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IS GERMANY READY FOR THE FUTURE?

THE CASE FOR ACTION IN A CLIMATE CHANGED WORLD

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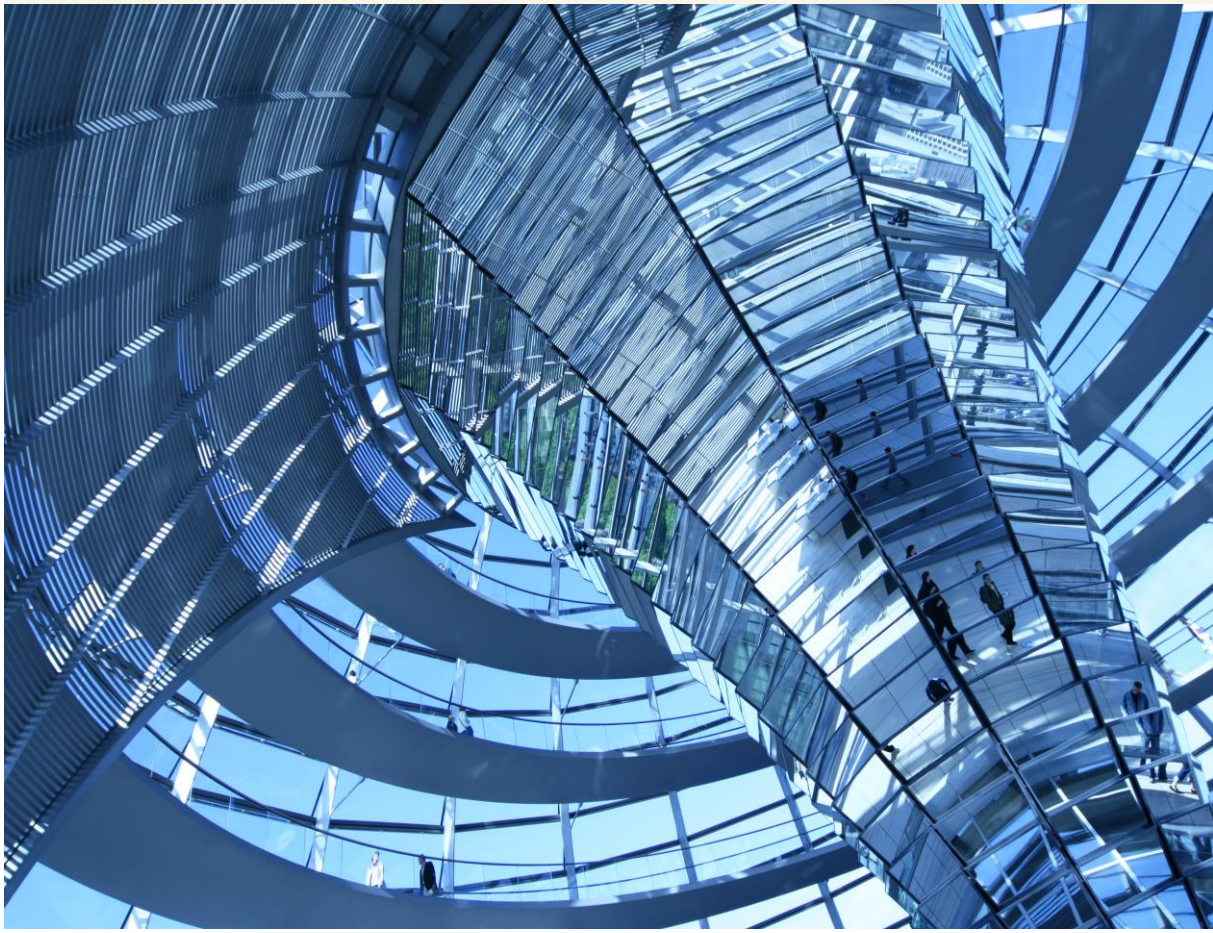

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EIT Climate-KIC Germany, Austria, Switzerland is a branch of a knowledge and innovation community established and funded by the European Institute of Innovation and Technology (EIT) in 2010.

EIT Climate-KIC is Europe's largest public-private innovation partnership focused on climate change, consisting of over 300 dynamic companies, the best academic institutions and the public sector. EIT Climate-KIC integrates education, entrepreneurship and innovation resulting in connected, creative transformation of knowledge and ideas into economically viable products or services that help to mitigate climate change. Its activities are driven by four themes: Urban Transitions, Sustainable Production Systems, Sustainable Land Use, as well as Decision Metrics & Finance.

EIT Climate-KIC's mission is to accelerate the transition to a zero-carbon economy. It is one of six Knowledge and Innovation Communities (KICs) created in 2010 by the European Institute of Innovation and Technology (EIT).

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CONTENTS

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EXECUTIVE SUMMARY

Germany, the largest economy in Europe, with a strong financial sector closely tied to the real economy, faces massive, potentially disruptive changes in the coming years. Specifically, these are the challenges of digitalisation, the geopolitical context, the macroeconomic slowdown and the climate crisis.

For many years, Germany's economic strength has been based on prudent monetary policy, a highly skilled workforce and a renowned manufacturing sector that has successfully built up export markets across the world. Germany has enjoyed political stability and exhibited a contained approach towards foreign policy, where Germany regularly played by the rules set by others in the liberal international order.

However, these pillars of Germany's strength and stability may not be the right tools to manage the upcoming disruptive changes. The emerging megatrends of the 21st century bring new challenges:

> Digitalisation is changing the rules by which businesses and markets are run, and the famous German "Mittelstand" is lagging in adopting digital technologies. Innovations in automation and artificial intelligence are changing manufacturing processes and job profiles.

> With an export-oriented economy and international supply chains, Germany thrived under the multilateral, rules-based system of the last decades. But this system is now challenged by rising nationalism around the world, by social inequality and political fragmentation, and by the climate crisis. The future will require the European Union, and Germany in particular, to play a more proactive role in making and supporting international rules.

> Germany has recovered well from the 2008 financial crisis and has been thriving for a decade in an economy with low interest rates, decreasing public and private debts and low inflation. However, with stagnant demand and limited appetite for additional targeted investment the market alone will fail to deliver the stimulus needed to kick-start sustainable economic growth.

In many countries, and internationally, governments are taking steps to address structural economic shifts through new financial policy approaches. The trend is particularly well developed in relation to climate change and sustainability, from the European Commission's sustainable finance agenda to the moves by central

banks to green financial rules. Different national circumstances have led to a variety of green finance approaches at national level. To date, Germany and its financial system have been slow in preparing for the coming changes.

Faster and stronger climate policy is a crucial means to increase Germany's resilience in the face of these intertwined disruptions, by spurring innovation, ensuring social cohesion and restructuring an industrial core that will be competitive in tomorrow's climate-neutral world. Altogether, a set of policies and measures – summarised in figure 1 below – can help to make Germany, deeply rooted in the European Union, ready for a fundamentally different future. A future that is climate-safe, digital, geopolitically balanced, and economically successful.

Given the parallel development of major disruptive trends in technology, geopolitics, macroeconomics, finance and climate, the question is not if Germany will be changed or not, but to what extent Germany can actively shape the transition and reap the benefits of change. Ambitious climate policy supported by financial policy innovation can reduce systemic risk, ensure the competitiveness of German industry, and mobilise the necessary investment for Germany's transformation to a net zero economy.

Figure 1: Making Germany fit for the future – Recommendations

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INTRODUCTION

Only three decades ago Germany navigated a process of massive social and economic restructuring when it reunified the economies of East and West. To successfully find its place in the 21st century Germany must again confront and acknowledge the social and economic risks that it faces and take control of its destiny through a positive, socially equitable plan that makes the necessary investments in the future.

The global transition to a climate-neutral economy will involve structural economic changes. The traditionally important automotive, power generation, and high-quality manufacturing sectors, including energy-intensive industries such as chemical manufacturing which have been dominant parts of Germany's export economy, face the challenge of adjusting to a new world in a way that does not risk the value of core assets.

These structural changes are hard to deal with, and there is little reason to believe that markets, under the current regulatory framework, will sufficiently adjust to them. Germany has taken some cautious active steps in the direction of a societal level response, for example with its multi-stakeholder "Coal Commission" that negotiated the phase-out of coal-fired electricity generation.[1]

Crumbling public infrastructure, digitalisation and the climate crisis are all strong reasons to move beyond prioritising debt avoidance ("Schwarze Null").
A cautious reaction of incrementally adapting to a world that is rapidly changing will only lead to more disruptive, less controllable changes in the future. Risk awareness alone will not build prosperity; a positive vision for Germany's economy and its place in the world, combined with transformative action, is urgently required.

Finance has a key role to play in Germany's response, both in assigning value to risks and in enabling the necessary changes in the real economy, thereby opening new, green markets for European economies. With climate change happening at a faster rate than predicted[2] the global financial system is starting to respond: central banks, including the US Federal Reserve and the Bank of

[1] E3G (2019). **The German Coal Commission – A Role Model for Transformative Change?**

[2] InsideClimate News (2017). **Climate Change Is Happening Faster Than Expected, and It's More Extreme**

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England, increasingly address the climate crisis as part of their core strategy for monetary policy; the International Monetary Fund (IMF) is starting to consider climate risk in its assessment of national budgets; the managers of large asset funds are committing to move towards 1.5 degrees compatible portfolios; and markets are shifting away from investments in coal and gas.

Germany faces the challenge of catching up with these global trends, staying competitive, remaining a credible international player, and ensuring the stable development of its domestic economy. In this paper we describe this challenge and suggest some policy actions.

- Chapter 1 examines some of the major trends that are reshaping the global economic and political system as well as their links to the climate crisis.
- Chapter 2 takes an in-depth look at the role that the financial sector can play in responding to these challenges.
- Chapter 3 presents case studies on lessons that can be learnt from four other countries.
- Chapter 4 provides a detailed assessment of how the analysed trends are affecting Germany today and how its actions on sustainable finance compare to those of other geographies.
- Chapter 5 makes recommendations on how cross-cutting actions today can help avoid a loss of assets and significant costs of inaction for Germany and the world in the future.

Our analysis is based on E3G's previous and current work as well as strategic thinking for the future, extensive desk research on quantitative and qualitative sources, expert interviews and two multi-stakeholder workshops. We would like to thank all those who have contributed to this work, including E3G staff and external experts.

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CHAPTER 1
THE FACTORS SHAPING TOMORROW'S WORLD

To determine the right course of action in the present, one must understand the implications of today's interdependent choices on tomorrow's world. **To assess Germany's readiness for the future as the third decade of the 21st century begins, one must thus look at the big picture and understand how the different major disruptions shaping the world interact.** This is true in the context of this report but also more generally: those who seek to shape the future need to consider the complex constellation of factors influencing it in order to devise the most effective strategies and to avoid unintended consequences.

In this chapter we analyse the major trends shaping the world we live in based on a review of relevant literature as well as expert interviews and a workshop. We have picked trends that we believe have the most disruptive potential and have the strongest interlinkages with climate change and climate politics. To date, there are still significant gaps in our understanding of the systemic transformation to a climate safe world. A limited grasp of the connections between different major developments, for example digitalisation and climate policy, is at the core of this challenge. Our analysis intends to fill some of these gaps.

Technology is progressing - but in which direction?

Humanity's technological capabilities are advancing rapidly.[3] In a process that is described as the "Fourth Industrial Revolution" or the transition to "Industry 4.0", technological innovation is increasingly blurring the distinction between cyberspace and the physical world.[4] Over the coming years, digital technologies will be increasingly integrated into all areas of the economy and everyday life and will continue to gain economic importance. **This makes it necessary to develop a sound understanding of the interaction between technological change and the economic transition driven by climate change**.

[3] Our World in Data (2019). **Technological Progress**

[4] World Economic Forum (2016). **The Fourth Industrial Revolution: what it means, how to respond**

In the industrial sector, the digitalisation of production processes, i.e. the transition to "Industry 4.0", is the most marked shift. It is based on two new kinds of systems: connected systems and self-guided systems. When combined, connection allows automated systems to communicate with each other and act without relying on human input in their day-to-day operations.

One technological development related to digitalisation that is attracting particular attention is the **rise of Artificial Intelligence (AI)**, i.e. machines that can perform "human-like cognitive processes such as learning, understanding, reasoning and interacting".[5] In the future, AI will have great impact on economic processes and development. For example, research by Accenture finds that AI could double annual global economic growth rates by 2035. The most important factors driving this growth are increases in labour productivity, the creation of a new "virtual workforce" and the diffusion of innovation through AI.[6]

Other key innovations are advances in material science and 3D printing, which enables efficiency improvements and more localised production. So far, 3D printing has been used mainly in industries that require a high degree of customisation. In the future, it could help create a circular economy if it is able to overcome the cost and product design barriers that are already faced by traditional technologies for recycling and sustainability efforts. 3D printing can also contribute to the dematerialisation of production systems as it makes it possible to produce products with fewer input materials.[7]

Due to automation, and other trends such as the declining bargaining power of workers, **capital plays an increasingly important role relative to labour in modern economies**.[8] This puts increasing pressure on lower- and medium-skilled working people whose jobs are more likely to be replaced.

Technological shifts have profound effects on the nature and distribution of jobs and professions. The **most immediate impact of technological progress on professional work will not be on jobs per se but on tasks**.[9] First, new

[5] European Parliament (2019). **Economic impacts of artificial intelligence (AI)**

[6] Accenture (2016). **Why Artificial Intelligence is the Future of Growth**

[7] World Economic Forum (2017). **Technology and Innovation for the Future of Production: Accelerating Value Creation**

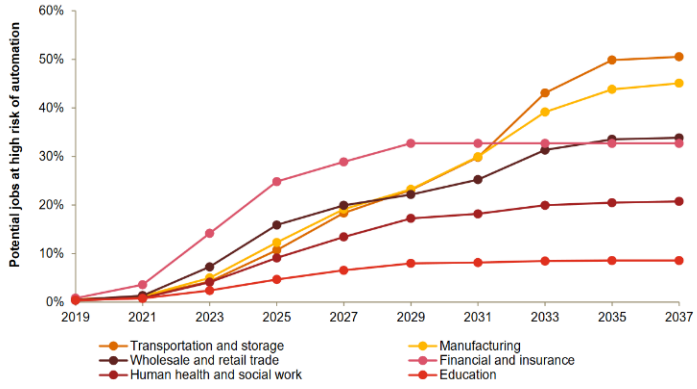
[8] Federal Reserve Bank of San Francisco (2019). **Are Workers Losing to Robots?**

[9] McKinsey Global Institute (2017). **Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation**

technologies will change the type of tasks at the workplace. In the medium term, task profiles will change profoundly, leading to a "substantial redeployment"[10] or "great restructuring"[11] of the workforce through the creation of new jobs that require different skills. Increasingly, over time, workers will complement the work done by machines.[12] Consequently, the demand for technological expertise will increase dramatically, and the importance of soft skills such as social competence and creativity will grow. Manual labour will become less important and will be partially replaced by technology[13] – particularly in countries with a strong industrial core.

As can be seen in Figure 2, **technological progress is predicted to affect different economic sectors to varying degrees**, with transport and manufacturing being the most strongly affected sectors, but also requiring the most time for the impacts to fully play out.[14] At present, technological progress is contributing to a decrease in the share of routine jobs in the middle of the earnings and skill distribution, while the number of non-routine jobs, both low- and high-skilled, is growing. Altogether, these dynamics mean that blue- and white-collar routine workers in the lower middle class are most strongly challenged by upcoming changes.[15] Job profiles will change fundamentally over the coming years, with changes also driven by climate change, highlighting the growing importance of life-long learning and qualification.

Figure 2: Jobs at high risk of automation[16]



Source: PIAAC data, PwC analysis

[10] Susskind & Susskind (2017). **The Future of the Professions**

[11] McAfee & Brynjolfsson (2014). **Race Against the Machine**

[12] McKinsey Global Institute (2017). **The digital future of work: What will automation change?**

[13] McKinsey Global Institute (2018). **Skill Shift: Automation and the Future of the Workforce**

[14] PwC (2018). **Will robots really steal our jobs?**

[15] Kurer & Palier (2019). **Shrinking and shouting: the political revolt of the declining middle in times of employment polarization**

[16] PwC (2018). **Will robots really steal our jobs?**

In the economic realm, digitalisation means that **data itself has become a crucial economic resource**, affecting business practices and macroeconomic structures. Today, digital flows exert a larger impact on economic growth than trade in goods.[17] And this development is far from over: over the coming years, global connectivity will increase both in the virtual as well as in the physical world. By 2030, 75% of the world population will have mobile connectivity, and the number of people and goods moved will continue to increase.[18] By 2020, data production will be 44 times greater than it was in 2009.[19] At the same time, connectivity of energy infrastructure, for example smart grids to ensure efficient energy systems, are becoming a crucial element of change.

Furthermore, **digitalisation has reduced the costs of entry into many markets**, for example by allowing flexible access to computing power without investments in physical infrastructure. In addition to this, core digital products are replicable at close to zero marginal cost, enabling the quick growth of young companies even without many initial resources.[20] This has enabled the emergence of many start-up companies with the potential of disrupting the energy sector and other sectors of the economy to accelerate the just transition to a net-zero economy. However, a lack of funding for such projects remains a serious issue. Investors such as venture capitalists do not explicitly value green or social start-ups when allocating risk capital, despite their positive impact on society, preferring instead to prioritise economic returns. [21] Furthermore, other aspects of the digital economy create significant economies of scale, such as the importance of intellectual property and network effects, which benefit those companies that have access to more resources, including data, and make it more difficult for smaller companies to succeed in the sector.[22] In summary, this means that it becomes easier to set up new businesses but more difficult for smaller companies to succeed, indicating the value of targeted policy schemes that support smaller companies.

In the political realm, the importance of technology means that **technological issues have become a key area of competition**, both within states, for example

[17] McKinsey Global Institute (2016). **Digital globalization: The new era of global flows**

[18] European Strategy and Policy Analysis System (2019). **The Mega-Trends**

[19] PwC (2019). **Technological breakthroughs**

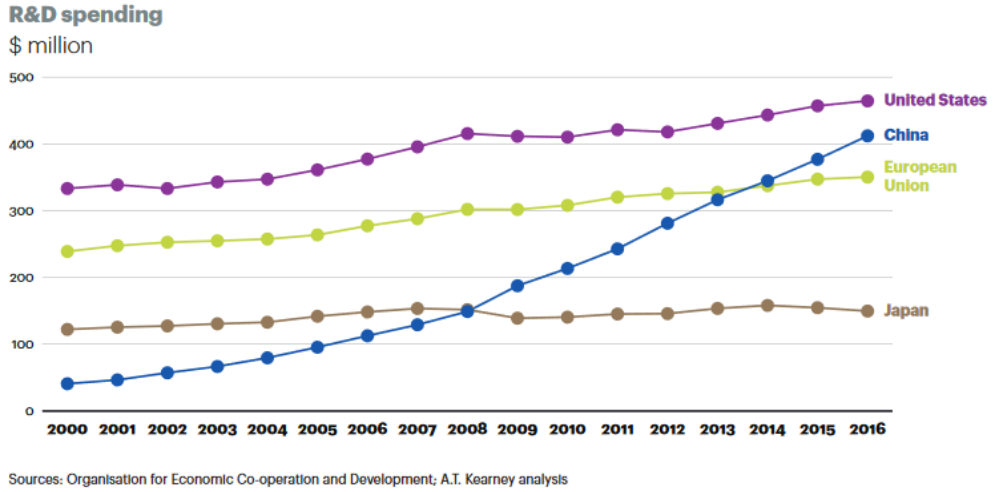
[20] OECD (2018). **Maintaining competitive conditions in the era of digitalisation**

[21] Climate-KIC (2019). **The challenge of redesigning venture capital**

[22] OECD (2018). **Maintaining competitive conditions in the era of digitalisation**

in debates about privacy, and between states, particularly between the US and China, and 'technological sovereignty' has started to become a political concern.[23] In today's world, technological superiority provides a host of direct and indirect benefits, contributing to both soft and hard power.[24] Furthermore, digital technology has enabled the spread of "digital weapons" that can be used in cyber-attacks, which diffuse the distinctions between inter-state peace and war, allow new forms of intrusions, and convey additional power to non-state actors. In addition, increasing digital capabilities make more sophisticated forms of "information warfare" possible, as used, for example, by the Russian government during the annexation of Crimea in 2014.[25] Questions about the future governance of technologies including cyber technology and AI are rapidly emerging as sources of multilateral tension.[26]

Figure 3: Research and development spending around the world[27]



Sources: Organisation for Economic Co-operation and Development; A.T. Kearney analysis

In addition, the **spread of digital technologies has also changed the way in which politics is being conducted**. There is no pre-determined impact of the digital world on political processes: it can trigger disruptive events such as the Arab Spring, but it can also be used to manipulate democratic processes, as happened, for example, during the Brexit vote. [28] In a time in which most citizens

[23] POLITICO (2019). **What's driving Europe's new aggressive stance on tech**

[24] A.T. Kearney (2018). **Global Trends 2018-2023**

[25] National Defense University Press (2017). **Information Warfare in an Information Age**

[26] ECFR (2019). **Rescuing multilateralism**

[27] A.T. Kearney (2018). **Global Trends 2018-2023**

[28] Deutsche Bank Research (2019). **Digital politics: AI, big data and the future of democracy**

in democratic societies acquire their political information online, all political players are present in the digital arena, and organisations which are gatekeepers to this arena have gained considerable political power. Examples of this include the international attention received by Twitter for its decision to ban political advertising, and by Germany for its introduction of specific requirements against hate speech on social media.[29] For governments and regulators, a new vital task has arisen in ensuring the safety and factuality of digital political discourse.

Lastly, the **effects of new technology on politics and society are not a one-way street** – on the contrary, political and societal processes condition how new technologies are implemented in the real world, and the acceptance of digital technologies plays a critical role in the pace of their roll-out.

Making digitalisation sustainable requires policy action

In the transition to net-zero emissions, digitalisation is an "equal opportunity revolution".[30] It can benefit solutions to the climate crisis, but it can also cause or worsen problems, for example by reducing the costs of extracting oil and gas or increasing energy demand.[31] Until today, digital innovations have mostly been used to facilitate conventional growth in established markets rather than to disrupt climate-harmful sectors and have thus exacerbated unsustainable trends.[32] Overall, there are **two main ways in which digitalisation interacts with climate change and climate politics**. First, it can have direct effects on emissions and emitting activities. Second, it can have indirect effects by affecting the potential for adopting ambitious climate policies through its impacts on societal and political debates.

There can be no doubt that **technological advances are a key piece of the decarbonisation puzzle**. By contributing to rapidly decreasing renewable energy prices, technological progress has dramatically accelerated the global transition to renewables, which are now cheaper than fossil-fuelled power production in many places.[33] Emerging technologies such as AI, machine learning and data science offer new opportunities to further accelerate the transition to a zero-carbon economy. On aggregate, PwC estimates that applying AI to energy and

[29] Reuters (2019). **Twitter tightens bans on political ads and causes ahead of 2020 U.S. election**; The Guardian (2017). **Germany approves plans to fine social media firms up to €50m**

[30] Council on Foreign Relations (2018). **Digital Decarbonization**

[31] Wall Street Journal (2018). **How AI Will Increase the Supply of Oil and Gas – and Reduce Costs**

[32] WBGU (2019). **Towards our Common Digital Future**

[33] IMFBlog (2019). **Falling Costs Make Wind, Solar More Affordable**

climate challenges has the potential to reduce emissions by up to 4% by 2030 against a business-as-usual baseline with a concurrent uplift of up to 4.4% to global GDP.[34] New technologies can contribute to efficiency improvements and hence reductions in energy demand, but this benefit is challenged by the "rebound effect", i.e. efficiency gains decreasing costs and hence increasing consumption, which offsets the initial efficiency gains.

There are **specific opportunities for new technologies in the energy sector**. Energy systems are transitioning from being centralised and fossil fuel dominated, to increasingly decentralised and renewable, with a starting transition in the transport and building sectors. Moving forward, there will be an increasing need to optimise and manage the dispersed and complex constituents of the energy system including renewable generation, electric vehicles (EVs), battery storage and demand-side response (DSR). Machine learning and data science will not only be useful tools but will become essential as we manage this more complex system and the data that it provides. Additionally, digital technologies can be used to give citizens more ownership of the energy transition, for example by allowing them to become active participants in energy markets ("prosumers"), hence increasing public support for renewable energies.[35] Already today, investments in digital energy infrastructure and software exceed the global investments in gas power generation. [36] In Germany, energy and water companies plan to rapidly accelerate their use of AI over the coming years.[37]

Beyond electricity grid optimisation, there is **widespread potential for AI to be used for efficiency improvements**. This could come in the form of optimising renewable energy generation facilities, industrial and building energy efficiency or battery technology. Such optimisation is possible both in terms of the operation of existing hardware, but also has the potential optimise the design of new hardware solutions. For example, using AI, Google's DeepMind has reduced the energy consumption needed to cool Google's data centres by 40% and has increased the value of Google's wind farms by 20%.

Despite the potential opportunity it offers, **a more systemic use of AI in the energy sector is being held back by existing data sharing models, policy**

[34] Microsoft & PwC (2019). **How AI can enable a Sustainable Future**

[35] Stiftung Neue Verantwortung (2017). **Welche Chancen ein digitales Energie-Marktdesign bietet**

[36] International Energy Agency (2017). **Digitalization and Energy**

[37] Bundesministerium für Wirtschaft und Energie (2018). **Monitoring-Report Wirtschaft DIGITAL 2018**

frameworks, market incentive structures and a lack of early-stage finance. Solving this could unlock the potential for AI to systemically improve the efficiency of energy systems worldwide and support action on wider climate challenges.

On the negative side, the **"physical shadow" of the digital world, that includes, for example, server farms, is leaving a significant emission footprint**.[38] The electricity consumed by digital infrastructure is of increasing importance as a share of global electricity use, and though energy efficiency improvements have been made, its relative impact will further increase as government policies around the world aim to further extend access to digital services.[39] Currently, digital technologies account for 4% of global CO_2 equivalent emissions, which is more than civil aviation.[40] New digital innovations could increase emissions further as, for example, energy demand from blockchain technologies has ballooned over recent years, with Bitcoin alone reaching over 7GW demand – more than the entire electricity demand of Switzerland.

In governing technological change, policy makers face two major challenges: they must "tap the enormous potential of novel information and communication for the purpose of sustainability transformation and prevent possible, indeed probable, negative spin-offs from the surge of innovations".[41] To ensure that these goals are met, two groups of actors must make critical adjustments. On the one hand, climate professionals and policymakers must ensure there is dedicated support to help realise the opportunities offered by digitalisation and wider technological progress, whilst being aware of the risks. On the other hand, digitalisation experts, technology pioneers and policymakers must ensure that they conduct their activities in line with the pressing requirement to tackle the climate crisis.

Policies can, indeed, make all the difference: for example, if vehicles are automated but not electrified or shared, greenhouse gas emissions from transport will increase by 50% by 2050 compared to a business as usual scenario

[38] Wuppertal Institut (2018). **Digitalisierung in die richtige Richtung lenken – Eckpunkte für Wissenschaft und Politik**

[39] Morley et al. (2018). **Digitalisation, energy and data demand: The impact of Internet traffic on overall and peak electricity consumption**

[40] The Shift Project (2019). **Climate Crisis: The Unsustainable Use of Online Video**

[41] WBGU (2019). **Towards our Common Digital Future**

– but they could drop by 80% if automated vehicles are electrified and shared.[42] In the much-discussed case of blockchain technologies, policy decisions matter critically, too, as some blockchain technologies are over 99% more energy efficient than other blockchain technologies, and hence policies are needed to guide the adoption of the most efficient technologies.[43] The important connections between climate policy and digitalisation policy are recognised in the European Commission's call for an industrial strategy that addresses "the twin challenge of the green and the digital transformation".[44]

In addition to the direct impact new digital technologies can have on carbon emissions, they also have indirect implications as **new digital technologies re-shape the wider economy and political processes**. We have shown above that technological changes will lead to a significantly changed job landscape. This also needs to be considered when making transition plans for workers and regions in sectors that are affected by climate policies, as the increasing automation of tasks affects both green and non-green jobs. For example, the German car maker Audi recently announced that it will cut 9,500 jobs due to decreasing demand for its internal combustion engine cars but will at the same time create 2,000 new jobs in the areas of electromobility and digital technologies.[45]

The job losses associated with technological disruption also have the potential to fuel support for populist political parties, who may seek to stoke resentment and frustration, and a return to a past that cannot be achieved. Given the strong correlation between populism and climate scepticism this represents a non-trivial risk for the climate movement. In addition, the spread of disinformation through new technologies further intensifies the structural impacts of technological change on political discourse.

Global rules are changing - who will be maker, who will be taker?

International relations experts agree that the age of bipolarity (during the Cold War) and US-dominated unipolarity (post-Cold War) are over, giving rise to a more complex ordering of the international system. While there is disagreement about the future nature of this new system, and the degree to which it has

[42] Yale Environment 360 (2018). **Will Self-Driving Cars Usher in a Transportation Utopia or Dystopia?**

[43] Stiftung Neue Verantwortung (2019). **Blockchain & das Klima**

[44] European Commission (2019). **The European Green Deal**

[45] SPIEGEL Online (2019). **Audi streicht 9500 Stellen bis 2025**

already begun, there is broad agreement that **international power today is more dispersed and that regional power structures have become more important**.

In a rapidly changing international environment, today's choices are shaping the character of the future international system. In the past, the rules of the global system suited Germany's needs, making rule-taking a successful foreign policy strategy. **In a world that is tending towards major power competition, Germany is at risk of losing out, and thus must actively shape, not only work with, the global rules-based order.** Otherwise, the global, multipolar environment will likely be much less favourable for Germany.

Few geopolitical shocks have been more significant over the past years than the election of US President Trump. Today, the Trump administration is actively working to dismantle important parts of the multilateral order which the US helped build, as can be seen, for example, in its announced withdrawal from the Paris Agreement. The US has also significantly reduced its financial support for key elements of the Bretton Woods international order, such as the IMF, the World Bank, and other multilateral development banks, and is currently supporting fewer multilateral institutions and programs than any previous administration of the past 30 years.[46] Together with the rising importance of (regional) powers, as discussed below, this has increased concerns regarding a "geopolitical recession", in which international cooperation and multilateralism are challenged.[47]

One of the most salient expressions of this threat is the **conflict between protectionism and free trade**, most notably the "trade war" fought between the US and China, which is the result of both the continued rise to power of China and the specific policy views of the Trump administration. This ongoing conflict has ripple effects beyond the field of trade, and many of them are worth noting for their connections with the issues discussed in this paper. For example, the conflict poses a serious challenge for established multilateral institutions, including the UN, which are at risk of becoming associated with one side of the growing conflict.[48] Furthermore, the conflict has strong interlinkages with the field of technological progress, with, for example, both China and the US aiming to set global standards for the roll-out of fifth generation (5G) mobile networks.

[46] Center for Global Development (2018). **The Incredible Shrinking US Multilateralism**

[47] AXA & Eurasia Group (2019). **Future Risks Report**

[48] Project Syndicate (2019). **Can Multilateralism Survive the Sino American Rivalry?**

This new conflict also reflects **a shift in the regional focus of global politics**, with the Indo-Pacific becoming the new megaregion at the heart of the global economy and geopolitical competition.[49] Nonetheless, the **geopolitical weather over the coming years will continue to be set by the dynamics between the US and China**. Economic tensions between the two countries will continue to rise, as the US has pivoted to seeing China as a strategic rival, and China has accordingly adjusted its perception of the US to it being in pursuit of a strategic containment of China.

China's rise over the past years has been a story of gradually increasing assertiveness. While its rise was largely facilitated by measures of economic power and influence-building, for example through the Asian Infrastructure Investment Bank and clear commitments to multilateral cooperation, it is now also increasingly pursuing confrontational strategies which are more strongly based on hard power. Examples include China's activities in the South China Sea, its Belt & Road Initiative, and the global expansion of technology giant Huawei. Today, already nine of the world's top 20 technology companies are Chinese, while the remaining eleven are American.[50]

China has also begun to use multilateral financial engagement for its ends, for example through the Asian Infrastructure Investment Bank or the Belt & Road Initiative. At the same time, China remains committed to multilateral processes, including those on international climate action, but also makes clear its desire to shape global governance. All in all, the issues related to and triggered by the rise of China will continue to dominate international politics, as can be seen by the ongoing "trade war" or the strong geopolitical attention devoted to the expansion of Huawei and the associated politicisation of 5G network technology.

Despite all this, **international politics in the 21st century is shaped by a number of different states and actors**. Other countries and alliances, most notably (but not limited to) the EU, India, Russia, and Brazil, are playing key roles on the global stage. Here, too, some notable shifts have occurred: Russia, having lost much of its global political influence over the last 30 years, has returned to adopting a significantly more assertive and confrontational role on the global stage under President Putin, as can be seen in the annexation of Crimea or the

[49] A.T. Kearney (2018). **Global Trends 2018-2023**

[50] MarketWatch (2018). **China has 9 of the world's 20 biggest tech companies**

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Syria conflict. Brazil's new President Bolsonaro is strongly opposed to multilateral cooperation, criticising the newly founded Alliance for Multilateralism as a "useless institution", and denies climate change and its global responsibility.[51] India, too, has concerns about Chinese foreign policy, most importantly its Belt & Road Initiative, which it considers a regional security threat, a significant assessment given that Indian foreign policy is mostly focused on its direct neighbourhood.[52]

The EU, while an important global power, will not be able to take on the many challenges of global governance on its own, as could be seen, for example, in the negotiations on the Iran Deal. The new European Commission has branded itself a "geopolitical Commission", but there are significant strategic challenges and open questions for the Commission and EU member states in their pursuit of "European sovereignty". Measures to achieve this goal will include improving Europe's research output, strengthening European monetary and financial autonomy, and ensuring that Europe speaks with one voice on the international stage.[53] An issue that will continue to be hotly debated centres on calls by international partners for the EU – and especially Germany – to take on more responsibility in the military space. In addition, the EU must build on its existing network of reliable international partners. Positively, the German government has advanced initiatives towards this end, such as the "Alliance for Multilateralism", though these initiatives have not yet produced tangible results.[54]

The Brexit process has shed light on the value, but also the fragility, of European cooperation. If Brexit does happen, the EU will lose valuable foreign policy assets. In either scenario, the **European Commission must provide the tools necessary for the EU to remain a credible geopolitical actor**. This includes a sound conceptualisation of the function of the stated goal of "strategic autonomy", which should not be an excuse for the isolation of Europe from the rest of the world. On the contrary, the EU must retain its role as a facilitator of rules-based cooperation. This is the case both for internal reasons, as the EU itself is founded on rules-based cooperation, and for external reasons, as an isolated EU is not strong enough to play an influential role in a power-based global order.

[51] German Institute of Global and Area Studies (2019). **Brazil First, Climate Last: Bolsonaro's Foreign Policy**; Clingendael Institute (2019). **Brazil under Bolsonaro: (Inter)national Re-Positioning**

[52] The Diplomat (2019). **Modi's Second Term Foreign Policy Kicks off With a Neighborhood Focus**

[53] ECFR (2019). **Empowering EU Member States with Strategic Sovereignty**

[54] PRIF Blog (2019). **Saving Multilateralism in Times of Trump: What Can Europe Do?**

In the context of this debate it is also necessary to consider some **transregional trends and developments**. One such key development is **the rise to prominence of nationalist politics in many nations and continents**, for example in the US, India, Brazil and the Philippines as well as in many parts of Europe. Overall, the number of populist leaders has more than doubled since the early 2000s.[55] Currently, populist forces are entrenching their power position and will continue to shape political processes over the years to come. The disruptive impact of this development, both on global politics and climate politics in particular, cannot be overstated: the rise of populist parties and movements complicates global cooperation, threatening established multilateral processes, and disrupts the internal checks and balances of social democracies. It also makes it more difficult to achieve global cooperation on tackling climate change and implementing domestic climate policies.

At the same time, **bottom-up protest movements against incumbent governments are an important factor shaping contemporary national debates**, for example in Chile, Iran and Hong Kong. The success of new climate movements such as Fridays for Future and Extinction Rebellion is a further example of this. In a globalised world, many of these movements have global effects, as many are transnational (such as the youth climate strikes) or have global effects even when they are national (for example, the global repercussions of the protests in Hong Kong).

Climate change: the newest force shaping geopolitics

The role of climate in international politics has changed fundamentally in the last decade. Climate issues used to be at the side-lines of international politics, often being negotiated in separate institutions without having effects on high-level political decisions. Recently, however, **climate issues have shifted from being a taker of the prevailing geopolitical winds, driven by other issues such as security and trade, to being a force that is shaping geopolitics**.[56] In the words of the European Commission, "the ecological transition will reshape geopolitics".[57]

The impact of climate change on geopolitics as a **"threat multiplier" to already existing risks**, for example by exacerbating water or food scarcity, has long been

[55] The Guardian (2019). **Revealed: the rise and rise of populist rhetoric**

[56] E3G (2019). **The Geopolitics of Climate Change**

[57] European Commission (2019). **The European Green Deal**

established.[58] In 2007, the UN Security Council held its first ever meeting examining the linkages between climate change and insecurity. Nowadays, the security effects of climate change, for instance in the Lake Chad basin, are regularly debated in the security community.[59]

Today, the consequences of climate change – both climate impacts and climate policies – are at the heart of the national interest of countries across the world. This is the result of increasingly severe climate impacts, such as extreme weather events, as well as the continued deployment of climate policies which lead to shifts in resource needs and global supply chains, as for example oil becomes less valuable and raw materials for batteries more valuable, thereby affecting the geopolitical landscape. This has also triggered increasingly vocal opposition to global efforts from those countries that fear to lose out from the climate transition, such as Saudi Arabia with its oil reserves and Russia with its gas reserves.[60]

The new geopolitical importance of climate issues also means that **trade-offs between climate and other issues, such as national trade interests, will be more frequent in international negotiations**. While this may facilitate more constructive negotiations, it feeds the risk of ambitious climate policy being traded off against other, equally crucial challenges.

In the long run, the **success of coordinated international measures against climate change depends on the stability of the global rules-based system**. Achieving climate safety requires global cooperation, and hence trust that can only be achieved through mechanisms with strong governance. Current trends in global governance point towards more interest-based cooperation in an international system dominated by major powers not necessarily willing to cooperate, a system in which global climate action becomes much more difficult to achieve.

Notably, **populist movements – and politicians' fears of their rise – also make it more difficult to implement climate policies domestically**, as the reaction to the French "Yellow Vest" protests has shown. Various factors are at work in explaining populists' opposition to climate policy, including the perception of

[58] For more information see E3G (2019). **Climate Security**

[59] UN News (2019). **Climate change recognized as 'threat multiplier', UN Security Council debates its impact on peace**

[60] The Guardian (2018). **US and Russia ally with Saudi Arabia to water down climate pledge**

climate change as a “cosmopolitan” issue, the technical complexity and uncertainties surrounding climate policy, and a mistrust towards experts.[61] In addition, there are often concrete ties between populist governments and organised fossil fuel interests. It is worth noting that severe climate impacts may strengthen the appeal of right-wing nationalist parties, as such ecological threats can cause societies to become “tighter”, leading to stricter cultural norms and higher levels of prejudice against minorities.[62]

Over the coming years, climate impacts and policies will continue to have strong effects on the geopolitical weather, and vice versa. As the Paris Agreement is put to its first major test, with states being required to announce more ambitious climate policies in 2020, it becomes increasingly clear that international climate institutions need to change in order to adapt to, first, a global system that is less cooperative and, second, to the changed demands they face: before the Paris Agreement, international climate negotiations aimed to produce a broad global agreement. Now, post-Paris, all climate efforts must deliver ambition and implementation.

New macroeconomic challenges - how to transform a slowing economy?

Today’s macro-economy is markedly different to the one before the 2008 crisis. Pervasive uncertainties make it hard to be precise about what the future of the macro-economy will be, and that in turn will affect how countries can adapt to climate change. In this section we set out the major drivers of macro-economic change and draw some tentative implications for preparedness for the challenges ahead. We also address the changing demography, one of the biggest factors that will determine the future of the global economy.

The dominant feature of **today’s macro-economy is the persistence of low interest rates**. This may be due to a range of factors, including decreasing marginal benefits of technological progress, demographic forces, a savings glut, and insufficient investment.[63] **Despite these low interest rates, low inflation persists even in the face of relatively high levels of employment**, which is a prime reason for why additional investments would be possible without

[61] Oxford Research Group (2019). **Right-Wing Populism and Climate Change Policy**

[62] The Conversation (2019). **Could climate change fuel the rise of right-wing nationalism?**

[63] World Economic Forum (2018). **The Global Financial and Monetary System in 2030**

E3G

overheating the economy. Prices reflect global supply chains rather than local labour markets, so even tight local labour markets may not be pushing prices up.

The fact that interest rates are persistently low is itself affecting the financial sector. With low interest rates and flat forward yield curves (i.e. little difference between short- and long-term interest rates) traditional banks find their profit margins squeezed. This in part explains why money may now be moving to private equity and less traditional banking institutions.[64] It is also affecting insurance companies' business models, as they too relied on being able to earn money from investments, to cover their longer-term liabilities.

The **range of financial actors is also changing**, not least with the emergence of financial technology firms which bring new business models, and with the growing interest of big technology firms in the field.[65] It is still too early to say what impact this might have, but the potential for disruption in the financial sector is as significant as it has been in retail. The **changing nature of the financial sector is also related to the changing nature of business ownership**. Fewer companies are going public, as debt and private equity become more attractive ways of financing, and controlling, businesses.[66]

World trade, a major element of the globalised economy, continues to grow, but **threats to trade are now an increasingly important issue**.[67] As discussed in the previous section of this paper, geopolitical tensions are having strong effects on the nature of global trade, and there is an active conflict between protectionist and free market foreign policies. These developments are also particularly relevant for Germany due to its strong dependence on exports.

The implications of all these developments for investment are not clear. While in developing countries many firms are taking on debt, in advanced economies firms seem less willing to invest, with many holding large amounts of cash.[68]

[64] The Wall Street Journal (2018). **The New Business Banker: A Private-Equity Firm**

[65] International Center for Monetary and Banking Studies (2019). **Banking Disrupted? Financial Intermediation in an Era of Transformational Technology**; World Economic Forum (2018). **The Global Financial and Monetary System in 2030**

[66] For a useful discussion of this phenomenon, see ECGI (2019). **Why Are Fewer Companies Going Public?** and The Atlantic (2018). **The Death of the IPO**

[67] McKinsey Global Institute (2018). **A decade after the global financial crisis: what has (and hasn't) changed?**

[68] IMF (2018). **The Rise in Corporate Saving and Cash Holding in Advanced Economies: Aggregate and Firm Level Trends**

Many governments have limited public spending since the financial crisis and are pursuing austerity measures.

Either way, **the net effects of these trends are very significant.** Low interest rates, accompanied by low inflation, reduce the ability of central banks to manage the economy. Hence the development of tools such as quantitative easing, which would previously have been considered unorthodox. It also blurs the lines between fiscal and monetary policy, as central banks may be pressed to intervene more directly in markets, for example by increasing their ownership of shares in non-bank businesses.[69]

The **emergence of new forms of money, and of new forms of banking, also affect how central banks, and indeed financial authorities generally, can influence the economy**. For example, the more financial intermediation is conducted by non-banks, the more it is outside of the traditional zone of control of central banks. On a more general level, **technology fundamentally affects the nature of money.** This is evident in the development of crypto-currencies, and in the use of data as a medium of exchange – for example when online services are provided "free" in exchange for data.[70]

However, it is also possible that the trends will work in the other direction. Given that monetary policy may be struggling and also given the pushback against globalisation and the growing lack of faith in austerity, **there is now more space to consider more wide-ranging fiscal policies, including spending on socially and environmentally beneficial investments**. This could be directly by governments, or in public partnership with the private sector. This is the context into which the European Green Deal has emerged.

One specific issue that it is worth taking a closer look at is demographic change. After centuries of very modest population growth, the global population began to grow rapidly from 1800, growing from around one billion people to 7.6 billion people. By 2100, the global population is projected to reach 10.9 billion.[71] These changes reflect the effects of major trends such as technological progress, particularly in farming and health care.

[69] The Economist (2019). **The world economy's strange new rules**

[70] Medium (2018). **Personal Data as Currency**

[71] United Nations (2019). **World Population Prospects 2019**

Notably, this **demographic change does not occur evenly across the world** – on the contrary, there are strong differences between regions. While the population in Europe is likely to decrease, from 742 million people in 2017 to 653 million people in 2100, population numbers in all other parts of the world will increase, most strikingly in Africa (from 1,256 million people in 2017 to 4,468 million people in 2100).[72] Overall, 97% of population growth until 2030 will come from emerging or developing countries. At the same time, people in all regions are living longer while having fewer children. Therefore, the fastest growing segment of the population will be the over 65s – there will be 390 million more of them in 2030 than in 2015.[73]

In Europe, the population will both shrink and age, leading to a significant decline in the size of the working age population. There were four working-age people per elderly person in 2015; there will be just two by 2050.[74] Given this context of shrinking working-age populations and environmental constraints, the future of economic prosperity depends on technological innovation which can decouple economic growth from material growth and increase productivity per worker.

These developments also present a major challenge for the long-term stability of the financial systems in ageing Western societies. Public schemes such as social security are largely funded through pay-as-you-go systems, i.e. through present public revenues. As the demand for pensions increases while the working age population shrinks, pension schemes will become increasingly strained.[75] Furthermore, an ageing population is more likely to favour lower-risk investment products with faster availability, meaning that it becomes more difficult to finance riskier and long-term investments, leading to an increase in the cost of corporate financing.[76]

Macroeconomic stability is fundamentally threatened by the climate crisis

There are many links between the climate crisis and macroeconomic conditions. Nicholas Stern's historic review, which found that runaway climate change would cost the world at least 5% of GDP each year, and possibly up to

[72] United Nations (2017). **World Population Prospects: The 2017 Revision**

[73] PwC (2019) **Demographic and social change**

[74] PwC (2019) **Demographic and social change**

[75] ECB (2018). **The economic impact of population ageing and pension reforms**

[76] Bankenverband (2014). **Nullwachstum – das Schicksal einer alternden Gesellschaft?**

E3G

20%, has paved the way for the consideration of climate as a macroeconomic issue, and the implications of the review continue to drive the debate.[77] The two main impacts of climate issues on macroeconomics are, first, caused by the consequences of climate change ("climate risks"), and, second, caused by the effects of climate policy.

One key macroeconomic risk relates to "stranded assets" as a consequence of implementing climate policy: fossil-fuel-based firms are a significant part of global financial markets. As climate policies become more stringent and low carbon technologies more competitive and hence more diffused, global demand for fossil fuels will significantly drop. Such a reduction in demand for fossil fuels would lead to significant global economic losses of $1-4 trillion by 2035, larger than the losses caused by the 2008 financial crisis.[78] A prime example for this risk is the threat to Indian financial stability caused by risky loans to fossil fuel companies which were unable to deliver the expected returns.[79] Another example of this is the threat that the crisis at the electricity supplier Eskom, caused by overinvestment in uneconomic coal, poses to the South African economy.[80] Fossil fuels also underpin the liquidity of important stock exchanges, such as the London Stock Exchange or the New York Stock Exchange.[81]

At the same time, **climate action provides an opportunity for securing macroeconomic stability**: on the one hand, by avoiding the risks posed by climate impacts; on the other hand, by reaping the economic opportunities offered by the transition to the low carbon economy. For example, solar and wind stocks are already outperforming oil and gas shares by a widening margin.[82] In addition, the current environment of low interest rates provides a prime opportunity for satisfying the large investment needs for climate as well as other transitions, such as digitalisation.[83]

Overall, the **impacts of the climate crisis on macroeconomic conditions are still strongly underestimated by macroeconomic practitioners**. Most

[77] Grantham Research Institute on Climate Change and the Environment (2006). **The Economics of Climate Change: The Stern Review**

[78] Mercure et al. (2018). **Macroeconomic impact of stranded fossil fuel assets**

[79] The Economic Times (2018). **How India's power story derailed, blowing a Rs 17.4 lakh crore NPA hole**

[80] The Washington Post (2019). **Why Eskom's Power Crisis Is South Africa's Top Risk**

[81] Wearing, D. (2018). **AngloArabia: Why Gulf Wealth Matters to Britain**

[82] Financial Times (2019). **Clean energy shares streak ahead of fossil fuel stocks**

[83] OECD (2019). **Economic Outlook**

E3G

macroeconomic decision makers, such as central bankers and finance regulators, still consider macroeconomic climate risks to be too marginal to affect the indicators that most concern them, including GDP, inflation, employment, and productivity. However, as impacts become increasingly material, it is becoming clear that future consequences of unstopped climate change will start shaping macroeconomic realities.[84] For example, it is expected that the labour productivity losses due to higher temperatures will be substantial even under moderate climate change.[85] In a similar vein, real estate and land values will change dramatically with growing climate impacts. Furthermore, it has been estimated that rising temperatures could reduce the overall growth of US economic output by as much as one-third by 2100.[86]

Conventional macroeconomic responses to the climate crisis focused on the established solution of carbon pricing, but **as awareness of the likely impact of climate change and the economy grows, practitioners are increasingly calling for a mobilisation of the whole macroeconomic toolkit**. These discussions are very important as the world and Germany are about to embark on the next stage of decarbonisation, which will require deeper structural reform across all economic sectors, and the support of macroeconomic actors. The persistent unwillingness of firms, and of governments still committed to austerity, to increase investments is a relevant issue as green and climate neutral investments are needed to successfully fight climate change.

An adequate overall understanding of the financial and macroeconomic risks of climate change is slowly emerging and starting to reshape financial decision practices, as discussed in depth in the 'finance' section of this report. For example, the outcomes of the Taskforce for Climate Risk Disclosure (TCFD) and the EU Sustainable Finance Action Plan have begun to define climate change as a macroeconomic issue in terms of its economic risks but also its growth benefits, such as job creation and innovation opportunities in emerging clean industries. These headline interventions have been helpful but are not yet enough as they still have to change day-to-day decision-making practices.

Traditionally, economic downturns have slowed down climate action as they made policymakers focus more on short-term rather than long-term issues,

[84] Batten et al. (2019). **Climate change: Macroeconomic impacts and implications for monetary policy**

[85] Vivid Economics (2017). **Impacts of higher temperatures on labour productivity and value for money adaptation: lessons from five DFID priority country case studies**

[86] Federal Reserve Bank of Richmond (2018). **The Impact of Higher Temperatures on Economic Growth**

causing them to steer investments into established economic sectors rather than making the active choice in favour of clean investments for the future. For example, Germany launched an anti-cyclical economic stimulus package to kickstart the economy as a reaction to the global financial crisis in 2008. While being successful in the short term to bring Germany back on track much faster than many other countries which imposed (voluntary or forced) austerity measures, the package did not target future-oriented growth markets specifically. Quite the contrary - it incentivised, for example, the replacement of older internal combustion engine cars with newer models. Many experts see the current slowdown of the global, European and German economies as an opportunity to target anti-cyclical investment in the climate transition and in the sectors most relevant to future economic performance, such as infrastructure and the digital economy.

One specific macroeconomic trend that deserves further attention is **demographic change**, which also **has serious effects on climate issues that are not often discussed**. For example, ageing societies are more vulnerable to the impacts of climate change, particularly heat. In addition, more extreme weather events are likely to lead to increased mental stress, especially for elderly people.[87]

Furthermore, **the decreasing population levels in rural areas, which can be observed in many Western countries, change the type and quantity of infrastructure needed**. This can lead to a less efficient use of infrastructure and hence increased resource consumption: for example, the heating costs of occupied homes in a partly vacant block of flats are around 30% higher than in a fully occupied building. Beyond this, declining population numbers in rural regions can alienate remaining populations from broader political processes as they feel increasingly distant from those processes. This applies particularly in cases in which local changes are perceived to be the result of larger political decisions, for example when coal mines close due to national climate policy measures.

Lastly, **climate impacts, which hit developing countries worst, will cause new large-scale human migration**. The World Bank expects that by 2050, three regions (Latin America, sub-Saharan Africa, and Southeast Asia) will generate

[87] Austrian Panel on Climate Change (2018). **Österreichischer Special Report: Gesundheit, Demographie und Klimawandel**

143 million more climate migrants.[88] Furthermore, climate change will indirectly become a cause of migration, for example due to its contribution to the emergence of conflicts and to slow-onset events, such as desertification.[89]

[88] World Bank (2018). **Groundswell: Preparing for Internal Climate Migration**

[89] Brookings (2019). **The climate crisis, migration, and refugees**

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CHAPTER 2
FINANCIAL SYSTEM RESPONSES TO THE COMING TRANSITION

The financial system is starting to recognise and respond to the array of economic impacts that will result from a changing world. The financial risk resulting from climate change has been a key driver of innovation, and **the trend is now towards holistic approaches that include financial measures in economy-wide plans for transformation**, such as the European Commission's Communication on a European Green Deal[90].

There is no one-size-fits-all solution. **Measures developed in different regions are specific to countries' very different national contexts, needs and priorities.** Some examples are outlined below in our case studies on the UK, Canada, Mexico and China which were developed by country experts.

Europe has consistently led in using finance to internalise the costs of climate change and climate policy. Carbon pricing has been the central climate change policy for the EU which was a pioneer in introducing its Emissions Trading Scheme (ETS) for a range of high-emitting sectors in 2005.[91] Approaches to national implementation varied between member states, and Germany has shown substantial leadership by allocating revenues from auction permits to funds for climate change mitigation – one for domestic projects and one for international mitigation – although these have not been used in full each year.

Europe's financial toolbox expanded following the 2008 financial crisis, which raised awareness of the fragility of the global financial system as well as highlighting deep unmet needs for investment in sustainable economic growth. Sustainability concerns were quickly incorporated into the Capital Markets Union agenda. The European Commission then appointed a High-Level Expert Group (HLEG)[92] on Sustainable Finance which made recommendations in January 2018 and moved quickly to create a Sustainable Finance Action Plan[93] which adopted many of the HLEG's recommendations. **The new European Commission which**

[90] European Commission (2019). **Communication on the European Green Deal**

[91] European Commission (2017). **Analysis of the use of Auction Revenues by the Member States**

[92] European Commission (2018). **Final report of the High-Level Expert Group on Sustainable Finance**

[93] European Commission (2018). **Commission action plan on financing sustainable growth**

E3G

will start in 2020 is already working on a strategy for green financing and a Sustainable European Investment Plan which will underpin a European Green Deal.[94]

The 2008 financial crisis led to financial reform and innovation well beyond Europe. Concerns about risk management led to reform of the international banking system through the Basel III agreement[95], but discussion also arose about the provision of sustainable economic stimuli, including shifting financial flows to green investments. **The UK piloted a public Green Investment Bank in 2012 and similar public institutions are now in design all over the world[96].**

Central banks soon began to consider the financial impacts of macro trends, and the implications of hidden risk. In 2015, the Chairman of the Financial Stability Board (FSB) and Governor of the Bank of England, Mark Carney, identified[97] systemic and disruptive risks to the global financial system as a result of climate change, both from taking strong climate change policy action and from failing to do so. This led to the G20's decision to create an industry-led Taskforce for Climate-related Financial Disclosure (TCFD) which made detailed recommendations in 2017 for risk disclosure by companies and financial firms, including a proposal that firms should test their strategies against forward-looking climate change scenarios. By June 2019, 898 organisations including many of Europe's largest financial actors,[98] were formal supporters of the TCFD.

The COP21 climate negotiations were a pivotal moment for mainstreaming the financial response to climate change. As the conference host, France took a strong climate leadership stance which has included a focus on green finance. The Energy Transition Law of 2015 was based on a national stakeholder debate on the energy transition and its Article 173[99] requires listed companies, banks, credit providers and institutional investors to report on climate-related financial risk and the measures being taken by the firms to address climate change.

Since 2015 financial innovation to address sustainability concerns has accelerated and been internationalised. In 2016, China as Chair put green finance on the G20 agenda, creating a Green Finance Study Group which was co-chaired with the UK and led on Guidelines for Establishing a Green Financial

[94] Von der Leyen. (2019). **A Union that strives for more: My agenda for Europe**

[95] BIS (2019). **Basel III: international regulatory framework for banks**

[96] Green Bank Design Platform (2019). **Global Green Bank Design Platform**

[97] Bank of England (2015). **Breaking the tragedy of the horizon – climate change and financial stability – speech by Mark Carney**

[98] Task Force on Climate-Related Financial Disclosures (2019). **TCFD Supporters**

[99] Principles for Responsible Investment (2016). **French Energy Transition Law: Global Investor Briefing**

System.[100] In September 2017, the UK government appointed its own Green Finance Taskforce which made recommendations[101] six months later, followed by a national Green Finance Strategy[102] in July 2019. One of the UK's actions was to take the global lead on the creation of sustainable finance standards within the International Standards Organisation (ISO)[103].

Latin America and Asia have been active players in the development of the international green finance agenda. At the COP25 meeting in Madrid, Chile announced a new Green Finance Strategy for the climate transition[104]. Meanwhile, South East Asia has seen strong regional competition for leadership in increasing green financial flows including issuance of green bonds.

In general, financial markets have been quick to expand green finance but have not been as fast to address climate risk by shifting financial flows out of energy investments that look set to be disrupted. The green bond market has shown continued growth worldwide and as of Q3 2019 there were 139 issuers from 32 countries, with 12 countries issuing sovereign green bonds. Germany is the fourth-largest issuer of green bonds after the USA, France and China, and is also the fourth-largest green bond marketplace after France, Luxembourg and the UK.[105] However, in 2018 the greenhouse gas emissions of the G20 rose by 3.1%, partly because of a shift of heavy industry away from developed countries towards emerging and developing countries, and 82% of the G20 energy mix still comes from fossil fuels.[106] Major oil and gas companies have committed to 'a sustainable low-emissions future'[107] yet have approved $50 billion of investment since 2018 in major projects that undermine climate targets and will threaten shareholder returns if those targets are met.[108]

Attention is therefore now returning once again at international level to addressing climate-related financial risk. From an initial focus on systemic risk and supervision of the banking and insurance sector, **central banks and financial supervisors are also now discussing other potential tools including changes to**

[100] World Resources Institute (2016). **China Champions Green Finance in the G20**

[101] Green Finance Taskforce (2018). **Accelerating Green Finance**

[102] UK Government (2019). **Green finance strategy**

[103] ISO (2018). **Mobilizing the green dollar: a new expert committee to help**

[104] Twitter (2019). **BID Cambio Climático**

[105] Climate Bonds Initiative (2019). **Green bond market summary**

[106] Climate Transparency (2019). **Brown to Green: The G20 Transition Towards a Net-Zero Emissions Economy**

[107] Oil and Gas Climate Initiative (2019). **Oil and Gas Climate Initiative**

[108] Carbon Tracker (2019). **Oil and gas companies approve $50 billion of major projects that undermine climate targets and risk shareholder returns**

collateral guidelines, greening their own portfolios, and green monetary policy.[109] The new President of the European Central Bank, Christine Lagarde, has said that "the discussion on whether, and if so how, central banks and banking supervisors can contribute to mitigating climate change is at an early stage but should be seen as a priority".

These actions by central banks are not isolated but internationally co-ordinated. The Central Banks and Supervisors Network for Greening the Financial System now has 48 members and 10 observers and is chaired by Banque de France. Members include the ECB, BaFin and the Bundesbank as well as the central banks of China, Mexico, UK, Germany and Japan. Observers include the World Bank and the IMF, the Bank of International Settlements and the Basel Committee on Banking Supervision. The US Federal Reserve is now considering joining the coalition[110].

Stress testing national economies against climate-related risk is very quickly becoming a new expectation for advanced economies. The IMF has recommended that national central banks conduct economy-wide climate stress tests[111], and the Bank of England announced that it will do so in 2021 once it has completed internal work on different forward-looking climate risk scenarios[112]. This was quickly followed by announcements that France would do the same in 2020[113], and the Bank of Canada would follow suit[114]. The US Federal Reserve has said that it is closely following the progress of the stress tests in the UK.

Meanwhile, the Swedish central bank announced that it had sold its holdings in sovereign bonds affected by climate risk, divesting bonds from the Canadian province of Alberta and the Australian states of Queensland and Western Australia due to concerns about their high greenhouse gas emissions.[115] **Use of monetary policy to shift economy-level financial flows from brown to green is under discussion but remains controversial** as witnessed by recent sceptical

[109] Network for Green the Financial System (2019). **A call for action**

[110] Federal Reserve Board (2019). **Why Climate Change Matters for Monetary Policy and Financial Stability**

[111] Bloomberg (2019). **Central Banks Should Do Stress Tests on Climate, IMF Says**

[112] City A.M. (2019). **Mark Carney says Bank of England to stress test banks with 'catastrophic' climate scenario**

[113] Insurance Journal (2019), **France to require insurers, banks, to run climate stress tests in 2020**

[114] National Observer (2019), **Bank of Canada announces a plan to prepare for climate shocks**

[115] Environmental Finance (2019). **Riksbank divestments 'open floodgates' to questions on climate divestment**

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remarks by Jens Weidmann, President of the German Bundesbank, in response to signals made by the ECB about potential future actions.[116]

As a macroeconomic and financial sector issue that bears on global stability, **climate change is now being taken into account by the International Monetary Fund** which recently announced that climate and other sustainability risks will be taken into account in its multilateral and bilateral budgetary surveillance[117].

Last but not least, **ministers of finance are now collaborating across borders on macroeconomic and other measures to address climate change**. The Santiago Action Plan[118] launched at COP25 by the Coalition Finance Ministers includes a commitment to work on macroeconomic management and public finance, including preparing toolkits and guides on whole of government approaches that integrate climate in the policy and budget process.

While differences and debates abound, within 15 years the sustainable finance agenda has progressed far beyond carbon pricing. **The increasing focus by policymakers on whole-economy and macroeconomic approaches to climate change brings with it additional demands**, as financial policy for sustainable growth must now grapple with some of the other major trends addressed in this report, including social equity and a just climate transition, the effect on international financial flows of geopolitical changes, and the structural impact of technological changes such as digitalisation. **System-level financial interventions such as National Finance Strategies, or the European Green Deal, are thus emerging as a new norm.**

[116] Financial Times (2019). **Weidmann opposes using monetary policy to fight climate change**

[117] Bloomberg (2019), **IMF Will Include Climate in Country Analysis, Georgieva Says**

[118] Coalition of Ministers for Climate Change (2019). **Santiago Action Plan.**

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CHAPTER 3
SUSTAINABLE FINANCE CASE STUDIES

In this chapter we present four case studies on financial policy responses to a changing world, from the United Kingdom, Canada, Mexico and China. Each of these major economies has differing circumstances which include both similarities and differences in relation to Germany. All of them have in one way or another taken a leadership or innovative stance in sustainable finance reforms and provide valuable lessons for Germany in terms of governance, ambition or specific regulation. Our analysis also purposefully looks at approaches outside the well-researched EU cases, to widen the perspective on sustainable finance globally.

Financial innovation and reform since 2008 to address national needs and concerns has played out in different ways depending on national circumstances. Factors which have shaped developments have included the ability to set international norms, the economic structure of the country, the internationalisation of its finance sector, and its government and political structure. There is no one-size-fits all example, and no other country is exactly like Germany.

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Case Study 1: United Kingdom

Key trends and concerns

The UK is on the brink of 'going it alone' as it leaves the European Union. The vote which led to this decision and the ensuing political deadlock has exposed strong social divisions and financial inequality within the country. Major investment needs have been exacerbated by years of fiscal austerity in the wake of the 2008 financial crisis and will be complicated by the upcoming departure from European funding mechanisms. The UK is placing high hopes in the continued strength of its financial sector which creates 7% of economic output.[119]

2008 was not only the year of the financial crisis but also of the UK Climate Change Act, the first to put a national emissions reduction target into law. These events sowed the seeds of a debate on how to meet the UK's future investment needs in a sustainable way. In 2012 the UK created the world's first national Green Investment Bank (privatised several years later following a change in government), recognising that there was a substantial investment gap in green markets, for example to scale up the development of the onshore wind sector and develop finance models for energy efficiency and buildings.

Sustainable finance innovation

In 2015 the Bank of England took the lead to warn of systemic financial risk from climate change, resulting in the creation of the TCFD by the G20 in the following year. In that same year the UK co-chaired the G20 Green Finance Study Group with China. **The Bank of England has continued to take ground-breaking steps to address systemic climate-related financial risk** – in 2018 it issued a Supervisory Statement on Climate Change to the banks and insurance companies that it supervises and in 2019 it announced that it would be stress-testing UK banks and insurers against climate risk in 2021.[120]

Since late 2015, the UK has taken forward a domestic policy process to create a Green Finance Strategy, starting in early 2016 when the City of London Corporation, a local authority which is home to the majority of the UK's financial sector, established the Green Finance Initiative. The GFI was the first public

[119] House of Commons Library (2019). **Financial services – contribution to the UK economy**

[120] Financial Times (2019). **Bank of England to set up tough climate stress test**

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sector led programme to support sustainable finance across London's finance sector and in 2017 it hosted the Green Finance Taskforce, established under the Conservative government's Clean Growth Strategy.

The UK's finance ministry announced the Green Finance Taskforce jointly with the business ministry (which also oversees climate and energy issues). The Taskforce was asked to provide recommendations for the delivery of the public and private investment required to meet the UK's carbon budgets and maximise the UK's share of the global green finance market.[121] The body drew on international precedents; China had convened a Green Finance Taskforce that reported in April 2015, while the European High-Level Expert Group on Sustainable Finance was created in December 2016.

The Taskforce's thirty recommendations to government[122] included regulatory, fiscal and policy measures. The government's response was the 2019 Green Finance Strategy. [123] The key actions in the strategy include:

> Setting up a review process under which corporate climate risk reporting will become mandatory if there is not sufficient voluntary disclosure by firms;

> Creating a new Green Finance Institute to catalyse the scaling up of green finance opportunities for the UK, which launched in July 2019;

> Including climate risk in the government's next fiscal risks report in 2020.

Alongside this policy process within government, independent financial regulators in the UK have been taking steps to address climate risk. After a Prudential Regulation Authority[124] (PRA) survey in 2018[125] found that only ten per cent of the UK banking sector is managing climate change risk comprehensively, the PRA in partnership with another UK regulator, the Financial Conduct Authority[126] (FCA), launched a private sector Climate Financial Risk Forum[127] which met through 2019. The intended result is an enhancement in the UK financial system's resilience to climate change, and improvements to the quality and quantity of climate risk management by financial firms.

[121] UK Government (2016). **Carbon Budgets**

[122] Green Finance Taskforce (2018). **Accelerating Green Finance**

[123] UK Government (2019). **Green finance strategy**

[124] Bank of England (2019). **Prudential regulation**

[125] Bank of England (2018). **PRA review finds that 70% of banks recognise that climate change poses financial risks**

[126] Financial Conduct Authority (2019). **Climate Financial Risk Forum**

[127] Financial Conduct Authority (2019). **Climate Financial Risk Forum**

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Green finance is now a standing item on the agenda of a UK government interdepartmental forum which treats climate change as a national security issue. Finance is also likely to be a key theme of the UK's Presidency of the COP26 climate negotiations in 2020.

Unmet needs and opportunities for the future

Over the last five years the UK has moved with impressive speed to mainstream and institutionalise the green finance agenda in response to systemic financial risk from climate change as well as unmet UK investment needs for the future. **But this change has not yet been transformative**. The City of London continues to be dominated by fossil fuel finance and the UK's green investment needs are still a matter of political debate. However, the seemingly inexorable progress of the financial regulators in addressing climate risk looks set to keep this issue in the political mainstream.

The political debate is currently around **how to scale up green investment** – the Green Investment Bank has been sold and funding from the European Investment Bank will stop as the UK leaves the EU. Meanwhile, social inequality means that many citizens lack access to green infrastructure including home energy efficiency. There is an opportunity for the UK to build financing tools which can support the investment required, and around the 2019 general election all political parties floated plans for new public banks that could generate a pipeline of infrastructure projects and leverage private finance.

Points of relevance for Germany

> The UK has adopted a Green Finance Strategy which sits alongside a net-zero emissions reduction target for 2050 and builds on advice from a Green Finance Taskforce;

> The UK has been open to making mistakes and changing its mind, for example in relation to the Green Investment Bank, but has continued to innovate;

> The UK's economic reliance on the finance sector means that for a successful transition it will be important to find ways to shift out of 'brown' investment as well as investing in 'green'.

Case study 2: Canada

Key trends and concerns

Canada is highly exposed to the physical impacts of climate change.[128] Warming in Canada is on average double the global level. Impacts such as melting permafrost and changes to marine and land ecosystems are already evident, and coastal flooding is projected due to local sea level rise exacerbated by loss of Arctic ice. Rapid global warming scenarios have profound future impacts on all sectors and the 2019 Bank of Canada Financial System Review[129] cited climate change as one of six vulnerabilities facing Canada's economy.

Canada is also highly exposed to the financial impacts of a global low-carbon transition. Its economy is highly dependent on fossil fuels and in 2018 it earned the fourth largest revenues from exports of crude oil, behind Saudi Arabia, Russia and Iraq[130]. Canada's challenge is to engineer an orderly economic transition in the face of climate change – one which will maintain economic prosperity, given high current dependence on fossil fuels, while avoiding adverse social impacts.

Canada's over-reliance on oil and gas revenues poses systemic risk for its financial sector. The credit exposure of Canada's largest six banks to the oil and gas sector exceeds $100 billion[131]. Furthermore, the price of non-oil commodities, which account for an estimated 20-30% of Canada's exports, tend to correlate to oil prices which increases the country's overall exposure to the fossil fuel sector. Analysis by the International Institute for Sustainable Development (IISD) has suggested that under the IPCC 1.5 scenario (66% chance of staying below 1.5 degrees of warming), 61% of Canada's listed equity in oil and gas would be at risk[132].

Canada has high social inequality driven by fossil fuel production. 80% of the population lives in cities, of which half live in Toronto, Montreal, Vancouver and

[128] CCCR (2019). **Canada's Changing Climate Report**

[129] Bank of Canada (2019). **Financial System Review – 2019.**

[130] World's Top Exports (2019). **Crude Oil Exports by Country**

[131] International Banker (2016). **How low oil prices are affecting Canada's banks**

[132] International Institute for Sustainable Development (2019). **Leveraging Sustainable Finance Leadership in Canada**

Calgary. Wages are generally low in rural areas whereas urban incomes vary greatly, with Calgary having four times the national level of income inequality[133]. Canada's ten provinces each have different economic characteristics and show markedly different levels of per capita income – Alberta is the centre of national fossil fuel production and has by far the highest per capita income.

Table 1: 2017 Province Scorecard by Conference Board of Canada[134]

REPORT CARD

Economy Indicators

	Canada	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Income per capita	D	C	D–	D–	D–	D–	D	D	B	A	D
Economic growth	D	C	C	D	D	D	C	C	D–	D–	B
Labour productivity growth*	B	D–	C	C	C	C	C	A	A	B	A+
Unemployment rate	C	D–	D–	C	D	C	B	B	B	C	B
Employment growth	C	D–	D–	D–	D	C	C	D–	D–	D–	A
Inflation	A	A	A	A	A	B	A	A	A	A	A
Inward greenfield FDI performance index	C	D	D	D	D	C	C	D	D	D	C

*Labour productivity grades calculated without Ireland.
Note: Data for the most recent year available were used. For details on methodology and data sources, see the Methodology & Data section of this website.
Source: The Conference Board of Canada.

Sustainable finance innovation

In May 2018, the ministries of finance and of environment and climate change established an Expert Panel on Sustainable Finance (EPSF) to look at sustainable finance and climate risk disclosure. This move followed two major international milestones which had implications for global markets and for Canada – the 2017 recommendations by the Taskforce for Climate-related Financial Disclosure and the 2018 recommendations of the European High-Level Expert Group on Sustainable Finance.

The EPSF's interim report was published in October 2018, after which various sustainable finance developments took place in Canada, for example:

> Bank of Canada – the Canadian central bank – joined the Network of Central Banks and Supervisors for Greening the Financial System;

[133] Global News (2017). **Rise of income inequality in Canada 'almost' exclusive to major cities: study**

[134] The Conference Board of Canada (2017). **Economy**

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> Export Development Canada agreed a new climate change policy that included a commitment to set targets to reduce the carbon intensity of its lending portfolio;

> Canada created an institution – the Pan-Canada Expert Collaboration – to provide advice to policymakers on clean growth solutions.

The EPSF made its final report in June 2019 and made fifteen recommendations to government, for example, that it should:

> Map Canada's long-term path to a low-emissions, climate-smart economy, sector by sector, with an associated capital plan;

> Establish a standing Canadian Sustainable Finance Action Council (SFAC) with a cross-departmental secretariat, to advise and assist the federal government in implementing the Panel's recommendations;

> Establish a Canadian Centre for Climate Information and Analytics

> Embed climate-related risk into monitoring, regulation and supervision of Canada's financial system.

The report also acknowledged Canada's unique economic structure and need for economic transition in light of climate change. In September 2019 the Canada Standards Authority launched an industry-led process to develop a 'National Standard of Canada for Green Taxonomy', building on existing global frameworks such as the EU taxonomy of sustainable economic activities, and existing standards for green bonds. The Canadian taxonomy is expected to be different from the one that has been developed by the European Commission's Technical Expert Group – the latter focuses on defining 'what is green' whereas **Canada's taxonomy will look specifically at the transition needs of resource-intensive economies**.

Impact of reforms

The various reforms which have taken place in Canada over the last two years indicate an economy-wide shift towards planning a national climate transition, set in the context of a relatively small political class and a culture of consensus-building.

However, **many hurdles lie in the way of implementation, not least the difficulty of transitioning a fossil fuel-dependent economy while maintaining financial stability and social cohesion**. Unlike other countries with single

national integrated fossil fuel producers, Canada's fossil fuel sector is made up of dozens of small upstream producers. This industry make-up as well as the relative place of environmental liabilities and corporate pension assets in bankruptcy will pose significant challenges.

Structural issues such as the balance of power between the federal and regional levels, and the switch to a minority-led government following the election of October 2019, are also likely to present challenges. The federal government's difficulties in achieving provincial implementation of a national carbon tax may be a model for future difficulties around sustainable finance policy.

Unmet needs and opportunities for the future

Despite being a co-lead of the international Powering Past Coal Alliance and establishing a Task Force on Just Transition for Coal, **Canada is still cautious about fully publicly confronting the economic risks related to its fossil fuel dependency**. During the election period of autumn 2019 Canada's election agency warned organisations that advertisements or campaigns referring to climate change could be considered 'political'.

Although important first steps have been taken, much more remains to be done to put Canada firmly on a climate transition pathway with widespread social and political buy-in. Bank of Canada is emerging as a champion of this message; in November 2019 it issued a note stating that some of Canada's existing oil and gas reserves would not be usable in a below 2-degree scenario and would become stranded assets, with knock-on effects for many other sectors in the economy.[135] However, Canada's bank and federally regulated pension supervisor, the Office of the Superintendent of Financial Institutions, has not yet commented on the impact of climate risk on the firms that it regulates.

As well as focusing on energy transition, Canada needs to put in place financial policy responses to address its resilience needs, which are higher than average for a developed economy. Transition messages are understandably focused on opportunity and growth, but substantial physical climate change impacts are already locked into Canada's future. Making disclosure of climate-related risks mandatory across the economy, including reference to temperature-rated energy scenarios, would be an important first step.

[135] Bank of Canada (2019). **Researching the Economic Impacts of Climate Change**

Points of relevance for Germany

> Canada's federal political system is comparable to Germany's – substantial power lies at the provincial level and there are also comparable differences in regional economic profiles, regional disparities and social inequalities.

> Germany, like Canada, needs an economy-wide plan for transitioning heavy industry and hydrocarbon sectors and growing clean sectors of the economy while maintaining financial stability and social cohesion.

Case study 3: Mexico

Key trends and concerns

Mexico's export-oriented economy has generally experienced macroeconomic stability and moderate growth since the 2008 financial crisis, although as an emerging economy it still faces various unresolved challenges including income inequality and a need for additional infrastructure investment.

Mexico's ground-breaking 2012 General Climate Change Law was followed by key energy sector reforms which liberalised the market and opened it up to the private sector. Mexico has large and diverse opportunities to generate renewable energy, so these reforms were important in creating an environment for the transition to take place, and in providing a legal framework for sustainable finance innovation. The General Climate Change Law set a target of 50% emissions reductions by 2050, with 'clean' sources of energy accounting for 35% of electricity generation by 2024.

Mexico strengthened its climate ambition with its Nationally Determined Contribution (NDC) submitted under the Paris Climate Agreement, and by updating the General Climate Change Law to make it consistent with the Paris Agreement. **The updated law creates an inter-departmental National System on Climate Change** which is comprised of the Inter-Ministerial Commission on Climate Change and Energy Transition (IMCC), the Consultative Council on Climate Change, and the National Institute of Ecology and Climate Change[136].

[136] Grantham Research Institute on Climate Change and the Environment (2018). **Mexico's General Law on Climate Change: Key achievements and challenges ahead**

The IMCC acts as a coordination body amongst 16 different ministries within the government.[137]

Sustainable finance innovation

Mexico has been active in climate finance innovation. In 2015 the national development bank, NAFIN, was the first Latin American public bank to issue a green bond. In 2016, Mexico City was the first city in the region to do so (it has now issued three rounds of bonds) and overall Mexico is among the top ten countries for green bond issuance.[138]
A new department within the ministry of finance was recently created with the view of developing a methodology for green budgeting and a green taxonomy to further develop and mainstream sustainable finance. Work on a National Climate Finance Strategy is also planned.

Mexico has consistently participated in the main intergovernmental initiatives related to sustainable finance. In 2016 Mexico participated in the Green Finance Study Group established under the G20, and the central bank, Banxico, is the only Latin American founding member of the Network for Greening the Financial System. Other Mexican institutions have since joined the network – the financial regulator and the National Banking and Securities Commission. The Mexican Ministry of Finance is a member of the Coalition for Ministers of Finance.

Due to Mexico's vulnerability to natural disasters, including extreme weather associated with climate change, it has been an early adopter of financial innovations to insure against disaster risk. Mexico issued the world's first multi-peril, multi-region catastrophe bond[139], developed by Mexico's Fund for Natural Disasters with the Ministry of Finance and Public Credit, making use of technical assistance from the World Bank MultiCat Program.

Mexico has also created the first coral-reef insurance against storm damage and has used parametric index insurance[140] to reach small-scale farmers through its CADENA program. In Mexico this insurance is offered by a federal agency which then shares the risk among participants in financial markets.

[137] EFE (2018). **El Ejecutivo actualiza la Comisión interministerial de Cambio Climático**

[138] Reuters (2017). **Green bond deals hit record $100 billion in year to date: data**

[139] Catastrophe bonds are specialised financial instruments which can reduce the short-term fiscal impact of a one-off natural disaster by sharing risk within financial markets.

[140] Parametric insurance helps to shield farmers from financial losses due to weather whilst ensuring that it is in their interests to maximise their profits regardless of weather conditions.

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Unmet needs and opportunities for the future

Efforts to mainstream green finance are underway, but they are still fragmented and recent changes in policy direction risk undermining Mexico's ability to be a leader in green finance in the region. Nevertheless, there is increasing support from the Mexican private sector to mainstream green finance. Leadership on the issue by the central bank, Banxico, is also key to maintaining momentum.

Although Mexico has been a pioneer in adaptation, finance risks remain from increasing climate change impacts. Catastrophe bonds do not require "building back better" or support preventative measures. Therefore, there is still scope for improvement in financing Mexico's climate resilience, for example by using the same principle of transferring risks to the reinsurance market but issuing resilience bonds instead.

In terms of opportunities, ongoing plans to merge some of the Mexican development banks provide an opportunity to revisit institutional mandates and ensure a more joined-up approach to sustainable finance. This will be helpful as Mexico looks to pursue more integrated approaches such as a national Green Finance Strategy.

Points of relevance for Germany

> Mexico has maintained an overall level of climate ambition despite changes in government and has established an inter-departmental platform on climate. It plans to create a National Finance Strategy for climate change.

> Mexico has been strongly engaged in international green finance processes and coalitions.

> Mexico has been innovative in the areas that are most important to its economic prosperity, for example in financing climate resilience.

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Case study 4: China

Key trends and concerns

China's high-level **policy goal to build an "ecological civilization"** was established by the Communist Party of China in 2012. This measure was introduced against the background of rising pollution in major cities which was closely linked to China's rapid industrialisation and which also risked creating social unrest and political tension. The new goal led to a number of ambitious environmental targets being put in place which also affected the finance sector.

Specific example of sustainable finance innovation

The Peoples Bank of China (PBOC) created the **Green Finance Task Force** – which was aimed at **stimulating private sector finance into the green economy**. This was necessary as it was estimated that the public sector could only contribute between 10-15% of China's green investment gap. In parallel, the 13th Five Year Plan (agreed in 2015) laid the groundwork for the implementation of a green financial system[141]; **four of China's financial regulators, including the PBOC, were mandated by the State Council General Office to devise financial policies to foster the development of the environmental sector.** In 2016, a comprehensive plan on "establishing the green financial system" by seven finance-related ministers and commissioners was published[142].

In preparation for the G20 which China hosted in 2016, the Green Finance Committee of China Society for Finance and Banking was created to promote the growth of green finance through research, advocacy and international cooperation. At this point, the real push for promoting green finance started. More than 200 institutions are members, including large, medium-size funds, insurance and securities companies. By 2017 the Committee's members were managing two thirds of all financial assets in China[143]. There are also local versions of the Green Finance Committee in particular regions of China.

[141] US-China Economic and Security Review Commission (2017). **The 13th Five-Year Plan.**

[142] Peoples Bank of China et al (2016). **Establishing China's Green Financial System.**

[143] UN Environment (2017). **Establishing China's Green Financial System: Progress Report 2017**

In response to government policies, green finance pilot zones were launched in five cities in 2017. By 2018, every Chinese province had set out policies to promote green bonds. Some have provided monetary incentives to the issuers whilst others are focusing on promoting small and medium enterprises.

At a macro level, the Peoples Bank of China has taken measures to promote green finance. In 2018, it became the **first Central Bank to recognize AA green bonds as qualifying to meet collateral requirements,** in order to spur investment in green products. It also offers a discounted price on green credit.

Lastly, the China Securities Regulatory Commission has mandated that **by 2020 all listed companies and bond issuers will have to disclose the ESG risks associated with their business**.[144] This will provide a valuable mechanism for increasing scrutiny and a lever for investors to induce companies to better assess and manage the environmental impact of their operations.

As well as driving domestic action, China's Green Finance Committee has acted as a gateway for international cooperation on green finance. This has given outsiders an opportunity to better understand green finance in China but has also allowed Chinese policymakers to learn from international experience. Currently, the UK-China Green Finance Centre – until recently UK-China Green Finance Taskforce – is working on the implementation of Green Investment Principles along the Belt and Road Initiative.[145]

China has been active in shaping the international green finance agenda. China put green finance on the G20 finance agenda when it hosted the 2016 meeting, and for the first time this group adopted a shared goal of promoting green finance. China co-chaired the G20 Green Finance Study Group with the UK. It was a founding member of the Network for Greening the Financial System and also participates in the International Platform for Sustainable Finance, along with the EU and six other countries.

[144] Lexology (2018). **China Mandates ESG Disclosures for Listed Companies and Bond Issuers**

[145] Green Finance Institute (2019). **UK-China Green Finance Centre**

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Unmet needs and opportunities for the future

One reason for China's continued leadership on green finance may be that it is seen at the highest level as a way of maintaining economic growth whilst mitigating environmental degradation. There has been strong top-down pressure from central government and regulators which has resulted in a plethora of guidelines and initiatives. However, implementation on the ground has varied. For example, both the National Development and Reform Commission and the Peoples Bank of China authorise the issuance of green bonds, but each has its own criteria. This has hampered the potential internationalisation of the green bond market. There are three underlining issues: eligibility of 'clean' coal-fired power generation, transparency on use of proceeds, and (in the case of NDRC) rules allowing for half of the bond to be used for working capital in the case of state-owned enterprises. This means that, **although China's green bond market is the second largest in the world, it has not fulfilled its potential –** only 65% of the green bonds issued in China in 2018 were acceptable to international investors.[146]

Crucially, despite China's green finance policies, its emissions are continuing to rise, and the rate has recently gathered pace after a ban on new coal-fired power generation was lifted and following pressure on Chinese export income from the US-China trade war.[147] There appears to be a trade-off between China's need for continued economic growth to ensure political stability, and its goals to reduce emissions and improve the environment which also have political support.

The impact of China's green finance policies is dwarfed by its financial impact abroad. Green Investment Principles for China's Belt and Road Initiative were published in December 2018 and endorsed by 28 regional institutions, supported by a UK-China Secretariat. Given the scale of the initiative, how these principles are enacted could make or break the success of the global climate transition. The China Development Bank alone is a major financier of brown and green infrastructure and has huge potential both to direct financial flows towards greener projects, and to mainstream green principles into Chinese projects.

[146] IPE (2019). **China: The greening of China**

[147] Climate Action Tracker (2019). **China**

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Points of relevance for Germany

> China has combined a central planning approach with a high level of local experimentation and innovation in financial policy, for example through the green finance pilot zones.

> China has taken a strong international leadership role on green finance, for example, through the G20, and has helped to shape this agenda globally.

> China has struggled to reconcile political demands for environmental protection and for continued economic growth, but a failure to integrate these will put both goals at risk.

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CHAPTER 4
GERMANY: READY FOR A TRANSFORMED ECONOMY?

Germany is at the geographical, economic and political core of the European Union, and is about to take on additional responsibility during the second half of 2020 when it will hold the Presidency of the European Council, including hosting a major EU-China summit.

In this chapter we analyse the effects on Germany of the major disruptive trends introduced in the previous section and combine this with a discussion of Germany's current response to the climate crisis in order to assess the country's readiness for upcoming transformations. We also take an in-depth look at Germany's finance sector and the debate on sustainable finance, asking what role finance does and can play in accelerating the necessary change.

Major trends are disrupting Germany's status quo

Germany does not fully use the opportunities of technological innovation

Germany is structurally well prepared for benefiting from future technological progress, but the uptake of the most recent digital technologies is slower than in other countries, particularly among small- and medium-size enterprises.[148] For example, every second manufacturing company is still relying heavily on traditional, non-digital production processes, and only every sixth company is prepared for advanced digitalisation measures.[149] The German public is, compared to other European countries, sceptical towards digitalisation, and concerns about privacy and data protection are exceptionally high. Only 54% of citizens expect digitalisation to have a positive societal impact.[150] A well-managed digital transition offers many opportunities to the German economy and society, but so far, only large companies have been able to reap the benefits

[148] OECD (2018). **Leveraging the Opportunities of Digitalisation in Germany**

[149] Frauenhofer-Institut für System- und Innovationsforschung (2017). **Wie digital ist Deutschlands Industrie wirklich?**

[150] Körber Stiftung (2019). **Deutsche sehen wenig Chancen in der Digitalisierung, andere Nationen schon**

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of new digital technologies. The potential of digital technologies for supporting small and medium enterprises as well as climate action is not fully used, and there is a lack of supportive policy frameworks.

Digitalisation has become a key issue of German industrial and innovation policy, but it is mainly seen as an opportunity for incremental rather than transformative change. Elsewhere, for example in the US, the disruptive effect of new technologies takes centre stage, but the German "Industry 4.0" discourse prioritises gradual change and improvements of existing processes over transformative changes and leapfrogging.[151] The predominance of an established manufacturing industry at the heart of Germany's industrial core, which is opposed to fast changes, is one of the main reasons for this. Germany is comparatively bad at producing small, disruptive digital companies, and "Industry 4.0", i.e. connecting factories and machines, may be an opportunity to offset this disadvantage. However, this position may be endangered by the rising importance of data-processing technologies such as artificial intelligence (AI), a field in which German companies are relatively uncompetitive.[152]

Nonetheless, the importance of digital technologies in German industry will continue to grow, and the related turnover is expected to double from €24.5 billion in 2018 to more than €50 billion in 2020.[153] While the roll-out of digital technologies proceeded more swiftly in the services sector than in the manufacturing sector, the progress has recently stalled in the service sector but continued in the industrial manufacturing sector.[154] Currently, large companies increasingly integrate digital technologies, while small enterprises are facing difficulties in adopting these technologies.[155] Given Germany's reliance on small and medium enterprises, this poses a challenge for the key pillars of the country's economy in an increasingly digital world.

Additionally, the long-standing global leadership position of German heavy industry is increasingly threatened by competition from abroad, including from China and innovative peers such as Tesla which move into the markets of

[151] Friedrich-Ebert-Stiftung (2016). **Germany's Industry 4.0 strategy**

[152] PwC (2014). **Industrie 4.0: Chancen und Herausforderungen der vierten industriellen Revolution**

[153] GTAI (2018). **Digital Economy in Germany**

[154] Bundesministerium für Wirtschaft und Energie (2018). **Monitoring-Report Wirtschaft DIGITAL 2018**

[155] Institut für Arbeitsmarkt- und Berufsforschung (2016). **Arbeitswelt 4.0 – Stand der Digitalisierung in Deutschland**

Germany's core industries.[156] In conjunction with the weakness of Germany in leading on disruptive technologies such as AI, this makes it **necessary to devise new strategies to respond to a structurally changed global economic and technological environment**.

The German transition to Industry 4.0 has the potential to create additional jobs, based on re- or upskilling and productivity gains in the manufacturing sector, for example in the automotive industry and mechanical engineering.[157] At the same time, 12% of jobs in Germany are at risk due to automation, and the automation risk is highest for employees with elementary and primary education (80%).[158] This mirrors the analysis of the global situation outlined in Chapter 1, which has found that low-skilled workers and members of the lower middle-class are most at risk from automation. This suggests that conversations about how to devise socially just transition pathways for people in many different sectors is becoming necessary for the twin reasons of automation and climate policy. Over the past years, significant political attention has been paid to the 20,000 workers left in the coal sector, in particular because of the regional concentration of these jobs, but Germany's job market will face significantly larger challenges in the coming decades.

The Economy Ministry's industrial strategy for 2030 aims to adapt German industry to rising global competition and the emergence of new technologies. An earlier version of the strategy had been heavily criticised for its heavy focus on state intervention to protect large industrial players and its lack of attention to small- and medium-sized enterprises which play an important role in the German economy. [159] This earlier version also did not include any climate protection measures and failed to recognize the benefits of becoming a leader in emerging low-carbon markets. The final version has improved in this regard, but **the industrial strategy still falls short of enabling a climate neutral and resilient industry as well as creating linkages between decarbonisation and other trends such as digitalisation**. [160] As these trends exert growing pressure on established industrial entities, their competitiveness and associated jobs, the industrial sector must adapt – and this requires targeted investments as well as a

[156] CNBC (2019). **Tesla CEO Elon Musk announces plans for fourth factory and design center near Berlin**

[157] BCG (2015). **Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries**

[158] Zentrum für Europäische Wirtschaftsforschung (2015). **Übertragung der Studie von Frey/Osborne (2013) auf Deutschland**

[159] Global Counsel (2019). **German industrial strategy: big firms for big challenges?**

[160] For more on industry and climate see E3G (2019). **The Race to Decarbonise Industry**

supportive regulatory framework for efficiency, circularity, new processes and new technologies.[161]

All technological changes must also be aligned with the requirement to tackle the climate crisis. The German industry sector has continuously decreased emissions by 31% since 1990, but a further halving of emissions is necessary by 2030 to reach the sectoral climate target. Energy and process-related greenhouse gas emissions from the industry sector still account for a significant share of Germany's emissions. In particular, process emissions in energy-intensive industries such as steel, cement and chemicals are technologically and economically difficult to mitigate.

Nevertheless, **various large businesses such as Heidelberg Cement or Thyssen Krupp have announced net zero emission plans by 2050 and are actively exploring feasible pathways**, for example based on alternative gases, circular processes and carbon capture and storage technologies as well as investment strategies to decarbonise. In addition, the German government supports research and innovation in the industry sector to speed up the transition process and optimise efficiency in cross-cutting implementation measures and industrial processes.[162]

Digitalisation and its effects are already causing major changes in the German industrial and economic landscape. At the moment, decision-makers are reluctant to embrace the reality of these changes, leading to a slow adoption of digital technologies and ineffective measures against climate change. In the long run, failing to prepare and guide these changes will lead to more negative consequences than action in the present. **Policymakers thus need to recognise the opportunity to combine the changes triggered by technological innovation with the need for effective climate action.** This would make it possible to build tomorrow's climate neutral, digital economy while keeping disruptions at a minimum.

[161] See for example WWF (2019) **Klimaschutz in der Industrie**

[162] See also Agora Energiewende (2019). **Klimaneutrale Industrie**

E3G

Germany has become a key geopolitical player, but lacks a strategy

Germany is one of the key countries in Europe and a significant player in global relations. With its large diplomatic assets, the country is a strong and stable supporter of multilateralism and international liberalism, and an important member of the G7, G20, OECD and NATO. Within the EU Germany is an economic powerhouse, and European integration is a continuous and strong foreign policy priority based on a close, at times complicated, relationship with France. However, **Germany does not yet deliver the geopolitical leadership that is needed**, and its foreign policy is largely focused on achieving short-term economic gains.

German international leadership is needed due to recent fundamental geopolitical changes, such as the rise of populist governments in other Western countries. Such leadership would also be in Germany's interest: over the past decades, global rules have suited its needs, making rule-taking a largely successful foreign policy strategy. But in a world that is tending towards major power competition, Germany is at risk of losing out, and would thus benefit from becoming an active shaper of global rules.

Such a strategic shift would need to happen against a backdrop of tensions with key partners such as the US and the UK, which are increasingly shaping key aspects of German foreign policy. In parallel, disagreements and conflicts with some other key powers such as Russia and Turkey have deepened, while business cooperation, for example with regards to Nord Stream II, is still strong. This has also sparked international criticism: for example, many Eastern European states called on Germany not to support Nord Stream II due to its geopolitical implications, such as a weakening of Eastern transit countries including Ukraine.[163] Despite concerns from major allies, including the US and Poland, Nord Stream II will likely be constructed, indicating the **predominance of economic over strategic geopolitical aspects in German decision-making**.

Links between competition, trade, security and climate in relationships with China, USA and Russia will be particularly pronounced in 2020 when Germany holds the EU Council Presidency and hosts the EU-China Summit in Leipzig in the runup to the critical climate conference COP26 in Glasgow. Competitive and technological pressure, accelerated by regulation, is perceived as the main risk by many companies in Germany, meaning that at the international level,

[163] Brookings (2019). **Nord Stream 2: A failed test for EU unity and trans-Atlantic coordination**

E3G

Germany will be forced to integrate the climate crisis much more actively in foreign policy and economic spaces.

Climate diplomacy has become an important part of international relations. Germany, as a key player within the EU delegation, has for a long time been **at the core of international climate negotiations and still has a strong reputation.** This is based on its past climate leadership in international negotiations and contribution to producing renewables at scale, thus making low carbon technologies more affordable. However, the **German reputation in the UN climate negotiations is weakened** because of the stronger engagement of other main emitters and international players, and Germany's failure to deliver domestic climate action at an ambition level which leads the way for other nations. This not only puts a burden on German credibility but also the EU's ability to increase climate ambition in its Nationally Determined Contribution in 2020. Nevertheless, Germany is regularly sending the largest number of participants from any EU country to the UN climate negotiations and played an important role in other key climate processes such as the Cartagena Dialogue, the High Ambition Coalition, and its annual Petersberg Climate Dialogue.

The German government has continuously raised climate action at key international fora such as the World Economic Forum and the G7 and G20. In addition, the German government made climate and security one of the priorities of its membership of the UN Security Council. Lastly, Germany is one of the largest contributors to international public climate finance, through domestic funding instruments as well as its development and promotional bank (KfW) and development agency (GIZ), but also through international funding instruments such as the Green Climate Fund and the Adaptation Fund, UN agencies and multilateral development banks. According to its current budget, the German government is set to reach its domestic goal of contributing €4 billion per year to international climate financing by 2020.[164]

Germany is still heavily reliant on imported fossil fuels, a problem that may be exacerbated by increasing gas demand in the power sector and heating in the coming years, but projections show that gas demand must decrease by 2030 if renewable expansion targets are met.[165] Dependence on energy imports is high and increasing. In 2016, energy imports, largely fossil fuels, accounted for 64% of energy consumption. In the same year, **almost all oil and gas was imported**.

[164] Clean Energy Wire (2019). **Germany to reach goal of 4 bln euros for intl climate financing by 2020**

[165] Agora Energiewende (2017). **Energiewende 2030: The Big Picture**

E3G

Since the beginning of 2019, all hard coal has been imported since the last hard coal mine was closed just before Christmas 2018.

Germany's key role in the redistribution and storage of gas in Europe also has profound geopolitical implications. Germany's dependence on imports from Russia is high and will likely increase, including due to the Nord Stream II pipeline project. In parallel, gas is still perceived as a viable bridge technology, for example in the context of the coal phase out, while overall declining demand in Europe suggests that new gas investments are at high risk of turning out to be stranded assets. To counterbalance this dependence and to prevent any pressure by the US on the German export industries (in particular automotive), Germany is considering its own liquified natural gas (LNG) terminal infrastructure. It is unclear however to what extent a domestic LNG terminal infrastructure is viable and economically sound given the high interconnection of the EU gas market, increasing electrification and efficiency gains.

An accelerated deployment of domestic renewable energies, especially wind and solar, would reduce import dependence and increase Germany's geopolitical scope of action. However, with the current deployment trajectory, Germany will likely not reach its goal of integrating 65% of renewables in the power mix by 2030. This is both fuelling energy security concerns, given the parallel nuclear and coal phase out, and concerns about the stability of energy prices, and makes new investments in fossil infrastructure more likely. In other sectors, competitiveness concerns are more pronounced. Through sector coupling, transport, buildings and industry will require large amounts of renewable power to be decarbonised. At the same time, Germany is outcompeted by lower-cost economies such as China, for example in steel production, and lagging behind in the deployment of key low carbon technologies such as electric vehicles and batteries compared to China and others.[166]

With its high degree of public support for multilateral cooperation, economic clout, and unique position as a potential bridge-builder between East and West, Germany's geopolitical leadership is crucial in a context of geopolitical disruption and realignment. While domestically there is still a strong perception of geopolitical stability in the European neighbourhood, looming disruptions suggest that Germany must define and act on its foreign policy interests more clearly. Thanks to its strong track record on manufacturing, Germany could pivot

[166] The Economist (2018). **China is rapidly developing its clean-energy technology**

E3G

to becoming a manufacturing hub for the clean economy – but there will be international competition for this role. In addition, Germany must work together with other EU member states to enable the EU to show strong leadership in the world, on issues ranging from conflict to climate change and authoritarianism.

Germany has recently upped its rhetoric on taking on more responsibility and defending multilateralism, but this must be followed by action. The German and French Foreign Ministers' Alliance for Multilateralism has not yet resulted in concrete next steps, and Germany lacks a proper and coherent strategy towards countries such as Russia and China.[167] Germany must more clearly identify where it can have a strong impact. For example, Germany's influence on EU monetary policy has had significant consequences on austerity and investment policies in other EU member states. Over the last decade, Germany was continuously criticised for keeping other member states in deficit and dependence, while benefitting from the broader economic situation, namely low interest rates and high exports.

Germany is struggling under the macroeconomic slowdown and low investment rate

With a GDP of €3.4 trillion (2018), Germany has the largest economy in Europe. Family-owned, internationally competitive businesses are perceived as the "engines" and pride of the German economy, even though Germany is also home to some of the largest corporations worldwide.

Germany is the third largest export economy worldwide and manufacturing exports are driving economic growth. Thus, global economic conditions have significant effects on the German economy. Overall, Germany has a strongly service-based economy (69% in 2017), however public debate is often centred on the still large, world-renowned and export-oriented industry and manufacturing sectors in the country (31%). This results in a German economy sensitive to global competition and financial and economic shocks in partner countries and key markets.

However, key pillars of Germany's export economy are at risk of losing their competitive position due to the coming transformations. For example, the automotive industry, already challenged by digitalization and automation, is lagging behind in the transition towards electric mobility, the solar PV industry has already lost large shares of its manufacturing capacity towards China, and

[167] DW (2019). **Germany launches Alliance for Multilateralism**

industrial actors in various sectors are at risk of losing market shares due to their slow uptake of digital technologies.

Table 2: Germany's main export goods by percentage share of exports (2018)[168]

Automotive goods	Machines	Chemical products	ICT goods	Electrical equipment
18%	15%	9%	9%	7%

After years with a strong economy and a significant reduction of public debt, **Germany is currently on the brink of a recession**. Recent announcements by Audi, Continental and Daimler have lifted the tally of job cuts announced in 2019 across Germany's manufacturing sector to more than 100,000, according to Bloomberg calculations.[169] Nevertheless, the German federal government has committed – again – to not making any new debts in the coming budget cycle. This approach ("Schwarze Null"), a key priority of Chancellor Merkel's Conservatives, is increasingly criticised given the slowing economy and large investment needs for infrastructure, digitalisation and climate. The critics include the German Council of Economic Experts, the industry association, trade unions and civil society.[170] In addition to the overall amount of investment, Germany struggles to deliver critical small- and large-scale infrastructure projects, due to often poorly coordinated public participation and extensive planning processes. Recent statements by the Finance Ministry suggest that the government might move away from the "Schwarze Null" approach in 2020.[171]

Germany's labour market is strong, particularly in science, engineering and technology jobs, thanks to world-renowned vocational and on-the-job training. At the same time, there are concerns about a lack of skilled employees, particularly in rural areas.[172] Trade unions play an important role in decision-making processes as they are often directly and formally involved in these processes through established formats such as "social dialogues" and "social partnerships". Social dialogues usually take the form of close and decentralised structures of contracts and mutual agreements between employers' associations, trade unions and workers' councils, ensuring regular meaningful

[168] Bundesministerium für Wirtschaft und Energie (2019). **Fakten zum deutschen Außenhandel**

[169] Bloomberg (2019). **German Manufacturing Job Losses Top 100,000 With Daimler Cuts**

[170] Deutschlandfunk (2019). **Wirtschaftsweise rütteln an der Null**

[171] Der Tagesspiegel (2019). **Olaf Scholz stellt schwarze Null infrage**

[172] Deutsche Welle (2019). **German firms face skilled workers shortage**

E3G

interactions between employers and employees in individual industries.[173] The whole system is challenged to provide talent required for moving to a green economy, including by attracting and retaining talent from abroad, and investing in targeted education and qualification in the country.

However, the **low-wage segment of the labour market has significantly grown in recent years**, partly due to social and economic reforms introduced in the 2000s. Compared to many other countries, the difference between market income and disposable income is relatively high, driven by the tax, transfer and social welfare system.[174] Germany's public spending on social protection (per capita) ranks second in the EU. The labour share of income is still at 69% but has decreased significantly since the 1970s. The share of workers with the right to collective bargaining is high at 57%, but has decreased dramatically from 85% in 1985, reflecting a decrease of unionisation and the decline of some highly organised large-scale industries. Overall, wealth is distributed much more unevenly than income, and further inequalities persist between the genders, rural and urban areas, and industries. The reunification in 1990 was a unique challenge for the economy, and its effects are still visible in data and reality. Median net incomes in the Western states of Germany are still 20% higher than in the East, despite recent convergence trends.[175]

Another key macroeconomic shift faced by Germany is demographic change, characterised by a low birth rate and an increased life expectancy, which together lead to an overall ageing population. This trend is not offset by migration into Germany.[176] By 2035, the size of the working population in Germany will decrease by 4-6 million people. The overall population size will continue to increase slightly over the coming years, before plateauing and decreasing after 2040.[177] These developments have varying effects on different regions of Germany: while ageing can be observed across all states, decreases in population particularly affect rural, structurally weak regions. Importantly, the demographic trends combined with the low interest environment put major pressure on the stability of the traditionally strong Germany pension system as

[173] Dustmann et al. (2014). **From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy**

[174] Federal Ministry of Finance (2019). **Social inequality and inclusive growth**

[175] Wirtschafts- und Sozialwissenschaftliches Institut (2019). **Medianeinkommen**

[176] Demografie Portal (2019). **Der Demografiebericht**

[177] Statistisches Bundesamt (2019). **Bevölkerung im Erwerbsalter sinkt bis 2035 voraussichtlich um 4 bis 6 Millionen**

E3G

well as pension funds.[178] Structural reforms of the system can be expected for the coming decade.

Again, it becomes clear that **the various disruptions that are occurring for reasons not related to climate policy have strong implications for the fight against climate change, too**. For example, the threat to pension systems caused by demographic change is exacerbated by the risk of stranded assets due to necessary climate policy, showing the need for change in the financial sector. Furthermore, the environment of stagnating growth and low interest rates makes it necessary and desirable to invest into the economy, investments which could very well be aligned with the need to build new, green infrastructure. **Altogether, a "green stimulus", as demanded for example by the OECD Economic Outlook, would provide a solution to many of the different problems analysed here**.[179]

Pressure for more climate protection is not translated into effective policies

Climate change is currently a top priority in the German political debate as a result of both increasingly salient climate impacts and the broad mobilisation of the climate movement, in particular the strikes of Fridays for Future. Most Germans perceive climate as a key political issue for their voting decision and 63% believe that climate protection is more important than economic growth.[180] Germany has a historically strong environmental movement, but the climate movement has regained momentum only recently. Fridays for Future Germany regularly reports the highest participation in the Friday strikes worldwide, with a peak in September 2019 with 1.4 million people on the street.

Considering this, **political pressure to deliver more ambitious climate policy is immense but the government has so far failed to agree on adequate measures aligned with the Paris Agreement**. At the same time, climate impacts have become more visible in the country, particularly during the exceptionally hot summers of 2018 and 2019 which caused major economic losses, for example in agriculture, inland shipping, tourism and even fossil industries due to a lack of cooling water. In 2018 alone, climate damages led to costs of €700 million in

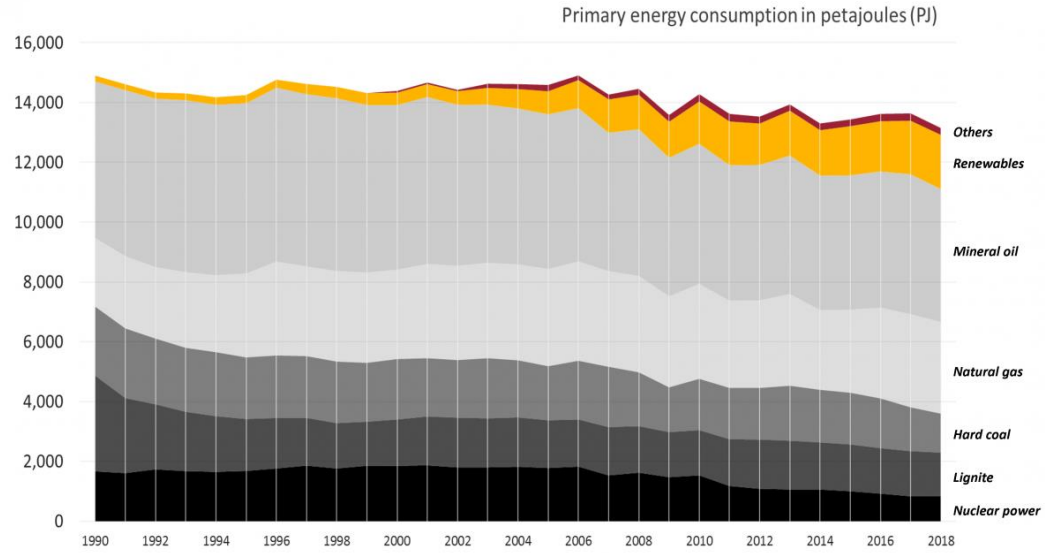
[178] Handelsblatt (2018). **Die Zinsflaute geht ersten Pensionskassen an die Substanz**

[179] OECD (2019). **Economic Outlook**

[180] Tagesschau (2019). **ARD-DeutschlandTrend: Klima toppt Wirtschaft**

agriculture, and extreme weather events caused total costs of €3 billion.[181] While a broader understanding of the impacts of climate change is growing, and Germany has built capacity on adaptation, climate-related migration and issues around disaster displacement, the debate is mainly focused on domestic mitigation measures.

Figure 4: German energy sources' share in primary energy consumption 1990-2018[182]



The internationally praised "Energiewende" has contributed to the successful deployment and integration of a large share of renewables in the power mix. However, at the same time, Germany is still the largest coal-burning country in Europe. In 2018, seven of the top ten emitters of CO_2 across all sectors in Europe were German lignite plants. While the share of coal has been reduced, renewables have mainly replaced nuclear power. **In other sectors such as buildings, transport or industry, progress has been much slower**, resulting in a persistent reliance on oil, fossil gas and coal. In 2018, renewables accounted for only 14% of primary energy consumption (see Figure 4), while energy sources which are largely imported – oil (34%), fossil gas (24%) and hard coal (10%) – accounted for more than two-thirds of the overall consumption figure. **Large investments will be needed to manage the transformation to a net zero economy across all sectors.**

[181] Umweltbundesamt (2019). **Monitoringbericht 2019 zur Deutschen Anpassungsstrategie an den Klimawandel**

[182] Clean Energy Wire (2019). **Germany's energy consumption and power mix in charts**

In its 2018 study on climate pathways, the German industry association BDI estimated that a **95% emission reduction by 2050 would require additional investments of €2.3 trillion or 1.8% of GDP annually**.[183] In an optimal scenario, assuming global climate action and a level playing field, the net economic effects would be positive: GDP would grow slightly, driven by key markets such as renewable energy, energy efficiency and low carbon mobility. This would however entail a transformation of major parts of the German economy with negative or at least disruptive effects on currently significant sectors such as coal, gas, and the high-carbon car industry. It is estimated that at least an additional €270 billion is needed to reach the domestic climate targets for 2030.[184] Significantly more will be needed for a Paris-compatible pathway and the modernisation of existing wider public infrastructure. **For the finance sector, this means not only a complete divestment from fossil fuels but also strategic investment in net zero infrastructure and markets of the net zero economy**.

Germany was one of the first countries to develop a long-term climate strategy after adopting the Paris Agreement. However, as shown in figure 5, **Germany will miss its domestic climate targets for 2020 and 2030 in almost all economic sectors. For a Paris-aligned path to net zero emissions before 2050, the targets would need to be even higher**.[185] In September 2019, the government presented plans for a Climate Law, based on legally binding sector targets and a governance for reaching the climate goals, as well as a package of measures in all sectors to implement on existing targets. This includes a carbon pricing system for two sectors which are not covered by the EU emission trading scheme (ETS) (with an insufficiently low entry price of €10 per ton of CO_2, later increased to €25 after negotiations with state governments), incentive and support schemes for greener technologies and a few regulatory interventions such as the end of almost all new oil heating systems in buildings by 2025. In addition, the German government has introduced a Climate Cabinet, led by the Environment Ministry, and including all affected ministries. This has helped increase the visibility, cross-sectoral thinking and political importance of climate politics in Germany.[186]

[183] BDI (2018). **Klimapfade für Deutschland**

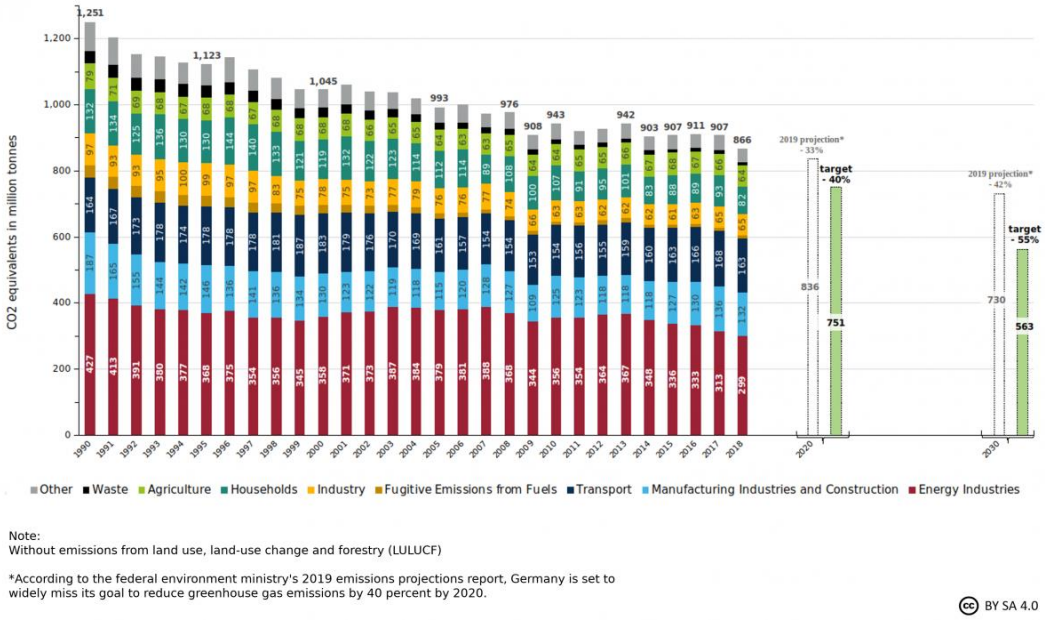
[184] Öko-Institut (2018). **Folgenabschätzung zu den ökologischen, sozialen und wirtschaftlichen Folgewirkungen der Sektorziele für 2030 des Klimaschutzplans 2050 der Bundesregierung**

[185] SWP (2019). **Klimaneutralität als Langfrist-Strategie**

[186] E3G (2019). **One step forward does not make a leader: Germany's climate package and its relevance on the international level**

The ambition of this "climate package", which was the result of months of intense and polarised political debate, is too low. Agora Energiewende estimates that the package will only close one third of the gap to reaching the 2030 emission reduction targets.[187] If the government does not increase ambition, it will fail to deliver on its climate commitments under the Paris Agreement and will also be responsible for a heavy budgetary burden. If Germany does not reach EU targets in the non-ETS sectors, it must pay billions in fines over the next decade.[188] Germany's support for a net zero emissions economy in Europe by 2050 has not yet trickled down to concrete implementation and more ambitious domestic 2030 goals, though the government has recently said that it supports higher EU-wide goals for 2030.[189]

Figure 5: Greenhouse gas emission trends in Germany by sector 1990-2018[190]



International pressures on democratic political systems are mirrored in the domestic debate. Rising populism and the weakness of the two traditionally largest party blocs, Conservatives (CDU/CSU) and Social Democrats (SPD), shed light on challenges for two key features of the German political system: federalism and the consensus democracy. Political discourse is polarised, for example on migration and climate issues. While in the Western states of Germany and at the federal level, the Green party is polling above 20%, with

[187] Reuters (2019). **Regierung verteidigt vor UN-Gipfel ihr Klimapaket**

[188] Agora Energiewende (2018). **Die Kosten von unterlassenem Klimaschutz für den Bundeshaushalt**

[189] Clean Energy Wire (2019). **Merkel says govt supports raising EU's 2030 climate target but little on consequences for Germany**

[190] Clean Energy Wire (2019). **Germany's greenhouse gas emissions and climate targets**

majorities in cities and among highly-educated groups, the far-right, anti-system AfD has celebrated victories in elections in the Eastern parts of Germany, thereby putting major pressure on democratic coalition-building.

As systemic challenges such as the climate crisis and digitalisation require a whole-of-government approach to shape the societal transformation across economic sectors, **traditional decision-making attitudes which seek middle ground between industry, government and trade unions are increasingly challenged**. Nevertheless, Germany is still a stronghold of liberal democracy, with clear majorities pro-EU, pro-democracy and anti-populism at the federal level.

Overall, the country and the current government do not seem to be ready for transformative climate policy. The outcome of the Coal Commission and the overall climate package are not ambitious enough to align the German economy with the Paris Agreement and incentivise sustainable investment decisions. Germany's consensus-oriented, federal political system which traditionally sought to find a compromise between employers and trade unions is struggling to reach agreements around the physical realities of climate change. In addition, the emergence of new players including powerful social movements is challenging the logic of established decision-making structures. For these reasons, institutional innovation will be required to establish climate change as a cross-cutting political topic at the highest level of government, that is also linked to all the key policy fields. Institutional cross-ministerial learning on climate issues, to enable Germany to design and implement effective policies for the whole economy, will be one of the main challenges for the coming year. In this context, Germany can learn from the experiences, showcased in chapter 3, of the Mexican cross-ministerial platform.

Just transition challenges

Debates about the social and economic implications of climate policy have intensified. Reflecting the need for just transition, the so-called "Coal Commission" was tasked with reaching a compromise on a just transition process for Germany's coal producing regions, rather than developing a phase out pathway for coal power.[191] Over the next 20 years, the federal and state governments will invest up to €40 billion in the transition of coal regions, for example in infrastructure, social security schemes, innovation, education and economic diversification. This is a remarkable development given the overall

[191] E3G (2019). **The German Coal Commission – A Role Model for Transformative Change?**

moderate ambition of the phase out deal and the relatively low numbers of workers – approximately 20,800 in lignite mining and 5,700 in hard coal plants.[192]

Similar transition conversations have started and will increasingly be necessary in other sectors such as industry, buildings and transport. The German car industry, which includes a large supply chain of small- and medium-sized businesses, is under pressure to accelerate the transformation to producing low-carbon alternatives such as electric vehicles. It is questionable to what extent a governance approach similar to the Coal Commission could be used for a much larger industry which will not disappear but rather change disruptively. Furthermore, the car industry is more dispersed across the country, with 819,996 workers and an overall record revenue of €423 billion in 2017.[193] Similarly, energy-intensive industries such as steel, cement, chemicals and building materials employ 880,000 people, in contexts of heavy international competition and often closely linked to fossil energy and other large manufacturing industries.[194] This shows that the most significant employment challenges of the climate transition still lie ahead.

Beyond employment effects, **concerns about social cohesion, the rise of populism, and the cultural importance of cars and coal for regions and the German economy play a major role** in this debate.[195] These legitimate concerns were, however, also used as arguments to delay or slow down climate action, as exemplified by the coal phase out date which is far too late to be in line with the Paris Agreement[196], and a proposed carbon price which is too low to be effective in driving climate action in the transport and buildings sectors, while also not being socially just.[197]

[192] Umweltbundesamt (2018). **Beschäftigungsentwicklung in der Braunkohleindustrie: Status quo und Projektion**; RWI – Leibniz Institut für Wirtschaftsforschung (2018). **Strukturdaten für die Kommission „Wachstum, Strukturwandel und Beschäftigung“**

[193] Verband der Automobilindustrie (2019). **Zahlen und Daten**

[194] Die Energieintensiven Industrien in Deutschland (2019). **EID: Daten und Fakten**

[195] Reitzenstein et al. (2019). The Story of Coal in Germany: A Model for Just Transition in Europe? In **Just Transitions: Social Justice in the Shift Towards a Low-Carbon World**

[196] Climate Analytics (2018). **Coal phase out in Germany**

[197] MCC & PIK (2019). **Bewertung des Klimapakets und nächste Schritte**

In general, three key factors of a coherent just transition discussion are not yet adequately reflected:

1. **The economic and social costs of inaction are poorly addressed in just transition debates.** This refers both to the impacts of climate change such as natural disasters, droughts and flooding[198] in Germany but also international impacts such as increased forced migration or the role of climate change as a risk multiplier in conflicts, with effects on German domestic and foreign policy.

2. **The opportunities stemming from the transition are not highlighted sufficiently**. Employment opportunities in green growth markets such as renewable energies, energy efficiency, low carbon mobility, green industry or circular economy could provide credible alternative employment in many affected regions. For example, the coal region Lusatia is also a large producer of renewable energy. Based on existing energy infrastructure, the region could be a good site for data and energy storage facilities. Only recently, Tesla announced plans to build a new Gigafactory between Berlin and the coal region of Lusatia in the state of Brandenburg. Coherent investment strategies, such as the one for the Coal Commission, provide further opportunities for a broader sustainability transition across the regions, and can trigger additional private investment if done well.

3. Inaction **puts an additional burden on economies and societies**, for example, air and water pollution, or the need for regeneration of ecosystems in coal regions. Overall, the just transition process should be more focused on credible planning for security for communities and businesses, based on stakeholder engagement in affected regions and linked to investment strategies.

Sustainable finance in Germany

Germany is a late mover on sustainable finance. Domestically, Germany has only recently started to drive the agenda with the establishment of a Sustainable Finance Council which inputs to a Sustainable Finance Strategy to be published in 2020. Compared to international peers such as the UK, France or Canada, Germany is lagging behind on domestic implementation of innovative sustainable finance measures. At the EU level, Germany was perceived as a blocker of ambitious legislation for the Sustainable Finance Action Plan, with little indication of a coherent strategy on the topic. Proactively shaping the

[198] Umweltbundesamt (2015). **Germany's vulnerability to Climate Change**

E3G

agenda is however not only in the domestic interest to ensure the competitiveness of Frankfurt, Germany's financial hub, but will also be crucial to enable financial markets to support the rapid transformation of the real economy in times of climate crisis.

Germany's financial sector is internationally relevant. Frankfurt ranks 11th among global financial centres and its stock exchange is the 12th largest globally. Importantly, Germany has the third largest asset management industry in Europe. Overall, the German financial system is exceptionally heterogeneous and decentralised. The importance of public banks and the large number of member-owned credit unions distinguishes Germany from other financial centres and these features are shaped by the federal political system.

In 2018, finance and insurance sectors contributed 4% to GDP, a low share compared to other countries with a strong finance industry.[199] Contrary to, for example, the UK, where financial services' direct contribution to GDP (7% in 2018[200]) is a more important factor, **Germany's financial sector has a strong tradition of being linked to financing real economy activities**. Overall, the German sovereign bond market is still perceived as a safe haven with top ratings and is used as benchmark for fixed income instruments. Banks foreign exposures stand at only 20% of total assets, with only small exposure to vulnerable emerging markets. Germany's net external assets have been growing relatively continuously since the start of this millennium. At the end of 2017, Germany had a balance of €1.8 trillion, making it the world's second-largest net creditor in absolute terms, after Japan.[201]

Germany is also the **fourth largest FinTech market in Europe**, with 700 companies in the sector. In 2017, €541 million were invested in FinTech, making it the second biggest recipient of investments among digital start-ups after E-Commerce (€1,810 million).[202] However, financial innovations spread relatively slowly in the established structures of the banking and finance sector, as exemplified by the slow roll-out of cashless and contactless payments.[203] On the European level, the opportunities of linking financial innovation through FinTech

[199] GTAI (2019). **Financial Services**

[200] House of Commons Library (2019). **Financial services: contribution to the UK economy**

[201] Deutsche Bundesbank (2018). **Germany's international investment position: amount, profitability and risks of cross-border assets**

[202] GTAI (2018). **Digital Economy in Germany**

[203] Statista (2019). **Number of cashless payment transactions in Germany from 2013 to 2017**

and sustainable finance are not yet used, as, for example, the European Commission's action plans on FinTech and sustainable finance were written separately and do not cross-reference each other. The recent creation of a unit on "Financial Technology and Sustainable Finance" in the Commission's Directorate-General for Financial Stability was a positive step, however.[204]

In international fora, Germany is perceived as a credible player, as well as a major climate financer, working towards more climate-related finance in multilateral development banks and UN organisations. **However, Germany's international track record is not always consistent.** Only recently, Germany was one of the countries pushing for exceptions for fossil gas in the European Investment Bank's new energy lending policy which includes a commitment to end all fossil fuel funding by the end of 2021.[205]

Positively, the country continued the priority on green finance during its G20 presidency in 2016 and acknowledged the recommendations of the Task Force on Climate-related Financial Disclosure (TCFD) and the G20 Green Finance Study Group. During Germany's G20 presidency, the G20 Hamburg Climate and Energy Action Plan for Growth was adopted, which included commitments to establish a Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions, and work towards creating an enabling environment to making public and private investments consistent with the Paris Agreement's Article 2.1c on shifting financial flows towards the climate transition.

Sustainable and green finance did not feature highly in any domestic policy strategy or coalition treaty until recently. In contrast to neighbouring countries which took domestic steps on climate-related risk disclosure (France) or climate change impacts on financial market stability (UK), Germany was largely reacting to EU regulation. For example, Germany translated the EU Corporate Social Responsibility Directive into national law, thereby imposing some disclosure duties on banks, insurance companies, and capital market oriented businesses with more than 500 employees; but, in contrast to France, it did not add specifics on the type and quality of reporting nor did it add mandatory, comparable reporting, including for other actors such as investment funds. Similarly, Germany has not yet played a proactive or progressive role in the process following the EU Sustainable Finance Action Plan. In all areas – particularly taxonomy and disclosure – Germany is perceived to play a relatively conservative

[204] MLex (2018). **Sustainable finance and fintech get boost as EU Commission created dedicated unit**

[205] E3G (2019). **Die Europäische Investitionsbank – nächster Schritt hin zur Klimabank Europas?**

role, pushing for voluntary instead of mandatory disclosure and a narrow scope of application of the sustainability taxonomy.

Germany's long tradition of family-run businesses with strong corporate governance and social protection measures, as well as a central role for trade unions, contributes to regularly strong sustainability ratings. Elements of Germany's "social market economy" which is based on a strong industrial core are also reflected in the close link between the decentralised banking system and real economy actors. Financial markets in Germany perform different functions compared to markets in, for example, the US or the UK. While in the US and UK, financial services are perceived more strongly as directly contributing to value creation and GDP itself, the German system is more focused on banking and its link to financing real economy action. Based on this perspective, sustainable finance is a slightly less important driver of change in Germany compared to other countries, given the strong reliance on the real economy which means that policy changes are more strongly driven by an industry sector with low corporate debts.

Overall, **sustainable finance has not yet arrived in the German finance mainstream**. Positively, the market for sustainable investments has increased by 28% to €219 billion in 2018, accounting for 4.5% of the overall investment market (which decreased by 2% in the same period). The recent growth is largely driven by institutional investors which make up 93% of sustainable investments.[206]

A lack of a long-term and credible regulatory framework is a major barrier for the creation of sustainable finance products and additional sustainable investment. Nevertheless, over the last few years, significant action has been taken by private finance actors, in particular sustainability-focused financial actors, large insurance and reinsurance companies, and also some asset managers and banks. For instance, Allianz joined the Net Zero Asset Owners Alliance in 2019. Furthermore, large energy-intensive industry actors such as ThyssenKrupp and Heidelberg Cement have set science-based net zero targets in an environment of low regulatory clarity. Various initiatives such as the Sustainable Finance Cluster are actively working towards strengthening sustainable finance in Germany, and positioning Frankfurt as a major sustainable finance hub. Demand is growing for strong political signals towards the financial

[206] Forum Nachhaltige Geldanlagen (2019). **FNG-Marktbericht Nachhaltige Geldanlagen 2019**

industry as an enabler of the transformation in the real economy, both from a risk and an investment perspective.

Germany has not decided to lead any major innovation or reform initiative on green public investments. For example, climate risk is not yet a criterion to assess the federal public budget. While ESG standards are implemented and considered for many public funds, for example, there is an exclusion of all investments in nuclear power, and guidelines are not yet systemic and far-reaching. The public development bank KfW, as a major issuer of green bonds and funder of green projects in Germany and worldwide, has committed to not fund any coal projects. It has however not yet taken a strong leadership role on greening other financial players or taking the next steps with its own portfolio. For example, after the EIB's decision to end funding for all fossil fuels by 2021, KfW has missed the opportunity to move forward and show how it plans to reduce the risk of stranded assets, and coherently develop towards a Paris-aligned investment strategy.

The two main supervisory authorities in Germany, Bundesbank and Bafin, are increasingly active in the sustainable finance space. Particularly Bafin has upped its game by publishing a guideline note to give orientation on the role of sustainable finance in addition to existing risk management standards, calling for a strategic assessment of risks, and exploring stress testing and climate-related scenario development.[207] While the German Bundesbank, together with Bafin, is a member of the Network for Greening the Financial System, its position on sustainable finance is still cautious. In November 2019, Bundesbank President Jens Weidmann opposed using monetary policy to fight climate change, for example in the form of green quantitative easing and directing asset purchases, thereby positioning himself against the new ECB President, Christine Lagarde, and Mark Carney, Governor of the Bank of England.[208] Nevertheless, Weidmann does see scope for the Bundesbank to help green the financial system, for example in terms of its own fund portfolios or facilitating better knowledge on climate-related risks.[209]

Germany is set to develop a domestic sustainable finance strategy early in 2020. As a reaction to increasing demand and expected EU regulation, the German government set up a domestic Sustainable Finance Council to develop a

[207] BaFin (2019). **Merkblatt zum Umgang mit Nachhaltigkeitsrisiken**

[208] Financial Times (2019). **Weidmann opposes using monetary policy to fight climate change**

[209] Deutsche Bundesbank (2019). **Weidmann and Mauderer: Protecting the climate a hugely important topic for central banks**

German sustainable finance strategy and establish the country as a key player for sustainable finance. In June 2019, the 38 person-strong council, with representatives from most major stakeholders, met for the first time, subsequently establishing four working groups: strategy and communication, financial market stability and risk management, disclosure and transparency, and private and institutional customers.[210] It remains to be seen to what extent both a systemic perspective on the enabling role of the financial system for the transformation, as well as clear suggestions of policy measures are included in its final report.

Furthermore, **it will be important to observe if and to what extent the recommendations are translated into a strong government strategy.** Only if Germany can present a clear plan for policy change which goes beyond EU regulation, will it be able to shape the debate during its EU Presidency in the second half of 2020 and in the runup to COP26 in Glasgow. In the coming months, the government must also make major decisions on EU sustainable finance. Based on the current conversations about the scope, governance and timeline of an EU taxonomy for sustainability, the legislative file might either be closed before the German Presidency or be an important legislative part of it.

The strategy process is currently led by the Finance and Environment Ministries, in cooperation with the Economy and Energy Ministry. It is however so far **neither well connected to the broader climate and financial discourse nor prioritised by high level government representatives**. While more capacity has been designated to the topic from government, finance industry and civil society over the course of the last two years, and sustainability is slowly making its way up to the offices of CEOs, there is still a lot of **room to increase capacity, knowledge and education on the links of finance and sustainability**. This refers to all levels, from leadership to end customers, not only to allow for an informed discourse but also to shape behaviour and strengthen the agenda.

The **German sustainable finance debate so far mainly takes place in separate siloes**. Stronger links to the EU process, broader climate legislation and other, related policy fields would be key to allow for a systemic perspective and transformative approach. Given the concerns about the social and economic implications of climate policy and climate change, a **more integrated approach** is necessary. When designing public policies to address the climate crisis, social, economic and cultural factors must be considered. Initial ideas about **investment**

[210] Bundesministerium der Finanzen (2019). **Sustainable Finance-Beirat der Bundesregierung gibt sich umfangreiches Arbeitsprogramm**

in a just transition to a net zero economy should be further explored and considered by the German government to ensure the most effective use of funds.[211] Since the **"Coal Commission" approach** with vast public investments is **unlikely to be replicable in other sectors such as mobility**, debates about how to steer private investments towards green growth markets should take centre stage in coming months.

Linking this back to the real economy, **Germany is well placed for a green and transformative stimulus in times of a slowing economy**, being on the brink of recession.[212] Alongside major economists, trade unions and industry associations have asked for more investment in a rare joint initiative.[213] 2020 is expected to be a tough year for the German economy, and a discussion about a green stimulus will likely intensify under these circumstances. Growth in 2019 was mainly driven by government and household spending as well as exports, while domestic industry is struggling. Against this backdrop, climate protection has already created more than one million jobs in Germany over the last decades, and the OECD expects the German economy to grow in a high ambition scenario.

Investment needs to ensure competitiveness, job protection and justice in the transition to a green economy, in particular in the automotive sector, energy-intensive industries, buildings and energy sectors. Germany will need to invest more, and in more targeted ways, but also make planning of small- and large-scale infrastructure more efficient to enable timely implementation. Several proposals have been made for how to speed up planning while still ensuring public participation and addressing conflicts with other policy fields.[214]

Targeted German investment is essential for the EU's ability to deliver on a net zero emissions goal by 2050. As pointed out by ECB President Lagarde, the EU is relying on Germany, alongside other key member states to invest with a broader economic perspective. **Maintaining the status quo is not prudent, because it risks the core credibility of the German economy and the value of its assets, but the investment required for the ambitious agenda of the new EU Commission will be burdensome.**

[211] Grantham Research Institute on Climate Change and the Environment (2019). **Investing in a just transition – global project**

[212] The Guardian (2019). **Germany downplays stimulus hopes as economy escapes recession**

[213] Tagesschau (2019). **DGB und BDI fordern mehr Investitionen**

[214] Handelsblatt (2019). **So lassen sich Bauprojekte beschleunigen**

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Financial innovation is key for Germany to prepare for change

Germany, the largest economy in Europe, with a strong financial sector closely tied to the real economy, faces massive, potentially disruptive changes in the coming years. This refers to challenges of digitalisation, the geopolitical context, the macroeconomic slowdown and the climate crisis. So far, those challenges have not yet been sufficiently addressed and linked to financial market reform. However, **without faster financial sector reform, it is unlikely that the vast investment and innovation needs across the economy can be met.**

Germany was an early mover on financing green projects with its Energiewende and innovative industrial economy, significantly large investments in renewable energy and support schemes for energy efficiency investments. This is however still not combined with a credible fossil fuel phase out and just transition plan for coal, oil and gas and related productive sectors. While KfW, Allianz and others took steps to phase out coal, there is still no systemic move away from fossil fuels in the absence of an enabling regulatory environment. In recent years, this was combined with relatively low investment and high saving rates given the excellent economic situation. The risk of a recession might be an opportunity to launch a systemic green investment package. The climate package, as proposed by the government, is neither enough to reach the climate targets, nor would it be sufficient as an economic stimulus. The recently adopted Climate Act could however be a strong governance framework for investment.

Importantly, Germany must pursue opportunities of the transformation towards a net zero economy much more actively. With growing domestic and European climate legislation, the need for additional investment but also the opportunity of sustainable finance becomes ever clearer. As the world shifts to fully decarbonise in three decades and to manage a changing climate, all financial transactions will have to include due diligence over a wide range of increasingly material climate and environmental risks. Frankfurt and Germany would be well placed to play a major role in and shape the sustainable finance space, based on its financial market relevance, and world class organisations in insurance, law, climate science, manufacturing, academics and think tanks. Integrating these capabilities into a global financial offer and helping build the global regulatory and marketplace to support its growth should be a central strategic German interest. Concretely, Germany is hosting the EU-China summit

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in Leipzig next year. Cooperating with China on green finance, including on China's Belt and Road investments, is key for the international climate regime and economic cooperation. This should however not neglect challenges in the bilateral relationship with China when it comes to human rights violations.

Germany must move beyond its reactive approach to finance and the economic slowdown. **Given the parallelism of major, potentially disruptive trends in technology, geopolitics, macroeconomics, finance and climate, the question is not if Germany will be changed or not, but to what extent Germany can actively shape the transition and reap the benefits of change**. In this picture, ambitious climate policy enabled through sustainable finances reduces material systemic risk, ensures competitiveness of German industry, and mobilises the necessary investment for the transformation to a net zero economy. In our interviews, it came across that the main risks to companies do not come from, for example, carbon pricing, but competitive and technological pressure which is accelerated by regulation. All this shows that the costs of action in the present are much smaller than the future costs of inaction: under rapidly changing circumstances, preserving the status quo no is longer the safest option.

This will require a whole of government approach in a strong Europe, based on substantial institutional and regulatory innovation. The transition towards a net zero economy in Germany first and foremost requires political commitment and a strong regulatory framework for change. The policy mix depends on sectors and regional contexts, but it is quite clear that measures are necessary to both mobilise green investment and urgently phase out "brown" fossil investments. Both the climate crisis and digitalisation impact on most parts of the German and world economy and cannot be addressed with the traditional policy siloes in governments. Hence, new institutions will be necessary for a coherent policy approach. The Climate Cabinet and the Climate Law with legally binding sector targets are a good step in this direction but a further strengthening of climate in the institutional governance of the government is essential to deliver on the cross-cutting and global nature of the challenge. **Climate and digitalisation are, in the end, a responsibility of the Chancellery and not for single ministries**.

Germany is lagging behind on greening the financial system. In contrast to other European countries such as the UK, France or Luxemburg, Germany has not yet made ambitious domestic steps to accelerate sustainable finance, neither on disclosure nor on stability aspects of the financial system. With its Sustainable

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Finance Council, the country has now the opportunity to catch up ahead of its EU Council Presidency, and potentially drive the finance agenda in the future.[215]

For this to happen, the domestic approach needs to move beyond reaction to an EU regulatory framework and incorporate risk but also opportunity aspects. It is however crucial to point out that **Germany's close link of finance and real economy puts a stronger focus on "financing green" than on "greening finance".** A focus on boosting investment to transform the real economy means that Germany can contribute significantly to strengthen this link and to address the challenges of real economy change.

So far, the **German approach to sustainable finance is mainly characterised by necessity**. In the wake of the financial crisis, a new set of ideas emerged towards a Capital Market Union in Europe. As one key priority, the EU Commission started a process which culminated in the EU Sustainable Finance plan and the recent wave of legislative files. For Germany, it was simply necessary to develop positions towards a new regulatory framework. Only in recent months, a deeper debate on the question was triggered as to what extent private investments need to be mobilized more systematically to fund the transformation towards a net zero economy. As a key learning from other countries such as the UK, risk aversion and rigidities mean that even mature financial markets will not adapt to new technologies, business models and markets fast enough to finance the pace and scale of the climate transition. A smart regulatory framework with a clear net zero vision is needed to accelerate investment and minimise policy costs.

Germany must extend its framing of sustainable finance towards stability in its push towards a sustainable financial market reform. Germany hosts an industry and a financial centre that is highly exposed to fossil fuel investment and faces risks from climate change impacts but also transitory risks from climate policy for fossil-based economies. Evidence is strong that markets do not yet adequately price in these material systemic risks to domestic financial markets and the global financial system. Internationally, central banks and financial regulators mad strong efforts to improve data and analysis, strengthen disclosure and introduce regulation – these issues are also being looked at by the IMF and by the Coalition of Finance Ministers for Climate Action. Countries must set clear political and regulatory frameworks, including for mandatory climate disclosure, to move beyond the analysis of risk exposure, towards a financial system that reduces systemic and structural risk exposure.

[215] Clean Energy Wire (2019). **Germany launches sustainable finance council to leverage climate action**

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CHAPTER 5
RECOMMENDATIONS

Finance policy

> **Ensure that the domestic Sustainable Finance Strategy enables an economic transformation to net zero emissions across all sectors.** The strategy which is currently being developed by the Sustainable Finance Advisory Council must be closely aligned with the EU process and develop clear, actionable measures for implementation, including actions on risk management and disclosure. The government should also strengthen the mandate of domestic supervisory authorities to support them in increasing Germany's financial resilience to climate-related risks across the economy.

> **Make KfW a champion of the transformation of the German economy, and a leader internationally.** KfW stands ready to power Paris-compatible investment in green industry and infrastructure within Germany and just needs to be mobilised and mandated towards this goal. The bank can also lead the way internationally by demonstrating what a transformative green development finance institution can look like.

> **Greening public finances.** Germany should integrate climate risk into fiscal risk assessment and planning, public budgeting and GDP forecasting, in order to ensure financial resilience and stability in German public finances and establish a plan for future fiscal stability.

> **Mainstream climate within development finance and create a single, overarching, climate finance strategy** which includes smart use of German shareholdings in multilateral development banks to ensure Paris alignment and a transformational role in national economies, together with an international climate leadership role for GIZ.

> **Use Germany's role in the governance structures of international institutions and coalitions** to accelerate the development of new financial norms and solutions that respond to a changing world. Germany can, for example, wield influence in the International Monetary Fund and the Financial Stability Board, as well as the Network for Greening the Financial System and the Coalition of Finance Ministers for Climate Action, to drive action to address climate change.

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> **Map Germany's systemic climate-related financial risk and use Germany's expertise in risk management to shape international best practice**. German firms should be required to disclose climate-related financial risks in line with the TCFD recommendations, potentially using an experimental 'regulatory sandbox' or 'safe harbour' approach at first. As well as promoting national financial stability, in the medium term this action will put Germany in a strong position to influence international norms for risk disclosure and management.

Economic policy

> **Move beyond "Schwarze Null" politics to address the climate crisis in all economic sectors, linking investments to a net zero emissions goal before 2050.** In the 2020s the prudent option to protect the value of domestic assets is to invest more in key future-oriented areas. Ensuring competitiveness, sectoral growth and social cohesion in the transformation to a green economy requires more green public investment, leaner planning processes which ensure strong participation, and a better leveraging of private investment. Importantly, this is also about protecting Germany's export power in growth markets, against the backdrop of serious competition from China, India and others.

> **The net zero investment strategy should include targeted and mission-based green economic stimulus measures** that take advantage of historic low interest rates to grow new industries, enable a just transition and rebalance regional inequalities, in line with state aid rules. There should be a prominent role for innovation and new technologies, taking into account the need for a resilient domestic economy that will support the needs of an increased proportion of older citizens, demographic inequalities and those affected by climate impacts.

> **The transition to a Green Industry 4.0 must consider all key components towards climate neutrality – efficiency, circularity, new processes and technologies.** Targeted investments in those areas as well as a supportive regulatory environment for open and inclusive innovation and transition are essential to ensure the competitiveness of German industry in low-carbon and digital growth markets. The government should partner with universities and digital front-runners to host open innovation platforms for exploring the potential for digital technologies to decarbonise industrial processes. Together they should also work to provide training to address the digital-

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skills shortage in the industrial sector with a view to retaining the number and improving the quality of industrial jobs in the country.

> **Based on Germany's experience with strong SMEs, the government should provide targeted support and de-risking schemes for the high-potential, transformative business plans of existing and new companies.** Currently only France has made such a signal to the global business community[216], particularly green entrepreneurs, but Germany can be at the core of building a cross-border green economy cluster in Europe.

> **Attract and retain skilled engineers and workers in low carbon industries**, through research and education, immigration routes and strong and competitive employment packages. The country should provide strong support for companies willing to invest in a green transformation, including by qualifying and retraining the workforce, and offering relevant programmes at public universities. Also, given the demographic trends, the country must attract talent in future-oriented markets.

> **Build and secure the net zero, resilient infrastructure of the future.** The parallel disruptions arising from, for example, climate change, digitalisation and demographic change require massive investments in existing and new infrastructure. A finance strategy must address the need for targeted infrastructure investments, both in the context of the climate crisis and a potentially shrinking, ageing population. This will require both additional funds, and a better absorption of existing funds as outlined above. For this, planning processes must be accelerated, especially for important low-carbon infrastructure projects.

Foreign policy

> **Treat climate diplomacy and climate security as key cross-cutting priorities for Germany's foreign policy.** In its own interests, Germany should return to its previous role as a leading power in accelerating climate ambition internationally. For this to happen, it must regain credibility through domestic implementation but also by taking a proactive role in the EU. In addition, climate diplomacy must be established as a key aspect of German foreign policy, both in terms of scope and capacities across government, importantly in the Foreign Ministry.

[216] Make Our Planet Great Again (2019). **Business**

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> **Use Germany's European Presidency in the second half of 2020 to turn Europe into a global leader in responding to change.** For this to happen, Germany must support the delivery of various important policy projects and diplomacy efforts, detailed below, and ensure that the urgent need to tackle the climate crisis is considered across policy areas.

> **Play a creative and constructive role in the rollout of the European Green Deal agenda** to support a just transformation of economies across Europe. For this, Germany must also support an ambitious EU sustainable finance agenda and an economy-wide Green Financing Strategy that supports climate mitigation and resilience.

> **Ensure that the EU-China Council in September 2020 results in a strong bilateral commitment on climate action** that sends clear long-term signals to financial markets, as well as reflecting a positive joint vision of a future in which both powers are able to achieve sustainable economic growth through technology development and international trade. Germany is particularly responsible for the success of this summit, not only as Europe's largest economy but also because it will hold the EU Presidency during the time.

> **Bring the EU to COP26 with strong climate commitments, in particular an increase in its 2030 targets,** and play a constructive role in taking forward financial aspects of negotiations. This will be crucial to the overall success of the talks and to maintaining international collaboration on climate change. For this increased ambition to be credible, Germany must also increase its own domestic climate targets accordingly.

Climate policy

> **Set up structures and institutions for a joined-up national response to the climate crisis.** Based on the Climate Cabinet, the German government should anchor climate change as a cross-cutting issue, led by the Chancellery, to ensure continued advancement of climate policies, which also address social, economic and foreign policy challenges. The Chancellery must be in charge of the overall ambition and strategy, while a "Climate Ministry" with far-reaching competencies for example in the realms of energy, buildings and industry should be in charge of implementation based on a strong climate governance (Climate Law). In addition, establish a cross-ministry "Think Tank for the Future", including experts from relevant ministries, and coordinated by the Chancellery, to develop coherent policy proposals for climate, digitalisation, economy, geopolitics and finance.

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> **Develop a national strategy for net-zero by 2050.** The German government, together with relevant stakeholders, should co-create a national plan to deliver climate neutrality across all sectors by 2050 at the latest, ensuring close ties of mitigation efforts with climate resilience, clean growth and industrial strategies. This plan should clearly identify Germany's national interests and international dependencies. Early target setting and implementation is essential for planning security and a better understanding of the right transformation pathways for industries and sectors.

> **Engage citizens and all relevant stakeholders in the new vision**. Build on the Coal Commission process to facilitate national conversations about the transition of other sectors, including the automotive manufacturing sector. These should build on lessons from previous experiences including the need to achieve outcomes that are in line with Germany's climate transition strategy, but also the need to develop tailored regional transition strategies and support schemes to ensure a just transition.

Figure 6: Making Germany fit for the future – Recommendations (identical to Figure 1)