social contributions) (% of GDP)	37.3	40.1	39.6	41.1		37.9	39.9	40.0	40.6	
	Labour taxes (as % of GDP)	21.0	23.0	23.3	23.0		20.0	20.7	21.3	20.9	
	Consumption taxes (as % of GDP)	10.7	10.2	9.6	10.3		10.8	11.1	10.7	11.2	
	Capital taxes (as % of GDP)	5.6	6.9	6.7	7.7		7.1	8.1	8.0	8.5	
	Total property taxes (as % of GDP)	0.8	1.2	1.3	1.3		1.9	2.2	2.2	2.2	
	Recurrent taxes on immovable property (as % of GDP)	0.4	0.4	0.4	0.4		1.1	1.2	1.2	1.1	
	Environmental taxes as % of GDP	2.2	1.8	1.7	1.8		2.4	2.4	2.2	2.2	
Progressivity & fairness	Tax wedge at 50% of average wage (Single person) (*)	41.7	42.1	41.6	41.3	40.5	33.9	32.3	31.9	32.1	31.7
	Tax wedge at 100% of average wage (Single person) (*)	49.0	49.3	48.8	48.1	47.8	41.0	40.1	39.9	39.6	39.7
	Corporate income tax - effective average tax rates (1) (*)		28.3	28.0	26.6			19.5	19.4	19.1	
	Difference in Gini coefficient before and after taxes and cash social transfers (pensions excluded from social transfers) (2) (*)	9.5	7.9	10.3	10.0		8.6	7.7	8.1	7.8	
Tax administration & compliance	Outstanding tax arrears: total year-end tax debt (including debt considered not collectable) / total revenue (in %) (*)		1.0	1.6				31.6	40.7		
	VAT Gap (% of VAT total tax liability, VTTL)		9.0	4.8				11.0	9.1		

(1) Forward-looking effective tax rate (OECD).
(2) A higher value indicates a stronger redistributive impact of taxation.
(*) EU-27 simple average
For more data on tax revenues as well as the methodology applied, see European Commission, Directorate-General for Taxation and Customs Union, *Taxation trends in the European Union: data for the EU Member States, Iceland, Norway and United Kingdom: 2021 edition*, Publications Office of the European Union, 2021, https://data.europa.eu/doi/10.2778/843047 and the *'Data on Taxation'* webpage (data https://ec.europa.eu/taxation_customs/taxation-1/economic-analysis-taxation/data-taxation_en).
For more details on the VAT gap, see European Commission, Directorate-General for Taxation and Customs Union, *VAT gap in the EU: report 2022*, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2778/109823.
Source: European Commission, OECD.

Graph A19.1: **Tax revenues from different tax types as % of total taxation**

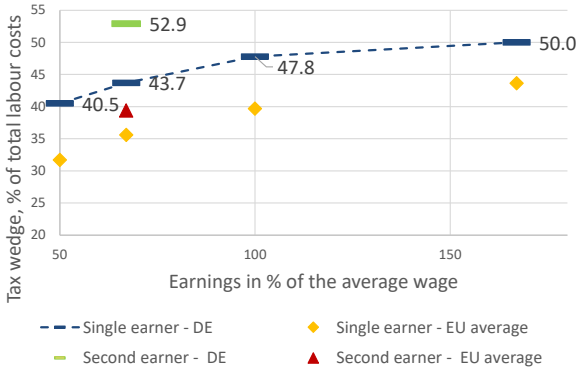


Note: Values for EU are GDP-weighted EU averages (EU aggregates)
Source: European Commission

levels of uncertainty due to fluctuating energy prices. The German government has introduced tax measures to alleviate the burden on business and households caused by energy price increases. These new measures include a temporary reduction of the VAT rate on gas, the temporary reduction to the EU minimum of the energy tax on fuels and additional expenditure (e.g. one-off lump sum payments, including an energy bonus, and the accelerated abolition of the surcharge for renewable energy). Most of these measures, however, do not appear to be targeted to the most vulnerable households and firms. In 2023 the main energy measures are a natural gas and heat price brake and an electricity price brake that cap energy prices for households, small and medium-sized enterprises and for industrial companies, set to last until April 2024. The price caps are based on consumption levels over the previous year and cover 80% of past consumption by households and small and medium enterprises and 70% for industrial companies. Any amount beyond this share will be subject to the market prices.

Germany's labour tax burden is considerably higher and less progressive than the EU average. Graph A19.2 shows that the labour tax wedge for Germany in 2022 was much higher than the EU average not only for single people at the average wage level, but also for those earning low wages at 50% and 67% of the average wage and high wages at 167% of the average wage. Also the tax wedge for second earners at 67% of the average wage was clearly above the EU average. It was also substantially higher than the tax wedge for single persons at the same wage level, which indicates that work disincentives for second earners moving into employment are even more pronounced than those for single persons at 67% of the average wage. The difference between the tax wedge for high and low wage earners (167% and 50% of the average wage), which is an indicator of the progressivity of the labour tax system, is considerably lower for Germany than for the EU average. The tax-benefit system helped reduce inequality, as measured by the Gini coefficient, by slightly less than the EU average in 2021 (Table A19.1).

Graph A19.2: **Tax wedge for single and second earners as % of total labour costs, 2022**



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

While Germany performs relatively well on tax compliance and tax administration, there remains room for improvement. Germany's recovery and resilience plan (RRP) contributes to digitalising public administration, including potentially also aspects of the tax administration. Outstanding tax arrears have increased slightly from 1.0% to 1.6% of total net tax revenue

between 2019 and 2020 but still remain well below the EU average (Table A19.1). This is significantly below the EU-27 average of 40.7% in 2020, but the average is inflated by very large values in a few Member States. The Annual Report on Taxation 2022 highlights scope for improvement in the rate of electronic filing of personal and corporate income tax returns. ([162]) Tax compliance has 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 9% to 4.8% between 2019 and 2020, which is considerably below the EU-wide gap of 9.1% in 2020 (Table A19.1). These results should be interpreted with some caution though, given that Germany's VAT burden was lowered by way of a significant reduction of its standard and in particular its reduced VAT rates and also that the year 2020 was influenced by the COVID-pandemic.

([162])European Commission, Directorate-General for Taxation and Customs Union, Annual *report on taxation 2022: review of taxation policies in the EU Member States*, Publications Office of the European Union, 2022.

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

	2004-07	2008-12	2013-19	2020	2021	2022	forecast 2023	forecast 2024
Real GDP (y-o-y)	2.2	0.7	1.6	-3.7	2.6	1.8	0.2	1.4
Potential growth (y-o-y)	1.3	1.0	1.4	0.8	0.8	0.5	0.6	1.1
Private consumption (y-o-y)	0.6	0.9	1.5	-5.7	0.4	4.3	0.0	1.8
Public consumption (y-o-y)	0.7	2.1	2.2	4.0	3.8	1.2	-0.3	1.4
Gross fixed capital formation (y-o-y)	2.9	0.7	2.2	-2.3	1.2	0.4	-0.7	2.0
Exports of goods and services (y-o-y)	9.8	2.2	3.1	-9.3	9.7	2.9	1.5	3.1
Imports of goods and services (y-o-y)	7.8	2.3	4.1	-8.5	9.0	6.0	0.4	3.4
Contribution to GDP growth:								
Domestic demand (y-o-y)	1.0	1.0	1.6	-2.6	1.3	2.5	-0.2	1.7
Inventories (y-o-y)	0.0	-0.4	0.1	-0.2	0.5	0.4	-0.1	-0.3
Net exports (y-o-y)	1.1	0.1	-0.2	-0.8	0.8	-1.1	0.5	0.0
Contribution to potential GDP growth:								
Total Labour (hours) (y-o-y)	0.2	0.2	0.4	0.0	0.0	-0.2	-0.1	0.2
Capital accumulation (y-o-y)	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.2
Total factor productivity (y-o-y)	0.8	0.6	0.7	0.6	0.5	0.5	0.5	0.6
Output gap	-0.3	-0.7	0.5	-3.2	-1.5	-0.2	-0.6	-0.3
Unemployment rate	9.6	6.3	4.0	3.7	3.7	3.1	3.2	3.1
GDP deflator (y-o-y)	0.9	1.2	1.8	1.8	3.1	5.5	6.1	2.4
Harmonised index of consumer prices (HICP, y-o-y)	1.9	1.7	1.2	0.4	3.2	8.7	6.8	2.7
HICP excluding energy and unprocessed food (y-o-y)	1.4	1.3	1.4	0.9	2.3	5.0	6.5	3.8
Nominal compensation per employee (y-o-y)	0.7	2.2	2.7	0.4	3.1	4.2	5.5	5.3
Labour productivity (real, hours worked, y-o-y)	1.3	0.5	0.9	1.0	0.9	0.4	-0.2	0.8
Unit labour costs (ULC, whole economy, y-o-y)	-0.8	2.3	2.2	3.4	0.6	3.7	5.9	4.1
Real unit labour costs (y-o-y)	-1.7	1.1	0.4	1.6	-2.4	-1.7	-0.2	1.6
Real effective exchange rate (ULC, y-o-y)	-2.9	0.3	1.3	-1.0	0.4	0.2	0.1	0.6
Real effective exchange rate (HICP, y-o-y)	0.4	-1.2	0.5	0.8	1.0	-1.6	.	.
Net savings rate of households (net saving as percentage of net disposable income)	10.6	10.3	10.3	16.4	15.1	11.4	.	.
Private credit flow, consolidated (% of GDP)	0.2	1.2	3.9	6.4	5.7	.	.	.
Private sector debt, consolidated (% of GDP)	125.9	119.0	109.3	121.2	120.4	.	.	.
of which household debt, consolidated (% of GDP)	65.9	59.0	53.7	57.0	56.7	.	.	.
of which non-financial corporate debt, consolidated (% of GDP)	60.1	60.0	55.6	64.1	63.7	.	.	.
Gross non-performing debt (% of total debt instruments and total loans and advances) (1)	.	2.1	1.7	1.1	1.0	.	.	.
Corporations, net lending (+) or net borrowing (-) (% of GDP)	1.6	2.4	1.4	2.0	3.2	0.6	1.6	0.4
Corporations, gross operating surplus (% of GDP)	26.4	25.1	23.9	23.2	24.5	23.9	24.2	22.5
Households, net lending (+) or net borrowing (-) (% of GDP)	5.9	5.4	5.3	9.0	7.8	5.4	5.9	5.9
Deflated house price index (y-o-y)	-2.0	0.7	4.1	7.1	8.2	-1.5	.	.
Residential investment (% of GDP)	5.2	5.4	6.0	7.0	7.2	7.6	.	.
Current account balance (% of GDP), balance of payments	5.5	6.1	7.8	7.1	7.7	4.2	5.9	5.7
Trade balance (% of GDP), balance of payments	5.6	5.5	6.7	5.8	5.5	2.1	.	.
Terms of trade of goods and services (y-o-y)	-0.7	-0.5	0.8	2.0	-2.6	-4.7	3.3	-0.1
Capital account balance (% of GDP)	-0.1	0.0	0.0	-0.3	0.0	-0.5	.	.
Net international investment position (% of GDP)	14.1	23.0	40.7	63.8	70.1	71.1	.	.
NENDI - NIIP excluding non-defaultable instruments (% of GDP) (2)	9.6	19.1	39.6	54.7	54.3	49.7	.	.
IIP liabilities excluding non-defaultable instruments (% of GDP) (2)	125.9	164.2	148.8	162.2	164.2	164.6	.	.
Export performance vs. advanced countries (% change over 5 years)	14.4	-1.0	-1.1	2.4	-0.8	.	.	.
Export market share, goods and services (y-o-y)	-0.4	-3.6	0.5	2.1	-3.7	-1.0	-1.1	-0.7
Net FDI flows (% of GDP)	1.7	1.2	1.5	-0.1	2.8	3.2	.	.
General government balance (% of GDP)	-2.0	-1.7	1.1	-4.3	-3.7	-2.6	-2.3	-1.2
Structural budget balance (% of GDP)	.	.	1.0	-2.7	-2.9	-2.3	-2.0	-1.0
General government gross debt (% of GDP)	65.9	76.2	68.6	68.7	69.3	66.3	65.2	64.1

(1) Domestic banking groups and stand-alone banks, EU and non-EU foreign-controlled subsidiaries and EU and non-EU foreign-controlled branches.
(2) Net international investment position (NIIP) excluding direct investment and portfolio equity shares.
Source: Eurostat and ECB as of 2 May 2023, where available; European Commission for forecast figures (Spring forecast 2023).

This Annex assesses fiscal sustainability risks for Germany over the short, medium and long term. It follows the same multi-dimensional approach as the European Commission's 2022 Debt Sustainability Monitor, updated based on the Commission 2023 spring forecast.

1 - Short-term risks to fiscal sustainability are low overall. The Commission's early-detection indicator (S0) does not signal major short-term fiscal risks (Table Ax.3). ([163]) Gross financing needs are expected to be around 16% of GDP in the short term (i.e. over 2023-2024) and to decline compared with the recent peak in 2020 (Table Ax.1). Financial markets' perceptions of sovereign risk are investment grade, as confirmed by the main rating agencies.

2 - Medium-term risks to fiscal sustainability are medium overall.

The Debt Sustainability Analysis (DSA) for Germany shows that, under the baseline, the government debt ratio is projected to decline slightly to 63.5% of the GDP by 2033 (Graph A21.1) ([164]) ([165]) The assumed structural primary balance (a deficit of 0.1% of GDP as of 2024) contributes to these developments. It appears plausible compared with past fiscal performance, indicating that the country has room for corrective action. At the same time, the baseline projections up to 2033 benefit from a favourable (although diminishing) snowball effect with real GDP growth at around 0.8% of GDP over 2025-2033. Government gross financing needs are expected to reach around 17% of GDP in 2033, slightly above the level forecast for 2024.

The baseline projections are stress tested against four alternative scenarios to assess the impact of changes in key assumptions (Graph A21.2**).** For Germany, reverting to historical fiscal trajectories under the 'historical structural primary balance (SPB)' scenario would lead to a smaller government debt ratio. If the SPB gradually converged to a surplus of 1.4% of GDP (its historical 15-year average), the projected debt-to-GDP ratio would be around 10 pps. of GDP lower compared to the baseline in 2033. A permanent worsening of the macro-financial conditions, as reflected under the 'adverse interest-growth rate differential' scenario (i.e. 1 pp. higher than the baseline) would result in a higher government debt-to-GDP ratio, by around 5 pps. of GDP by 2033, as compared with the baseline. A temporary worsening of financial conditions, as reflected in the 'financial stress 'scenario (i.e. temporarily increase of interest rates by 1 pp.), would lead to a broadly similar public debt-to-GDP ratio by 2033 compared with the baseline. The 'lower structural primary balance (SPB)' scenario (i.e. SPB level permanently reduced by half of the cumulative forecast change), would lead to a significantly higher government debt-to-GDP ratio by 2033 (around +7 pps. of GDP) compared to the baseline.

Additionally, stochastic debt projections indicate low risk (Graph A21.2**). ([166])** These stochastic simulations point to a 35% probability of the debt ratio in 2027 being greater than in 2022, entailing low risk given the initial moderate debt level. In addition, such shocks point to low uncertainty (i.e. the difference between the 10th and 90th debt distribution percentiles) surrounding the government debt baseline projections.

([163]) The S0 is a composite indicator of short-term risk of fiscal stress. It is based on a wide range of macro-financial and fiscal variables that have proven to perform well in the past in detecting situations of upcoming fiscal stress.

([164]) The assumptions underlying the Commission's 'no-fiscal policy change' baseline notably comprise: (i) a structural primary deficit, before ageing costs, of 0.1% of GDP as of 2024; (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 from now); (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 (as for all Member States); (iv) real GDP growth rates from the Commission 2023 spring forecast until 2024, followed by EPC/OGWG 'T+10 methodology projections between T+3 and T+10, i.e. for 2025-2033 (on average 0.8%); (v) ageing costs in line with the 2021 Ageing Report (European Commission, Institutional Paper 148, May 2021). For information on the methodology, see the 2022 Debt Sustainability Monitor (European Commission, Institutional Paper 199, April 2023).

([165]) Table 1 shows the baseline debt projections and its breakdown into the primary balance, the snowball effect (the combined impact of interest payments and nominal GDP growth on the debt dynamics) and the stock-flow adjustment.

([166]) These projections show the impact on debt of 2000 different shocks affecting the government's primary balance, economic growth, interest rates and exchange rates. The cone covers 80% of all simulated debt paths, therefore excluding tail events.

3 - Long-term risks to fiscal sustainability are medium overall. ([167])

The S2 sustainability gap indicator (at 2.3 pps. of GDP) points to medium risk, suggesting that Germany would need to improve its structural primary balance to ensure debt stabilisation over the long term. This result is mostly due to increasing ageing costs (2.1 pps. of GDP), mostly due to an increase of pension spending (1.0 pp. of GDP) together with health care and long-term care expenditure (joint contribution of 0.5 pp. of GDP) (Table A21.1).

Given low long-term debt vulnerabilities, as highlighted by the S1 indicator, overall long-term risks are assessed as medium. The S1 sustainability gap indicator signals that only a limited consolidation effort of 1.6 pps. of GDP would be needed to reduce debt to 60% of GDP by 2070. This result is mainly driven by expected ageing costs (contribution of 1.7 pps. of GDP) (Table A21.1).

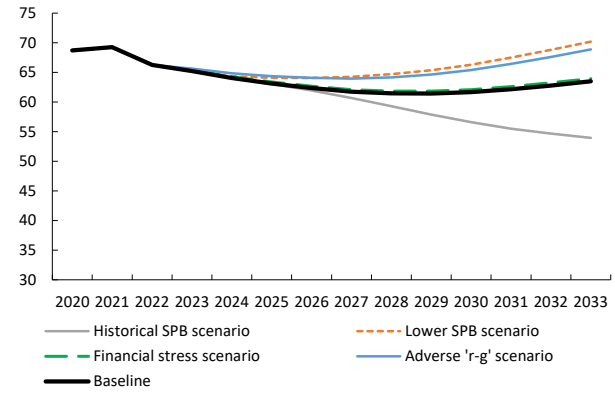
Finally, several additional risk factors need to be considered in the assessment. On the one hand, risk-increasing factors are related to the recent increase of interest rates and a relatively high share of short-term government debt. On the other-hand, risk-mitigating factors include the lengthening 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.

([167])The S2 fiscal sustainability gap indicator measures the permanent fiscal effort (SPB adjustment) in 2024 that would be required to stabilise public debt over the long term. It is complemented by the S1 fiscal sustainability gap indicator, which measures the permanent fiscal effort required in 2024 to bring the debt-to-GDP ratio to 60% in the long term (by 2070). 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 pps. of GDP, 'medium risk' if it lies between 2 pps. and 6 pps. of GDP, and 'low risk' if the effort is negative or below 2 pps. of GDP. The overall long-term risk classification brings together the risk categories derived from S1 and S2. S1 may notch up the risk category derived from S2 when it signals a higher risk than S2. See the 2022 Debt Sustainability Monitor for further details.

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

Table 1. Baseline debt projections	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Gross debt ratio (% of GDP)	**68.7**	**69.3**	**66.3**	**65.2**	**64.1**	**63.1**	**62.4**	**61.8**	**61.5**	**61.4**	**61.7**	**62.2**	**62.8**	**63.5**
Changes in the ratio	9.1	0.5	-3.0	-1.0	-1.2	-0.9	-0.8	-0.6	-0.3	0.0	0.2	0.5	0.6	0.7
of which														
Primary deficit	3.7	3.2	1.9	1.5	0.3	0.3	0.4	0.5	0.6	0.8	0.9	1.1	1.2	1.4
Snowball effect	1.8	-3.2	-4.1	-3.1	-1.5	-1.3	-1.1	-1.1	-0.9	-0.8	-0.7	-0.6	-0.6	-0.7
Stock-flow adjustments	3.6	0.6	-0.8	0.6	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)	20.3	18.7	15.6	16.4	14.9	14.8	14.8	14.9	15.1	15.3	15.6	16.0	16.3	16.6

Graph 1. Deterministic debt projections



Graph 2. Stochastic debt projections 2023-2027

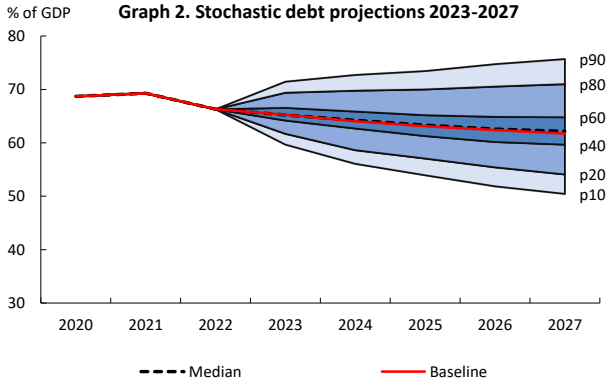


Table 2. Breakdown of the S1 and S2 sustainability gap indicators

		S1	**S2**
Overall index (pps. of GDP)		**1.6**	**2.3**
of which			
Initial budgetary position		-0.1	0.2
Debt requirement		0.1	
Ageing costs		1.7	2.1
of which	*Pensions*	0.8	1.0
	Health care	0.3	0.4
	Long-term care	0.2	0.1
	Others	0.4	0.5

Source: Commission services.

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**	**S2**	**S1**	**Overall** (S1 + S2)
LOW	**MEDIUM**	Overall	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**	**LOW**	**LOW**	**MEDIUM**	**LOW**	**MEDIUM**
		Debt level (2033), % GDP	63.5	54.0	70.2	68.9	64.0				
		Debt peak year	2022	2022	2033	2033	2022				
		Fiscal consolidation space	66%	39%	78%	66%	66%				
		Probability of debt ratio exceeding in 2027 its 2022 level						35%			
		Difference between 90th and 10th percentiles (pps. GDP)						25.2			

(1) *Debt level* in 2033. 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 consolidtation 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 2027 its 2022 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 2000 different shocks. Green, yellow and red cells indicate increasing uncertainty.

Source : European Commission (for further details on the Commission's multidimensional approach, see the 2022 Debt Sustainability Monitor)

Source: Commission services.

The Macroeconomic Imbalance Procedure matrix presents the main elements of the in-depth review undertaken for Germany ([168]). Germany was selected for an in-depth review in the 2023 Alert Mechanism Report. This in-depth review on the prevention and correction of macroeconomic imbalances presents the main findings on the gravity and evolution of the challenges identified, as well as policy responses and potential policy needs. Findings cover all areas of vulnerability assessed in the in-depth review.

Germany's persistently large current account surplus has eased gradually since 2015, reflecting a decline in net export of goods and services, and fell to 4.2% in 2022. In 2011 to 2021 the current account surplus exceeded 6% of GDP, reflecting a substantial demand shortfall with a gap between output and domestic consumption and investment. After peaking in 2015 at 8.6% of GDP, the current account balance started declining, easing to 7.6% of GDP in 2019 and 7.7% in 2021. The fall was driven primarily by a declining surplus in the trade in goods that fell from 8.2% of GDP in 2015 to 6.3% of GDP in 2019 and 5.4% in 2021, while manufacturing intensity receded. In 2022, the current account surplus dropped abruptly to 4.2% of GDP, reflecting price increases for imported energy, loss of export market shares in non-energy goods, higher imports of equipment and intermediate goods as well as higher tourism imports after the expiry of COVID-19 related restrictions. From the savings and investment perspective, the decline in the current account surplus also reflected the shrinking surplus of savings of corporates and households relative to domestic investment, as excess private savings related to the pandemic started to unwind while the investment ratio continued increasing. Domestically, the investment ratio increased, also reflecting record inventory growth. The government contributed to narrowing the current account balance becoming a net borrower in 2020, with a deficit of -4.3% of GDP. The deficit decreased to -3.7% in 2021 and to -2.6% in 2022. House prices have been growing in the decade preceding 2022, leading to overvaluation, which has been moderating somewhat as house prices started declining while inflation has been high. Although increased since 2010, housing supply cannot catch up with demand and housing completions have declined since 2020, remaining below government targets.

The current account surplus is expected to rebound towards 6% of GDP, remaining below the MIP threshold. The current account surplus is expected to increase, but stay below pre-pandemic levels as well as below the MIP threshold, due to a lower balance of trade in goods and services. In particular, energy prices are expected to fall from their 2022 highs but remain above earlier levels, affecting the value of imports and weighing on cost competitiveness, while incentivising investments. Wage growth is expected to accelerate reflecting continued labour shortages, with unit labour cost growth exceeding the euro area average. While in the late 2010s the government registered consecutive surpluses, in the future government deficits are forecast. The house price overvaluation and the ongoing price correction can have implications for the financial sector, meriting close monitoring, even if no major disruption is expected.

Several policy initiatives supported consumption and contributed to increased domestic investment. The government increased the minimum wage by 25% between December 2021 and November 2022 setting it at EUR 12 per hour and took ambitious measures against heightened energy costs to stabilise domestic demand and cushion the burden on household disposable income and corporate income. The timely and effective implementation of Germany's recovery and resilience plan, implementing reforms to tackle administrative bottlenecks related to planning and permitting and to address shortages of skilled labour are expected to benefit investment, and help effectively channel the funds from the recently set up or expanded special purpose vehicles for defence and for the green transition. This could reinforce the adjustment of the external position. In the housing sector, construction supply is hampered by administrative burden, divergent construction rules across Länder, insufficient digitalisation of administrative procedures and barriers to employment of skilled labour. Social housing remains very limited.

Based on this assessment, the Commission considered in its communication European

([168]) European Commission (2023), In-Depth Review for Germany, Commission staff working document, (COM(2023) 629 final), in accordance with Article 5 of Regulation (EU) No 1176/2011 on the prevention and correction of macroeconomic imbalances.

Table A22.1:**Assessment of macroeconomic imbalances matrix**

	Gravity of the challenge	Evolution and prospects	Policy response
		Unsustainable trends, vulnerabilities and associated risks	
External position	Over the past decade, Germany had a persistently large current account surplus, considerably above what fundamental factors suggest. The surplus has reflected a substantial gap between domestic demand and output, with consumption and investment both relatively limited. The domestic under-investment has impeded capital deepening and potential growth, while it has been accompanied by direct investments in other EU countries and internationalisation of value chains.	Germany's current account surplus has been declining from its peak in 2015, driven in particular by a declining balance of trade in goods and services. The current account balance dropped abruptly in 2022 to 4.2% of GDP, reflecting price increases for imported energy, loss of export market shares in non-energy goods and higher import of equipment and intermediate goods. The balance of services moved to a deficit of -0.8% of GDP from a roughly balanced position in 2021, mainly reflecting normalisation as tourism resumed after the expiry of COVID-19 related restrictions. The gradual decline in the current account surplus after 2015 was aligned with the shrinking excess savings of corporates as they increased their investment, while the rapid decline in 2022 was only partly explained by a rebound of domestic demand, and showed the effect of temporary factors which are likely to reverse to some extent. Reflecting both the contraction of GDP that reduced government revenues and generous support measures, the government became a net borrower in 2020-2022, running deficits of 2-4% of GDP. The current account surplus is expected to bounce back towards 6% of GDP in 2023 and 2024. This reflects a partial reversal of the energy price shock, while moderate external demand is expected to limit exports, in particular from the manufacturing sector. Effects that still weighed on consumption in 2022 (COVID-19 related restrictions still in place in early 2022 and soaring inflation resulting in loss of purchasing power) are expected to ease. As real wage growth resumes and economic uncertainty diminishes, this will benefit household incomes, while the growth of unit labour costs are expected to exceed that of other euro area economies. Investment is expected to be weak in 2023 reflecting high energy prices and increasing interest rates; and is expected to pick up in 2024, reacting to high order books, pressing needs for the green and digital transition, as well as the desire to enhance security of supply. Moderate gGovernment deficits are projected to persist in the coming years also due to increased spending by the various extra-budgetary funds.	The government took ambitious measures against heightened energy costs to stabilise domestic demand, lower consumer price inflation and cushion the burden on household disposable income. The measures implemented include a wide range of support (one-time bonuses and increased allowances, price brakes on heating and electricity, temporary VAT relief). As a permanent measure, the renewable energy surcharge was abolished and it is planned to systematically adjust the income tax schedule to inflation. Overall, Germany's government sector provided ample crisis policy support and the fiscal balance turned negative contributing to the reduction in the current account surplus. In addition, special purpose vehicles were set up with the objective of enhancing public investment in defence and promoting the green transition, and funds allocated to broadband rollout and rail also increased. Measures to reduce planning and implementation bottlenecks and to reduce red tape are expected to intensify public and private investment. The effective implementation of allocated public investment funding and reforms that remove obstacles to investment could reinforce the adjustment of the external position.
Housing market	House prices have been growing for a decade, leading to overvaluation. Although increased since 2010, housing supply cannot catch up with demand and housing completions have declined since 2020 and are below targets The overvaluation in the housing market and the ongoing price correction can have implications for the financial sector, meriting close monitoring, even if no major disruption is expected.	Following a decade of steady growth, in 2022 house prices in nominal terms were on average 80% higher than in 2012, having expanded with a peak annual growth rate at 12% during the pandemic. Housing affordability declined considerably, the price-to-income ratio has increased by 40% and the house price-to-rents ratio by 58% between 2012 and 2022, resulting in an estimated overvaluation of about 25%. Since the second half of 2022 house prices receded, reflecting the increasing interest rate environment and the reduced purchasing power of buyers. The number of housing completions increased to 293,000 in 2019 and around 306 000 in 2020, while going down to 278 000 in 2022, which is clearly below government estimates that around 400 000 new dwelling are needed a year, which was also included in the coalition agreement of 2021. In December 2021, the European Systemic Risk Board (ESRB) issued a recommendation on medium-term vulnerabilities in the residential real estate sector in Germany. The ESRB considered house price overvaluation and high house price growth as well as possible loosening of lending standards and significant data gaps to be the main vulnerabilities in the German housing market and the policy mix is considered only partially appropriate and partially sufficient to address the increasing vulnerabilities.	Construction supply is hampered by administrative burden, divergent construction rules across Länder, insufficient digitalisation of administrative procedures and barriers to employment of wkilled labour. The availability of social housing remains very limited too. The government acknowledged that the targeted 400 000 new housing completions will not be reached at least until 2024, yet it is not clear how government measures would make a tangible contribution reaching this objective – although the support for housing renovation is expected to contribute to improvements in the housing stock and to climate-friendly construction. The ESRB has concluded that borrower-based measures, in particular the loan-to-value (LTV) ratio measure should be activated.

Source: European Commission

Semester – 2023 Spring Package (COM(2023) 600 final) that Germany continues to experience imbalances.

EUROPEAN ECONOMY INSTITUTIONAL PAPERS SERIES

European Economy Institutional Papers series can be accessed and downloaded free of charge from the following address: Publications (europa.eu).

.

Titles published before July 2015 can be accessed and downloaded free of charge from:

- http://ec.europa.eu/economy_finance/publications/european_economy/index_en.htm
  (the main reports, e.g. Economic Forecasts)

- http://ec.europa.eu/economy_finance/publications/occasional_paper/index_en.htm
  (the Occasional Papers)

- http://ec.europa.eu/economy_finance/publications/qr_euro_area/index_en.htm
  (the Quarterly Reports on the Euro Area)

GETTING IN TOUCH WITH THE EU

In person
All over the European Union there are hundreds of Europe Direct Information Centres. You can find the address of the centre nearest you at: http://europa.eu/contact.

On the phone or by e-mail
Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696 or
- by electronic mail via: http://europa.eu/contact.

FINDING INFORMATION ABOUT THE EU

Online
Information about the European Union in all the official languages of the EU is available on the Europa website at: http://europa.eu.

EU Publications
You can download or order free and priced EU publications from EU Bookshop at: http://publications.europa.eu/bookshop. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see http://europa.eu/contact).

EU law and related documents
For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu.

Open data from the EU
The EU Open Data Portal (http://data.europa.eu/euodp/en/data) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

Publications Office
of the European Union