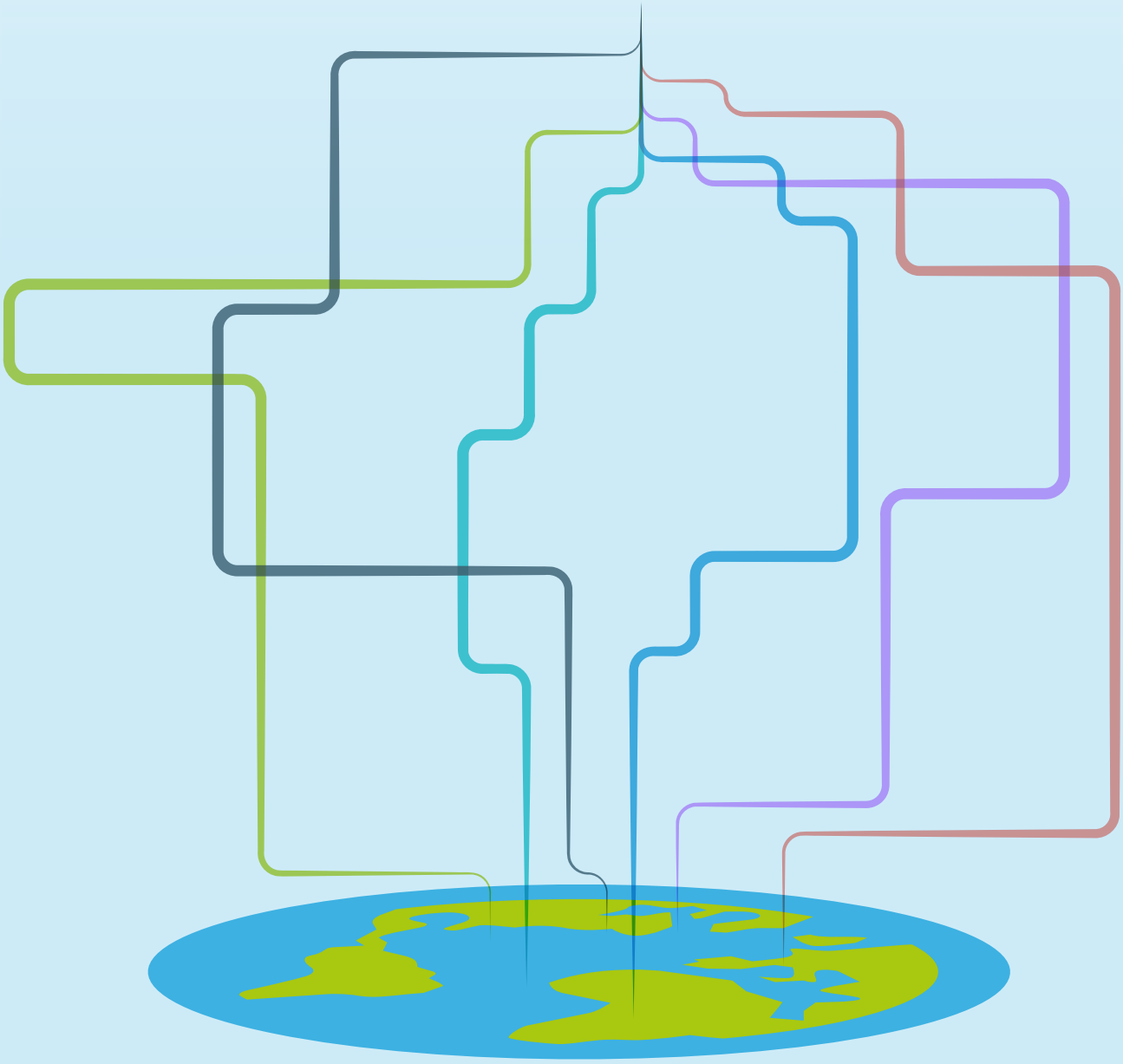


Moving towards implementation

A roadmap to net-zero emissions

Report 2026

ELEVATE
supporting international climate policy

PBL Netherlands Environmental Assessment Agency



PBL Netherlands Environmental
Assessment Agency

PBL Netherlands Environmental Assessment Agency is the national institute in the Netherlands for strategic policy analysis in the fields of environment, nature and spatial planning. PBL plays an important role in international assessment of global environmental change. The department of Global Sustainability at PBL uses the GLOBIO and IMAGE models to analyse the effects of global environmental challenges such as biodiversity loss and climate change on society. The team involved in the Integrated Model to Assess the Global Environment (IMAGE) produces scenarios of climate policy and climate change in terms of energy and land use and emissions of greenhouse gases. The IMAGE team has been involved in several European research projects and plays a key role in the development of scenarios for climate change assessment. PBL researchers play an active role in various international assessments, including those of the Intergovernmental Panel on Climate Change (IPCC), UNEP's Global Environmental Outlook (GEO), and the Global Land Outlook. PBL is part of many relevant scientific networks, including the Integrated Assessment Modelling Consortium (IAMC), the Global Carbon Project (GCP) and the Energy Modelling Forum (EMF). The organisation has extensive experience on advising policymakers on climate policy, including the European Commission and the government of the Netherlands.

Glossary

Current Policies

Current policies are defined as legislative decisions, executive orders, or their equivalent in order to mitigate greenhouse gas emissions (GHG). This does not include publicly announced plans or strategies (e.g. Nationally Determined Contributions – NDCs), but does include officially implemented polices to achieve such plans or strategies. The Current Policies (CPs) scenario in this work reflects the implementation of current policies at the national level as included in the list of high impact policies.

Nationally Determined Contributions (NDCs)

Nationally Determined Contributions (NDCs) is the term adopted by the United Nations Framework Convention on Climate Change (UNFCCC) where countries that have joined the Paris Agreement, outline their plans for reducing their greenhouse gas emissions. Each country is responsible for preparing, communicating, and maintaining the successive NDCs that it intends to achieve.

Net-Zero Emissions and Long-Term Strategies

According to the Intergovernmental Panel on Climate Change (IPCC), 'net-zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period' (IPCC, 2018). In this work, the NDCs to Long-Term Low-Emission Development Strategies (NDC-LT-LEDS) scenario reflects the implementation of countries' unconditional NDCs (i.e. pledges that have no conditions attached) by 2030 and 2035, followed by the implementation of net-zero pledges that have been announced since the Conference of Parties (COP26) in Glasgow, in 2021.

Paris Climate Goal

Article 2 of the Paris Agreement aims to keep the global mean temperature increase to well below 2°C (above pre-industrial levels) and pursue efforts to limit the increase to 1.5°C. In this report, for well below 2°C we used a limit to greenhouse gas emissions consistent with a 67% probability of staying below 2°C, equivalent to a likely temperature outcome around 1.7-1.8°C. For 1.5°C, we look at scenarios that are expected to be below 1.5°C by the end of the century.

Abbreviations

AR6	6th IPCC Assessment Report
CDR	Carbon Dioxide Removal
COP	Conference of Parties
CO_2e	CO_2 equivalents
CPs	Current Policies
DLS	Decent Living Standards
GHGs	Greenhouse gases
GST	Global Stocktake
GWP	Global Warming Potential
IAMs	Integrated Assessment Models
IMAGE	Integrated Model to Assess the Global Environment
IPCC	Intergovernmental Panel on Climate Change
LTS	Long-Term Strategy
NDCs	Nationally Determined Contribution
SDG	Sustainable Development Goals
UNFCCC	United National Framework Convention on Climate Change

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Main Findings

At this point in time, it is clear that 1.5°C can no longer be achieved without overshoot. Nonetheless, scenario analysis shows that it is still possible to limit overshoot to about 1.7°C and stay well-below 2°C. This will not be easy, as the current geopolitical landscape for climate policy has become increasingly challenging. This report shows that the path to net-zero remains open – but accelerated, well-designed and fair implementation is urgent to reach the Paris Agreement goals.

Key findings include:

- Net-zero emission targets cover most global emissions, but insufficient current policies leave a substantial implementation gap. As of August 2026, 138 of 198 UNFCCC Parties have a net-zero target in some form, covering 74% of global emissions. However, current policies are insufficient to reach these targets, leading to a stabilisation of emissions after 2050 and warming of 2.5-3.2°C by 2100. If countries would implement their net-zero targets, it could substantially reduce the emission gap, leading to warming of 1.5-2.1°C by 2100.
- Sectoral transformation and transitioning away from fossil fuels are essential to climate mitigation. Learning from "good performance" seen in the past decade, such as transport electrification and wind and solar uptake, can help reduce emissions, but further efforts are needed. Meeting the Paris Agreement goals requires total and unabated fossil fuels to fall by 68% and 78% below current supply levels, respectively, in a 1.5°C-compatible pathway.
- Carbon removal has become necessary to reach ambitious climate goals, and especially to deal with overshoot – but it must be governed fairly. CDR becomes increasingly important to reach net-zero and deal with overshoot, but large-scale deployment of CDR technologies faces techno-economic, environmental, social and institutional challenges. Public support for CDR hinges on procedural and distributive fairness: consulting experts and local communities, as well as sharing or foregoing profits consistently increase support for such technologies.
- Justice and ambitious climate objectives can be combined. Providing decent living to all can be reconciled with ambitious climate targets, but increases global energy demand by 10-20% around 2040 (though strongly affected by how services are delivered). Different effort-sharing principles imply various combinations of domestic action and international finance, but pathways with equitably distributed mitigation efforts exist.
- Climate policy must now be designed in a fractured landscape. This means that climate policy can no longer be treated as purely environmental. In order to make progress, it is important to link climate policy to other societal goals, such as energy security, air pollution and justice. Furthermore, governance needs to be built for a fragmented world - investing in coalitions of the willing, technology partnerships and sustained research collaboration can help in finding common ground and rebuilding trust.



1. Introduction

The ELEVATE project, sponsored by the Horizon Europe Programme, provides evidence-based insights to support international climate policymaking. The project is based on a unique collaboration between climate research institutes bringing together leading global and national modelling teams worldwide as well as experts in policy assessment and social sciences. Working directly with teams in more than 15 countries allowed us to integrate different national contexts directly into the global analysis. Throughout the project we also facilitated a continuous dialogue with stakeholders, particularly policymakers, negotiators and civil society involved in the UNFCCC process, to help ground research in the realities of climate negotiations and enhance the credibility of research outputs.

The project spanned four years, marked by a transition from the action agenda of COP26 and COP27 on mitigation and the loss-damage fund, to rising energy security concerns and a changing geopolitical landscape complicating international climate policy – all in a rapidly warming world where climate impacts are more visible than ever. Despite increasing uncertainty, we also witness growing determination to keep the world on track to meet the Paris Agreement goals. Pivotal moments include historic ruling at the International Court of Justice, indicating that the 1.5°C temperature target is a key interpretation of the goals set out in the Paris Agreement, and the First Conference on Transitioning Away from Fossil Fuels, in Santa Marta, creating space for international cooperation on delivering a just, orderly and equitable energy transition.

In this fourth and final edition of the ELEVATE Annual Net-Zero Report, we provide a critical assessment of the progress toward net-zero targets and present strategies for countries to reach net-zero consistent with the Paris Agreement – a roadmap to implementation.

Where do global efforts to reduce emissions currently stand in an increasingly fragmented world? **Chapter 2** looks at the status of the latest net-zero announcements by countries, followed by analysis of the impact of current climate policies, as well as pledges such as NDCs and net-zero targets. To inform the upcoming Global Stocktake, we provide an overview of major emitters including the EU, the U.S., China, India, Brazil, Japan, South Africa, as well as Saudi Arabia, Canada and Nigeria which have been added in this year's report.

Bridging a substantial emissions gap requires a combination of strategies. **Chapter 3** presents a roadmap to net-zero. What can we learn from "good performers" in the sectoral transition? What are the roles of carbon dioxide removal, trade measures, carbon pricing and lifestyle change, as we transition away from fossil fuels?

In **Chapter 4** we examine justice considerations in mitigation pathways, specifically related to access to energy for decent living and the distribution of mitigation effort and costs. While models can provide important insights, it is up to decision-makers to determine how those choices are negotiated, implemented and made acceptable in practice.

We conclude with **Chapter 5**, discussing how current geopolitical challenges affect climate policies and proposing ways to keep moving the climate agenda forward in a geopolitically challenging world.

ELEVATE is funded by the European Union's Horizon Europe programme and brings together leading research institutes with the goal of supporting international climate policymaking. The project aims to develop the necessary scientific understanding of the impact of current climate policies. It focuses on identifying opportunities to mitigate greenhouse gas emissions and supports the preparation of Nationally Determined Contributions (NDCs) and national policies aimed at achieving net-zero emissions by mid-century, in line with the Paris Agreement.

Additionally, the project seeks to establish strong interactions between researchers, policymakers, and other stakeholders. It brings together global and national modelling teams to link the overall progress in meeting the Paris Agreement goals with the implementation of climate policies at the national level. This also includes ensuring their alignment with other sustainable development goals.

More information about the ELEVATE project: www.elevate-climate.org

About the project

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Start: September 2022 | **End:** November 2026

Partners

PBL Netherlands Environmental Assessment Agency (Netherlands) – Project coordinator
PIK Potsdam Institute for Climate Impact Research (Germany)
COPPE/COPPETEC Graduate School of Engineering (Brazil)
UFRJ Universidade Federal do Rio de Janeiro (Brazil)
E3M E3-Modelling AE (Greece)
CMCC Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici (Italy)
CS/SCS Climate Strategies (UK/Netherlands)
Aarhus University (Denmark)
TERI The Energy and Resources Institute (India)
IIASA International Institute for Applied Systems Analysis (Austria)
NewClimate Institute for Climate Policy and Global Sustainability (Germany)
Wageningen University & Research (Netherlands)
WiseEuropa Institute (Poland)
BJUT Beijing University of Technology (China)

External partners:

AFREC African Energy Commission (Africa)
Kyoto University (Japan)
UMD University of Maryland (United States)
KAPSARC King Abdullah Petroleum Studies and Research Center (Saudi Arabia)

Co-creation with stakeholders in the ELEVATE project

Gaia Campanelli (CS), Gintarė Zinkevičiūtė (PBL)

The ELEVATE project is based on the principle that climate research has the greatest impact when researchers, policymakers, civil society and non-state actors co-produce knowledge and learn from one another. Stakeholder engagement therefore has been a core element through every phase of the project, from the framing of research questions to the communication of final results.

The Global Forum to Elevate Climate Ambitions (hereafter – the Forum) was set up at the beginning of the project as a core group of stakeholders, with more experts joining as the work progressed. The Forum members represent various backgrounds, subject areas and expertise, to ensure balanced gender and geographical representation. Members include international negotiators, including youth negotiators, national policymakers working on NDCs, modelling teams, other academic researchers, experts from industry and finance, and NGO and civil society representatives.

Seven international and six national workshops were held throughout the project to facilitate a continuous dialogue on policies and pathways toward net-zero. This enabled international cooperation and mutual learning between researchers and diverse stakeholders.

The international workshops were organised every six months, both in-person, aligned with UNFCCC SBSTA sessions in Bonn, and online. Participants discussed different aspects of a new generation of net-zero pathways, such as impact of current policies and justice representation in an interactive and accessible way. Additionally, researchers presented latest ELEVATE research. These events helped feed ELEVATE research into the UNFCCC processes such as research dialogues and specific negotiating streams (for instance, the Global Stocktake and the Just Transition Work Programme). The ELEVATE international workshops summaries are available on the project's website.

The national workshops, led by ELEVATE's country partners, were organised around national policy priorities and provided an opportunity for the modelling teams to exchange knowledge with national policymakers and researchers working on NDCs and domestic net-zero pathways in China, the U.S., India, Saudi Arabia, Poland and the EU.

By involving stakeholders at every stage of ELEVATE research, the project ensured that their inputs shaped the work as it was developed. The Forum provided advice on key design decisions (such as the scenario narratives), tested early findings, and helped steer the strategies to net-zero. The result is a set of findings grounded in realistic climate, development, economic and social assumptions, ensuring the credibility of the research and allowing Forum participants to feel a sense of ownership over the knowledge produced. These insights turned into practical policy recommendations to support more ambitious NDCs and help countries move towards net-zero.

2. Gap Analysis

Isabela Tagomori, Ioannis Dafnomilis, Elena Hooijschuur, Constance Crassier and Detlef van Vuuren (PBL)

The ELEVATE project addresses the challenge of supporting the climate negotiations by developing a robust scientific understanding of the impact of current climate policies and pledges, as well as identifying opportunities to mitigate GHG emissions further her towards net-zero by mid-century. In this context, this chapter presents the status of net-zero announcements by countries, and tracks progress by estimating the emission reductions resulting from current climate policies, as well as pledges such as the Nationally Determined Contributions (NDCs).

2.1. Status of net-zero announcements

As of August 2026, 138 out of the 198 countries that have ratified the United Nations Framework Convention on Climate Change (UNFCCC) – i.e., 70% – had a net-zero emission target either "proposed", "pledged", "in policy", "in law", or self-declared as "achieved", representing 74% of total global emissions. The remaining 60 countries (i.e., 30%) have no net-zero emission target. This includes the United States (U.S.), which recently withdrew from its previous climate commitments. Figure 1 and Figure 2 illustrates the status of the announced net-zero emissions targets.

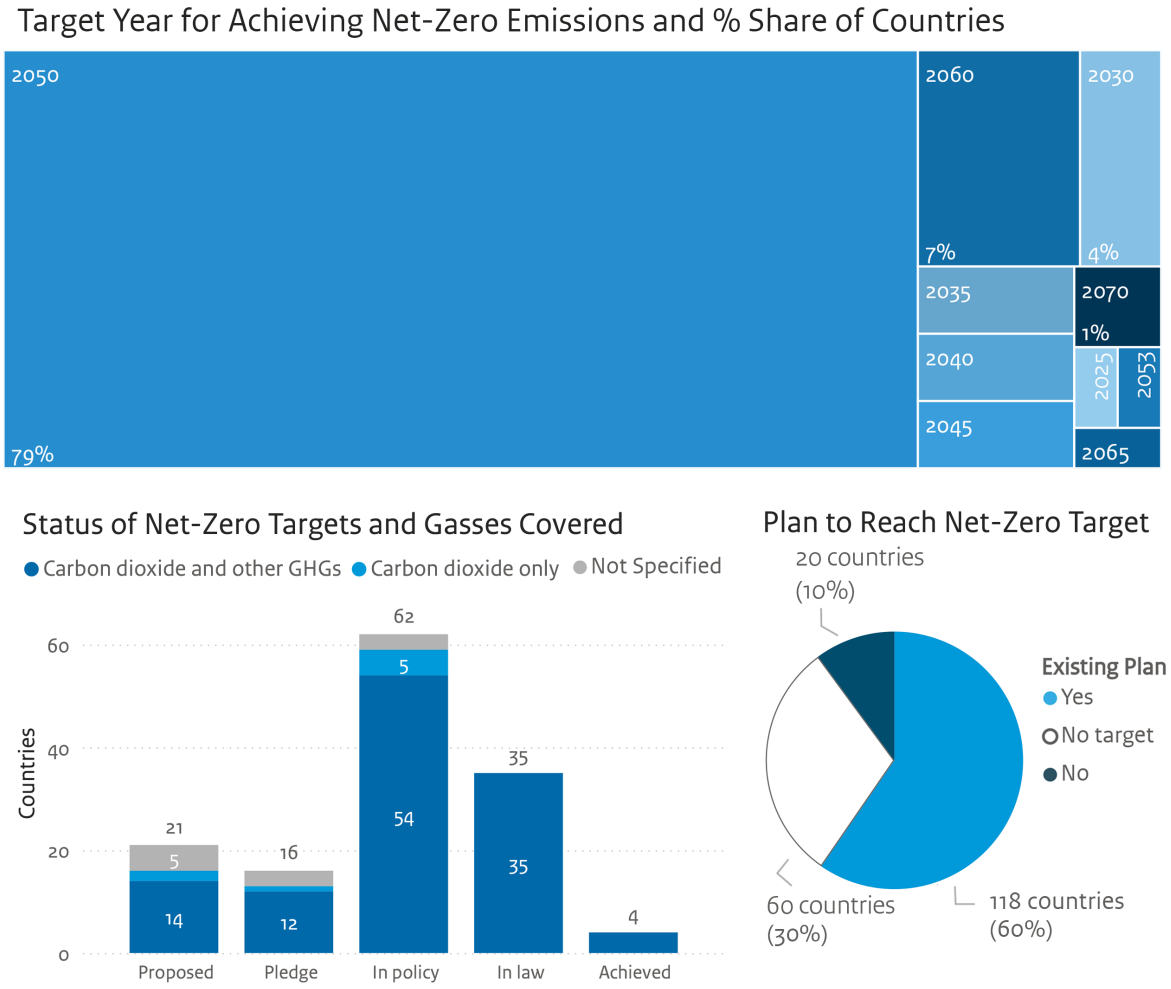


Figure 1: Status of announced net-zero targets, based on data from the Net-Zero Tracker (2026). Note: "Proposed" refers to net-zero targets that have been proposed but are still being discussed. "Achieved" net-zero targets are self-declared.

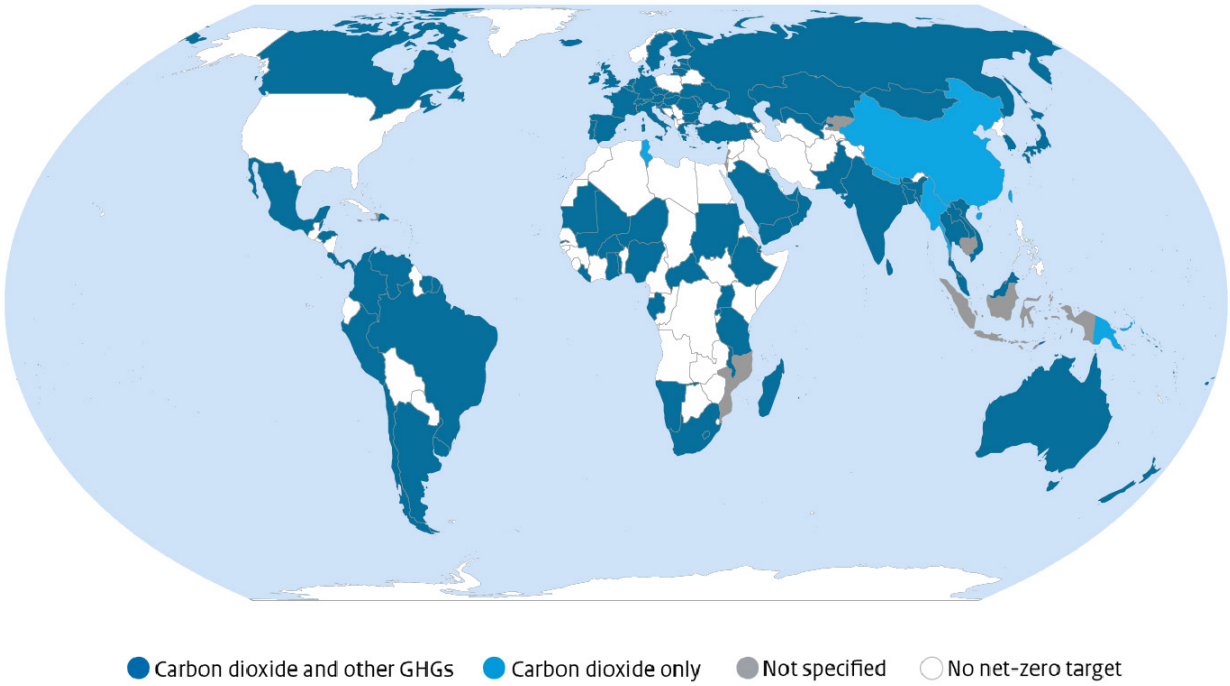


Figure 2: Emissions scope of the net-zero targets per country, based on data from Net-Zero Tracker (2026).

Most countries with a net-zero emissions target (79%) have chosen 2050 as the target year for reaching net-zero emissions. Furthermore, in terms of emissions coverage, most net-zero emissions targets (86%) include both carbon dioxide and other greenhouse gas (GHGs) emissions, while 6% only mention carbon dioxide emissions and 8% do not specify which gases are covered by their target.

2.2. Mind the gap

The Second Global Stocktake (GST2) under the Paris Agreement is scheduled to launch in November 2026 at COP31, to be held in Antalya, Türkiye, and to conclude in November 2028 at COP33. It should cover the period of 2024–2028, informing Parties on the overall progress towards the Paris Agreement goals. Integrated Assessment Models (IAMs) play an important role in providing science-based scenarios that project the impact of current climate policies and pledges, and the projected emissions gap.

In the ELEVATE project, 8 state-of-the-art IAMs[1] collaborated to compare new projections of global emission pathways. To assess the emissions gap, we compared two climate policy scenarios with scenarios consistent with the Paris Agreement's overall temperature goals. The policy scenarios are: 1) Current Policies (CP), and 2) NDCs to Long-Term Low-Emission Development Strategies (NDC-LT-LEDS). The Current Policies scenario reflects all adopted and implemented policies, which are defined as legislative decisions, executive orders, or their equivalent. Publicly announced plans or strategies, such as NDCs and long-term strategies do not qualify as "current policies" and are therefore not included in the Current Policies scenarios but are instead represented in the NDC-LT-LEDS scenario. The NDC-LT-LEDS scenario reflects the expected emission reductions for 2030 and 2035, according to countries' NDCs, and net-zero emissions, according to countries' long-term strategies. The modelling protocols (Hooijschuur et al., 2026; Dafnomilis et al., 2026) used to develop these scenarios are publicly available on ELEVATE's Zenodo Repository.

Figure 3 shows the latest and up-to-date progress in implementing the Paris Agreement. The ranges in the figure are derived from the multiple models used in the analysis. The differences across the models (indicated by the range) reflect an element of uncertainty. As the focus

1 AIM, COFFEE, GEM-E3, IMAGE, MESSAGEix-GLOBIOM, POLES, REMIND-MAgPIE and WITCH.

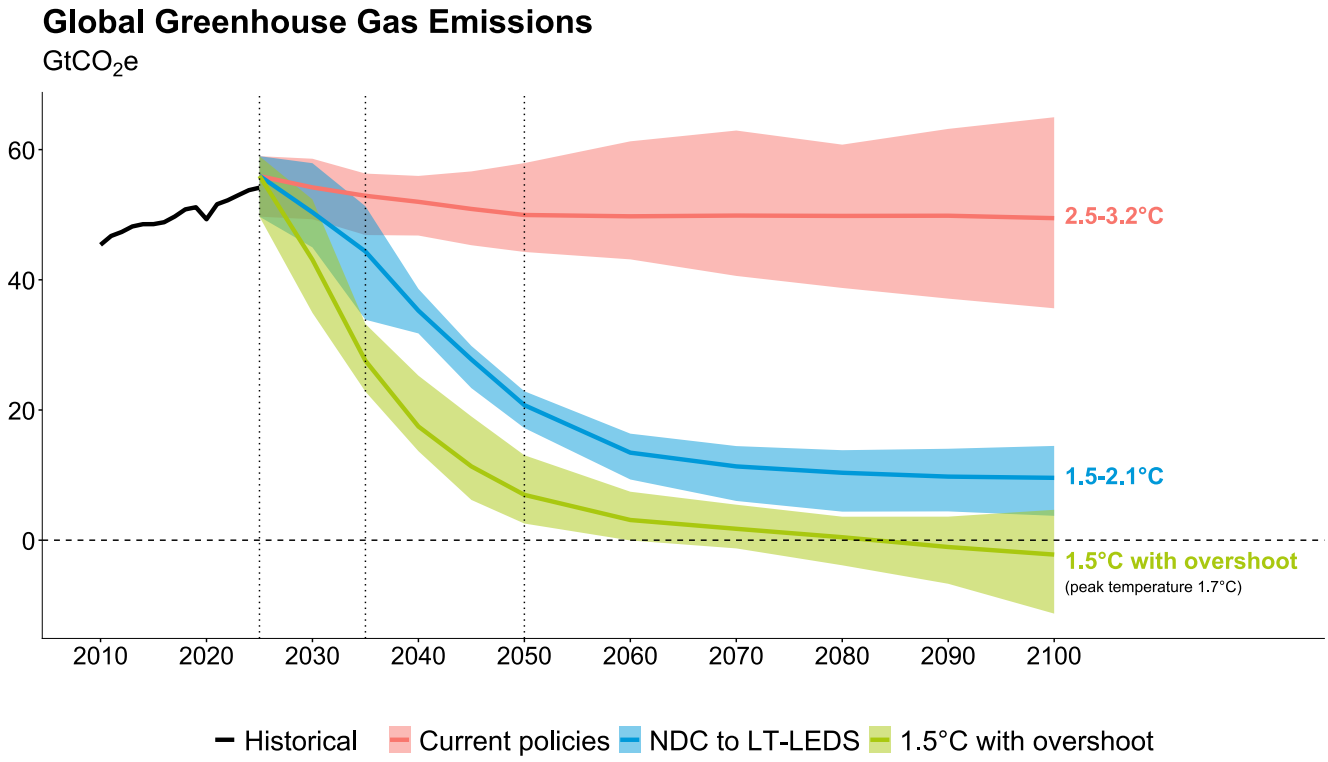


Figure 3: Global GHG emission pathways under various scenarios, and the projected implementation gaps in 2030 (current policies compared to NDC targets for 2030), 2035 (current policies compared to NDC targets for 2035) and 2050 (current policies compared to net-zero pledges).

shifts towards implementation, we estimate the implementation gaps by comparing projected emissions from current climate policies to the emission reduction targets in 2030 and 2035 (as established in the NDCs), and in 2050 (which is set as the net-zero target year for most of the long-term strategies). The figure shows current policies are expected to more-or-less stabilise emissions. This would lead to a warming of around 2.5-3.2°C. If, instead, countries would fully implement their NDCs and long-term strategies (assuming a linear pathway between them), emissions could be reduced substantially. This would lead to a warming around 1.5-2.1°C. We compare the scenarios to pathways aimed at limiting warming to 1.5°C, based on recent model implementation that strive for minimising overshoot. However, as a result of too little action over the past few decades, these pathways reach a peak warming of 1.7 °C, before returning to 1.5°C. The results show that current policies are insufficient to reach the NDCs and long-term strategy goals. Furthermore, the NDCs and long-term strategies themselves need to be strengthened to remain well-below 2 °C.

2.3. Tracking major emitters

In preparation for the upcoming Global Stocktake (GST2), one crucial step in evaluating the emissions gap is to track major emitters. In our analysis, we include a set of countries, such as the European Union (EU), the United States (U.S.)[2], China, India, Brazil, Japan, and South Africa. This section provides an overview of major emitters climate pledges (including the new targets submitted in their NDC 3.0), followed by an assessment of how the countries' intermediate targets (i.e., their NDCs) are progressing towards their long-term goals (Table 1; Figure 4). For the latter, we define the alignment of the NDCs with the net-zero targets as the positioning of the NDC targets with respect to a linear path of

2 Even though the U.S. withdrew from the Paris Agreement, it remains important to track their trends, and those of other major emitters.

emission reductions from the current year to each country's respective net-zero year. As such, it is not an indication of whether a country is currently on track to achieve its long-term goal, but rather whether the NDC emission targets put them on a linear pathway to meet its net-zero pledge.

2.3.1. European Union (EU)

The EU's NDC 3.0, submitted in November 2025, aims at reducing emissions by 66.25–72.5% below 1990 levels by 2035 (European Commission, 2025). The European Climate Law was also amended to establish a legally binding target of a 90% net GHG reduction by 2040, compared to 1990 levels. The deal also includes the possibility to use high-quality international credits with an adequate contribution of up to 5% (European Commission, 2026). EU's net-zero target remains unchanged, covering all GHG by 2050 (European Union, 2021).

As it stands, the NDC targets for 2030 and 2035, as well as the 2040 reduction target are aligned with a linear path from current emission levels to the EU's net-zero targets. This implies that the continuation of efforts after 2030-2040 would be sufficient to achieve GHG neutrality by 2050. However, it is crucial to note that the EU's progress towards its targets considers only EU-level policies. Member States still need to adopt and implement more ambitious policies on a national and individual level to be compatible with the EU's collective targets.

2.3.2. United States (U.S.)

The Trump Administration withdrew the U.S. from the Paris Agreement, annulling the Biden Administration's emissions reductions targets for 2030, 2035, and 2050. The "One Big Beautiful Bill Act" affects progress in deploying renewable energy and clean energy technologies under the Inflation Reduction Act (IRA). Additionally, the U.S. Environmental Protection Agency (EPA) has moved to revoke key emissions regulations and its legal authority to regulate GHG emissions across all sectors. At the same time, the Trump Administration has invoked emergency powers to rapidly expand oil and gas drilling across the country (Climate Action Tracker, 2026a; Carbon Brief, 2026a). According to our assessment using the IMAGE model, projected emissions in 2035 end up approximately 1.5 GtCO2e higher under the Trump Administration than they would have if policies from the Biden Administration were not rolled back (Dafnomilis et al., 2026).

2.3.3. China

In November 2025, China officially submitted its NDC 3.0, committing to an absolute reduction in economy-wide GHG emissions by 7% to 10% in 2035 from peak levels. Furthermore, the country aims to increase share of non-fossil fuels in total energy consumption to over 30% by 2035 and expand installed capacity of wind and solar power to over six times 2020 levels, striving to bring the total to 3600 GW; and scale up total forest stock volume to over 24 billion m3 (Ministry of Ecology and Environment, 2025). The coverage of gases in China's net-zero target remains unclear. While the economy-wide GHG target in its NDC 3.0 could indicate that the net-zero target also encompasses all GHGs, most independent analyses still consider it a CO2 only target, since official clarification is not currently available (Net Zero Tracker, 2026; Climate Action Tracker, 2026b).

Emissions in China are projected to peak before 2030 under current policies, possibly having peaked already in 2025, according to other analyses available in literature (Carbon Brief, 2025). While the 2030 and 2035 NDC targets are currently overachieved by the country's current policies projections, they are not on a linear path towards net-zero CO2 by 2060. Nonetheless, the emission reduction rate post-peak could bring China to a linear pathway towards its net-zero goal.

2.3.4. India

India submitted its NDC 3.0 in April 2026, aiming for an emissions intensity reduction of 47% by 2035 compared to 2005 levels (a 2% increase over its NDC 2.0 commitment for 2030), 60% of cumulative electric power installed capacity from non-fossil fuel sources by 2035, and an additional carbon sink of 3.5 to 4 $GtCO_2eq$ through forest and tree cover, as compared to 2005 (baseline year) (Government of India, 2026). Such targets

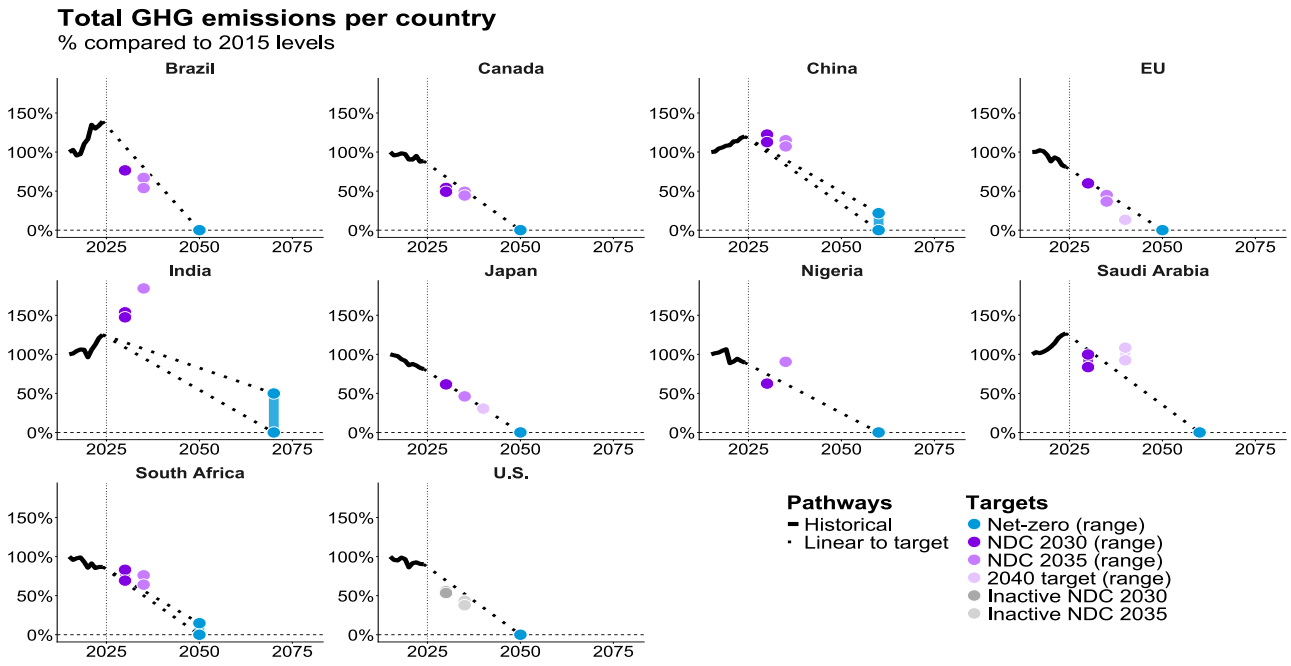


Figure 4: Linear GHG emission pathways between emission levels in 2023 and net-zero targets, and GHG emission levels by 2030, 2035 and 2040 corresponding to NDCs. Previous targets of the U.S. are indicated in grey as they are abandoned by the current administration. The EU 2040 emission level indicator is not an official NDC target but it has been enshrined into law – thus, it is included in this analysis.

result in emission levels above current policies projections both in 2030 and 2035.

India's Long-Term Low-Emission Development Strategy (LT-LEDS) outlines sector-specific action areas (Government of India, 2022), but does not clarify the scope of the target (CO_2 or all GHG) nor does it provide sufficiently clear policy guidance on how the government intends to achieve net-zero beyond its current policies and programmes (Climate Action Tracker, 2026c). Given the emissions increase expected under the NDCs, reaching its net-zero target would require a more substantial emissions reduction post-2035.

2.3.5. Brazil

Brazil submitted its NDC 3.0 in November 2024, setting a target to reduce GHG emissions between 59–67% below 2005 levels by 2035, covering all sectors and gases (Government of Brazil, 2024). Brazil aims to achieve carbon neutrality by 2040 and climate neutrality by 2050, a target reiterated in its NDC 3.0 submission, but has not yet officially submitted a Long-Term Low-Emission Development Strategy (LT-LEDS) to the UNFCCC (Climate Action Tracker, 2026d). Brazil's climate pledges highly depend on emissions from land-use, land-use change and forestry (LULUCF), thus highlighting the importance of the enforcement of LULUCF-related policies, especially on zero deforestation.

2.3.6. Canada

Canada's NDC 3.0, submitted in February 2025, aims at reducing emissions by 45–50% below 2005 levels by 2035, a slight upgrade over its NDC 2.0 (40-45% below 2005 levels by 2030) (Government of Canada, 2025a). Canada's commitment to net-zero GHG emissions by 2050 has been codified in law through the Canadian Net-Zero Emissions Accountability Act since 2021 (Government of Canada, 2021). Despite recent policy rollbacks (Government of Canada, 2026; Government of Canada, 2025b), Canada's emission projections decrease under current policies, and the country's 2030 and 2035 NDC targets fall within a linear path to its net-zero target.

2.3.7. Japan

Japan submitted its NDC 3.0 in February 2025 (Government of Japan, 2025), setting a target of 60% reduction in GHG emissions by 2035, compared to 2013 levels. Additionally, it has a

target for 2040 that stipulates a 73% emission reduction compared to 2013 levels. Japan's 2050 net-zero emissions target remains unchanged, covering all GHG emissions and economic sectors, which is also enshrined in domestic law. Japan's GHG emissions have been on a downwards trend for the past ten years. If all the 2030, 2035 and 2040 targets are met and the country continues the same rate of emission reductions, it should be able to achieve its net-zero target as well.

2.3.8. Saudi Arabia

Saudi Arabia's NDC 3.0 was submitted in December 2025. It provides no target for 2035, and its 2040 target is linked to an unspecified baseline projection, leading to uncertainty in its assessment and making ambition and progress hard to measure. The new pledge also explicitly states that its climate ambition is contingent on sustained fossil fuel exports and the revenue and economic growth they generate (Kingdom of Saudi Arabia, 2025). Saudi Arabia's net-zero target for 2060 was announced at the first Saudi Green Initiative Forum in October 2021 (Climate Action Tracker, 2026e). However, the target has yet to be enshrined in law or policy documents, and the country has not submitted a Long-Term Low-Emission Development Strategy (LT-LEDS) to the UNFCCC. Emissions in Saudi Arabia are expected to increase until at least 2035, with no clear signs of peaking. According to our assessment, Saudi Arabia's 2030 target is aligned with a linear path to its net-zero target, while its 2040 target is not, indicating that its most recent NDC submission allows for emissions increase until 2040 and signalling a change in direction regarding the country's climate ambition.

2.3.9. Nigeria

Nigeria's NDC 3.0, submitted in September 2025, stands out as one of the few submissions that strengthened the previous 2030 targets, along with submitting targets for 2035. Nigeria's NDC 3.0 aims at absolute emission reductions of 29% by 2030 and 32% by 2035, compared to 2018 emission levels. The strengthening of the 2030 NDC targets in absolute terms equates to approximately 100 MtCO2eq additional emission reductions for the unconditional 2030 target (from 380 MtCO2eq in NDC 2.0 to 280 MtCO2eq for NDC 3.0) and 25 MtCO2eq additional emission reductions for the conditional 2030 target (from 270 MtCO2eq in NDC 2.0 to 245 MtCO2eq for NDC 3.0) (Federal Government of Nigeria, 2025). For both the updated 2030 and new 2035 targets, 80% of these reductions are conditional on international financial support, while the remaining 20% of reductions are unconditional (Climate Action Tracker, 2026f). Nigeria's 2030 unconditional target is aligned with a linear path to its net-zero target, but its 2035 unconditional target is not.

2.3.10. South Africa

South Africa submitted its NDC 3.0 in October 2025, and while it represents an increase in ambition in absolute emission levels, aiming to limit 2035 emissions to 320–380 MtCO2eq (against 350-420 MtCO2eq in 2030) (Republic of South Africa, 2025), it fell short of the target originally proposed by the Presidential Climate Commission (PCC) in May 2025, that suggested limiting emissions to 278–330 $MtCO_2eq$ in 2035 (The Climate Group, 2026). South Africa stated its intention to commit to a net-zero target by 2050 as part of its Long-Term Low-Emission Development Strategy (LT-LEDS) (Republic of South Africa, 2020). However, its GHG coverage remains unclear. The significant range of emission levels is a major uncertainty factor for South Africa's NDC targets. While the lower range puts the country on a linear path towards its net-zero target, the upper range suggests a plateauing of emissions at their current level.

Table 1: Progress of major emitters towards achieving their net-zero targets

	NDC targets (2030, 2035 and 2040)	Net-zero target	Progress towards net-zero
EU	Reduce GHG by at least 55% below 1990 levels by 2030 Reduce GHG by 66.25-72.5% below 1990 levels by 2035 Reduce GHG by 90% by 2040 below 1990 levels, with a domestic target of 85% and up to 5% of international carbon credits (EU's emissions reduction target for 2040, not officially an NDC 3.0 target but in law)	Net-zero GHG by 2050	EU's 2030 and 2035 NDC targets, as well as its 2040 emissions reduction target, are on a linear path to its net-zero target
U.S.	No NDC target in effect	No net-zero target in effect	-
China	Reduce carbon intensity by over 65% compared to 2005 levels by 2030, peak CO_2 emissions before 2030, among other targets Reduce GHG emissions by 7-10% from peak levels by 2035, striving to do better, among other targets	Carbon-neutral before 2060 (Gas coverage not specified, most analyses assume CO_2 only)	China's 2030 and 2035 NDC targets are not on a linear path from its current emissions to its net-zero target
India	Reduce GHG intensity by 45% compared to 2005 levels by 2030, among other targets Reduce GHG intensity by 47% compared to 2005 levels by 2035, among other targets	Net-zero by 2070 (Gas coverage not specified)	India's 2030 and 2035 NDC targets are not on a linear path from its current emissions to its net-zero target
Brazil	Reduce GHG by 53.1% below 2005 levels by 2030 Reduce GHG by 59-67% below 2005 levels by 2035	Net-zero GHG by 2050	Brazil's 2030 and 2035 NDC targets are on a linear path to its net-zero target
Canada	Reduce GHG by 40–45% below 2005 by 2030 Reduce GHG by 45–50% below 2005 by 2035	Net-zero GHG by 2050	Canada's 2030 and 2035 NDC targets are on a linear path to its net-zero target

	NDC targets (2030, 2035 and 2040)	Net-zero target	Progress towards net-zero
Japan	Reduce GHG by 46% below 2013 levels by 2030 Reduce GHG by 60% below 2013 levels by 2035 Reduce GHG by 73% below 2013 levels by 2040	Net-zero GHG by 2050	Japan's 2030, 2035 and 2040 NDC targets are on a linear path to its net-zero target
Saudi Arabia	Reduce GHG by 278 MtCO2e annually by 2030, with 2019 as the base year No intermediate target for 2035 Reduce GHG by 335 MtCO2e annually by 2040, on the basis of a dynamic baseline, with 2019 as the base year	Net-zero by 2060 (Gas coverage not specified)	Saudi Arabia's 2030 NDC target is on a linear path to its net-zero target, but its 2040 target is not on a linear path from its current emissions to its net-zero target
Nigeria	Reduce GHG by 20% (unconditional) and 47% (conditional) below BAU by 2030 Reduce GHG by 32% below 2018 by 2035 (80% of reductions conditional, 20% unconditional)	Net-zero GHG by 2060	Nigeria's unconditional 2030 NDC target is on a linear path to its net-zero target, but its unconditional 2035 NDC target is not on a linear path from its current emissions to its net-zero target
Saouth Africa	Limit GHG emissions to 350–420 MtCO2e by 2030 Limit GHG emissions to 320–380 MtCO2e by 2035	Net-zero carbon emissions by 2050 (Gas coverage not specified)	South Africa's 2030 NDC target could be on a linear path to its net-zero target (considering the lower end of its NDC range), but its 2035 NDC target is not on a linear path from its current emissions to its net-zero target

3. Strategies to net-zero emissions

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Throughout the ELEVATE project and its multidisciplinary research, we identified several strategies that can help countries reach their net-zero emissions targets (Figure 5). Some are connected to technological development and the physical environment, while others are more connected to social and economic aspects, as well as the capacity and willingness required for the transition. Together, these strategies represent an agenda of action providing pathways to meeting the Paris goals.

3.1. Sectoral transformation

Sectoral transformation is essential for reaching net-zero emissions. As rapid change is crucial, a key strategy to keep the climate goals within reach involves technology development and transfer, as highlighted in the Paris Agreement's Article 10. Therefore, ELEVATE research explores how countries can learn from each other's successes, observing examples of "good performance" and the potential of replicating it. Because countries have different capabilities, we identified such examples for different income levels, according to the World Bank country classification (Metreau et al., 2024), and correspondingly replicated them across regions (Hooijschuur et al., 2026).

From our analysis, two sectors stand out: the transport and the power sector. For the transport sector, we mapped worldwide performances on electrification and efficiency of vehicles. Figure 6 shows the penetration of electric vehicles (x-axis) and the yearly growth rate (y-axis). The adoption of electric vehicles has substantially grown over the past years, with the highest shares found in Norway among high-income countries, China among upper-middle-income countries. If replicated worldwide, such a change in the global fleet could reduce global CO_2 emissions from transport by 1.2 $GtCO_2$ – 18% by 2050, compared to current levels.

For the power sector, a key element of the transition to net-zero emissions is the uptake of wind and solar photovoltaic (PV) in energy supply. In this context, examples of "good performance" around the world (Figure 7) include Denmark among high-income countries, Jordan and Brazil among upper-middle-income countries, and Morocco and Kenya among lower-middle-income countries. If such uptake was replicated globally, CO_2 emissions from energy supply could be reduced by 16 $GtCO_2$ – 53% by 2050, compared to current levels. It is important to note that spillovers from "good performance" in other sectors (such as the electrification and efficiency improvements previously discussed for the transport sector) influence the results for energy supply as well.

The "good performance" scenarios proposed in ELEVATE consider trajectories from multiple sectors, including the above-mentioned transport and power sectors, but also industry, buildings, land use, and non-CO_2 gases (Hooijschuur et al., 2026). Together, the "good performance" trajectories lead to economy-wide emissions reductions of 10.7 $GtCO_2eq$,by 2050 compared to current emission levels, with a temperature range of 2.4-2.9°C (Figure 8). While this is an improvement to projected current policies, it still falls short of the reductions that are needed to reach net-zero emissions. Bridging towards well-below 2°C and preferably 1.5°C requires combined efforts and strategies, especially transitioning away from fossil fuels (see Figure 9).

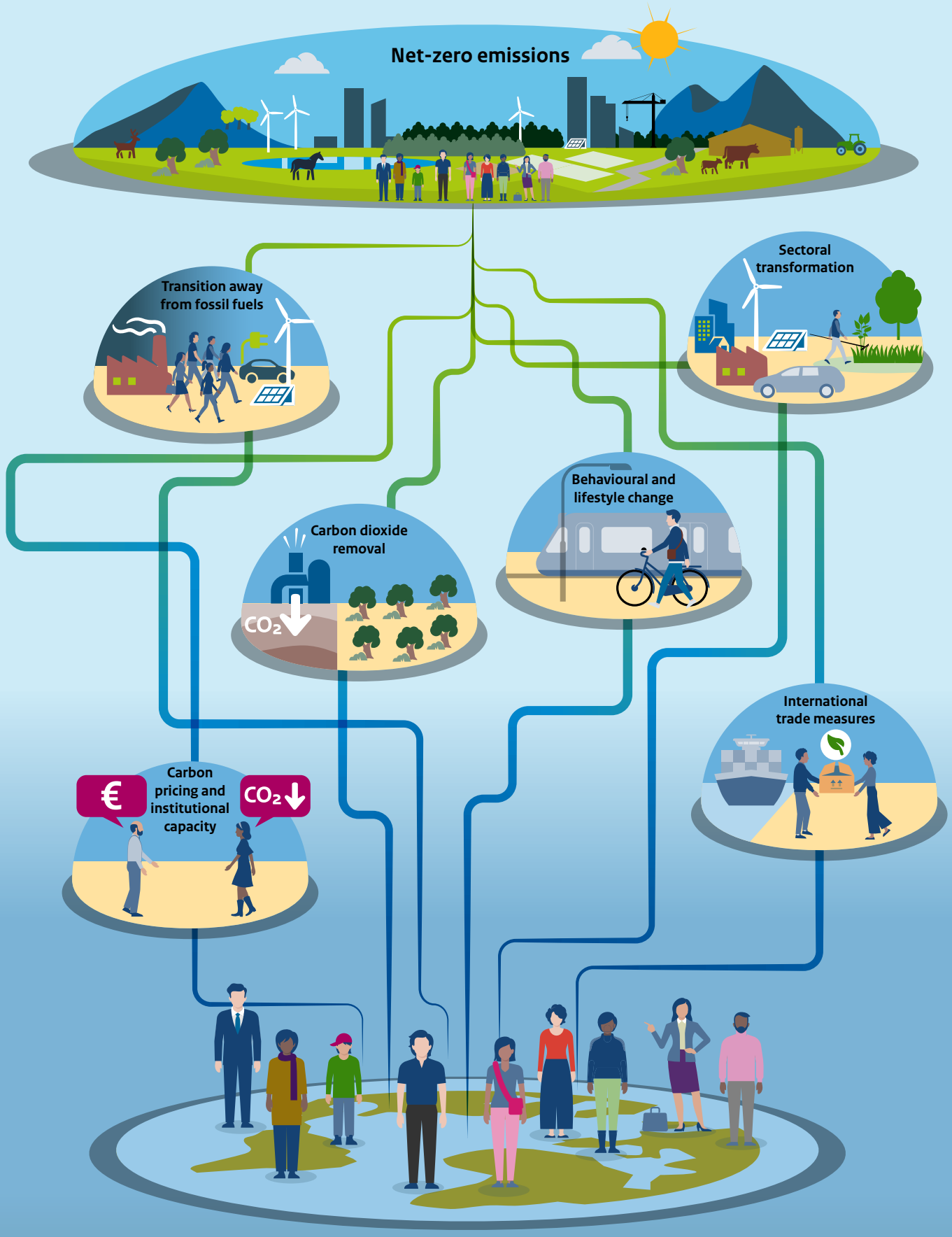


Figure 5: Roadmap of strategies to net-zero emissions

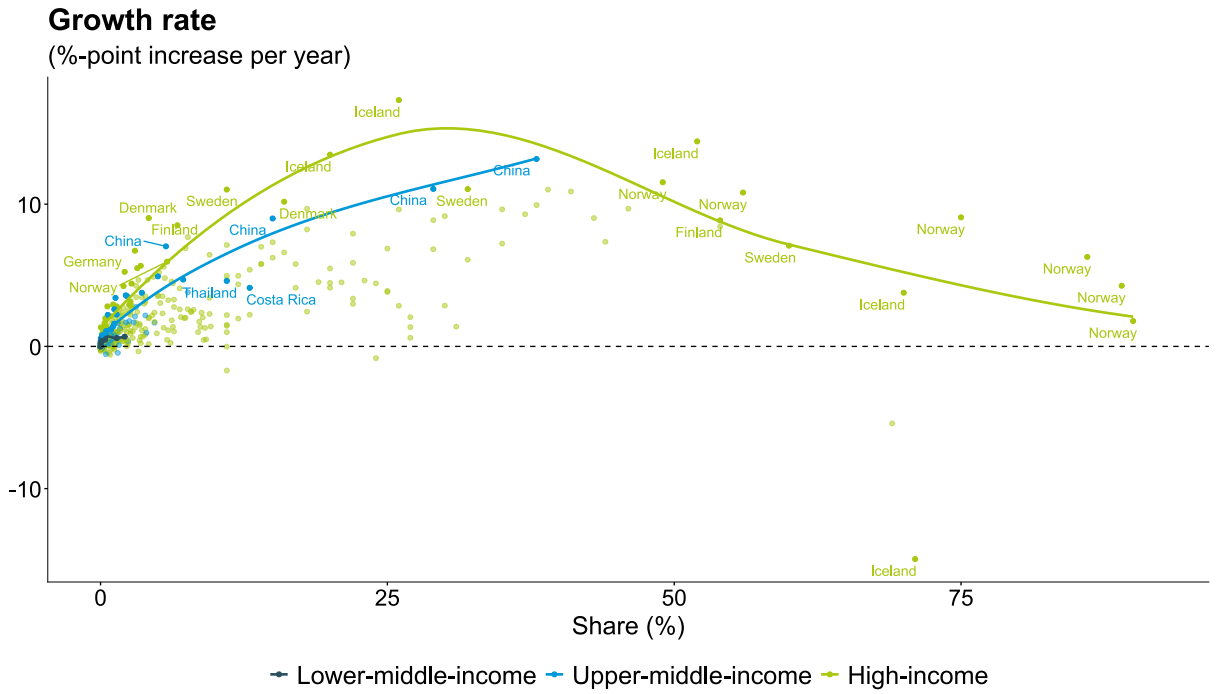


Figure 6: Growth rates and share (%) of electric vehicles in vehicles sales. Points labelled with country names represent performers that are on the boundary of the point cloud for a specific income group. Multiple points per country represent data from different years. The lines visualize the aggregate good performance trajectories derived from those points with a LOESS (Locally Estimated Scatterplot Smoothing) function.

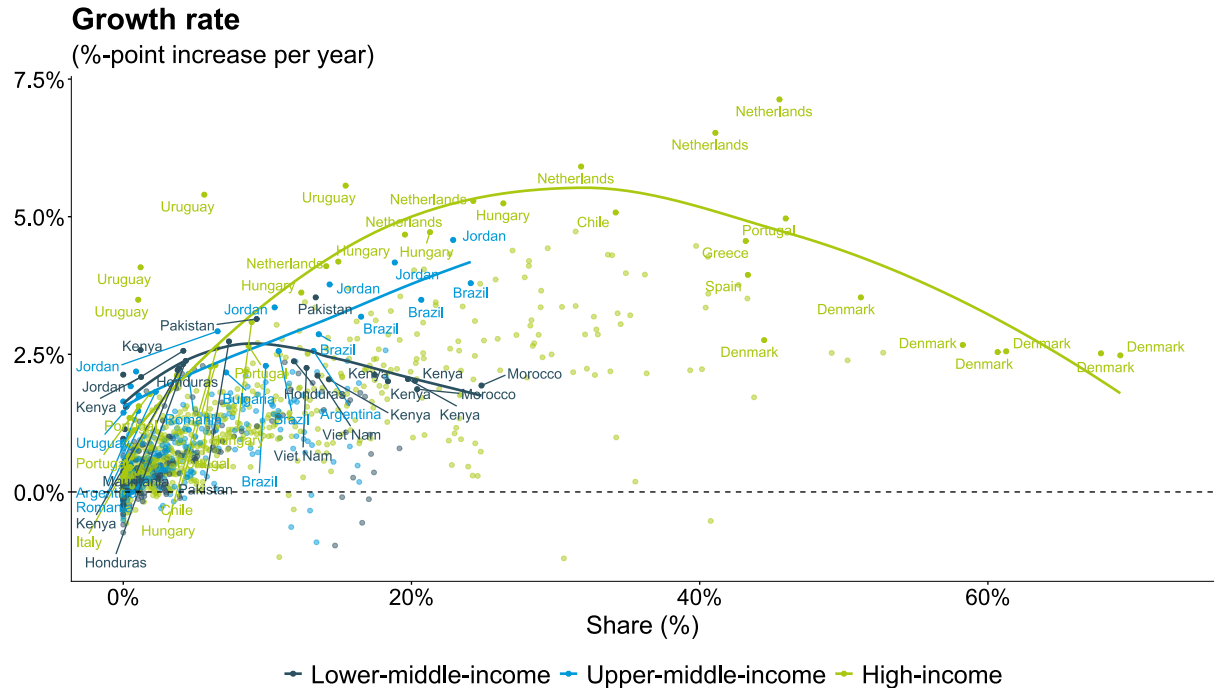


Figure 7: Growth rates and share (%) of wind and solar energy in electricity output. Points labelled with country names represent performers that are on the boundary of the point cloud for a specific income group. Multiple points per country represent data from different years. The lines visualize the aggregate good performance trajectories derived from those points with a LOESS (Locally Estimated Scatterplot Smoothing) function.

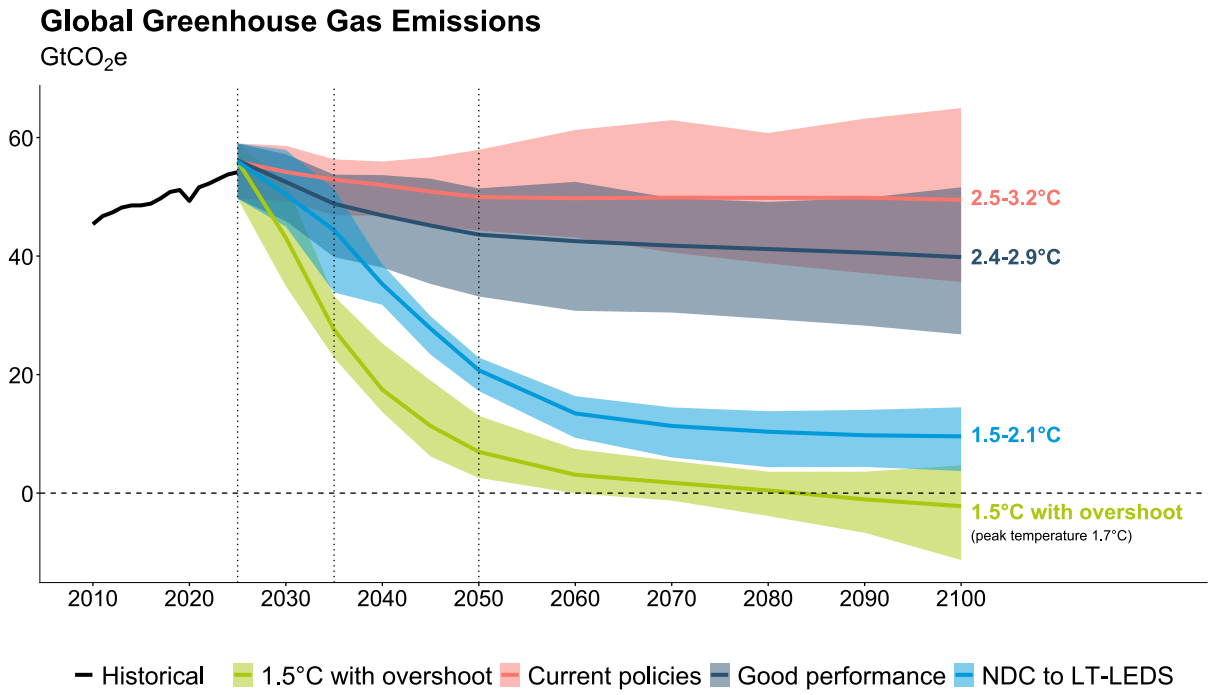


Figure 8: Global GHG emission pathways under various scenarios, including the "Good Performance" scenario, and their respective temperature outcomes.

3.2. Transition away from fossil fuels

To reach net-zero emissions and ultimately achieve the Paris Agreement goal it is necessary to reduce energy-related greenhouse gas emissions and thus reduce the use of fossil fuels. Literature shows that fossil fuels need to be substantially phased down in an effort to keep global temperature rise to well-below 2°C. This is also recognized by the United Nations Framework Convention on Climate Change (UNFCCC) in the outcomes of the First Global Stocktake (UNFCCC, 2023) and has sparked initiatives such as the "First Conference on Transitioning Away from Fossil Fuels" (Government of the Netherlands, 2026), that was held in Santa Marta, Colombia, in April 2026, co-hosted by Colombia and the Netherlands.

Such outcomes are also confirmed by the ELEVATE scenarios. As can be seen in Figure 9, the more ambitious the climate target, the lower the use of fossil fuels and the more it needs to be reduced compared to current levels. In our scenarios, total and unabated fossil fuels need to be reduced by 68% and 78% compared to current fossil supply levels, respectively, for a 1.5°C compatible pathway (IEA, 2026).

However, there is not a "one-size-fits-all" strategy to transition away from fossil fuels. ELEVATE research shows that the regional context is a crucial factor and understanding this can help in designing more effective policies. For instance, when investigating the political economy factors driving investments in coal-fired power plants, we can draw distinct clusters of countries (Figure 10) (Manych et al 2023). A computational analysis of interviews from 12 countries , using topic modelling, systematically identified six clusters: 1) policy driven phase-out, 2) governance of fossil fuel markets, 3) market driven phase-out, 4) civil society, 5) electricity mix and tariffs, and 6) energy sector planning.

Countries that have successfully phased out/down their use of coal were either policy or market driven. Policy driven phase-out/down is usually backed up by effective climate policies under strong political consensus, and support across stakeholder groups. Market driven phase-out/down, on the other hand, can happen regardless of policies due to price-led decline of

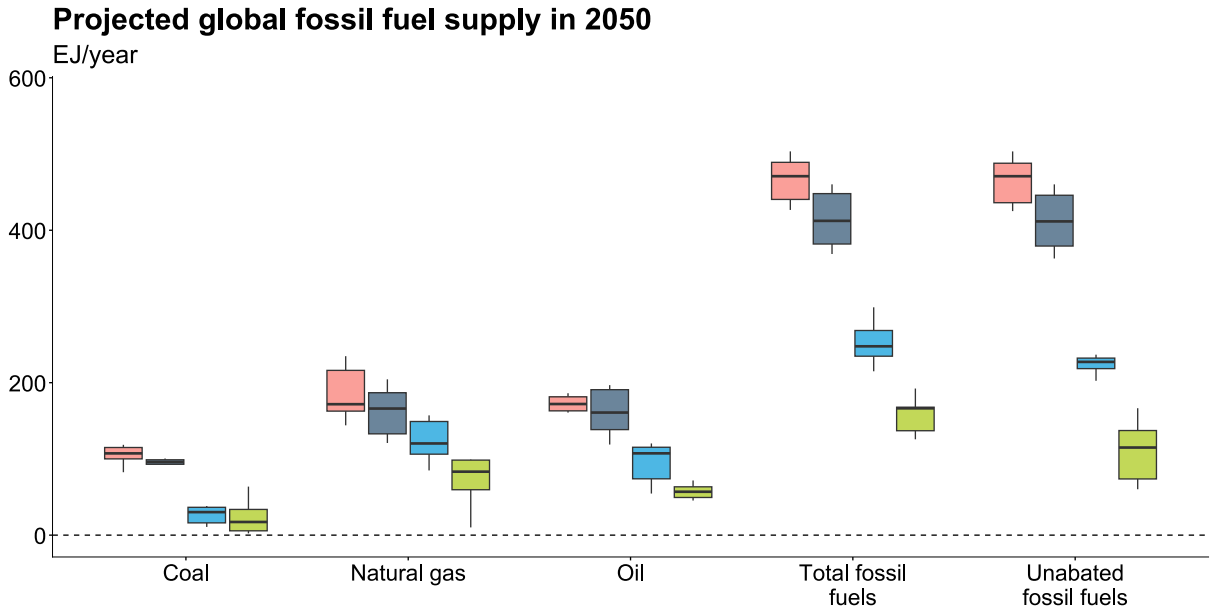


Figure 9: Projected global primary energy supply in 2050, under different climate policy scenarios, for coal, gas and oil, as well as total fossil fuels and unabated fossil fuels

the coal industry, which cannot be prevented by coal interest groups. Furthermore, the role of civil society is also highlighted in examples from countries where civil society organized itself against the construction of coal-fired power plants.

Countries that face difficulties in phasing out/down their use of coal highlight the governance of fossil fuel markets, the electricity mix and tariffs, and planning of the energy sector. In some cases, coal mining companies and interest groups have a strong influence on policy making and the governance of fossil fuel markets, stalling the transition due to revenues, employment and private sector interests. With the energy mix and tariffs, phasing down/out of coal needs to address a policy environment that is favourable to fossil fuels, including royalties and vested interests that lead to dependencies on such sources, despite mitigation targets. Finally, for the energy sector planning, the overarching characteristics focus on policy planning and market regulations, with companies highly involved in the formulation of the plans and related policies, considering both financial and technical aspects.

Strategies to phasing out or down of fossil fuels can directly benefit from the decreasing prices of renewable energy, better regulation

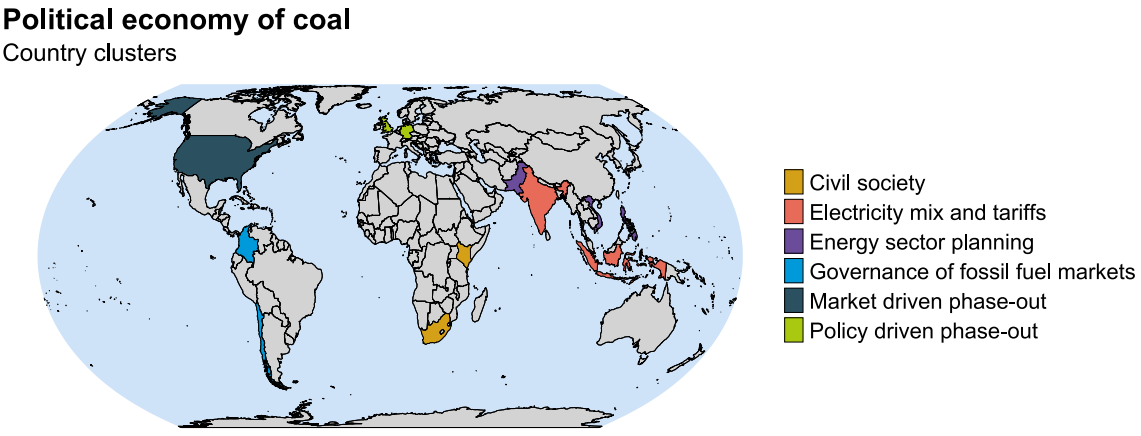


Figure 10: Clustering of countries, based on their topic distributions.

of energy markets, an effective climate policies environment, and support and coordination from multiple actors, including political, societal and private actors.

3.3. Carbon dioxide removal

Carbon Dioxide Removal (CDR) encompasses anthropogenic climate intervention activities that remove CO2 from the atmosphere. Such activities include "nature-based solutions", such as reforestation, afforestation and soil carbon management; "technological solutions", such as direct air capture (DAC); and "hybrid solutions", such as bioenergy with carbon capture and storage (BECCS) and enhanced rock weathering (ERW).

Deep mitigation scenarios often indicate a prominent role for CDR in dealing with the depleting global carbon budget compatible with limiting warming to 1.5°C. In fact, as a result of inaction, the use of CDR is now necessary in order to reach the 1.5°C target. This is also reflected in the ELEVATE scenarios. As we see in Figure 11, CDR becomes increasingly important as we move towards net-zero and the Paris Agreement goals.

However, the deployment of net-negative emissions at such a scale comes with techno-economic, environmental and societal challenges.

In particular, ELEVATE research explored the intergenerational justice and governance implications of CDR in scenarios with overshoot. When current emissions exceed a defined temporal share of a carbon budget, they generate a carbon debt: a future obligation to remove carbon dioxide from the atmosphere. Carbon Removal Obligations (CROs) are a proposed instrument (Bednar et al., 2021) to attach a financial obligation to that debt now, rather than leaving future societies to finance removal.

In the modelled CRO framework, revenues from charging for carbon debt are placed in an intertemporal fund and later used to finance net-negative emissions. This can improve credibility by linking present overshoot to a dedicated future payment stream. However, our findings suggest that this framework does not necessarily eliminate distributional choices.

Pricing of CDR is complex yet plays a central role in the outcomes. If removal providers are paid their average costs under a zero-profit or public-procurement structure, introducing an intertemporal fund does not alter the optimal emissions pathway in the model. It changes the accounting and timing of payments, but not the overall quantity of mitigation and removal.

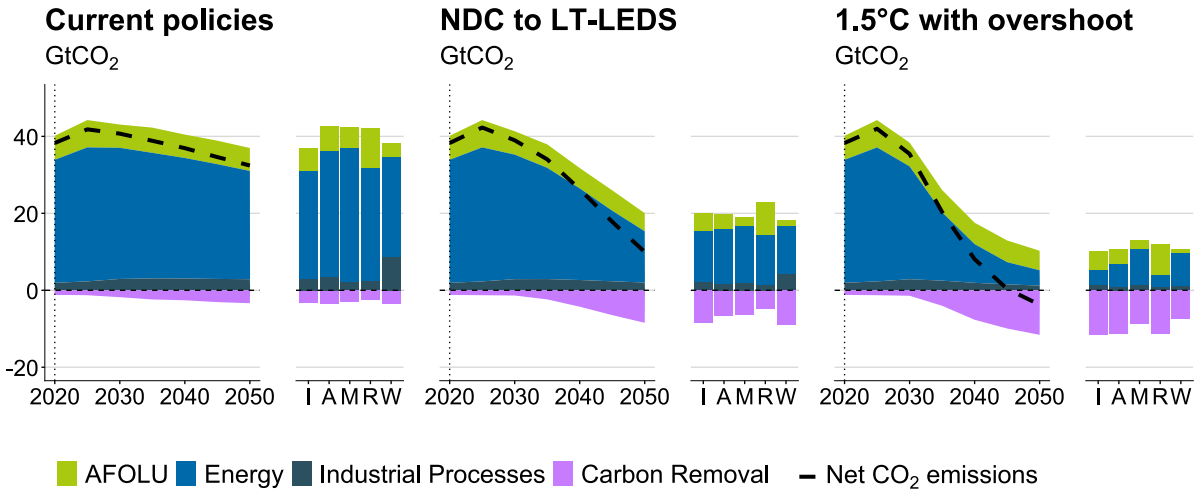


Figure 11: Global CO2 emissions (2020-2050) per sector, including carbon removal, for current policies (CP), NDC-LT-LEDS, and 1.5°C with overshoot scenarios. Left panel (area) shows results for IMAGE for 2020-2050, while right panel (columns) shows results for all models in 2050 (I = IMAGE; A = AIM; M = MESSAGEix; R = REMIND; and W = WITCH).

By contrast, a competitive removal market pays the marginal removal cost. Present emitters must then save enough to cover both future removal costs and the profit margin received by future CDR providers. This transfers wealth from present to future generations and, where removal firms are privately owned, towards owners of capital. In the model, this produces greater near-term mitigation, lower future net-negative emissions, and approximately 50 $GtCO_2$ less removal over the century relative to average-cost pricing. The result is not an argument against competitive markets. It shows that market design has intergenerational and distributive consequences that should be treated as policy choices, not technical details.

CRO systems should also distinguish between temporary offsetting within a period and repayment of accumulated carbon debt across periods. Blurring these functions risks creating poorly targeted funds or incentives for firms to sell into the most profitable market while leaving carbon-debt repayment to higher-cost providers. Long-term contracts, public procurement, or carefully regulated separate markets may be needed where governments seek secure, cost-controlled removal for budget replenishment.
Furthermore, a recent experiment by Fritz et al. (2026) shows that public support for CDR hinges on precisely the procedural and distributive fairness considerations that the design of CRO systems must confront. Through representative surveys from six countries ranging from global north to global south (Brazil, Italy, Malaysia, Norway, Saudi Arabia and the United Kingdom), it examined public support for CDR across diverse socio-political settings, evaluating CDR projects along four different socio-technical attributes: 1) implementing actor i.e., government or company; 2) decision making process, i.e. with or without consultation of experts and the communities; 3) profit distribution (no profit, shared or private profit); and 4) level of removal capacity.

The results, show that procedural fairness (consulting local communities and experts) had the strongest positive effect on public support, followed by distributive fairness, where profit sharing or not-for-profit arrangements consistently increase public support. Projects that privatise profits received the least support across all six countries, which also echoes the low trust in private companies to handle the use of CDR technologies. Importantly, respondents also indicated that higher removal capacity cannot compensate for lack of fairness, as they were unwilling to substitute more participatory approaches to decision making and profit distribution for higher technical performance. This provides interesting insights not just for CDR governance, but also for the prospective role of CDR in scenarios: given the increasing recognition that such technologies will be needed, especially to deal with temperature overshoot, their deployment should not hinder short-term emission reduction efforts, nor come at the cost of unfairness and lack of justice. Participation and societal deliberation should be incorporated more deeply in the national and regional processes where the role and scale of carbon removal are to be decided.

3.4. Lifestyle and behavioural change

Sustainable lifestyle and behaviour changes refer to individual and consumer decisions that, together, reduce the total energy consumption and CO_2 emissions of a population, contributing to the path towards net-zero. A common framework for describing demand-side strategies for reducing emissions, which include lifestyle change, is called Avoid-Shift-Improve: “avoid” is to reduce activity altogether (and thus energy consumption), “shift” is to select lower-carbon options for an activity, and “improve” is to create more energy-efficient means of accomplishing an activity (van Heerden, et al., 2025); Creutzig et al. 2018). Lifestyle change strategies fall mostly in the Avoid and Shift categories, although some Improve strategies can also be considered lifestyle change (van den Berg, et al., 2019).

As part of ELEVATE, we proposed a model intercomparison[1] exercise called “LifestyleMIP” to better understand the impact of lifestyle changes and how different IAMs represent

1 So far, IMAGE, GEM-E3 and COFFEE have joined the exercise.

Table 2: Comprehensive list of sustainable lifestyle changes proposed in LifestyleMIP, tagged with an indication of how they fall into the Avoid-Shift-Improve framework.

	Residential	Transport	Food/Agriculture
Shift	Communal dining	Teleworking Car sharing, car-pooling and taxi services More active transport (walking, cycling) More public transport	Lab-grown meat Vegetarian and flexitarian diets
Avoid	Extending temperature setpoints Reduce use of appliances Fewer and colder showers	Reduced work week Fewer long-distance trips Fewer short-haul air travel	-
Improve	-	-	Optimal cooking/meal prepping Communal dining

them. We identified measures across three main segments (Table 2): the residential sector, the transport sectors, and the food system. Changes in the residential sector revolve around reducing energy demand in appliances, heating, and cooling, as well as shifting towards taking up less space per person (thus being more efficient with heating and cooling). Changes affecting the transport sector include decreasing work commutes (through fewer days on-site or in office, as well as carpooling), shifting transport away from private vehicles (especially towards bicycling and walking, where possible), and both reducing long-haul travel as well as shifting it from planes to trains, where possible. Finally, in the food system, a reduction of food waste and increase in food sharing represents being more efficient with energy use for meeting nutritional needs, and a shift towards more sustainable diets (i.e., diets with lower meat intake) represents a reduction of overall emissions.

The exercise is still ongoing, but preliminary results using the IMAGE model already show that, as expected, sustainable lifestyle and behavioural change drive an overall decrease in energy demand, and thus in emissions (Figure 12). The transportation system sees the largest impact, a reflection of the sheer number of proposed measures. However, much of the total emissions decrease is passed to the electricity sector, suggesting that some lifestyle changes might have less (but still significant) impact in a world that aggressively decarbonizes its electricity generation.

In the real world, lifestyle changes cannot easily be imposed top-down and are often driven by individual behaviours. Hesitance to make sustainable lifestyle changes often comes from social, infrastructural, or informational barriers to sustainable decision-making, and thus policies that seek to encourage it must reduce these barriers and highlight congruent improvements to well-being (Creutzig, et al., 2021), which may help drive adoption. While ELEVATE research shows clear benefits of changing towards more sustainable lifestyles in terms of climate mitigation, more research is needed to better understand the behavioural drivers and potential

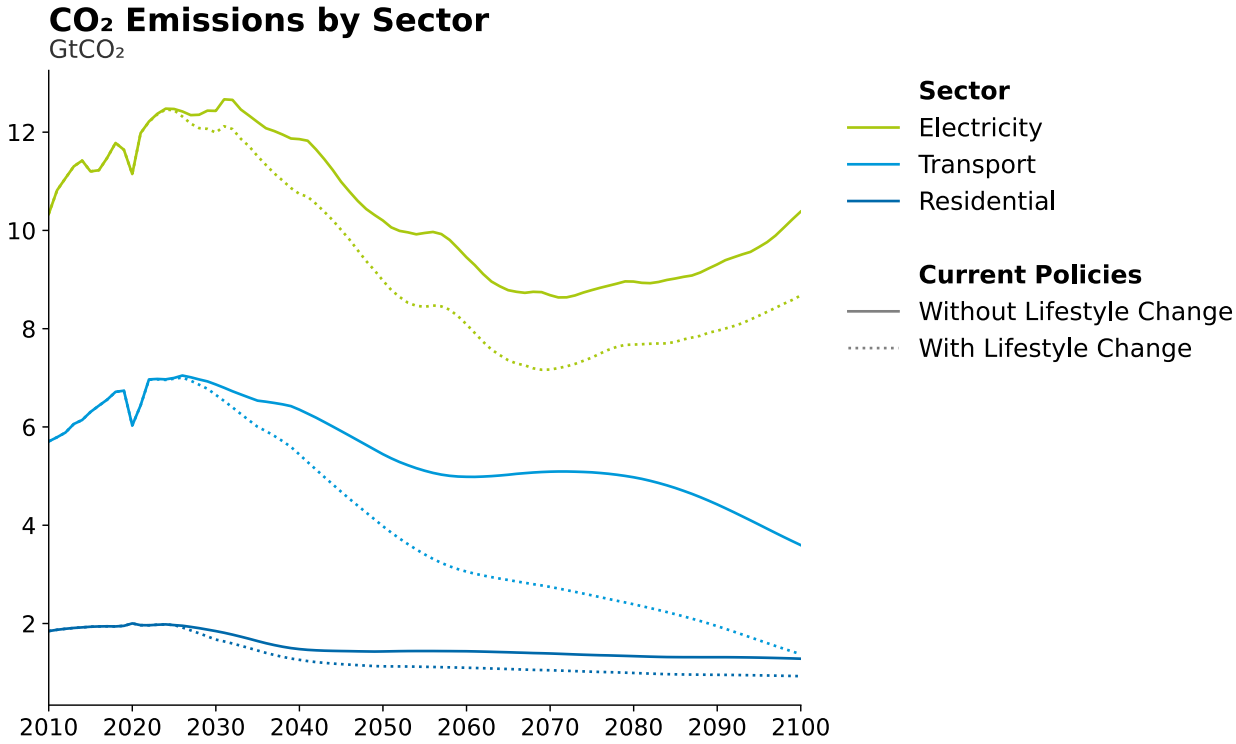


Figure 12: Results from an IMAGE run under current policy assumptions showing the impact of a collection of sustainable lifestyle changes on total emissions in the transport, residential, and electricity generation sectors. The lifestyle changes included are listed in Table 2 and are adopted gradually.

effectiveness of policies that seek to encourage such changes.

3.5. Carbon pricing and institutional capacity

Carbon pricing is often regarded as a cost-effective instrument for reducing greenhouse gas emissions. However, its adoption, design and durability depend as much on political and institutional conditions as on economic efficiency. We draw upon ELEVATE research to set out two complementary entry points for the roadmap: (i) understanding who actually bears the costs of carbon pricing and how institutions can compensate them; (ii) building the political coalitions needed to adopt and sustain carbon taxes.

3.5.1. Political economy barriers, distributional impacts and social protection

Textbook carbon pricing assumes that efficiency and equity can be separated: price the externality, then use the revenue to compensate losers. In practice, governments face two binding constraints. First, they rarely know in advance who the losers are. Missbach and Steckel (2026) construct a harmonised dataset covering 1.7 million households in 88 countries and use supervised machine learning to model the carbon intensity of household consumption[2]. They show that horizontal differences in carbon pricing exposure — between households of similar income — are generally larger than vertical differences between income groups, and that household income alone is a poor predictor of exposure once vehicle ownership, cooking-fuel choice, and urban/rural location are taken into account. Countries cluster into distinct patterns of heterogeneity, implying that a single, globally uniform compensation design (e.g. an equal per-capita transfer) will systematically miss many of the households most affected.

Second, even where the right households can be identified, existing social-protection systems frequently cannot reach them. Missbach et al. (2024) analyse cash-transfer programmes

2 The Carbon Pricing Incidence Calculator (CPIC, www.cpic-global.net) operationalises these findings, allowing policymakers to visualise the distributional incidence of a given carbon price and compensation design across 88 countries.

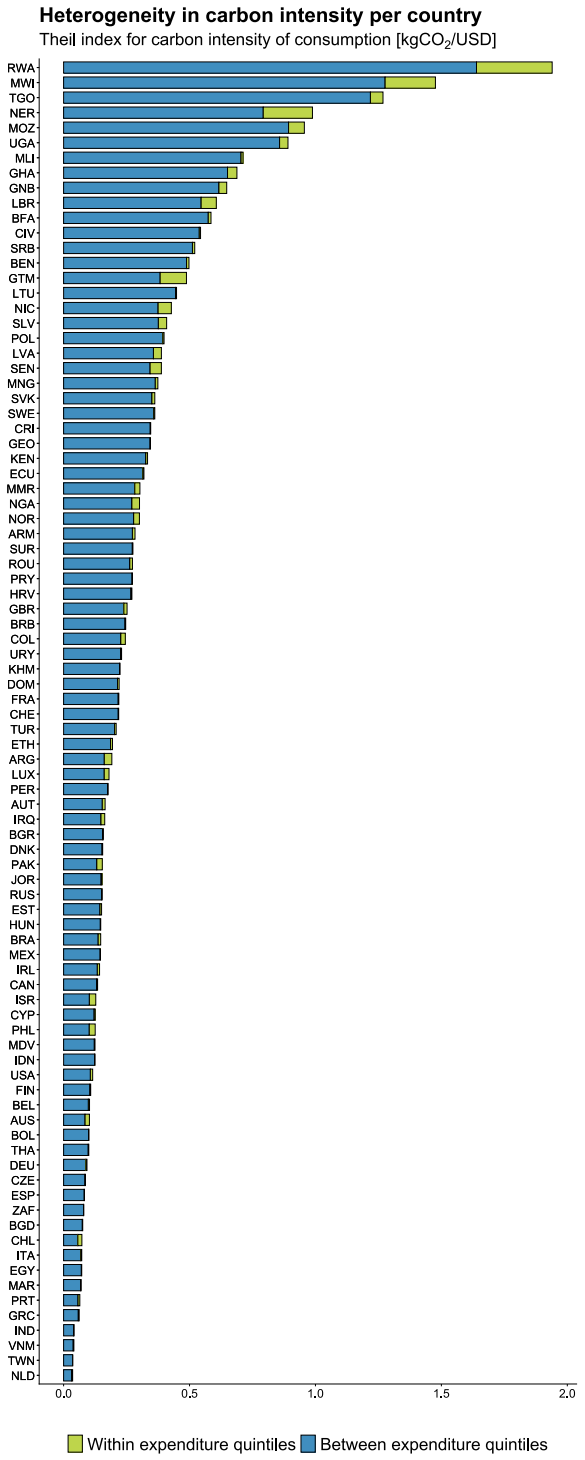


Figure 13: Heterogeneity in carbon intensity (Theil index) distinguishing between and within expenditure quintile heterogeneity. Bars show the Theil index of carbon intensity of consumption for 88 countries. A Theil index of zero indicates perfect homogeneity and the index increases with increasing overall heterogeneity. Countries are sorted by overall heterogeneity. For each country, bars indicate the heterogeneity that can be attributed to heterogeneity within expenditure quintiles (horizontal heterogeneity) and to heterogeneity between expenditure quintiles (vertical heterogeneity).

in 16 Latin American and Caribbean countries and find carbon pricing to be regressive in 11 of them and progressive in only 5; even in the progressive cases, within-quintile heterogeneity exceeds between-quintile differences in most countries. Households bearing the highest costs — those without electricity access, dependent on LPG or firewood for cooking, or car owners in car-dependent settings — are not necessarily covered by programmes such as "Bolsa Família" (Brazil), "Progresa" (Mexico) or "Juntos" (Peru), which were designed for poverty reduction rather than carbon-price compensation and often under-cover the poor while over-covering ineligible households. This is an institutional-capacity constraint as much as a design problem: targeted revenue recycling requires registries, delivery systems and administrative reach that many developing-country social-protection systems still lack. The proposed entry point here is therefore twofold: align carbon-pricing revenue recycling with the expansion and retargeting of existing transfer infrastructure, and invest in the institutional capacity (data systems, registries, delivery channels) needed to make targeted — rather than uniform — compensation feasible.

3.5.2. Strategic framing and coalition building for carbon taxes

Even well-designed, well-compensated carbon taxes can fail to be adopted, or fail to survive, for reasons that have little to do with their distributional design. Klein et al. (in review) conduct a systematic review of the case-study literature on carbon tax adoption, screening over 5,200 studies to identify 64 peer-reviewed cases covering 46 policy attempts across 35 jurisdictions, coded using the Actors–Objectives–Context (AOC) framework. These cases span both national and subnational levels with a wide geographic variation but are mainly concentrated in high-income countries in Europe, in Canada and in Australia. The analysis reveals that carbon taxes are rarely adopted purely on environmental grounds. Instead, they are typically embedded within broader agendas of fiscal reform, economic signalling, or political strategy. Political actors — particularly ministries of finance and environment — are

the most consistently influential in enabling or blocking adoption. Business actors are primarily obstructive, especially in fossil-intensive sectors, while NGOs and technocratic institutions tend to be supportive. Surprisingly, the public plays a limited and inconsistent role in most case studies, suggesting a gap in democratic engagement on this issue.

Klein et al. also identify six distinct clusters of political economy configurations. Some cases, such as those in Finland, South Africa, and Ireland, are marked by economic and climate synergies, where carbon taxes are framed as tools for both environmental protection and fiscal reform. Other successful cases arise in response to fiscal crises, especially during the post-2008 financial downturn, where revenue needs override opposition. A third group involves the crafting of coalitions, where political support is built across different stakeholder groups, often at the cost of reduced policy stringency. Conversely, institutional barriers — such as constitutional veto points, fragmented governance, or legal rulings — explain several cases where carbon taxes failed or were replaced with emissions trading schemes. In countries like Taiwan and Korea, industrial opposition successfully derailed carbon tax proposals. Finally, a set of cases (including Malaysia and Ukraine) is classified as having research gaps, due to sparse scholarly attention and limited publicly available information.

We can discern five practical lessons from the clustering analysis of 46 carbon tax cases. First, carbon taxes are most likely to be adopted where policymakers can credibly frame them around economic–environmental synergies. Success is facilitated by high budgetary pressure, a favourable public discourse on environmental policy, and close collaboration between environment and finance/economy ministries in particular. Second, institutional barriers (unanimity requirements, super-majoritarian rules, shared federal authority, legal challenges) are persistent but careful policy formulation can potentially overcome them, shifting the level of governance, or setting up cross-agency expert task forces to coordinate implementation. Third, well-organised industrial opposition is the hardest obstacle to overcome; where carbon taxes were adopted against such opposition, it was typically only through strong pro-tax coalitions and significant concessions on policy stringency — implying that a coalition-building strategy should anticipate the trade-off between ambition and adoption. Fourth, political actors are the pivotal group both for enacting and blocking carbon taxes, more so than business, civil society or the public. Finally, the international context — summits, agreements, economic crises, and accession-type pressure (e.g., OECD) — repeatedly opens or closes domestic windows of opportunity, therefore aligning national carbon tax pushes with such external moments could also be channelled as a lever.

3.6. International trade measures

Implementation of climate policies is also directly related to international trade. For instance, the current fossil-fuel based systems in many countries rely on large imports of fossil fuel. Transiting towards a net-zero economy has direct trade implications. This is also related to employment, competitiveness, access to finance, and thus to justice and public support.

In ELEVATE research, we concentrate on the European Union's Carbon Boarder Adjustment Mechanism (EU CBAM). From the EU's perspective, CBAM can help address competitiveness and carbon leakage concerns, but for other countries it might be seen as a trade-policy. A study using the FIDELIO model finds that the current EU CBAM has only small aggregate economic and environmental effects, with GDP impacts below 0.5% in the regions analysed and only a small reduction in global CO_2 emissions. Its impacts are considerably stronger at the sectoral and trade level, where it shifts European imports away from more carbon-intensive producers (Rocchi et al., 2024).

Domestic climate policies have substantially larger effects. In ELEVATE scenarios, stronger carbon pricing in China and India reduces their CO_2 emissions by around one quarter by 2040, although with GDP losses of around 2% when

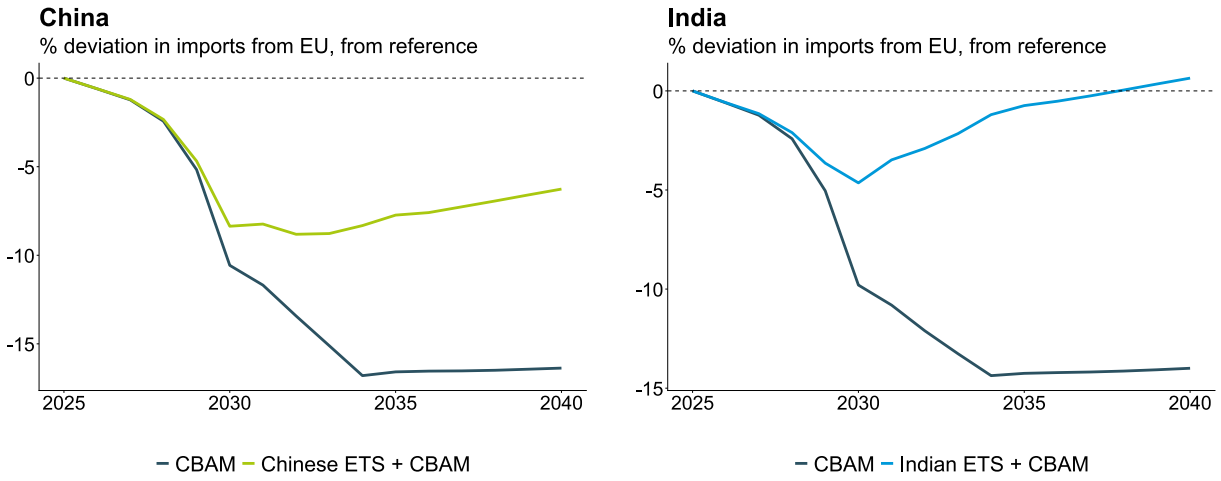


Figure 14: EU CBAM impact on European imports of energy-intensive commodities from China and India under alternative national decarbonisation policies

implemented unilaterally. Importantly, these domestic policies also change the effect of EU CBAM: by reducing the emissions intensity of exports and the corresponding border charge, they substantially reduce the adverse impact of EU CBAM on access to the EU market (Figure 14). This interaction illustrates why carbon border measures are best understood as complementary instruments. CBAM can protect European climate ambition and create incentives for cleaner production among trading partners, but domestic carbon pricing and industrial decarbonisation remain the main drivers of emission reductions.

Tariffs such as EU CBAM should be treated as complementary market instruments, not the core of the decarbonisation engine. International cooperation is key to avoiding a costly and fragmented transition.

International cooperation is essential to avoid a fragmented transition. ELEVATE research (Aleluia et al., 2026) shows that fossil-energy tariffs reduce fossil trade and can accelerate renewables but deliver limited climate benefits. A fragmented world, with tariffs imposed by multiple countries, ends up raising costs, especially for the Global South and fossil exporters. Furthermore, critical materials availability (Figure 15) leads to reshuffled dependencies rather than energy self-sufficiency (Aleluia Reis et al., 2026).

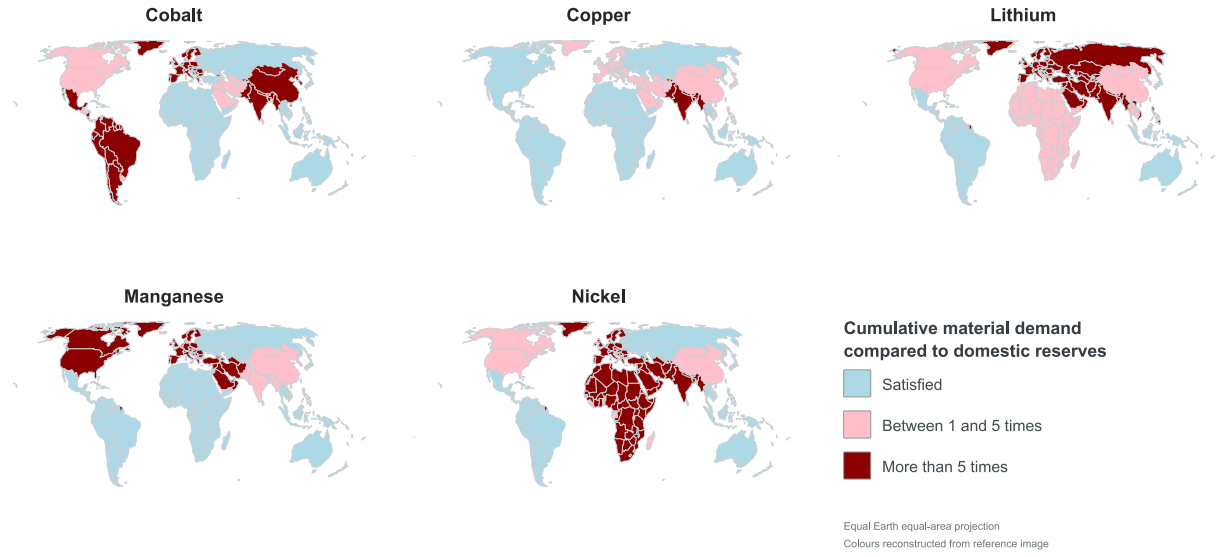


Figure 15: Projected materials demand compared to domestic reserves without tariffs

4. Delivering a just transition

Elina Brutschin, Tommaso Zaini, Setu Pelz, Keywan Riahi (IIASA), Detlef van Vuuren (PBL)

The concept of a just transition encompasses a broad range of concerns, including access to essential services, the distribution of mitigation costs and benefits, historical responsibility, support for affected workers and communities, and the fairness of decision-making processes. The relative importance attached to these dimensions varies across countries, communities and stakeholders, and no single operational definition of justice is likely to achieve universal agreement (Pachauri et al., 2026).

Integrated assessment models (IAMs) cannot resolve these differences in how justice is understood. They can, however, help translate different principles of justice into concrete assumptions and explore what they mean for energy-system transformation, mitigation pathways and international resource flows. By comparing results across different assumptions about what constitutes a fair transition, we can identify which conclusions remain robust and which depend on particular choices about justice.

This enables us to examine questions such as how much additional energy demand would arise if minimum levels of energy services consistent with decent living standards were secured globally, or how different principles for allocating mitigation responsibility would affect the distribution of costs across regions. IAMs can also help distinguish between the geographical allocation of mitigation and the allocation of its financial burden. Mitigation may occur in regions where resource endowments and technological conditions make particular options comparatively effective, while international transfers redistribute the associated costs according to alternative principles of responsibility or capability. This allows the location of mitigation to be separated, at least analytically, from the question of who ultimately finances it. At the same time, such allocations need to account for a broader set of constraints and impacts, including environmental pressures, land and resource availability, effects on local economies and employment, infrastructure requirements, and other social and institutional considerations.

IAM-based scenario analyses describe the implications of alternative allocation principles rather than the political processes through which they might be implemented. The policy instruments, institutional arrangements and compensatory mechanisms required to deliver particular outcomes remain highly context-specific and are not generally represented in global IAMs.

Against this background, this chapter highlights two core policy insights from the ELEVATE work on justice in mitigation pathways. The first concerns access to energy for decent living: how much additional energy would be required to meet basic energy-related service needs globally, where the largest gaps remain, and whether closing them is compatible with ambitious mitigation. The second concerns the distribution of mitigation effort and costs: how alternative principles of responsibility and capability affect regional mitigation pathways and the scale of international financial transfers.

Taken together, the analyses show that incorporating justice considerations can substantially change who needs additional energy, who undertakes mitigation, and who bears the associated costs, without necessarily changing the global climate objective. They therefore help distinguish between constraints that are inherent to the transition and choices about how its benefits, burdens and responsibilities are distributed.

4.1. Energy needs for decent living standards

The first policy insight concerns access to the energy services needed for a decent standard of living. Rather than relying on income alone, the Decent Living Standards (DLS) framework

identifies a set of essential needs—including housing, thermal comfort, water, mobility and other basic services—and estimates the energy needed to provide them. As achieving DLS could increase energy use and increase in energy prices might make it more difficult to achieve DLS, there is a direct relationship between DLS and climate policy.

The initial analysis contributing to the ELEVATE project developed the DESIRE framework to translate these service needs into country-specific energy requirements and compare them with current energy use (Kikstra et al., 2025). The resulting thresholds vary considerably across countries because the same level of service can require very different amounts of energy depending on climate, settlement patterns, transport systems and the efficiency of service provisions.

At the global level, the current energy gap is estimated to be around 57–60 EJ per year (Kikstra et al., 2025). This is substantial for the populations affected, but relatively modest compared with total global final energy use (~15%). The largest share of the gap is associated with transport, highlighting how strongly the result depends on assumptions about mobility needs and the technologies used to provide it. In the sustainable development pathways analysed in Kikstra et al. (2025), efficiency improvements reduce the estimated energy requirements for decent living by 30–46% by 2040, while substantial gaps in access can be closed.

The ongoing analysis initiated under the ELEVATE project takes the next step by implementing common DLS thresholds (Table 3) across a much broader set of integrated assessment models. This allows the same service objectives to be tested under different representations of the energy system. Models differ, for example, in assumed rates of transport electrification, technology costs and efficiencies, fuel switching and the technologies available to satisfy future energy demand. This multi-model experiment provides useful insights on how the same objective of universal DLS access, under the same climate mitigation target, can be achieved with different types of energy transitions.

Preliminary results from the models submitted so far (Figure 16) suggest that meeting the defined DLS thresholds increases global final energy demand by roughly 10–20% around 2040 relative to the corresponding reference pathways. The spread across models is itself an important

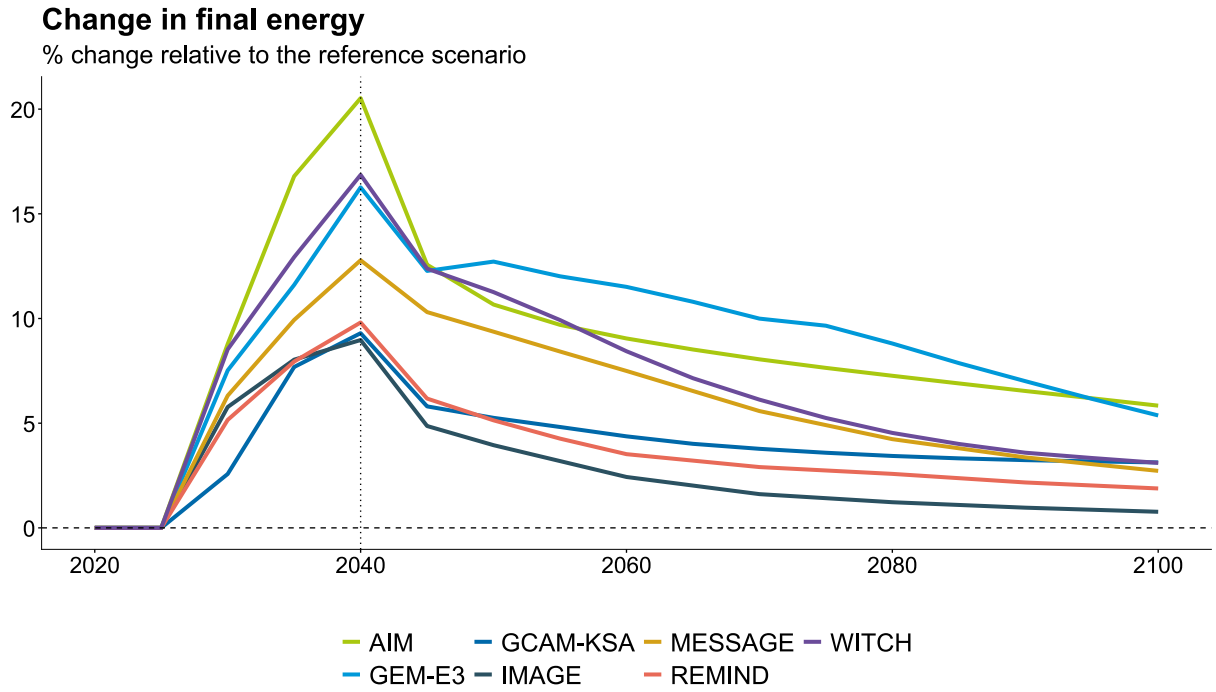


Figure 16: DLS selected thresholds and assumed final energy implications

result: it shows that the energy implications of providing the same minimum level of services depend strongly on how those services are delivered. Models with faster electrification and more efficient technologies tend to require less additional final energy, while less efficient technology and transport configurations imply a larger increase.

This means that DLS should not be interpreted as a single universal energy requirement: the energy needed to secure decent living standards varies across contexts, making uniform per capita primary energy benchmarks potentially misleading. Instead, the analysis identifies a range bounded by the service thresholds on one side and alternative technological and energy-system configurations on the other. The DLS thresholds are themselves scenario assumptions and can therefore be varied, for example with respect to the number of passenger-kilometres considered necessary to support a decent standard of living. This type of analysis therefore makes it possible to explore both how much energy is needed to secure a given level of access and how strongly that requirement depends on the way the future energy system develops.

Table 3: Common DLS thresholds.

DLS dimension	Threshold/proxy
Transport	Country-specific travel needs: 4,903 – 13,900 motorised pkm/cap/year (median: 7,400); plus road network needs
Space and water heating	Heating to 20˚C; 30 litres of hot water per person per day
Shelter	Durable housing for all; minimum 30 m2 dwelling; +10 m2 per person above household size of 3; applied national minimum around 10-15 m2/cap (midpoint = 12.4 m2/cap)
Space cooling	Cooling down to 26˚C
Water	Safely managed clean water supply of 65 litres per person per day

4.2. Distributing mitigation effort and financing the transition

The second policy topic related to justice concerns how mitigation efforts are shared across countries and regions. Even when there is agreement on the overall climate goal, there can be very different views on what constitutes a fair contribution of effort. These differences may reflect historical responsibility, population, economic capability or combinations of these factors. Dekker et al. (2025) recently showed how different definitions of fairness can lead to very different results in distribution of effort.

Recent ELEVATE analysis (Pelz et al., 2026) explores how different effort-sharing principles affect the balance between domestic mitigation and international financial cooperation. It considers six fair-share allocations, combining two approaches — equal cumulative per capita (ECPC) and capability-adjusted cumulative per capita (CAPC) — with three alternative starting years for accounting historical responsibility: 1990, 2015 and 2025. A key distinction is between where emissions reductions take place and who ultimately bears their cost. Mitigation can occur where technological and resource conditions make it comparatively less costly, while financial transfers redistribute part of the associated burden in line with the selected effort-sharing principle.

The results show that substantially different combinations of domestic action and international finance can achieve the same global climate outcome. In the 2°C pathway we analysed, allowing unrestricted international transfers leaves the physical transition unchanged from the cost-effective pathway, but implies cumulative interregional financial flows of US$10.1 to 44.8 trillion (NPV) over 2026–2100, depending on the fairness principle applied. When transfers are instead reduced to the lowest feasible level, their volume falls by more than half, and higher-responsibility regions undertake faster emissions reductions domestically.

This shift in how mitigation effort is shared also changes the pace of the energy transition. When international transfers are constrained and higher-responsibility regions undertake more mitigation domestically, global fossil fuel use in 2040 is 3–21% lower than in the corresponding pathways with unrestricted transfers. At the same time, the overall trajectories for renewable energy, electrification and cumulative emissions to 2100 remain broadly unchanged. The same global climate objective can therefore be achieved through quite different combinations of domestic action and international financial cooperation.

The additional economic cost of shifting more mitigation towards higher-responsibility regions is relatively small at the global level. In the globally cost-effective pathway, global consumption is around 0.8% lower than in a future with no new climate policy. When fair-share principles are introduced and international transfers are constrained, this reduction increases to at most 1.3%. At the same time, regions with lower responsibility and capability experience higher consumption than they would under the cost-effective pathway. In other words, incorporating equity considerations changes who bears the costs of mitigation much more than it changes the overall global economic cost.

These results show that different equity principles do more than redistribute mitigation costs. They can imply substantially different regional transition pathways, affecting how quickly emissions fall, where fossil fuel use declines most strongly, and which regions take on greater domestic mitigation. Making these implications explicit helps policymakers see how alternative understandings of responsibility and capability translate into different national and regional transitions, while still remaining consistent with the same global climate objective.

4.3. Pluralising just transitions

Taken together, the ELEVATE analyses show that justice considerations can be integrated into climate pathways without implying a single definition of a “just” transition. Ensuring decent living standards for all is compatible with ambitious mitigation, while different effort-sharing principles can imply very different combinations of domestic action and international financial transfers without changing the overall climate objective. The value of integrated assessment is therefore not to determine what is just, but to make the implications of alternative assumptions more explicit.

For policymakers, this helps distinguish between two levels of the transition. Global modelling can clarify the scale of the challenge, identify minimum energy and service needs, and show how mitigation effort and financial responsibility can be distributed in different ways. Political science research, however, consistently shows that the acceptability of these outcomes depends on how they are translated into policy. Perceived fairness, compensation for affected groups, and the distribution of costs all shape support for climate action (Bergquist et al., 2022; Drews & van den Bergh, 2016; Maestre-Andrés et al., 2019). Policy instrument choice and framing also matter: policies with similar outcomes can receive very different levels of support depending on who pays, how costs are distributed, and how the intervention is presented (Brannlund & Persson, 2012).

The main implication is that distributional choices and implementation choices need to be considered together. Modelling can reveal where additional energy is needed, how alternative equity principles change the distribution of mitigation effort, and where international finance may be required. But whether these pathways are politically and socially sustainable will depend on the institutions, policy packages and decision-making processes through which they are implemented.

A just transition therefore requires context-specific political strategies. The role of models is to clarify the available choices and their distributional consequences; the role of policy is to determine how those choices are negotiated, implemented and made acceptable in practice.

Exploring patterns of distributional justice in scenarios

Scheifinger et al. (2026) dive into five different patterns of distributional justice: 1) total utilitarian, 2) prioritarian, 3) egalitarian, 4) sufficientarian, and 5) limitarian (Table 4).

Table 4: Patterns of distributional justice: definition and trajectory requirements. Adapted from Scheifinger et al. (2026)

Pattern of distributional justice	Claim	Trajectory requirements
Total utilitarian	Overall improvement: a just distribution increases the total utility across all actors	Aggregated over all actors, the total at the end is greater than at the beginning
Prioritarian	Priority of improvements: those worse off gain the most	The lower the starting point, the higher the gradient
Egalitarian	Everyone has the same: no inequalities among all actors, or reducing inequalities to a target level	All actors converge to the same point
Sufficientarian	Everyone is above a certain threshold (minimum)	Actors below floor increase to floor levels
Limitarian	Everyone is below a certain threshold (maximum)	Actors above ceiling decrease to ceiling levels

In their research, the authors find that prioritarianism is the dominant pattern across the ensemble of scenarios in the IPCC's Sixth Assessment Report (AR6), while limitarian futures were the least represented. Interestingly, most scenarios consistent with a pattern of justice were not designed to model just futures – their outcomes are largely a by-product of the underlying scenario narrative, showing that justice assumptions are frequently made implicitly. Moreover, they find no evidence that any pattern of distributional justice is incompatible with ambitious climate mitigation, and therefore the choice of which pattern to model is a narrative decision. Finally, IAMs should make assumptions about justice more explicit, with a more participatory scenario development process, to help explore the distributional consequences of different justice principles. Nonetheless, the decision of which future to pursue and how to negotiate and implement it remains a political choice, rather than a modelling outcome.

5. The Road Ahead for Climate Action

Detlef van Vuuren, Isabela Schmidt Tagomori (PBL), Benjamin Sovacool (Aarhus)

Over the past few years, partners in ELEVATE cooperated on climate research to support climate policy. During this period, the conditions for effective international climate policy have changed significantly. First of all, we have witnessed rapidly rising global temperature, with 2026, again, being on track to become one of the warmest years on record (National Centers for Environmental Information, 2026). The rapid temperature increase has led to questions as to whether climate sensitivity is potentially higher than considered before (Gyuleva et al., 2026). 2026 has also been the year in which the sobering consensus that the 1.5°C threshold will be exceeded has spread beyond scientists and has become public knowledge (UNEP, 2026). The most optimistic scenarios now (requiring immediate acceleration of climate action) will lead to at least 1.7°C of warming, requiring further adaptation to climate change. That also means that reaching the 1.5°C goal of the Paris Agreement after a mid-century peak can only be achieved if carbon removal from the atmosphere is implemented (Van Vuuren et al., 2026). All in all, this shows that the urgency for climate action has never been higher.

At the same time, the geopolitical landscape has become profoundly challenging for implementing climate policy, internationally but, to some degree, also at the national scale. International cooperation is under severe strain given changes in national priorities, and the USA, one of the largest emitters of greenhouse gas emissions, officially withdrew in 2026 from the Paris Agreement. The UNFCCC negotiations themselves are slowed down, among others, by deeply fractured views on fairness and feasible action among the Parties.

In this closing chapter, written as a contextualisation of our research, we consider possible pathways forward leveraging insights from the ELEVATE project, and sometimes also going beyond. The challenge is to see how climate policy can move forward fast enough, while recognizing the challenging geopolitical landscape.

5.1. Key elements of a (geo) politically changing world

We start this section by looking at the current situation and subsequently analyse the most important factors leading to further fragmentation of international climate policy.

First, the science is more unequivocal than ever on the global benefits of limiting climate change. Research shows that from an optimal, global policy perspective, the benefits of ambitious climate action far outweigh the costs, and pathways to net-zero are technically feasible and economically sound (van der Wijst et al., 2023). This message is also supported by ELEVATE research. For instance, our analysis has shown that cost-optimal pathways exist both towards implementing countries net-zero emission goals and the Paris Agreement goals (Chapter 2). Such pathways rely on the upscaling of renewable energy and transitioning away from fossil fuels, as well as increasing energy efficiency, reducing non-CO2 emissions, and the deployment of carbon dioxide removal technologies (Chapter 3).

Second, while the ambition has increased, with many countries pledging net-zero by around mid-century, the implementation of climate policy to reach it is still insufficient. In fact, ELEVATE research shows that, in the past 10 years, the impact of emission projections at the global scale of national and international climate policies have shifted from increasing to stabilising or even slightly decreasing (Chapter 2). Main drivers of this outcome include the increase in climate action in response to the Paris Agreement, and the rapid technology development of, among others, renewable energy, batteries, and electric vehicles – making it easier and economically attractive to reduce emissions. As a result, the expected global mean temperature change

from just implementing current policies has gone down to around 2.5–3.2°C (Chapter 2), but this is still not good enough to reach the Paris Agreement goals.

Third, climate policy must now be navigated within a fractured landscape — a reality likely to persist for the foreseeable future. Climate change is, in principle, a collective action problem: it can only be solved through sufficient global participation (Bazilian et al., 2019), as emission reductions of only a few countries will not be enough and countries need assurance that other countries will act as well. However, achieving consensus has always been difficult given the disconnection between action, responsibility and impact: the countries suffering most from climate damage are often not those responsible for the climate crisis. It affects all countries in the world, either reaping the benefits or suffering the consequences of the action – or lack thereof – of other countries. While the climate crisis intensifies, the mechanisms for international cooperation are increasingly strained by fragmentation (Section 3.6). Below, we briefly indicate some of the key elements of fragmentation – some of which can also be part of the way forward (Section 5.2):

- Weakened multilateralism: Reports on the latest COPs indicate that international cooperation has become less productive and negotiations are slow. In fact, the role of international institutions itself is being challenged (Kim & Bridgewater, 2025).
- Focus on domestic supply chains: This is partly a reaction to the vulnerabilities of globalisation, exposed by the COVID-19 pandemic, but also driven by conflicts and interests regarding the competitiveness of domestic industries. This factor has led to an increase in trade barriers, export controls, and the "friend-shoring" of critical resources. In fact, international dependencies that were earlier seen in the context of international cooperation and efficiency, are now regarded as a liability due to resources being used as geopolitical leverage.
- Prioritisation of energy security: international conflicts – such as the war between Russia and Ukraine, and between the U.S. and Iran – have heightened concerns regarding energy supply and price volatility, with energy security becoming, for many countries, a more immediate priority than long-term climate goals.
- Existing global inequalities and shifting power: persistent global inequality has always been a root cause of international tension, but the landscape is changing as several developing countries have become significant economic and military powerhouses, fundamentally altering the global balance of power.

These identified trends are expected to continue for the coming years and have direct implications for climate policy. Even more than before, climate policy cannot be treated as a purely environmental issue: it is increasingly shaped by geoeconomic competition and national development interests, rather than by climate targets alone. This creates a two-way synergy, as progressive energy and climate policy can improve national energy security, and vice-versa (Zhang et al., 2026).

At the same time, geopolitical fragmentation raises policy uncertainty and can slow investments, especially in energy transition sectors and in countries exposed to sanctions or trade disruptions. Given the economic, political and demographic change, the global south will be increasingly important, and the diverse interests of global south countries implies that new coalitions will emerge. Furthermore, with the intensified power play and international tension, what will be the role of justice and fairness in the negotiations remains an open question. Overall, climate governance needs to be more aware of geopolitics than before, emphasising incentive mechanisms and building institutions that can function under strategic competition.

5.2. Enablers of action in a fractured landscape

The previous section showed how the landscape for climate policy has changed. In Chapters 3 and Chapter 4, we discussed elements of successful policy based on ELEVATE outcomes. In this

section, we leverage on these insights and go beyond them by discussing possible enablers that could help implement such strategies.

Defining climate policy as part of broader development policy

It is already clear for a long time that climate policy cannot be seen as environmental policy alone (e.g. comparable, for instance, to the regulation of ozone-depleting substances). The main drivers of climate change (the use of fossil fuels and the food system) are fundamentally related to development. Still, in the past it has been attractive to focus mostly on the environmental aspects. The current geopolitical situation, however, implies that it is interesting as part of national and international policy to link climate policy even more to other urgent issues. This can help in avoiding a potential dichotomy between climate policy and development. In reality, in the longer term development and climate policy are aligned (as the damage of climate change strongly outweighs the costs of mitigation) and in the shorter term finding synergy between them can help to raise support.

- Linking climate policy and energy security. Reducing fossil fuel dependency is a national security issue for many countries around the world, and can improve resilience, enable fuel savings, reduce air pollution, and deliver other co-benefits (Sovacool et al., 2020; AbdulRafiu et al., 2025). ELEVATE research shows that energy security and climate policy can be well aligned as part of transitioning away from fossil fuels (Section 3.2). However, it should be noted that the energy transition might create new dependencies, such as those related to critical minerals (Section 3.6).
- Climate policy is industrial policy. Industrial policy is back on the agenda given concerns regarding national competitiveness and supply chains. The most successful policies are therefore those that align decarbonisation with domestic job creation, securing supply chains and technological leadership. At the same time, while this accelerates domestic deployment, it creates new geopolitical tensions as reshoring could exclude currently exporting countries from value chains.
- Relationships of climate policy with other goals, including air pollution and environmental and energy justice. Global estimates put air pollution related deaths at more than 6 million deaths per year, with costs in the order of 6% of global GDP (World Bank, 2022). As there is strong synergy between reducing greenhouse gas emissions and air pollutants, there is a huge benefit for development in most low and middle-income countries from reducing reliance on fossil fuels. Countries are also confronted with other sustainability issues such as biodiversity loss, water security and loss of soil quality. As most of these have direct local benefits, these challenges together make it possible to identify strategies that are less costly than addressing them separately.

Leadership

Collective action problems require leadership. In this context, we briefly analyse the roles the EU and China could play.

Historically, the EU has been a proponent of climate policy for three key reasons: the expected climate impacts in the region, the economic necessity of energy independence, and the fact that interventions and policies that deliver net justice gains can still have winners and losers (Newell et al. 2022). At the moment, the EU faces key questions: how to reconcile climate policy, competitiveness and domestic opposition, and, at the international sphere, how to respond to the demand for greater climate finance by developing countries (given that the U.S. has withdrawn from the UNFCCC).

China is a major emitter, accounting for approximately a third of global emissions and having also high per capita emissions, but it also holds a unique position as global leader in the manufacturing of PV, wind, battery, and EV technologies. As a result, China is likely to benefit from increased global climate action. This also means that by showcasing its domestic success, China has the opportunity to frame mitigation not as a concession, but as a fundamental economic advantage, incentivizing other nations to adopt these technologies. In this context,

China could position itself as a global climate leader, especially towards developing countries (Zhang et al., 2026; Sovacool et al., 2026).

In a historical ruling (International Court of Justice, 2025), the International Court of Justice asked for leadership of all parties, emphasising that the key criterion for contribution is the "highest possible ambition" – thus partly decoupling each party's contribution from that of others. This leaves a potential role for an EU/China leadership in the climate negotiations, possibly together with other major countries like Brazil, India, and the U.S. (after a re-engagement). This would also respond to a new era of a less mono-powered world order. Leadership may be crucial not only in the negotiations, but also in implementing climate and trade policy (e.g., introduction of EVs) and in knowledge transfer and technology development (e.g., renewables or CDR). Such pluralising of leadership would also meet recent calls for more cosmopolitan and inclusive forms of global climate governance (Bauböck 2026; Caney 2025).

Showcase examples of successful action

As discussed in Section 3.2, there are many good examples of successful action across sectors. Countries in different stages of development have succeeded in expanding renewables – such as Denmark, Brazil, Jordan, Kenya and Morocco – while others have been successful in improving efficiency and expanding low carbon technologies in different sectors (including transport, industry, buildings, land use and the power sector) or in reducing non-CO2 emissions. These examples serve as real-world indications that a transition is possible. We acknowledge that policies cannot always be translated one-to-one from one country to another, as national circumstances matter. Nonetheless, as part of an action agenda, learning from each other would be a central pillar, identifying the success factors and translating them into a different context.

Avoid falling into a trap of a choice between mitigation and adaptation

In a world likely to exceed 1.5°C, we must reject the false choice between mitigation and adaptation: both are required. Adaptation is clearly needed to build resilience against climate impacts and extreme weather events. However, the effectiveness of adaptation measures is limited (IPCC, 2023). For instance, there are clear limitations to measures that can be applied to ensure liveable cities facing increasing temperature, stronger heat waves and extreme weather. Recognising the limits of adaptation means that trading off these policy strategies is not fruitful. In fact, both mitigation and adaptation are essential to protect populations against the impacts of climate change.

Finding common ground on climate finance

Transformative action is often stalled by lack of investment and the high cost of capital in developing countries. While economic opportunities to reduce emissions exist, these cannot be reaped given financial constraints: investment costs in developing countries can be several times higher than in developed countries. Climate finance can play a major role, both in terms of direct finance and of insurance for risky investments. However, this has become a highly disputed topic in the climate negotiations. One possibility for building common ground would be to link this to the broader discussions on finance as part of the Bridgetown Initiative (Bridgetown Initiative, 2024). Finding a compromise could help provide a more positive spirit in the negotiations, while ensuring that the resources needed for the transformation are available.

Focusing on coalitions of the willing and sub-national action

Given the difficulty of achieving universal consensus, shifting momentum toward smaller coalitions of the willing can be helpful. This is already happening: the initiatives launched at COP26 in Glasgow (2021) and the International Conference on Transitioning Away from Fossil Fuels in Santa Marta (2026) are examples of coalitions that aim to unite like-minded countries. Building further on this idea can provide momentum for action, in the form of climate clubs or through technology partnerships focused on specific sectors such as green hydrogen, critical minerals, or grid modernisation. The latter can also become attractive "clubs" for other partners to join. However, it is also important to recognise

the limitations of small coalitions: they can result in "selective collectivism" in which countries take only minimal action in areas where co-benefits exist. Therefore, such strategies can only be effective in combination with still pursuing a more global agenda.

The idea to move forward in coalitions of the willing also holds true in pursuing action at the more local levels. Especially cities might be a further locus of action. As centres of both emissions and innovation, they are fertile ground for climate action: cities account for 67-72% of global greenhouse gas emissions and often enjoy higher public support for ambitious policies, positioning them as potential climate leaders (Leffel & Sovacool, 2026). At the moment, action by cities (and companies) are largely based on voluntary initiatives – and as a result often lack concrete, quantifiable targets. It would be a major step forward to strengthen the position of sub-national action – also providing opportunities for change in countries where action at the national level is slow (Roelfsema et al., 2026).

Building trust

In the end, some form of global cooperation is still required for successful climate policy, as shown in Chapter 3.6. Therefore, it is important to replace a situation in which countries negotiate mostly against each other with one in which they work together to fight climate change. At a higher level, the need for trust is partly related to ensuring that parties are able and willing to deliver on their promises – whether in climate mitigation or in collective agreements on climate finance.

There are alternative routes to building trust. One is projects like ELEVATE itself: by having global research institutes around the world collaborate on challenging topics, it becomes possible to develop common ground on steps forward in climate policy. Throughout the project, ELEVATE researchers were in contact with a network of stakeholders – including negotiators, youth negotiators, NGOs, think tanks and civil society. This created a space for sharing knowledge and critical questions and provided an opportunity to build not only common ideas but, most importantly, trust. Such projects should continue – and perhaps be elevated to a more prominent platform.

5.3. A future pathway

The geopolitical difficulties of 2026 are real, but they are not insurmountable. The ELEVATE project has helped to show that the path to a net-zero future is still open. In the current political situation, any credible pathway must be both adaptive and resilient. It should pursue the most effective mitigation options available, while also investing in institutions and arrangements that function even when trust is low – coalitions of the willing, technology partnerships, sustained research collaboration and science-policy interfaces that can build common ground and strengthen climate action over time.

How to improve support for environmental policies? Evidence from five countries

Public support is key to ensuring the success of climate policy. Baum et al. explore how economic and social preferences shape the support for environmental policies, using cross-country, nationally representative surveys in five countries – Brazil, China, Germany, Kenya and the United States.

The study shows that support depends not only on the policy itself, but on the social and risk preferences of respondents, as well as who is the focus or target of such policies. Figure 17 shows that, while there are differences across countries, support for environmental policies is generally higher in the global south. Across the five countries, support is consistently highest for nature protection policies and mitigation policies that employed subsidies, such as investments in renewables and green jobs and businesses. On the other hand, support was lowest for various kinds of taxes, reflecting a broad preference for "pull" versus "push" mechanisms. For taxes, the policy target also matters – taxes on producers (such as airlines) face less resistance than taxes on households and consumer goods. Furthermore, the findings seem to reflect that the perceived restrictiveness of a specific policy on individual freedom matters, for instance given that behavioural nudges also tend to receive lower support.

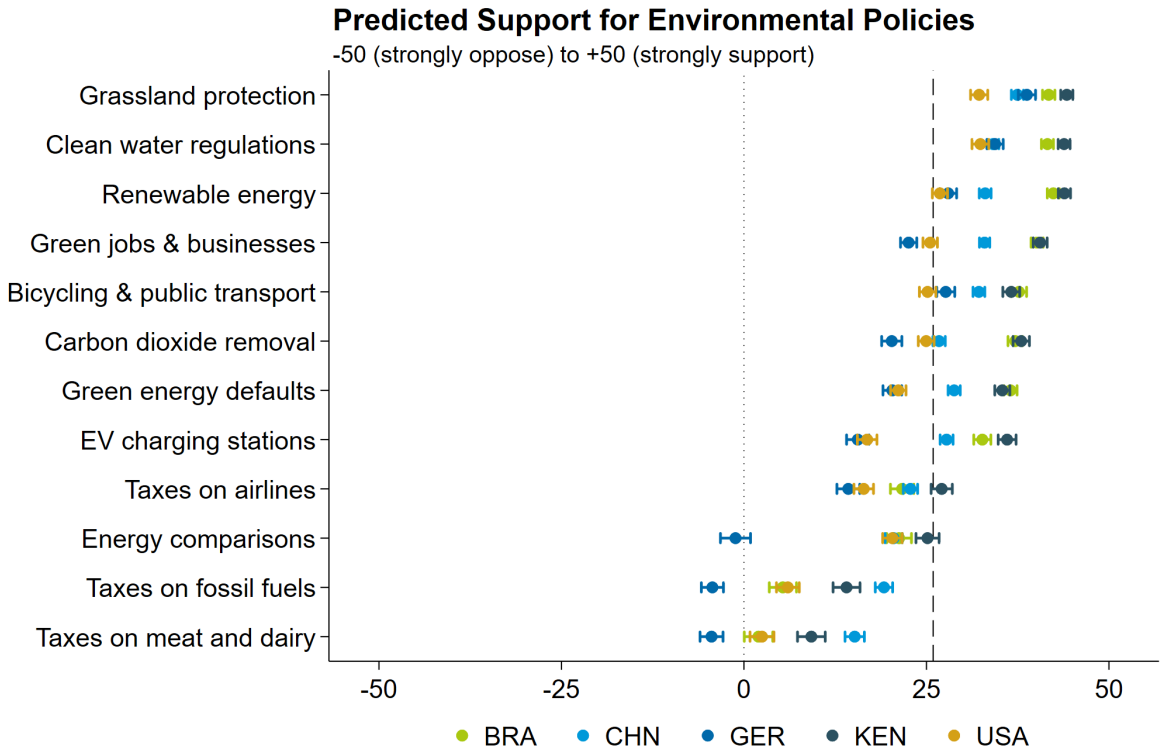


Figure 17: Individual support for environmental policies. Scale: -50 (strongly oppose), 0 (no opinion) and +50 (strongly support). Adapted from Baum et al. (under review).

How to improve support for environmental policies? Evidence from five countries

The study also identifies which social preferences predict support for environmental policies, providing insights through an individual lens on how issues such as fairness and trust matter in this domain. Altruism emerges as the strongest and most consistent predictor, followed by trust and positive reciprocity. Therefore, policies should be framed around such preferences, emphasising co-benefits, especially for the least well-off. Revenue recycling, depending on how it is implemented, and visible benefit-sharing can appeal to the altruistic and reciprocity motives that drive support, notably by linking policies to tangible social or economic benefits. While trust is a potentially more fraught issue, its absence, especially in particular contexts, can provide a richer understanding of why opposition to certain policies materializes. Finally, communication should be tailored to context and aim to make the fairness of policies more visible, while recognising that the same policy will be received differently across countries.

References

AbdulRafiu, A, BK Sovacool, M Hudson, M Maroto-Valer, C Howard. "Beyond Carbon Emissions Reductions: Exploring the Multifaceted Co-Benefits of Industrial Decarbonisation in the United Kingdom," Renewable & Sustainable Energy Technology 8 (December, 2025), 100132, pp. 1-11.

Aleluia Reis, L., Calcaterra, M., Magalar, L., Rocchi, P., Drouet, L., Fragkiadakis, D., Vrontisi, Z., Fragkiadakis, K., Fujimori, S., Fan, L., Nishiura, O., Mandaroux, R., Richters, O., Fuchs, S., Kriegler, E., van Vuuren, D. P., Schmidt Tagomori, I., De Boer, H., Daioglou, V., Fricko, O., van Ruijven, B., Krey, V., & Riahi, K. (2026). Fossil Tariffs and Green Industrial Policy in Fragmented Geopolitics: Multi-Model Evidence on Mitigation Costs and Critical-Minerals Constraints. SSRN. http://dx.doi.org/10.2139/ssrn.6189492

Bauböck, Rainer. "Climate cosmopolitanism: broadening and deepening citizenship in response to the climate crisis." Ethics & Global Politics 19.2 (2026): 64-76. https://doi.org/10.1080/16544951.2026.2660414

Baum, C.M., Lades, L., & Sovacool, B. (2026). Altruism, trust, and reciprocity predict public support for progressive environmental policies. Under review.

Bazilian, M., Bradshaw, M., Goldthau, A., & Westphal, K. (2019). Model and manage the changing geopolitics of energy. Nature 569, 29-3. doi: https://doi.org/10.1038/d41586-019-01312-5

Bednar, J., Obersteiner, M., Baklanov, A. et al. Operationalizing the net-negative carbon economy. Nature 596, 377–383 (2021). https://doi.org/10.1038/s41586-021-03723-9

Bergquist, M., Nilsson, A., Harring, N., & Jagers, S. C. (2022). Meta-analyses of fifteen determinants of public opinion about climate change taxes and laws. Nature Climate Change, 12(3), 235–240. https://doi.org/10.1038/s41558-022-01297-6

Brannlund, R., & Persson, L. (2012). To tax, or not to tax: Preferences for climate policy attributes. Climate Policy, 12(6), 704–721. https://doi.org/10.1080/14693062.2012.675732

Bridgetown Initiative. (2024). Bridgetown-Initiative.Org. https://www.bridgetown-initiative.org/

Caney, Simon. "A Cosmopolitan Perspective." The Oxford Handbook of Intergenerational Ethics (2025): 143.

Carbon Brief (2026). Q&A: What Trump's U.S. exit from UNFCCC and IPCC could mean for climate action. https://www.carbonbrief.org/qa-what-trumps-us-exit-from-unfccc-and-ipcc-could-mean-for-climate-action

Carbon Brief. (2025). Analysis: Clean energy just put China's CO2 emissions into reverse for first time. https://www.carbonbrief.org/analysis-clean-energy-just-put-chinas-co2-emissions-into-reverse-for-first-time

Climate Action Tracker. (2026a). The United States I Net zero targets. https://climateactiontracker.org/countries/usa/

Climate Action Tracker. (2026b). China I Net zero targets. https://climateactiontracker.org/countries/china/

Climate Action Tracker. (2026c). India I Net zero targets. https://climateactiontracker.org/countries/india/net-zero-targets/

Climate Action Tracker. (2026d). Brazil I Net zero targets. https://climateactiontracker.org/countries/brazil/net-zero-targets/

Climate Action Tracker. (2026e). Saudi Arabia I Net zero targets. https://climateactiontracker.org/countries/saudi-arabia/2035-ndc/

Climate Action Tracker. (2026f). Nigeria I Net zero targets. https://climateactiontracker.org/countries/nigeria/

Creutzig, Felix, et al. "Towards demand-side solutions for mitigating climate change." Nature Climate Change 8.4 (2018): 260-263.

Dafnomilis, I., Hooijschuur, E., Schmidt Tagomori, I., van Soest, H., Roelfsema, M., & den Elzen, M. (2026). Climate Policy Modelling Protocol [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.22231548

Drews, S., & van den Bergh, J. C. J. M. (2016). What explains public support for climate policies? A review of empirical and experimental studies. Climate Policy, 16(7), 855–876. https://doi.org/10.1080/14693062.2015.1058240

Earth.Org. (2026). Amsterdam, Florence become latest cities to ban fossil fuel ads. Earth.Org. https://earth.org/amsterdam-florence-become-latest-cities-to-ban-fossil-fuel-ads/

European Commission (2025). The nationally determined contribution of the European Union and its Member States. https://unfccc.int/sites/default/files/2025-11/DK-2025-11-05%20EU%20NDC.pdf

European Union (2021). REGULATION (EU) 2021/1119 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. https://eur-lex.europa.eu/eli/reg/2021/1119/oj

Federal Government of Nigeria. (2025). Nigeria's Third Nationally Determined Contribution (NDC3.0)

Fritz, L., Losi, L., Merk, C. et al. Public support for novel carbon removal hinges on procedural and distributive fairness. Nat. Clim. Chang. 16, 1152–1161 (2026). https://doi.org/10.1038/s41558-026-02741-7

Government of Brazil. (2024). BRAZIL'S NDC National determination to contribute and transform. https://unfccc.int/sites/default/files/2024-11/Brazil_Second%20Nationally%20Determined%20Contribution%20%28NDC%29_November2024.pdf

Government of Canada. (2021). Canadian Net-Zero Emissions Accountability Act. https://laws-lois.justice.gc.ca/eng/acts/c-19.3/fulltext.html

Government of Canada. (2025a). Canada's 2035 Nationally Determined Contribution. https://unfccc.int/sites/default/files/2025-02/Canada%27s%202035%20Nationally%20Determined%20Contribution_ENc.pdf

Government of Canada. (2025b). Removing the consumer carbon price, effective April 1, 2025. https://www.canada.ca/en/department-finance/news/2025/03/removing-the-consumer-carbon-price-effective-april-1-2025.html

Government of Canada. (2026). Canada Gazette, Part I, Volume 160, Number 33: Regulations Amending the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations. https://gazette.gc.ca/rp-pr/p1/2026/2026-08-15/html/reg2-eng.html

Government of India. (2022). India's long-term low-carbon development strategy. https://unfccc.int/sites/default/ files/NDC/2022-08/India Updated First Nationally Determined Contrib.pdf

Government of India. (2026). India's Nationally Determined Contribution. https://unfccc.int/sites/default/files/2026-04/INDIA%20NDC%202031-35.pdf

Government of Japan. (2025). Japan's Nationally Determined Contribution (NDC). https://unfccc.int/sites/default/files/2025-02/Japans%202035-2040%20NDC.pdf

Government of the Netherlands. (2026). Final report of the first conference on transitioning away from fossil fuels. https://www.government.nl/documents/2026/06/23/report-1st-conference-on-transitioning-away-from-fossil-fuels

Gyuleva, G., Fischer, E. M., Knutti, R., & Sippel, S. (2026). Recent Temperature and Energy Imbalance Trends Point to Higher Estimates of Future Warming. https://doi.org/10.22541/essoar.177245874.45134681/v2

Hooijschuur, E., Schmidt Tagomori, I., Dafnomilis, I., & van Vuuren, D. (2026). ELEVATE modelling protocol on transition scenarios to net-zero (Version v1). Zenodo. https://doi.org/10.5281/zenodo.22657403

IEA (2026), Total energy supply from fossil fuels, 2023-2025, IEA, Paris https://www.iea.org/data-and-statistics/charts/total-energy-supply-from-fossil-fuels-2023-2025, Licence: CC BY 4.0

International Court of Justice. (2025). Obligations of States in respect of Climate Change (Advisory Opinion). https://www.icj-cij.org/case/187

IPCC. (2023). AR6 synthesis report: Climate change 2023. Ipcc; IPCC. https://www.ipcc.ch/report/sixth-assessment-report-cycle/

Kikstra, J. S., Daioglou, V., Min, J., Sferra, F., Soergel, B., Kriegler, E., Lee, H., Mastrucci, A., Pachauri, S., Rao, N., Rauner, S., van Vuuren, D., Riahi, K., van Ruijven, B., & Rogelj, J. (2025). Closing decent living gaps in energy and emissions scenarios: Introducing DESIRE. Environmental Research Letters, 20(5), 054038. https://doi.org/10.1088/1748-9326/adc3ad

Kim, R. E., & Bridgewater, P. (2025). Environmental treaties are paralysed — Here's how we can do better. Nature, 646(8087), 1054–1056. https://doi.org/10.1038/d41586-025-03477-8

Kingdom of Saudi Arabia. (2025). Second Nationally Determined Contribution. https://unfccc.int/sites/default/files/2026-01/2nd%20KSA%20NDC%20Document%20Final%20Document%20%2828122025%29_DNA.pdf"

Klein, Franziska, Niklas Kramer, and Jan Christoph Steckel. 2025. 'The Politics of Carbon Taxes: Determinants of Successful Policy Adoption'. Unpublished Manuscript

Leffel, B., & Sovacool, B. K. (2026). Accelerating global city commitments and actions on climate change. Energy and Climate Change, 7, 100233. https://doi.org/10.1016/J.EGYCC.2025.100233

Maestre-Andrés, S., Drews, S., & van den Bergh, J. (2019). Perceived fairness and public acceptability of carbon pricing: A review of the literature. Climate Policy, 19(9), 1186–1204. https://doi.org/10.1080/14693062.2019.1639490

Manych, N., Müller-Hansen, F., & Steckel, J. C. (2023). The political economy of coal across 12 countries: Analysing qualitative interviews with topic models. Energy Research and Social Science, 101. https://doi.org/10.1016/j.erss.2023.103137

Metreau, E., Young, K. E., & Eapen, S. G. (2024, July 1). World Bank country classifications by income level for 2024-2025. World Bank. https://blogs.worldbank.org/en/opendata/world-bank-country-classifications-by-income-level-for-2024-2025

Ministry of Ecology and Environment. (2025). China's Nationally Determined Contribution Report for 2035. https://unfccc.int/sites/default/files/2025-11/2035%E5%B9%B4%E4%B8%AD%E5%9B%BD%E5%9B%BD%E5%AE%B6%E8%87%AA%E4%B8%BB%E8%B4%A1%E7%8C%AE%E6%8A%A5%E5%91%8A.pdf

Missbach, L., & Steckel, J. C. (2026). The heterogeneous effects of climate policy on households: Evidence from 88 countries. Journal of Environmental Economics and Management, 103382. https://doi.org/10.1016/j.jeem.2026.103382

Missbach, L., Steckel, J. C., & Vogt-Schilb, A. (2024). Cash transfers in the context of carbon pricing reforms in Latin America and the Caribbean. World Development, 173, 106406. https://doi.org/10.1016/J.WORLDDEV.2023.106406

National Centers for Environmental Information. (2026). Monitoring Global Temperature and Precipitation in September 2026. https://www.ncei.noaa.gov/news/global-climate-202609

Net Zero Tracker. (2026). China — 2060. https://zerotracker.net/countries/china-cou-0019

Newell, Peter J., Frank W. Geels, and Benjamin K. Sovacool. "Navigating tensions between rapid and just low-carbon transitions." Environmental Research Letters 17.4 (2022): 041006.

Pachauri, S., Brutschin, E., Gidden, M. J., Hasegawa, T., Hejazi, M., Jiang, K., Kikstra, J. S., Krey, V., Lamb, W. F., Mintz-Woo, K., Nauels, A., Pelz, S., Rogelj, J., Roy, J., Schaeffer, R., Scheifinger, K., Sokona, Y., Tavoni, M., Ruijven, B. van, … Riahi, K. (2026). Advancing representations of equity and justice in climate mitigation futures. PLOS Climate, 5(2), e0000763. https://doi.org/10.1371/journal.pclm.0000763

Republic of South Africa. (2020). South Africa's Low Emission Development Strategy. https://unfccc.int/sites/default/files/resource/South%20Africa%27s%20Low%20Emission%20Development%20Strategy.pdf

Republic of South Africa. (2025). South Africa's Second Nationally Determined Contribution Under The Paris Agreement. https://unfccc.int/sites/default/files/2025-10/South%20Africa%27s%20second%20Nationally%20Determined%20Contribution_2025.pdf

Rocchi, P., Lobato, E. C., Di Bella, A., & Bosetti, V. (n.d.). Expanding carbon pricing boundaries and the EU CBAM: insights into China and India. Retrieved https://ssrn.com/abstract=4997200

Roelfsema, M., Harmsen, M., Dafnomilis, I., & den Elzen, M. (2026). From agenda to action: Accountability through measurable goals (Policy brief). PBL The Netherlands.

Sovacool, BK, M Martiskainen, A Hook, and LH Baker. "Beyond cost and carbon: The multidimensional co-benefits of low carbon transitions in Europe," Ecological Economics 169 (March, 2020), 106529, pp. 1-19.

Sovacool, BK, W Zhang, M Iskandarova and S Griffiths. "Beyond a Single Path: A Meta-Theoretical Review of How Spatial, Political, and Institutional Dynamics Shape China's Net-Zero Transition," Energy Research & Social Science 138 (August, 2026), 104828, pp. 1-16.

The Climate Group. (2026). From Dialogue to Delivery: How South Africa's Provinces Are Shaping the 2035 Climate Agenda. https://www.theclimategroup.org/dialogue-delivery-how-south-africas-provinces-are-shaping-2035-climate-agenda

UNEP (2026). Limiting Overshoot: Navigating Exceedance of 1.5°C and Pathways towards Return, Nairobi

United Nations Framework Convention on Climate Change (UNFCCC). (2023). Outcome of the first global stocktake (Decision 1/CMA.5). (Climate Agreement Decision Report FCCC/PA/CMA/2023/16/Add.1; p. 2) https://unfccc.int/sites/default/files/resource/cma2023_16a01E.pdf

van der Wijst, KI., Bosello, F., Dasgupta, S. et al. New damage curves and multimodel analysis suggest lower optimal temperature. Nat. Clim. Chang. 13, 434–441 (2023). https://doi.org/10.1038/s41558-023-01636-1

van Heerden, R., Edelenbosch, O.Y., Daioglou, V. et al. Demand-side strategies enable rapid and deep cuts in buildings and transport emissions to 2050. Nat Energy 10, 380–394 (2025). https://doi.org/10.1038/s41560-025-01703-1

Van Vuuren, D. P., O'Neill, B. C., Tebaldi, C., Sanderson, B. M., Chini, L. P., Friedlingstein, P., Hasegawa, T., Riahi, K., Govindasamy, B., Bauer, N., Eyring, V., Fall, C. M. N., Frieler, K., Gidden, M. J., Gohar, L. K., Högner, A., Jones, A. D., Kikstra, J., King, A., ... Ziehn, T. (2026). The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7). Geoscientific Model Development, 19(7), 2627–2656. https://doi.org/10.5194/gmd-19-2627-2026

World Bank. (2022). The Global Health Cost of PM2.5 Air Pollution: A Case for Action Beyond 2021. International Development in Focus;. © World Bank. http://hdl.handle.net/10986/36501 License: CC BY 3.0 IGO

Zhang, S., Sovacool, B. K., & Wei, C. (2026). Do clean energy transitions enhance global energy security? A comparative analysis of trends and tradeoffs across eight major economies, 1990-2020. Energy Policy, 212, 115164. https://doi.org/10.1016/J.ENPOL.2026.115164

Zhang, W, M Iskandarova, S Griffiths and BK Sovacool, "Faster, Higher, Fairer? How Multi-level Instrumental Justice Reconfigures Net-Zero Energy Transitions in China," Energy Policy 215 (August, 2026), 115301, pp. 1-13.

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