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Europe’s 2040 climate target: four critical risks and how to manage them

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Executive summary

THE EUROPEAN COMMISSION has recommended that the European Union should cut greenhouse gas emissions by 90 percent by 2040 compared to 1990. Modelling shows that this target is feasible technically and is in line with social acceptability and global fairness objectives. Achieving it will require massive expansion of renewable electricity generation, drastic reductions in fossil-fuel use, energy efficiency measures and deep electrification of end-use sectors.

TECHNOLOGICAL ADVANCES and strong policies have already enabled the EU to start this transformation and make substantial progress on parts of it. Most technologies required to achieve the emissions-reduction targets are market-proven, and in many cases are cost-competitive with or cheaper than fossil alternatives. After decades of successful innovation, clean-technology deployment is accelerating, with costs of key clean technologies continuing to drop rapidly.

NEVERTHELESS, ECONOMIC, SOCIAL and political risks threaten ambitious climate policies. The four main risk categories are: geoeconomic instability, technological progress, exacerbated inequality and policy credibility. A global economy with more trade disputes and greater risk of conflict endangers the massive capital investment needed for the transition, while the cost of clean technologies is a primary determinant of the economic viability of decarbonisation. Climate policies will affect people’s everyday lives in disruptive ways, meaning that regressive outcomes must be guarded against, balanced with a concrete commitment to the established climate policy pillars.

TO SUCCEED, the 2040 climate and energy policy framework needs to be designed to be resilient to such risks. The EU should put distributional issues at the heart of its climate policy, develop an emissions-reduction strategy that monitors geoeconomic and technological risk factors, and put in place contingency plans to manage the impact of negative outcomes and to maximise the societal, economic and environmental co-benefits of the energy transition.

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1 E ’c a. a b

Under the 2021 European Climate Law (Regulation (EU) 2021/1119), the European Union is required to establish a binding climate target for 2040 as an intermediate goal between the 2030 target of a 55 percent emissions reduction (compared to 1990) and the goal of net-zero emissions by 2050. In February 2024, the European Commission recommended that the 2040 target should be a 90 percent emissions reduction compared to 1990 levels (Figure 1; European Commission, 2024). is goal is aligned with the recommendations of the European Scienti c Advisory Board on Climate Change, which analysed the scienti c evidence against criteria including global fairness, technological feasibility and social acceptability, and determined an appropriate range for the 2040 emissions reduction target of between 90-95 percent (ESABCC, 2023).

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e 2040 target is not yet law, but if it is adopted, it would mean almost full decarbonisation of the EU economy within two decades. is would signal continued commitment to European decarbonisation, focusing the e orts of policymakers, industry, investors and civil society.

Consistent, credible policy targets increase investor trust and can create a foundation for the associated climate and energy policy framework that the European Commission would have to put in place during its next ve-year term.

e European Commission’s impact assessment demonstrates in principle the technical feasibility of securing a 90 percent emissions reduction by 2040 (European Commission, Eu(e)-2 ut2 Eecu3u d4l yaschnol Cgicoc1.1 (ae ale p)-1.9 (t(hnic)5 (n pr)-72 (s)k(or)1 et l)1 (m)10 ah2 (e)1d(a

While our assessment[1] of energy transition feasibility and our categorisation of risks are selec- tive, we o er a structured framework for considering the resilience of energy and climate policy in an evolving and unstable global environment.

Section 2 illustrates that the energy transition is already underway in Europe, providing a foundation for discussion of the future risks. Section 3 covers the essential elements of the EU's projected decarbonisation strategy. As a check on the results of the European Commission's impact assessment on the proposed 2040 target, it uses REMIND, a tool for modelling future economic developments with a focus on energy and implications for the changing climate (see footnote 1). European Commission (2024) and REMIND modelling are broadly in line. Section 4, based on the decarbonisation pathway set out in the previous section, discusses the risks that could hold up deeper emissions cuts. Section 5 concludes with recommendations on pursuing a resilient climate and energy policy framework.

2 T a E ’ a

e EU is in the early stages of a comprehensive transformation to climate neutrality, driven by European and national policies and substantial investment in renewable energy, energy e ciency and sustainable technologies. Stringent emissions targets, an expanding emissions trading system (ETS), substantial funding for green projects, the adoption of strong policies on energy e ciency and renewable energy expansion, and a shift towards circular-economy principles are all steering the region towards a more sustainable, climate-neutral future.

Policies implemented over the last 15 years, such as the EU ETS, have begun to pay o . Overall emissions in 2022 were 33 percent lower than in 1990[2], with a substantial further 8 per- cent drop in CO2 emissions in 2023, according to initial data (CREA, 2024). In the ETS sectors (mainly power generation and heavy industry), emissions in 2023 were 47 percent lower than in 2005[3]. e contribution of wind and solar energy to electricity is increasing exponentially, while key clean technologies including electric vehicles and heat pumps are being sold in larger volumes (Figure 2).

As a consequence of dedicated support policies and technological advancements, the EU has seen a signi cant upscaling of renewables. Wind and solar power have become economi- cally viable and are now the preferred choice for new energy investments. In terms of electricity produced, they now cost far less than new fossil-fuel or nuclear generation, while providing energy security and health bene ts (Figure 3). As a consequence, EU power-sector emissions reduced by a record amount in 2023, nearly halving since their peak in 2007 (Ember, 2024).

1 is Policy Brief builds on work done as part of PRISMA and ECEMF, projects funded under the EU Horizon Europe and Horizon 2020 programmes to develop computer models (called integrated assessment models) to better support climate and energy policymaking. is paper also relies on modelling scenarios produced by

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Other economic sectors are also starting to transform. e 2022 gas price spike resulting from Russia's curtailment of gas exports to the EU has given heat pump sales and investments in heat pump factories a substantial boost (although heat pump sales declined in 2023[4]). Similarly, the adoption of CO_2 emission standards for passenger cars helped the share of battery-electric vehicles in car sales increase mar[illegible]

Many brands now aim for almost full battery-electric sales in Europe in the early 2030s[5].

e EU has also at least partially caught up with China in the manufacturing and deployment of batteries. e EU currently has substantial cell-manufacturing capacity relative to annual demand, and planned projects should ensure that Europe continues to retain the capac- ity to meet most of its nal electric vehicle battery demand (Tagliapietra *et al*, 2024). e EU is not a leader in this eld but still manages to capture a small share of the battery manufacturing market. However, the EU lacks production capacity for earlier stages of the battery value chain, such as lithium re ning, and planned projects remain surrounded by a large degree of uncer- tainty. China remains the global leader in these markets.

3 T 2040 a

e energy system transformation pathway up to 2040 foreseen by the European Commission (2024) would involve a huge scale-up of wind and solar generation to provide clean electricity, and deep electri cation of energy services including heating and transport to make use of the clean power for consumer needs. is would lead to a rapid phase-down of fossil-fuel usage, reducing greenhouse gas emissions[6].

e most important result from the European energy transition will be drastically reduced of fossil-fuel consumption. To achieve 90 percent emissions reductions by 2040, European Commission modelling shows a 75 percent reduction in fossil fuels in primary energy compared to 2019 (Figure 4). For comparison purposes, Figure 4 and subsequent gures also show results of modelling using REMIND (see footnote 1).

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e required investment for the energy transition is already being deployed and the theoretical overall decarbonisation pathway to net-zero emissions is clear. However, the techno-economic modelling and the initial phases of clean technology deployment do not take account of four main categories of risk that face the energy transition: geoeconomic, technoneeded for the energy transition, and for many essential technologies – most notably solar PV and bat- teries. Reduced imports from China of these products, because of competitiveness concerns or economic security, imply the risk of both slowing down the energy transition and increasing its cost (Fragkos *et al*, 2024). In other words, economic de-risking may increase climate risk. While tari s on imported technologies are possibly justi able on fair competition grounds, trade interventions should also be commensurate to the climate and environmental impacts, to avoid causing delays in the uptake of clean technologies.

A less stable geoeconomic environment could lead to an increased frequency of shocks to the European economy, for instance through trade wars a ecting the price and availability of energy and other essential commodities, or through nancial instability caused by geoeconomic uncer- tainty. Such shocks could undermine macroeconomic stability through in ationary pressures, driving up interest rates, and shifting spending priorities away from the energy transition.

e cost of capital will play a more signi cant role in the overall cost of the clean-energy economy compared to a fossil-fuel based economy, because the total cost of many of the essential technologies, including wind, solar, and batteries, is dominated by the initial capital expenditure. erefore, interest rates have a direct and substantial e ect on the overall cost of the energy transition (Schmidt *et al*, 2019). While the costs of many of these key clean technolo- gies have fallen steeply in recent years (Figure 3), rising interest rates have the potential to slow these gains, or even reverse them temporarily.

Figure 7 shows the potential contribution of interest rates to the cost of wind and solar elec- tricity generation, measured by the levelised cost of energy (LCOE: the lifetime cost divided by the total output). It shows that plausible scenarios of tighter monetary policy (with ‘ at,’ ‘mod- erate’ or ‘extreme’ interest rates) would signi cantly a ect the overall cost of essential clean technologies. Any such increases in clean technology costs are likely to be short-lived as new innovations continue to feed through to lower production costs, yet uncertainty about capital costs could be damaging, both in terms of actual and perceived progress.

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Fiscal constraints could also limit European countries' public spending on climate and energy investments. e EU suspended its borrowing rules in the early parts of the COVID-19 pandemic and during the energy crisis to help protect citizens and nance economic recovery. However, new scal rules have since been agreed, which, in light of the debt accumulated to manage the public health and energy shocks, may limit countries' capacities for green invest- ment (Darvas *et al*, 2024). Moreover, Europe's heightened security concerns highlight another risk emerging from geoeconomic instability: policymakers may be forced to consider new trade- o s between spending requirements. Green spending may face increasing competition from areas such as defence.

Geoeconomic instability is mostly an external threat European policymaking must deal with. Several measures could be implemented in a timely and coordinated manner to reduce the impacts. Kremer *et al* (2024) compared the policy response to the energy price shock that resulted from the full-scale Russian invasion of Ukraine with a counterfactual scenario in which there were no policy interventions. Results suggest that without policy intervention, such a shock would have led to substantial macroeconomic losses, characterised by a sharp decline in GDP (up to 8 percent) as well as a pronounced uptick in defaults on loans to rms (Figure 8). Kremer *et al* (2024) demonstrated that policy intervention based on transfers to households and a ected rms is highly e ective at mitigating the negative e ects of the shock on macroeconomic outcomes. eir modelling also suggested that the in ationary e ects of

On the other hand, certain technology costs may fall faster than anticipated. Way *et al* (2022) estimated that cost projections in many major energy system models have often been overestimated for key green technologies, and a probabilistic forecasting method suggests that the costs of solar, wind and batteries could further reduce by an order of magnitude in the next decades. While an eventual floor for clean tech costs is likely, it is difficult to say how low they may be; solar PV, wind and batteries have steadily beaten all major predictions so far.

trading are used to reduce government debt (Figure 11). If carbon revenues were used to reduce government debt rather than to make payments to citizens, virtually all households would be worse-o in the short term because of higher prices, among other factors.

Note that by the end of the century, the choice between recycling carbon revenues to citizens versus reducing government debt would no longer have a signi cant e ect, while the impact of prevented climate damages would become very large: 90 percent of the EU population is expected to be better-o if global warming is kept well below 2 degrees Celsius above pre-indus- trial levels, compared to a baseline scenario without additional climate pol- icies in which global mean temperatures increase by 3°C . e risk is that without appropriate compensation mecha- nisms, rising inequality could erode support for the energy transition, leading to weaker ambition and diluted policies.

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et al (2024).

Carbon dividend distribution schemes should be designed to explicitly favour the poorest segments of society, which are most adversely a ected by energy price rises. Remaining scal revenues can then be invested in green infrastructure and other projects that catalyse the support of the median voter. Eastern Europe is especially dependent on fossil fuels for home

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political disputes about climate policy. Incipient trade wars, security concerns and persistent inflation might push climate policy down the priority list, while weak technological progress could increase the cost of the transition. Climate policies that lead to regressive distributional outcomes would face even stronger pushback.

Tensions in the run up to the European elections in June 2024 related to policy measures including the phase-out of internal combustion engines, the Nature Restoration Law (Regulation (EU) 2024/1991) and gas boiler sales bans in Germany[13], emphasised the fraught nature of implementing policies that more directly impact households, businesses and the agricultural sector. While difficult political debates about the rate of green transformation are unfolding, hundreds of billions in clean technology investment is still needed each year to meet the 2030 goals (Calipel *et al*, 2024).

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Strong policy credibility can reinforce the expectations of market participant, leading to carbon prices sustained at the level needed to drive decarbonisation of Europe's electricity and energy-intensive industrial sectors (Sitarz *et al*, 2024). The corollary is that weak policy credibility can lead to reduced investor confidence, indicated by falling carbon prices (Figure 13).

5 R c a a 2040
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Fragkos, P., L. Hermwille and K. Fragkiadakis (2024) 'A Race at All Costs? Economic and Environmental E ects of Industrial Policy Nationalism', NDC ASPECTS D6.3b, available at https://www.ndc-aspects.eu/sites/default/ les/2024-03/20240313_NDC%20ASPECTS_D6-3_paperB.pdf

Gutowski, P. and K. Głowacki (2023) *Study of the Impact of EU ETS 2 on Household Welfare in Poland*