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Germany's energy transition

Building a just and resilient *Energiewende* amid economic and geopolitical crises

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Summary

- Germany's green energy transition, or *Energiewende*, acquired policy relevance in the late 1990s. Since then, it has promoted the replacement of fossil fuels and nuclear energy with renewable energy, alongside power grid expansion, energy efficiency, and broader industrial and societal transformation.
- Since the loss of its energy partnership with Russia in 2022, Germany has experienced an economic slowdown. Geopolitical competition is undermining the country's export-oriented economy, including its trade relations with China.
- Germany must accelerate its low-carbon transformation in a way that preserves its industrial power, makes energy systems more resilient, and ensures a socially just transition. Despite creating a special fund to accelerate the energy transition, the current German government has prioritised gas imports and supported polluting industries.
- The *Energiewende* faces resistance from local communities due to their limited influence in decision-making and the uneven distribution of costs. Far-right parties have sometimes sought to exploit the resulting protests for their own gain.
- Due to Germany's economic significance, the progress of the *Energiewende* will strongly influence the EU's decarbonisation path.

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Introduction

Global energy prices skyrocketed in early March 2026, as Israel and the United States attacked Iran and unleashed a war that plunged the Middle East into turmoil. While a humanitarian crisis engulfed the region, economic shockwaves reached further afield. Large energy-importing countries were exposed to spiralling energy prices and uncertainty about supply chains. In the European Union, a new chapter in the protracted saga of energy crises began. EU energy prices had been high and volatile since the autumn of 2021, with peaks in the months after Russia's attack on Ukraine in February 2022. Now, a new major challenge looms for key industrial producers, most notably Germany.

Since the loss of its strategic energy partnership with Russia, Germany has spent the last four years reviewing and redefining its energy policy. The previous model, based on large imports of cost-competitive Russian energy to fuel the export-oriented German economy, was shaken to its foundations. Broader geopolitical competition now threatens German foreign trade, including its strategic commercial relationship with China – Berlin's largest trade partner.¹ Combined with other long-standing issues such as ageing national infrastructure and stagnating innovation capacity,

these factors caused the German economy to enter recession in 2023 and 2024, before returning to anaemic GDP growth (+0.2%) in 2025.

EU-level policies addressing the crisis with Russia, notably the REPOWEREU plan, call for the simultaneous acceleration of renewable energy deployment and the abandonment of Russian energy imports.² Since 2022, Germany has been building import terminals for liquefied natural gas (LNG) and signing new supply contracts with US and Qatar producers. While partly meeting immediate needs, these policies divert resources away from the primary goals of the energy transition and greater self-sufficiency. The decision to replace Russian pipeline gas with more polluting LNG imports across the ocean is no green or secure solution to the crisis. President Donald Trump's pursuit of US energy dominance and the large-scale disruptions in supplies from the Middle East in March 2026 clearly reinforced this.³

Germany is now left with one strategic option for its energy and economic future: accelerate the energy transition in a way that preserves what remains of its industrial power, while making energy systems more resilient and ensuring that the shift to

1 Statistisches Bundesamt, Ranking of Germany's trading partners in foreign trade 2025, 2. https://www.destatis.de/EN/Themes/Economy/Foreign-Trade/Tables/order-rank-germany-trading-partners.pdf?__blob=publicationFile. China is Germany's largest trade partner, with over EUR 250 billion of trade. On domestic developments and foreign policy challenges to Germany, see Siddi, Marco, T. Iso-Markku, M. Müller and N. Helwig (2025) "Germany's 'perfect storm': A structural crisis for the EU's engine?". *FIIA Briefing Paper* 403. https://fiia.fi/wp-content/uploads/2025/02/BP403_Germanys-perfect-storm.pdf.

2 Siddi, Marco (2022) "Assessing the European Union's REPOWEREU plan: Energy transition meets geopolitics". *FIIA Working Paper* 130. https://fiia.fi/wp-content/uploads/2022/10/wp130_assessing-the-european-unions-repowereu-plan-1.pdf.

3 Campbell, Loyle, Andreas Goldthau and Kira Vinke (2026) "Venezuela, Oil and us Energy Dominance: Implications for German Policy", *DGAP Memo* 3. https://dgap.org/system/files/article_pdfs/dgap%20Memo_No-3_January-2026_4pp.pdf; Piria, Raffaele, Kacper Szulecki, Hannah Lentschig and Louise van Schaik (2026) "Europe's Selective Blindness on Gas: US LNG and the Limits of Supply Diversification". *Policy Brief*. https://www.clingendael.org/sites/default/files/2026-01/Policy_brief_Europes_Selective_Blindness_on_Gas.pdf; Interview with Deputy Head of Division working on Energy Diplomacy, German Federal Foreign Office, 21 February 2025.

renewables occurs through a socially just process. The task is daunting but unavoidable if Germany is to transition to a viable economic model and achieve the country's climate targets for 2030 and beyond.

This Briefing Paper analyses the current state of play of the energy transition in Germany. The paper begins by examining the “German brand” of energy transition, known as *Energiewende*. It then explores its main economic and political challenges, as well as key issues in terms of resilience and justice. It concludes by highlighting the European dimension of the *Energiewende*. The paper argues that, as Germany is the largest industrial country and economic engine of the EU, the outcome of its energy transition is a matter of strategic European significance.

The *Energiewende*: Long-term domestic and international factors

The term *Energiewende* (literally, the ‘energy turnaround’) became popular in Germany in the 1980s, but the German energy transition only gained momentum in the late 1990s. The Social Democratic-Green government of Chancellor Gerhard Schröder introduced an energy tax on fossil fuels used in transport, heating, and electricity generation. Most significantly, in 2000 it passed the Renewable Energy Law, which was designed to meet Germany's emission reduction targets under the Kyoto Protocol and became an important political step towards replacing fossil fuels with renewable energy.⁴

The *Energiewende* was conceived as a strategic transformation of the entire energy system. It included the replacement of fossil fuels and nuclear energy with renewable energy, as well as the expansion of the power grid. It also entailed promoting energy efficiency through building insulation and energy savings, and advancing research and

development in the climate and energy sector. In addition, social and industrial transformation were seen as essential steps towards a low-carbon society.

In the context of a gradual shift to renewables, German policymakers envisioned gas as a bridging technology and as a back-up for intermittent wind and solar power generation. The reasoning was that gas pollutes less than coal and oil, two energy sources on which Germany has been heavily dependent. In the 2000s and 2010s, most German policymakers viewed Russia as a reliable gas provider, based on four decades of growing energy trade and a positive bilateral relationship. This logic led to the construction of the Nord Stream pipelines, completed in 2011–2012, and Nord Stream 2 after 2015 – the latter being particularly controversial in the EU, as planning started after Russia's annexation of Crimea.

The role of gas was further enhanced after the Fukushima nuclear power plant accident in Japan in 2011. The accident reignited anti-nuclear sentiment among the German population and prompted Chancellor Angela Merkel to commit to the gradual decommissioning of German nuclear power plants, to be completed by 2022. Despite the energy crisis unleashed by the Russo-Ukrainian war in 2022, the last three German nuclear power plants were shut down after a minor delay in April 2023.⁵

Excessive reliance on Russian gas and the decommissioning of nuclear power plants were the two most controversial aspects of the practical implementation of the *Energiewende*. Most critics argued that Russia's company Gazprom had been allowed to gain an overly dominant role in gas supply and critical gas infrastructure. After 2022, attitudes towards nuclear power partly shifted as well. While anti-nuclear sentiment remained high, a temporary extension of operations for the remaining plants was seen as acceptable to guarantee security of supply.

4 Sacco, Rafael Luis et al. (2024) “Energy transition policies in Germany and the United Kingdom”. *Energy Research & Social Science* 110. <https://doi.org/10.1016/j.erss.2024.103460>; Wiertz, Thilo, Lilith Kuhn and Annika Mattissek (2023) “A turn to geopolitics: Shifts in the German energy transition discourse in light of Russia's war against Ukraine”. *Energy Research & Social Science* 98. <https://doi.org/10.1016/j.erss.2023.103036>.

5 Schneider, Volker (2025) “Germany's Energy and Climate Policy as an Ecology of Games”. *Politics and Governance* 13. <https://doi.org/10.17645/pag.10023>. Until the Fukushima accident, Merkel had been a supporter of nuclear power and opposed the decision to phase it out taken by the Schröder government. After Fukushima, support for nuclear power in Germany dropped sharply and was confined to a few conservative politicians.

Electricity generation in Germany in 2024

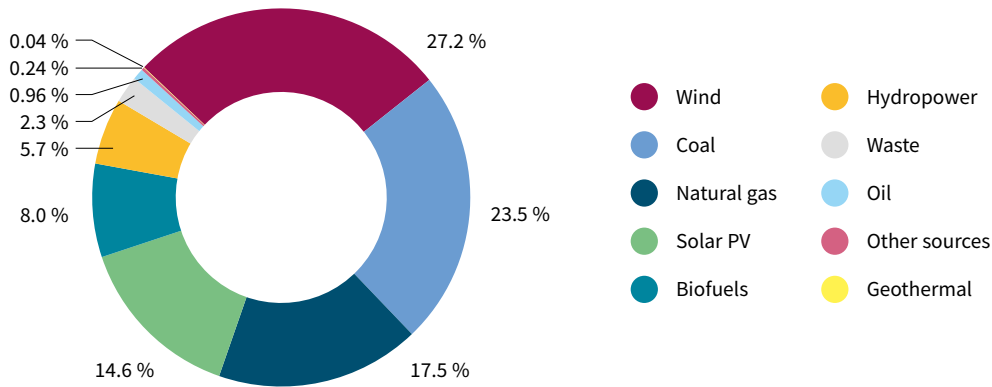


Figure 1. Electricity generation in Germany in 2024.

Source: International Energy Agency (2026) Germany – Energy mix. <https://www.iea.org/countries/germany/energy-mix>.

Total energy supply in Germany in 2024

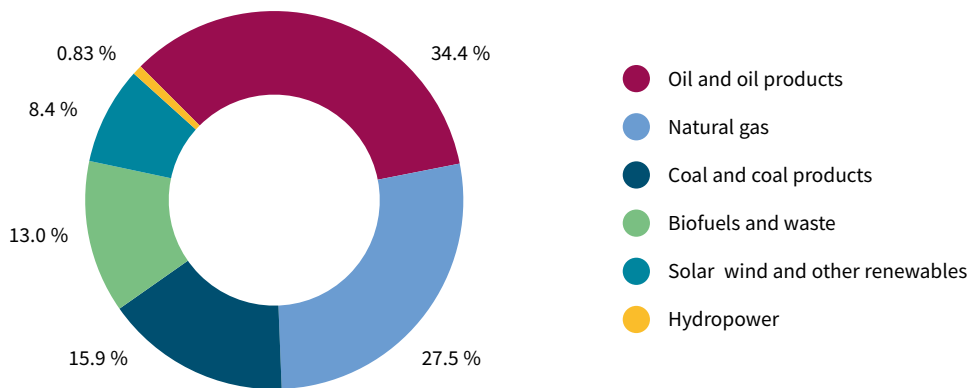


Figure 2. Total energy supply in Germany in 2024.

Source: International Energy Agency (2026) Germany – Energy mix. <https://www.iea.org/countries/germany/energy-mix>.

Despite these controversies and continued reliance on coal, the *Energiewende* made important progress. By 2024, solar and wind power accounted for over 41% of electricity generation; together with hydropower, biofuels and waste, they accounted for around 22% of total energy supply (see Figures 1 and 2). Domestically, a broad consensus exists on pursuing the energy transition; until recently, contestation was limited to modes of implementation at regional and local levels. Internationally, the *Energiewende* has become a symbol of Germany’s

leadership in climate policy and part of the country’s soft power in global politics.⁶

However, decarbonisation has proceeded at a much slower pace in the industrial, district heating, and transport sectors, all of which remain highly reliant on fossil fuels, with gas being essential to the first two (see Figure 3). Efforts to import hydrogen, which is critical to decarbonising hard-to-abate sectors such as the chemical and steel industries,

6 Quitzow, Rainer and Sonja Thielges (2022) “The German energy transition as soft power”. *Review of International Political Economy* 29(2), 598–623. <https://doi.org/10.1080/09692290.2020.1813190>.

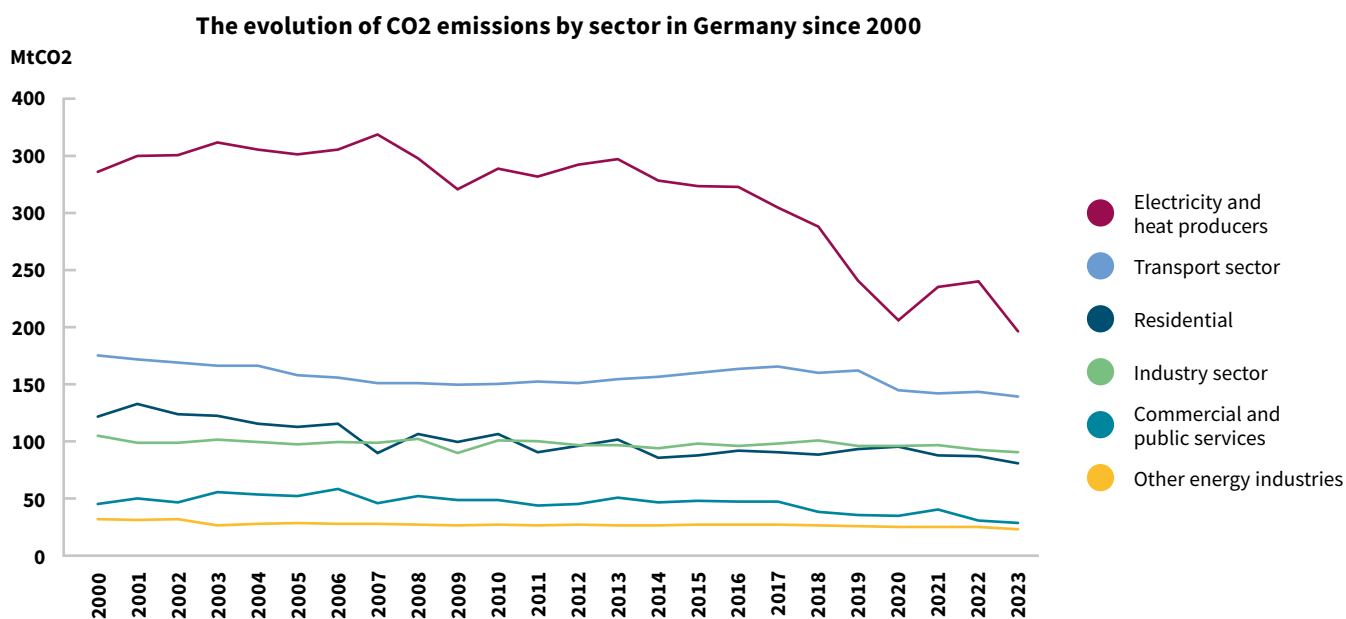


Figure 3. The evolution of CO2 emissions in Germany since 2000.

Source: International Energy Agency (2026) Germany – Emissions. <https://www.iea.org/countries/germany/emissions>.

have only picked up speed in recent years. While the low-carbon transition has received new policy impetus due to international crises and disruptions in fossil fuel supply, accelerating implementation is difficult at a time of economic slowdown and public investment needs in other important sectors, such as the country’s essential infrastructure. The ecological modernisation paradigm of the *Energiewende* has been challenged, with lignite, LNG, and nuclear power to some extent gaining popularity as bridging technologies.

Although the underlying consensus remains intact, policy opposition to the *Energiewende* has also grown, as the far-right party Alternative for Germany seeks to link decarbonisation to the country’s economic woes. So far, populist parties have rarely succeeded in co-opting local opposition to green energy projects, which tends to be rooted in the unequal distribution of costs and benefits and in insufficient citizen involvement in decision-making. However, dismissing bottom-up concerns would be risky, especially now that renewable energy deployment is gaining speed, while a new major energy crisis is providing fertile ground for populist arguments.

Justice and democracy in Germany’s energy transition

Empirical evidence from different areas across Germany shows that the expansion of power grids and renewable energy – particularly wind power – faces significant local opposition.⁷ Resistance stems from concerns regarding governance, distributive justice and procedural justice.⁸ In terms of distributive justice, namely the allocation of costs and benefits, a general perception among opponents is that the transition is an elitist project that benefits urban elites while placing disproportionate burdens on rural communities, such as negative impacts on agriculture, the landscape, and local tourism.

7 For a good empirical analysis and literature review of other studies, see Radtke, Jörg and David Löw-Beer (2025) “Unpacking local energy conflicts: Drivers, narratives, and dynamics of right-wing populism and local resistance to energy transitions in Germany”. *Energy Strategy Reviews* 61. <https://doi.org/10.1016/j.esr.2025.101844> and Weisskircher, Manès et al. (2026) “Explaining Attitudes Towards Climate Action in Germany: AfD vs. the Greens, the East vs. the West, Wind vs. Solar Energy”. *German Politics*. <https://doi.org/10.1080/09644008.2025.2587229>.

8 For a discussion on energy justice in the EU and the US contexts, see Buchanan-Ponczek, Cordelia and Marco Siddi (2024) “Energy justice through policy: A comparison of us and EU approaches”. *FIIA Working Paper* 139. <https://fiia.fi/en/publication/energy-justice-through-policy>.

While bottom-up opposition tends to focus on specific renewable energy projects affecting local communities, a broader distributional issue concerns the prospective phase-out of lignite mining in the Rhenish area, Lusatia (Brandenburg and Saxony), and Central Germany (Saxony and Saxony-Anhalt), which should take place by 2038 at the latest. This will have an impact on the local economy; staving off discontent will require careful management of dedicated federal and European funds.⁹ After Poland, Germany is the second-largest recipient of financial support from the EU's Just Transition Fund, with nearly EUR 2.5 billion (almost 13% of the total JTF budget).

The effects of miscalculating the distributional impact of decarbonisation were illustrated by the controversy surrounding the German 'heating law' (or Building Energy Act) in 2023. The law originally sought a 65% renewable energy requirement for new heating systems, but this was criticised extensively for forcing expensive, early renovations on homeowners, which would disproportionately affect poorer citizens. Following public backlash and infighting within the Social Democratic-Green-Liberal coalition in power between 2021 and 2025, the law was delayed, and the renewable energy target was scrapped by the new government led by Chancellor Friedrich Merz in February 2026.

Energy governance concerns and procedural justice are interlinked. A widespread critique is that the governance of the *Energiewende* is strongly influenced by economic elites that collude with the media. Citizen involvement is deemed insufficient and participation opportunities are viewed as placating dissent rather than allowing genuine inclusion. In some instances, grassroots opposition even rejects expert assessments and adopts post-truth arguments. However, in many cases, protesters simply argue for reductions in energy consumption and a different type of energy transition, with decentralised and locally managed projects instead of large-scale installations.

The most vocal opponents are usually local citizen initiatives that act through public

demonstrations, social media campaigns, the commissioning of expert studies, and sometimes legal actions or blockades. Their claims often have valid grounds: consultation processes and public participation tend to be inadequate, and decision-making favours well-organised stakeholders, while excluding local communities and marginalised groups. The acceleration of authorisation procedures envisioned by the EU's Net Zero Industry Act for renewable energy installations can make this issue more acute. More timely, open and democratic processes are essential to defuse conflict and ensure that local opposition does not turn into a rejection of the *Energiewende*.

Recent empirical evidence shows that renewable energy communities, which are intended to promote inclusive bottom-up decarbonisation, struggle to reach out to vulnerable groups and to advance a just and democratic transition in Germany.¹⁰ According to EU law (notably Article 2(16) of the Renewable Energy Directive), renewable energy communities are constituted by natural persons, small and medium enterprises and local authorities such as municipalities that own joint renewable energy projects located in their proximity. Their primary purpose is to provide environmental, economic or social community benefits for their members or for the local areas where they operate, rather than financial profits.

While Germany has achieved one of the highest numbers of energy communities in Europe, members tend to be male, with high incomes and education levels, whereas women and younger people are much less represented. Hence, without adequate regulatory support and resources, the contribution of energy communities to justice and democracy remains limited. Furthermore, it is important to note that, regardless of the performance of energy communities in terms of justice and democracy, the welfare state remains primarily responsible for addressing energy poverty and other related vulnerabilities. This responsibility should not be shifted to the local level.

9 Interviews with senior expert at the Department of Energy, Transportation, and Environment of the German Institute for Economic Research, Berlin, 17 October 2025, and with energy expert at the Rosa Luxemburg Foundation in Berlin, 16 October 2025.

10 Hanke, Florian and Rachel Guyet (2023) "The Struggle of Energy Communities to Enhance Energy Justice: Insights from 113 German Cases". *Energy, Sustainability and Society* 16. <https://doi.org/10.1186/s13705-023-00388-2>.

Geopolitical, economic and resilience challenges

A significant challenge for Germany's green transformation is that its acceleration should take place at a time when the country is mired in economic stagnation, geopolitical crisis, and issues related to decades of underinvestment in public infrastructure.

High energy prices, limited innovation capacity, and international competition have pushed the German automotive, chemical, and steel industries into crisis – sectors that have epitomised the country's economic and technological prowess since the twentieth century. Due to their impact on emissions, these sectors are of particular significance to the energy transition. The car sector has fallen behind international competitors, particularly those in China and the US, in the production of electric vehicles. Following intense lobbying by corporate interests and member states led by Germany and Italy, the EU has postponed its full ban on the sale of cars powered by internal combustion engines, initially planned for 2035; however, this will not solve the competitiveness problems of German car-makers. Likewise, the structural crisis of the German chemical and steel industries, which have so far done too little to decarbonise, will not be resolved by generous state aid unless they swiftly innovate and 'green' their production processes.¹¹

Scenarios in which Germany returns to extensive imports of Russian gas, long the lifeline of German industry, are unlikely. The feasibility of such a shift is limited by political opposition, legal constraints and ongoing geopolitical conflict, despite some domestic support and backing by US businesspeople with links to the Trump administration.¹² Although current German minister for economic affairs and energy,

Katherina Reiche, has called the phaseout of nuclear power "a huge mistake", a nuclear revival scenario is also unlikely due to high costs, slow implementation and public opposition. Meanwhile, despite some progress, large-scale hydrogen projects have long implementation timetables and are not proceeding as fast as expected.

In March 2025, shortly after taking office, the new governing coalition led by Chancellor Merz established a EUR 500 billion special fund aimed at upgrading the country's transport and digital infrastructure and accelerating renewable energy deployment over the next twelve years. While substantial, this one-off investment bypassed the self-imposed borrowing limit of 0.35 per cent of GDP for German governments without formally reforming it. Significantly, in September 2025, the German Federal Ministry for Economic Affairs and Energy presented a monitoring report on the energy transition that highlighted challenges and announced a greater policy focus on competitiveness and security of supply, in addition to sustainability.¹³ While the report was generally well received by industry associations, environmental organisations warned that the proposed strategy would perpetuate Germany's dependence on fossil fuels.

Rather than focusing on fossil fuel-based systems, Germany should concentrate on strengthening its net-zero industry and the resilience of critical mineral supply chains. Moreover, efforts in hard-to-decarbonise sectors should be accompanied by a renewed regulatory focus on efficiency and the greening of heating systems. Without swift progress in these areas, the 2030 climate targets will not be reached.¹⁴

- 11 Interviews with former State Secretary at the German Federal Ministry for Economic Affairs and Climate Action, 28 October 2025, with research group leader working on sustainable innovation and energy transitions at the Research Institute for Sustainability in Potsdam, 19 February 2025, and with senior researcher working on industrial decarbonisation at the German Institute for International and Security Affairs in Berlin, 16 October 2025.
- 12 Interview with high-ranking official working on Russia at the German Federal Foreign Office, 21 February 2025; Bernardini, Matt and Morgane Felt Malka (2026) "Nord Stream 2: back in political play". *Le Monde Diplomatique*, March. <https://mondediplo.com/2026/03/06nordstream>.

- 13 German Federal Ministry for Economic Affairs and Energy, Klimaneutral werden - wettbewerbsfähig bleiben, 15 September 2025. https://www.bundeswirtschaftsministerium.de/Redaktion/DE/Downloads/J-L/klimaneutral-werden-wettbewerbsfaehig-bleiben.pdf?__blob=publicationFile&v=14; Wehrmann, Benjamin (2025) "Germany's €500bln special fund for infrastructure and climate neutrality". *Clean Energy Wire*, 15 October. <https://www.cleanenergywire.org/factsheets/qa-germanys-eu500-bl-infrastructure-fund-whats-it-climate-and-energy#nine>.
- 14 Kempter, Claudia (2024) "Energie- und Klimapolitik: Mehr Tempo für die Transformation", *Internationale Politik*, 2 September. <https://internationalepolitik.de/de/energie-und-klimapolitik-mehr-tempo-fuer-die-transformation>; Steinicke, Stefan (2026) "Unterschätztes Nadelöhr", *Internationale Politik*, 23 February. <https://internationalepolitik.de/de/unterschaetztes-nadeloehr>.

Conclusions

Recent studies highlight the need for immediate action in all aspects of the German energy system, together with fundamental changes in society, in order to meet Germany's climate targets as set out within EU frameworks and the Paris Climate Agreement. Annual capacity additions of renewable energy sources such as wind and solar need to increase by four- to sevenfold compared to current rates and be accompanied by rapid electrification. This will only be possible if the transition is reframed in terms of a strong crisis response or a disruptive revolution.¹⁵

This also requires significant adjustments to the German model, including 'ways of life' that are deeply ingrained in national culture, such as driving private high-speed internal combustion cars. Underinvestment in the railway network, its partial privatisation, and the closure of numerous branches in rural areas further complicate the modal shift that is necessary to decrease emissions.¹⁶

Meanwhile, the current government appears intent on securing LNG imports and protecting industrial majors, even if they are reluctant to adopt overdue innovation and decarbonisation strategies. Ongoing investments in LNG infrastructure foster carbon lock-in and perpetuate the country's

dependence on external fossil fuel suppliers; indeed, Germany's greenhouse gas emissions barely decreased in 2025 (-0.1%, compared to -3.4% in 2024). Furthermore, state aid will not resolve the structural issues of the German economy.

In turn, economic stagnation and attempts to preserve outdated models may increase societal discontent, weaken consensus for the *Energiewende*, and further increase support for the far right. The challenge is particularly severe in economically weaker regions, notably in eastern Germany, but it also concerns other areas dependent on coal extraction, energy-intensive industries, and export-oriented companies facing intense competition.

While acknowledging the numerous challenges that stem from geopolitical crises and domestic issues, German leaders should use available fiscal and borrowing capacity to swiftly advance a fair energy transition. As the EU's main economic engine, Germany's decarbonisation is crucial to the outcome of the European Green Deal and the achievement of the Union's climate neutrality targets. Conversely, further delays and the perpetuation of an outdated economic model would aggravate Europe's decline as an economic and geopolitical actor. ◆

15 Jürgens, Patrick et al. (2026) "Closing the ambition gap: Germany's energy transition in line with a 1.5C carbon budget". *Climate Policy* 26(2), 314-331. <https://doi.org/10.1080/14693062.2025.2506610>.

16 Interviews with senior expert at the Department of Energy, Transportation, and Environment of the German Institute for Economic Research, Berlin, 17 October 2025, and with former State Secretary at the German Federal Ministry for Economic Affairs and Climate Action, 28 October 2025.

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