



The point of return

Urgent emissions cuts needed to come
back from overshoot of 1.5°C

ISBN: 978-92-807-4308-1
Job number: DEP/2790/NA
DOI: <https://doi.org/10.59117/20.500.11822/50038>

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Suggested citation

United Nations Environment Programme (2026). *Emissions Gap Report 2026: The point of return – Urgent emissions cuts needed to come back from overshoot of 1.5°C*. Olhoff, A. (chief ed.), Lamb, W., Kuramochi, T., Rogelj, J., Pelz, S., Khanna, T., Boehm, S., den Elzen, M., Jeffery, L., Minx, J., Muûls, M., Pachauri, S., Pathak, M., Riahi, K. and Sudharmma Vishwanathan, S. (eds). Nairobi. <https://doi.org/10.59117/20.500.11822/50038>.

Production: Nairobi
URL: <https://www.unep.org/en/publications/report/emissions-gap-report-2026>
Cover credit: Beverley McDonald

Co-produced with:



Supported by:



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Government of the Netherlands



Federal Foreign Office



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Emissions Gap Report 2026

In memory of John Christensen

Acknowledgements

The United Nations Environment Programme (UNEP) extends its gratitude to the members of the steering committee, the chief scientific editor, the lead and contributing authors, the reviewers, and the secretariat for their contributions to the preparation of this report. Authors and reviewers have contributed to the report in their individual capacities. Their affiliations are only mentioned for identification purposes.

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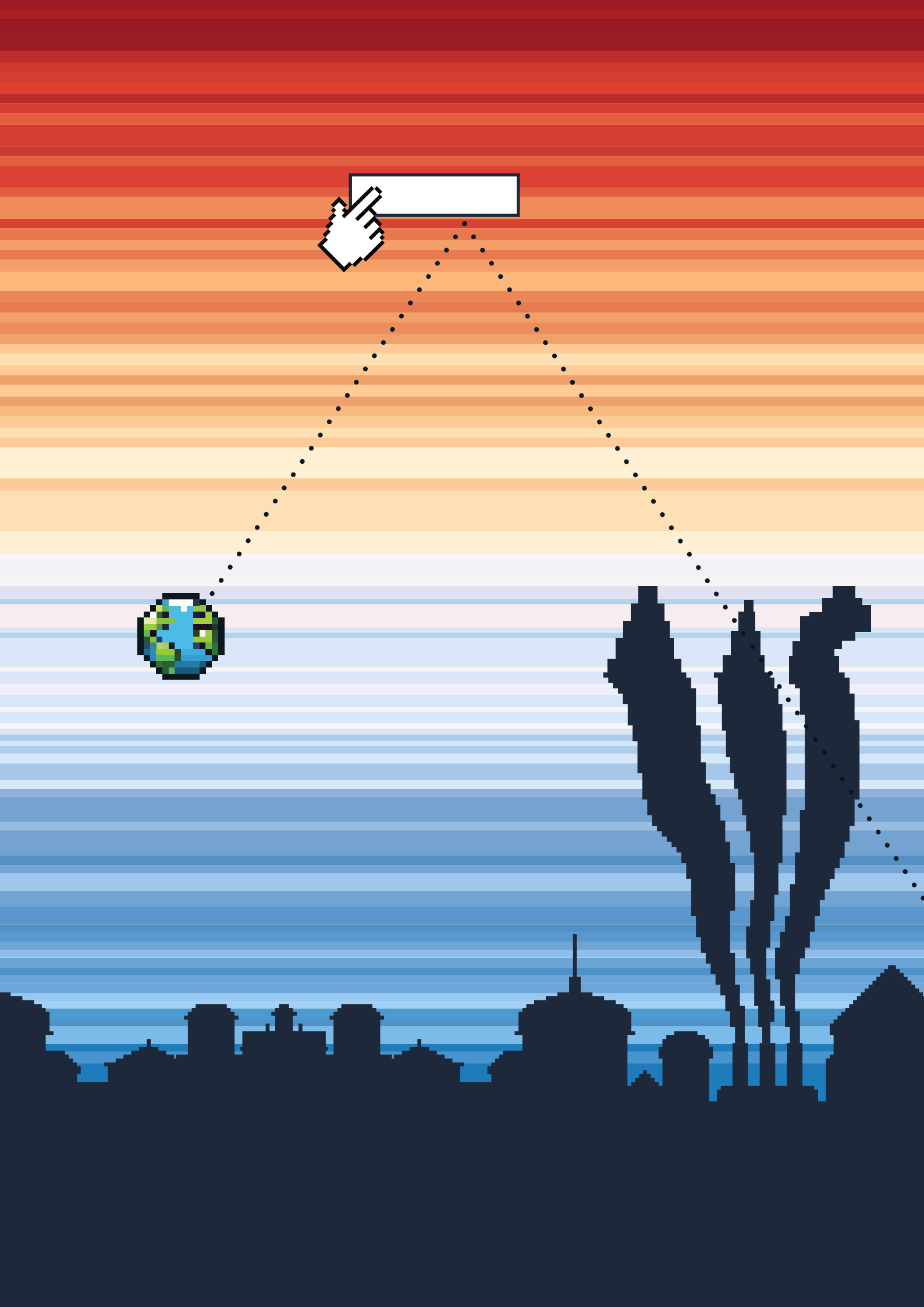
Translation of the executive summary and language editing

Strategic Agenda

Thanks also to:

Zhuolun Chen (UNEP-CCC), Kathryn Eden (Department of Climate Change, Energy, the Environment and Water, Australia), Kelsey Gray (Department of Climate Change, Energy, the Environment and Water, Australia), Clara Bartram Gurrusø (UNEP), Christian Ibsen (CONCITO), Mohamed Walid Jomni (UNEP-CCC), Aiymgul Kerimray (UNEP-CCC), Pia Riis Kofoed-Hansen (UNEP-CCC), Jarl Krausing (CONCITO), Thomas Laursen (UNEP-CCC), Virginia Njoroge (UNEP), Thibaut Pasquet (UNEP-CCC), Rafael Peralta (UNEP), Alejandro Regatero Labadia (UNEP-CCC), Audrey Ringler (UNEP), Pinya Sarasas (UNEP) and Steven Stone (UNEP)

The 2026 edition of the Emissions Gap Report is supported by the Environment Fund, UNEP's core financial fund. UNEP would like to thank the Danish Ministry of Foreign Affairs, Climate Emergency Collaboration Group, the International Climate Initiative of Germany, and the Dutch Ministry of Economic Affairs and Climate Policy for their support to produce the Emissions Gap Report 2026.



Glossary

This glossary is compiled drawing on glossaries and other resources available on the websites of the following organizations, networks and projects: the Intergovernmental Panel on Climate Change, United Nations Environment Programme and United Nations Framework Convention on Climate Change (UNFCCC).

Anthropogenic emissions: Emissions derived from human activities.

Carbon dioxide emission budget (or carbon budget): For a given temperature rise limit, for example a 1.5°C or 2°C long-term limit, the corresponding carbon budget reflects the total amount of carbon emissions that can be emitted for temperatures to stay below that limit. Stated differently, a carbon budget is an area under a carbon dioxide (CO₂) emission trajectory that satisfies assumptions about limits on cumulative emissions estimated to avoid a certain level of global mean surface temperature rise.

Carbon dioxide equivalent (CO₂e): A way to place emissions of various radiative forcing agents on a common footing by accounting for their effect on the climate. It describes, for a given mixture and amount of greenhouse gases (GHGs), the amount of CO₂ that would have the same global warming ability, when measured over a specified time period. For the purpose of this report, unless otherwise specified, GHG emissions are the sum of the basket of GHGs listed in Annex A to the Kyoto Protocol, expressed as CO₂e, assuming a 100-year global warming potential.

Carbon dioxide removal (CDR): Refers to anthropogenic activities removing CO₂ from the atmosphere and durably storing it in geological, terrestrial or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage, but excludes natural CO₂ uptake not directly caused by human activities.

Conditional nationally determined contribution: A nationally determined contribution (see below) proposed by some countries that is contingent on a range of possible conditions, such as the ability of national legislatures to enact the necessary laws, ambitious action from other countries, realization of finance and technical support, or other factors.

Conference of the Parties to the United Nations Framework Convention on Climate Change (COP): The supreme body of the UNFCCC. It currently meets once a year to review the UNFCCC's progress.

Emissions pathway: The trajectory of annual GHG emissions over time.

Global stocktake (GST): The GST was established under Article 14 of the Paris Agreement. It is a process for Member States and stakeholders to assess whether they are collectively making progress towards meeting the goals of the Paris Climate Change Agreement. The GST assesses everything related to where the world stands on climate action and support, identifying the gaps, and working together to agree on solutions pathways, to 2030 and beyond. The first GST was completed during COP 28 in 2023, with the second scheduled for COP 33 in 2028.

Global warming potential (GWP): An index representing the combined effect of the differing times GHGs remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

Greenhouse gases (GHGs): The atmospheric gases responsible for causing global warming and climatic change. The major GHGs are CO₂, methane (CH₄) and nitrous oxide (N₂O). Less prevalent but very powerful GHGs include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

Integrated assessment models: Models that seek to combine knowledge from multiple disciplines in the form of equations and/or algorithms, in order to explore complex environmental problems. As such, they describe the full chain of climate change, from the production of GHGs to atmospheric responses. This necessarily includes relevant links and feedback between socioeconomic and biophysical processes.

Land use, land-use change and forestry (LULUCF): A GHG inventory sector that covers emissions and removals of GHGs resulting from direct human-induced LULUCF activities.

Least-cost pathway: Least-cost pathway scenarios identify the least expensive combination of mitigation options to fulfil a specific climate target. A least-cost scenario is based on the premise that, if an overarching climate objective is set, society wants to achieve this at the lowest possible cost over time. It also assumes that global actions start at the base year of model simulations (usually close to the current year) and are implemented following a cost-optimal (cost-efficient) sharing of the mitigation burden between current and future generations, depending on the social discount rate.

Likely chance: A likelihood greater than 66 per cent chance. Used in this assessment to convey the probabilities of meeting temperature limits.

Medoid: Medoids are representative objects of a data set or a cluster within a data set whose sum of dissimilarities to all the objects in the cluster is minimal. Medoids are similar in concept to means or centroids, but medoids are always restricted to be members of the data set. Medoids are most commonly used on data when a mean or centroid cannot be defined, such as graphs. They are also used in contexts where the centroid is not representative of the data set.

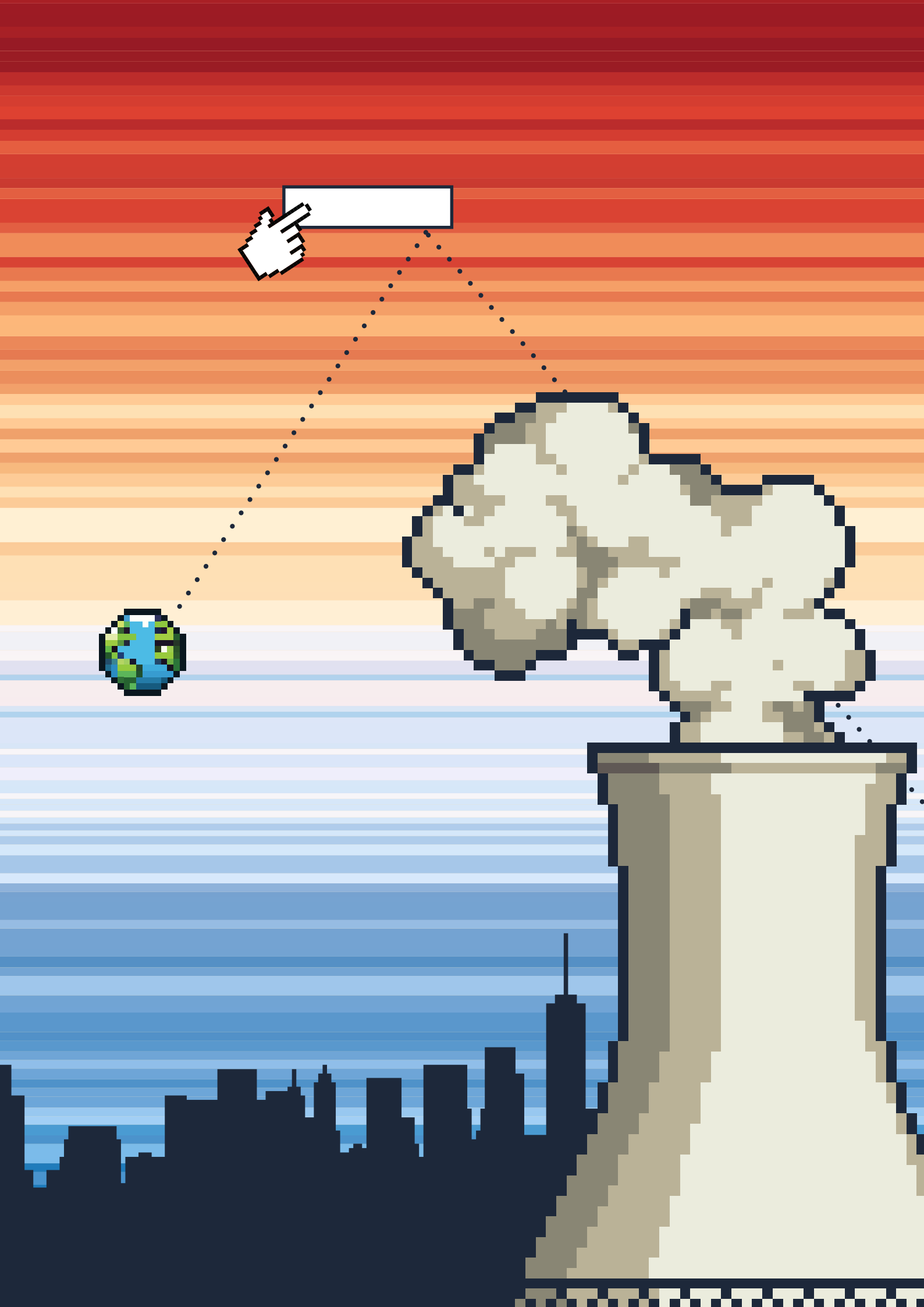
Mitigation: In the context of climate change, mitigation relates to a human intervention to reduce the sources or enhance the sinks of GHGs. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other “sinks” to remove greater amounts of CO₂ from the atmosphere.

Nationally determined contribution (NDC): Submissions by countries that have ratified the Paris Agreement which present their national efforts to reach the Paris Agreement’s long-term temperature goal of limiting warming to well below 2°C. New or updated NDCs are to be submitted in 2020 and every five years thereafter. NDCs thus represent a country’s current ambition or target for reducing emissions nationally.

Overshoot pathways: Pathways that first exceed a specified global warming level (e.g. 1.5°C) followed by a decline to or below that level again during a specified period (e.g. before 2100). Sometimes the magnitude and likelihood of the overshoot are also characterized. The overshoot duration can vary, but typically lasts for multiple decades.

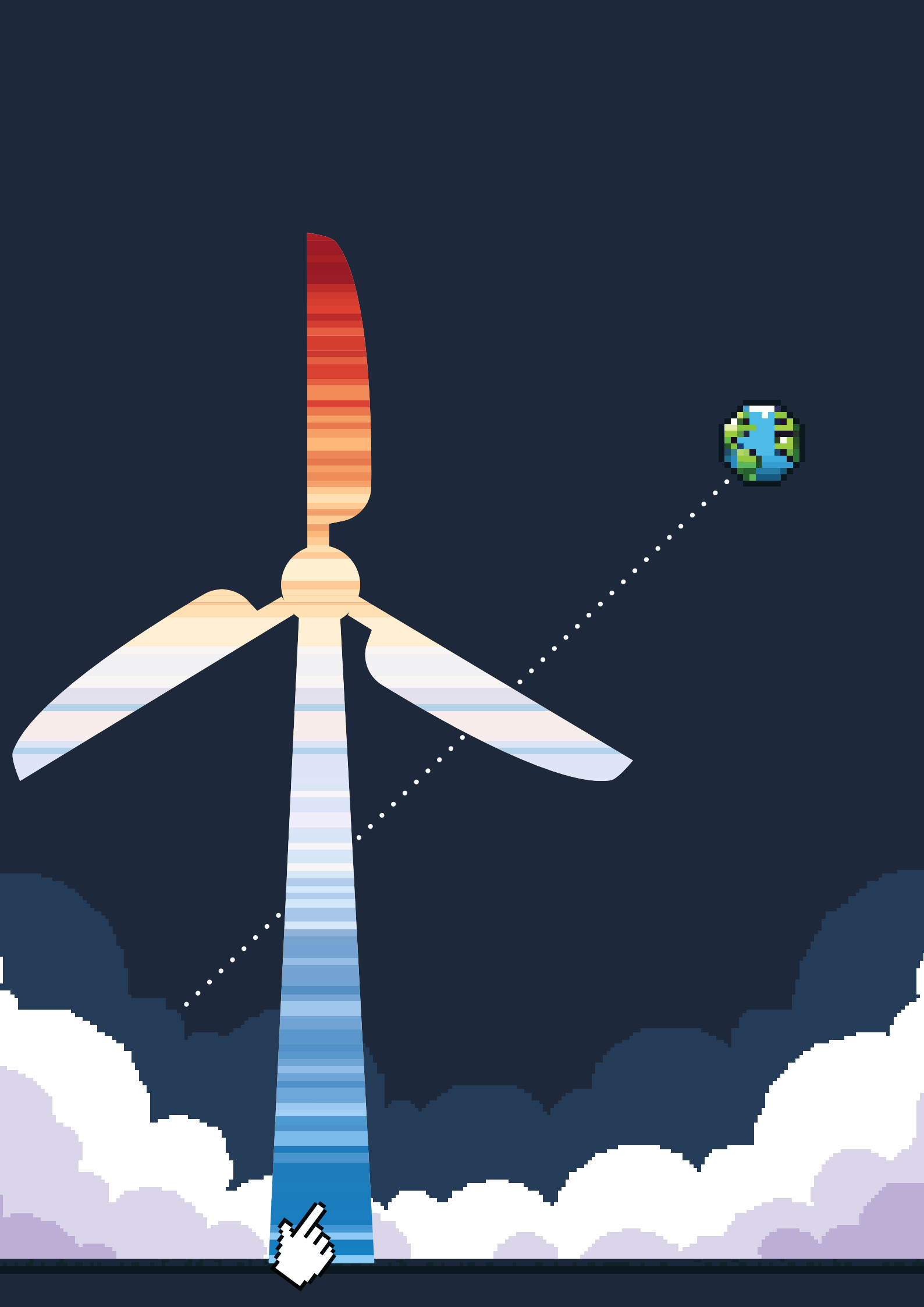
Scenario: A description of how the future may unfold, based on “if-then” propositions. Scenarios typically include an initial socioeconomic situation and a description of the key driving forces and future changes in emissions, temperatures or other climate change-related variables.

Source: Any process, activity or mechanism that releases a GHG, an aerosol or a precursor of a GHG or an aerosol into the atmosphere.



Contents

Acknowledgements	iv
Glossary	viii
Foreword	xiii
Executive summary	xiv
Chapter 1 Introduction	2
1.1 The context – a new climate reality amid accelerating impacts and expanding capabilities	2
Chapter 2 Global emissions trends	4
2.1 Introduction	4
2.2 Global emissions in 2025 were comparable to those in 2024	5
2.3 Emissions trends by greenhouse gas – fossil CO ₂ continued to increase, but was offset by reductions in LULUCF CO ₂	5
2.4 Emissions growth slowed down in the G20, with the United States of America being the major exception	6
2.5 Emissions by fuel and sector over the past decade indicate structural changes in the energy and transport sectors	8
Chapter 3 Nationally determined contributions and policy developments: The global landscape and G20 insights	12
3.1 Introduction	12
3.2 NDC submissions have more than doubled since 2025, providing a stronger basis for assessment	13
3.3 Climate policy updates and new NDCs show limited enhanced global mitigation action and ambition	14
3.4 Climate policy updates and new NDCs of G20 members indicate varied enhanced mitigation action and ambition	17
3.5 New policies from major emitters generally support emission reductions, but implementation remains critical	23
Chapter 4 The global emissions gap	26
4.1 Introduction	26
4.2 Scenarios for assessing the emissions gap	26
4.3 The emissions gaps are still large	33
4.4 Temperature implications of the emissions gap show overshoot can be minimized with immediate action	35
Chapter 5 Collective progress towards the mitigation action areas of the first global stocktake	38
5.1 Introduction	38
5.2 Developments since the adoption of the Paris Agreement are clear, yet progress towards the outcome of the first GST is uneven and insufficient overall	38
5.3 New global milestones beyond 2030 are needed	44
5.4 Considerations for the second GST	52
Chapter 6 What works in climate policy and how action can be accelerated	54
6.1 Introduction	54
6.2 Sharp shifts in national emission levels are associated with specific policies	55
6.3 Evaluations of specific policies point to emission reductions vary by sector, scheme and context	60
6.4 Synthesis – what the evidence implies for effective policy mixes	67
References	68



Foreword

The chance of holding global warming to below 1.5°C above pre-industrial levels with no or limited overshoot is gone. Every additional fraction of a degree and additional year of warming above 1.5°C will increase climate impacts and risks, such as the deadly floods, heatwaves and wildfires that have plagued many nations this year. So, we must pull out all the stops to minimize peak warming and return to 1.5°C by the end of the century.

The *Emissions Gap Report 2026: The point of return* shows us how this could be done. The report looks at a 'lowest possible' 1.5°C overshoot scenario, in which peak warming is limited to 1.7–1.8°C by around the middle of the century, and carbon dioxide (CO₂) is increasingly removed from the atmosphere and stored to bring temperatures back down by 2100.

To get on this pathway, stringent greenhouse emission reductions would have to start this year to deliver cuts of 18 per cent by 2030, 45 per cent by 2035 and 69 per cent by 2040, all relative to 2025 levels. However, even full implementation of all current nationally determined contributions does not get anywhere near this level of cuts, leaving the world on track for global warming of 2.6°C by 2100.

We clearly have a huge undertaking ahead of us. However, the report provides ample evidence that we can succeed. Since the adoption of the Paris Agreement, renewable energy has boomed, fossil fuels have grown slower than projected and several G20 members have shown sustained emission reductions over several decades, while some are aligning their targets with their net-zero pledges. An analysis of hundreds of climate policies in the report also showed real emission reductions in many places and sectors. Getting onto a lowest possible 1.5°C overshoot pathway requires replicating and sustaining these policies globally.

Stronger efforts to meet the goals of the first global stocktake (GST) could also make a real difference. Absolute greenhouse gas emissions – including CO₂ emissions in energy systems, road transport emissions, and non-CO₂ emissions, notably of methane – are heading in the opposite direction of the GST targets. However, additional policy support could change this trajectory – for example, building on the trend of growing clean energy could put the world on track to meet the GST goal of tripling renewable energy capacity by 2030.



This report shows that the world can still attain the goals of the Paris Agreement, but we must understand that the point of return begins now – with the implementation of fast, deep and sustained emissions reductions. So, at the United Nations Climate Change Conference – COP 31 – this November, across the second GST, and at the second International Conference on the Just Transition Away from Fossil Fuels in July 2027, nations must find ways to increase action, get onto the lowest possible 1.5°C overshoot pathway, and head for a more stable climate, more stable societies and more prosperous economies.

Inger Andersen

Executive Director

United Nations Environment Programme

Executive summary

Decades of insufficient climate action makes exceedance of 1.5°C unavoidable – whether it will be temporary crucially depends on decisions taken today

The headline finding of this seventeenth Emissions Gap Report is sobering. The opportunity to bridge the 1.5°C emissions gap with ‘no or limited’ overshoot has been lost. Decades of insufficient mitigation action means that larger exceedance of 1.5°C above pre-industrial levels based on multidecadal averages is now imminent and unavoidable.

Exceedance does not mark a single uniform state of risk. Every additional fraction of a degree and additional year of warming above 1.5°C raises the risk of irreversible changes including in ice sheets, permafrost carbon, ocean circulation and coral systems, along with devastating human impacts. The task now, therefore, is not only to ensure that global warming stays well below 2°C, but to minimize the duration and magnitude of overshoot and establish a credible return path to 1.5°C by the end of the century.

This year’s report responds to this new reality by providing an initial assessment of such new overshoot pathways. It redefines the emissions gap against a ‘lowest possible’ 1.5°C overshoot scenario, which assumes that stringent mitigation action starts from 2025 and is characterized by limiting peak warming to 1.7–1.8°C with 66 per cent chance, and returning global mean temperatures to or below 1.5°C by 2100 with around a 50 per cent chance. This scenario is still aligned with the long-term temperature goal of the Paris Agreement to limit global warming to well below 2°C, while pursuing 1.5°C. To get on such a pathway, global greenhouse gas (GHG) emissions must be reduced by 18 per cent by 2030, 45 per cent by 2035 and 69 per cent by 2040, all relative to 2025 levels. By contrast, the full implementation of the new nationally determined contributions (NDCs) submitted by around two thirds of all countries would reduce emissions by 5–8 per cent by 2030 and 11–15 per cent by 2035 relative to 2025 levels.

As the report also shows, there is ample opportunity to accelerate action. Since the adoption of the Paris Agreement, global developments in solar photovoltaics and wind deployment have continuously outpaced even the most optimistic forecasts. Growth in fossil fuels has been

slower than predictions made ten years ago, and there is evidence that climate policies have real effects on reducing emissions. These developments are reflected in global progress across several of the action areas of the first global stocktake. The pace must be accelerated, but opportunities to do so exist.

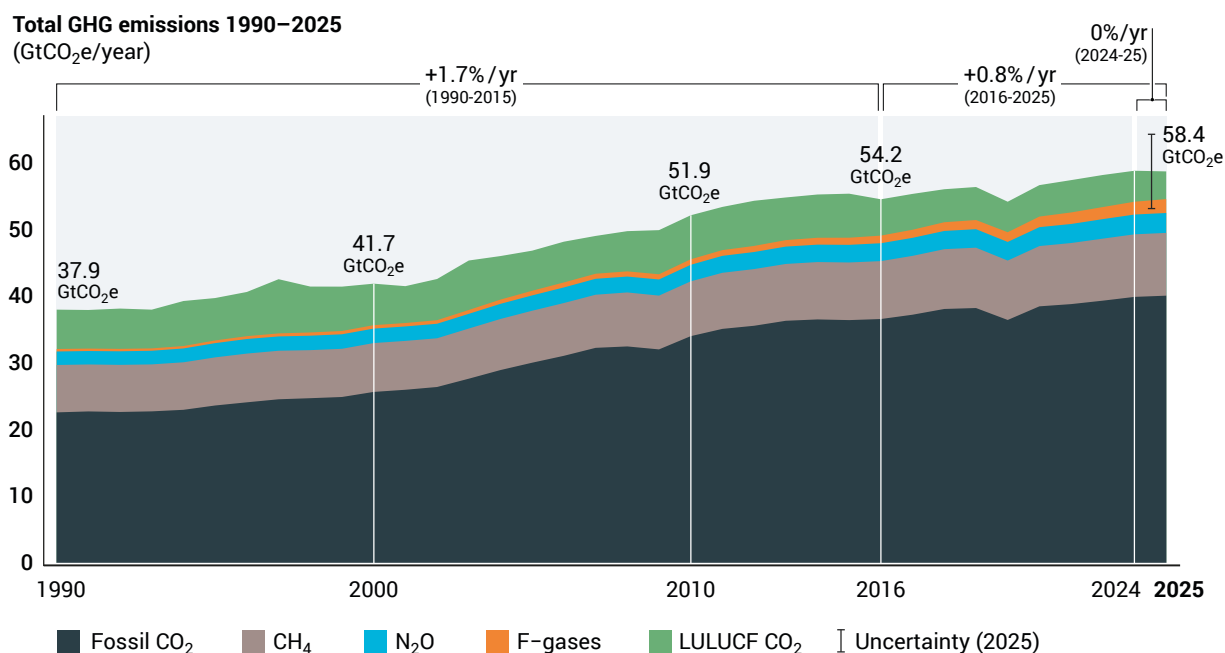
The call to Governments remains fundamentally unchanged. What has changed is the context. The opportunity to limit warming to 1.5°C without overshoot has been lost, but the future remains crucially dependent on decisions taken today. Countries can still limit peak warming, shorten the duration of overshoot and keep the goals of the Paris Agreement within reach. Doing so requires faster, deeper and sustained emission reductions starting immediately, as well as large-scale removals of carbon dioxide (CO₂) from the atmosphere.

1. Global GHG emissions in 2025 were similar to 2024 levels

- ▶ Global GHG emissions reached a total of 58.4 gigatons of CO₂ equivalent (GtCO₂e) (range: ±5.5) in 2025. Preliminary estimates suggest this to be a slight decline of 0.1 GtCO₂e from 2024 levels (figure ES.1), but it is not possible to conclude on the overall direction of emissions in 2025, due to the high uncertainty range.¹ Nonetheless, this diverges from a trend of growth in global emissions over the past decade of 0.8 per cent per year, and of 1.7 per cent per year for the period between 1990 and 2016.
- ▶ However, CO₂ emissions from fossil fuel combustion of oil, coal and gas, and nitrous oxide (N₂O) and fluorinated gases (F-gases) emissions continued to increase in 2025, while methane (CH₄) emissions remained almost the same as in 2024.
- ▶ These increases were offset by a decrease in CO₂ emissions from the land use, land-use change and forestry (LULUCF) sector of about 0.5 GtCO₂e. The decrease in LULUCF CO₂ emissions was partially driven by a decline in biomass-burning emissions, including a decline in global wildfire carbon emissions in 2025, compared with the exceptionally active 2024 season.

¹ Global GHG emissions in 2024 have been revised from the 57.7 GtCO₂e reported in last year’s report to 58.5 GtCO₂e, primarily due to a methodological revision in the Global Carbon Budget’s calculation of land-use change emissions.

Figure ES.1 Total net anthropogenic GHG emissions by gas, 1990–2025



- ▶ Based on these trends, it is too soon to conclude that global emissions are plateauing or peaking. Collectively, G20 members, excluding the African Union, account for 76 per cent of global emissions, and their emissions excluding LULUCF increased by 0.7 per cent in 2025.

- ▶ Overall, while 63 countries decreased their emissions over the past decade (totalling -1.8 GtCO₂e), these were outweighed by 124 countries increasing their emissions (totalling +7.2 GtCO₂e). Several countries with high per capita and historical emissions have still to peak their emissions.

2. The number of new NDCs with mitigation pledges for 2035 has roughly doubled since last year, but global ambition has not kept pace

- ▶ As of 1 September 2026, 124 Parties accounting for approximately 76 per cent of global GHG emissions had submitted new NDCs, up from 57 submissions covering 63 per cent last year. While the quality of NDCs is improving, their scope has not expanded substantially. More countries now use more robust target formats, such as base-year and fixed-level emissions targets, which strengthen transparency, comparability and accountability. However, progress in setting economy-wide GHG targets and extending coverage across all sectors and gases, as called for by the first global stocktake, remains limited.

- ▶ The full implementation of the new NDCs would reduce expected global emissions in 2035 by 3.5–4 GtCO₂e compared with 2030 NDC levels, indicating that while collective ambition has increased compared with 2030 targets, it is far from the scale required (table ES.2). These estimates remain similar to last year's, despite the increase in the number of new NDCs.

3. The global implementation gap for 2030 is still considerable, and enhanced ambition in 2035 remains limited

- ▶ The global implementation gap for **2030**, defined as the difference between projected emissions under current policies and emissions consistent with full implementation of NDC targets, remains significant. Expected emissions in 2030 based on current policies are about 2 and 4 GtCO₂e above the levels implied by unconditional and conditional NDC scenarios respectively. While the year 2030 is drawing closer, collectively countries have still not aligned policies with NDC targets.

- ▶ While there has been an apparent narrowing of the global implementation gap since last year's report, this does not reflect stronger policy action. Instead, it is largely explained by the withdrawal of the United States of America from the Paris Agreement, which led to the removal of its NDC target from global aggregations and its replacement with current policy emissions projections by global modelling teams.

Excluding this effect, there has been little overall progress in aligning policies with NDC targets for 2030.

- ▶ A substantial global implementation gap for **2035** would have suggested that the new NDCs enhance ambition significantly beyond what existing policies would deliver. However, compared with 2030, the 2035 implementation gap widens by only 1 GtCO₂e for the unconditional NDCs and 2 GtCO₂e if in addition the conditional NDCs are fully implemented, indicating limited enhanced collective ambition of 2035 NDCs. The implementation gap for 2035 is estimated at 3 GtCO₂e for the unconditional NDCs, and 6 GtCO₂e if the conditional NDCs are also considered.

4. Fewer than half of the G20 members are on track to closing their implementation gaps for 2030 and stringency of 2035 NDC targets varies

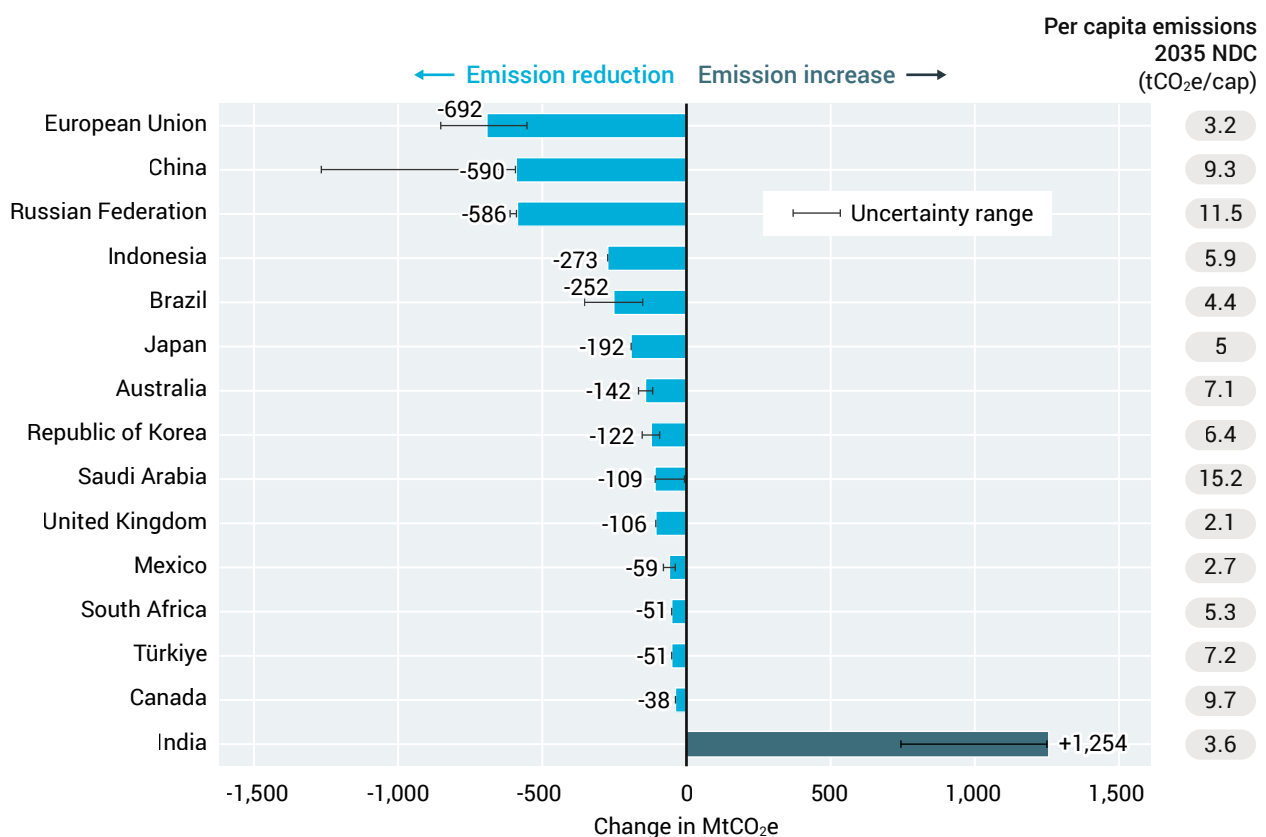
- ▶ All G20 members except Argentina, Saudi Arabia and the United States of America have new NDCs with mitigation targets for 2035. Mexico is the only

G20 member to have strengthened its 2030 target as part of its new NDC.

Under current policies, only six G20 members (China, India, Indonesia, Russian Federation, South Africa and Türkiye) are assessed as likely to achieve their unconditional 2030 targets, while the assessment of the European Union is inconclusive. Overall, this suggests limited progress in narrowing implementation gaps across the G20. Changes to the emission projections under current policies for the G20 members are limited since last year.

The new unconditional NDC targets for 2035 result in lower expected emissions than the 2030 targets for all G20 members with such targets except India (figure ES.2). The European Union shows the largest absolute emission reduction, followed by China. While India is projected to continue increasing its economy-wide GHG emissions under its NDC, its per capita emissions remain far lower than those of most other large emitters (figure ES.2).

Figure ES.2 GHG emissions in 2035 relative to 2030 levels resulting from the full implementation of the new NDCs of G20 members (MtCO₂e/yr) and associated per capita emissions (tCO₂e/yr)



- ▶ Many G20 members will need stronger policies to meet their 2035 NDCs, while some have set new NDC targets that are above the levels expected under current policies (figure ES.3). This is particularly

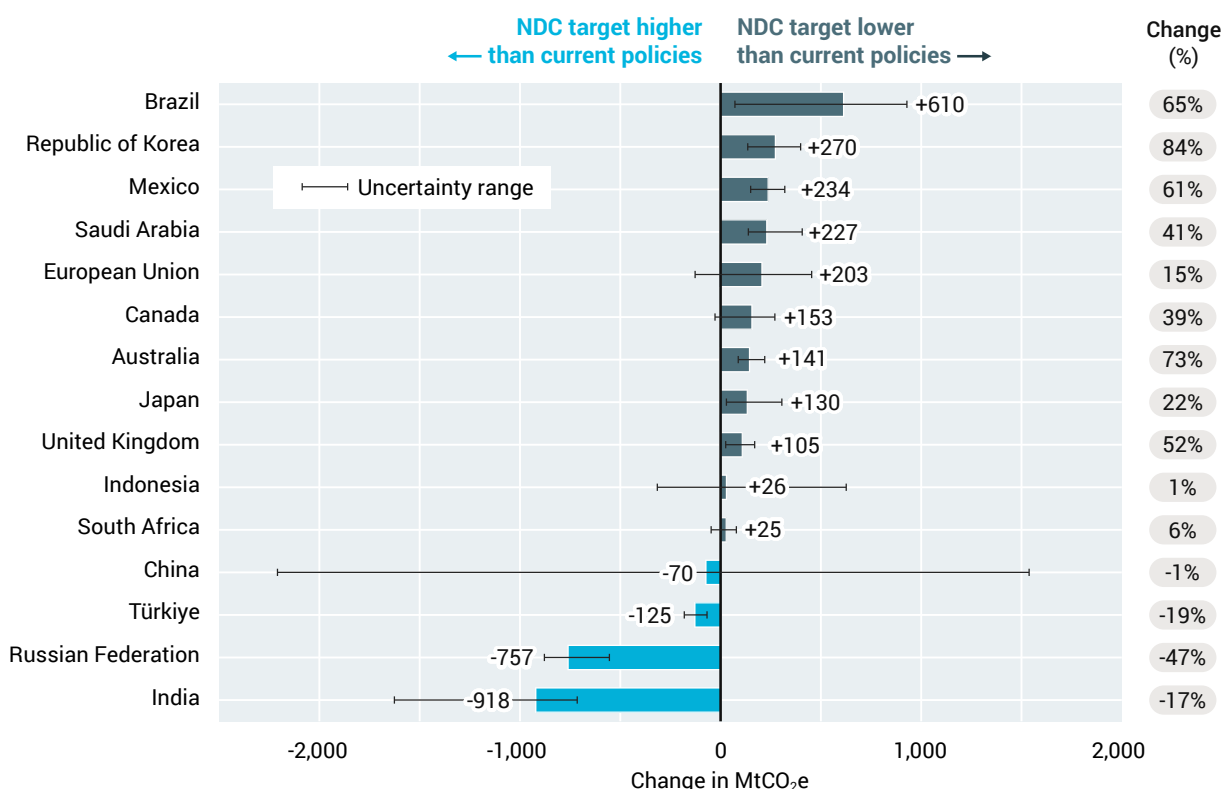
the case for the Russian Federation and Türkiye, suggesting limited stringency of their new 2035 NDCs, as achieving the targets does not require additional policy measures.

- ▶ India also appears likely to achieve its 2035 target based on policies already in place. However, this should be interpreted differently, because India's NDC is formulated as an emissions-intensity target. Strong economic growth combined with improvements in the carbon intensity of the economy can lead to substantial emission reductions relative

to gross domestic product, while total emissions continue to grow.

- ▶ Most G20 members would also need to accelerate emission reductions beyond current policy trends and NDC commitments to achieve their long-term net-zero goals.

Figure ES.3 GHG emissions in 2035 resulting from the full implementation of the new NDCs of G20 members compared with current policies projections, absolute (MtCO₂e/yr) and percentage (%) change



5. The opportunity to limit warming to 1.5°C with no or limited overshoot has been lost – stringent mitigation action could still return global warming to or below 1.5°C by the end of the century

- ▶ After decades of insufficient climate action, it is no longer possible to close the gap between current climate pledges and a pathway that limits warming to 1.5°C with no or limited overshoot, defined as a temporary exceedance of less than 0.1°C. While it is now inevitable that warming will exceed 1.5°C by more than 0.1°C, it is still possible to minimize the magnitude and duration of this overshoot, and to return global warming to or below 1.5°C by the end of the century.
- ▶ This conclusion builds on newly developed mitigation pathways, which are replacing the outdated scenarios from the Intergovernmental Panel on Climate Change Sixth Assessment Report

(IPCC AR6). The new pathways, which will inform the IPCC AR7, acknowledge the failure to cut emissions to date, and apply a set of guardrails for feasibility and sustainability. Starting with stringent mitigation action from 2025, the lowest 1.5°C overshoot scenario that is still available has a 66 per cent chance of limiting peak warming to 1.7–1.8°C, while returning global warming to 1.5°C by 2100 with around a 50 per cent chance. The below 2°C scenario, which has also been updated with emissions cuts starting from 2025, has a 66 per cent chance of limiting peak warming to 1.9°C (table ES.1).

- ▶ In addition to higher peak warming, the lowest 1.5°C overshoot scenario creates a need for aggregate CO₂ removal from the atmosphere and its permanent sequestration of roughly 320 GtCO₂ over the course of this century in order to return warming to 1.5°C by 2100. Our ability to remove such large amounts of CO₂ from the atmosphere is uncertain, because of

socioeconomic and technological challenges to the scale-up of CO₂ removal measures and technologies.

- Importantly, without stringent mitigation action from 2025, the lowest 1.5°C overshoot pathways available

today will also slip away, undermining the possibility of achieving the temperature goal of the Paris Agreement. Every five years of emissions at current levels adds around 200 GtCO₂ to the atmosphere, and pushes the peak warming up by around 0.1°C.

Table ES.1 Global total GHG emissions in 2030, 2035 and 2050, and global warming characteristics of different scenarios consistent with limiting global warming to specific temperature limits

Scenario	# scenarios	Global total GHG emissions (GtCO ₂ e)				Estimated temperature outcome		
		In 2030	In 2035	In 2040	In 2050	50% chance	66% chance	90% chance
Below 2.0°C (66% chance)	44	52 (45–58)	45 (28–53)	37 (15–43)	22 (3–30)	Peak: 1.7 (1.7–1.9)°C In 2100: 1.5 (1.2–1.8)°C	Peak: 1.9 (1.8–2.0)°C In 2100: 1.7 (1.3–2.0)°C	Peak: 2.2 (2.1–2.6)°C In 2100: 2.1 (1.7–2.6)°C
Lowest 1.5°C overshoot scenario	8	49 (36–50)	33 (22–39)	20 (13–24)	6 (4–11)	Peak: 1.7 (1.6–1.7)°C In 2100: 1.3 (1.1–1.6)°C	Peak: 1.8 (1.7–1.8)°C In 2100: 1.4 (1.3–1.7)°C	Peak: 2.1 (2.0–2.2)°C In 2100: 1.8 (1.6–2.2)°C

6. The emissions gap is still large: new NDCs reduce global emissions 5–8 per cent below 2025 levels by 2030, and 11–15 per cent by 2035, whereas 18 and 45 per cent are required for the lowest 1.5°C overshoot scenario

- To secure the lowest 1.5°C overshoot scenario, countries need to make immediate, deep, rapid and sustained cuts in global GHG emissions of 18 per cent (range: 15–36) from 2025 levels by 2030, 45 per cent (range: 30–60) by 2035 and 69 per cent (range: 60–76) by 2040. Global CO₂ emissions would still need to reach net zero by 2050 (range: 2046–2058), around which time temperatures also peak.
- To meet these new lowest 1.5°C overshoot benchmarks, Parties must collectively reduce their emissions by an average annual rate of 5.7 per cent (range: 3.4–8.7) between 2025 and 2035. This necessitates even more rapid action than would previously have been required to limit warming to 1.5°C with no more than 0.1°C of overshoot, starting in 2019: the previous benchmark of cutting emissions to 43 per cent below 2019 levels by 2030 required an average reduction rate of 5.0 per cent per year.
- The updated below 2°C scenario also relies on an immediate peak and decline in emissions of 11 per cent by 2030 (range: 0–23), 24 per cent by 2035 (range: 9–51) and 37 per cent by 2040 (range: 26–73), all relative to 2025 levels.

- Despite new submissions since last year, the latest NDCs will neither deliver the cuts needed to align with the lowest 1.5°C overshoot scenario, nor the below 2°C scenario. They are only sufficient to cut emissions to 5–8 per cent below 2025 levels by 2030, 11–15 per cent by 2035 and 20–27 per cent by 2040, depending on the conditionality of NDCs.

- This means there is a large and expanding emissions gap of 5 GtCO₂e in 2030 and 16 GtCO₂e in 2035, between the full implementation of current conditional and unconditional NDCs and the lowest 1.5°C overshoot scenario. For the below 2°C scenario, the gaps are 1 GtCO₂e and 5 GtCO₂e respectively. The gaps are even larger if only unconditional NDCs are implemented (figure ES.4, table ES.2).

- These gaps are not directly comparable with last year's report, which was benchmarked against scenarios that are now unachievable. Specifically, there is now an unbridgeable gap of 9 GtCO₂e in 2035, between the lowest 1.5°C overshoot scenario and the level of emissions that would have been consistent with limiting global warming to 1.5°C with an overshoot of no more than 0.1°C (figure ES.4).

Figure ES.4 Global GHG emissions under different scenarios and the emissions gap in 2035 with respect to the below 2°C and lowest 1.5°C overshoot scenarios

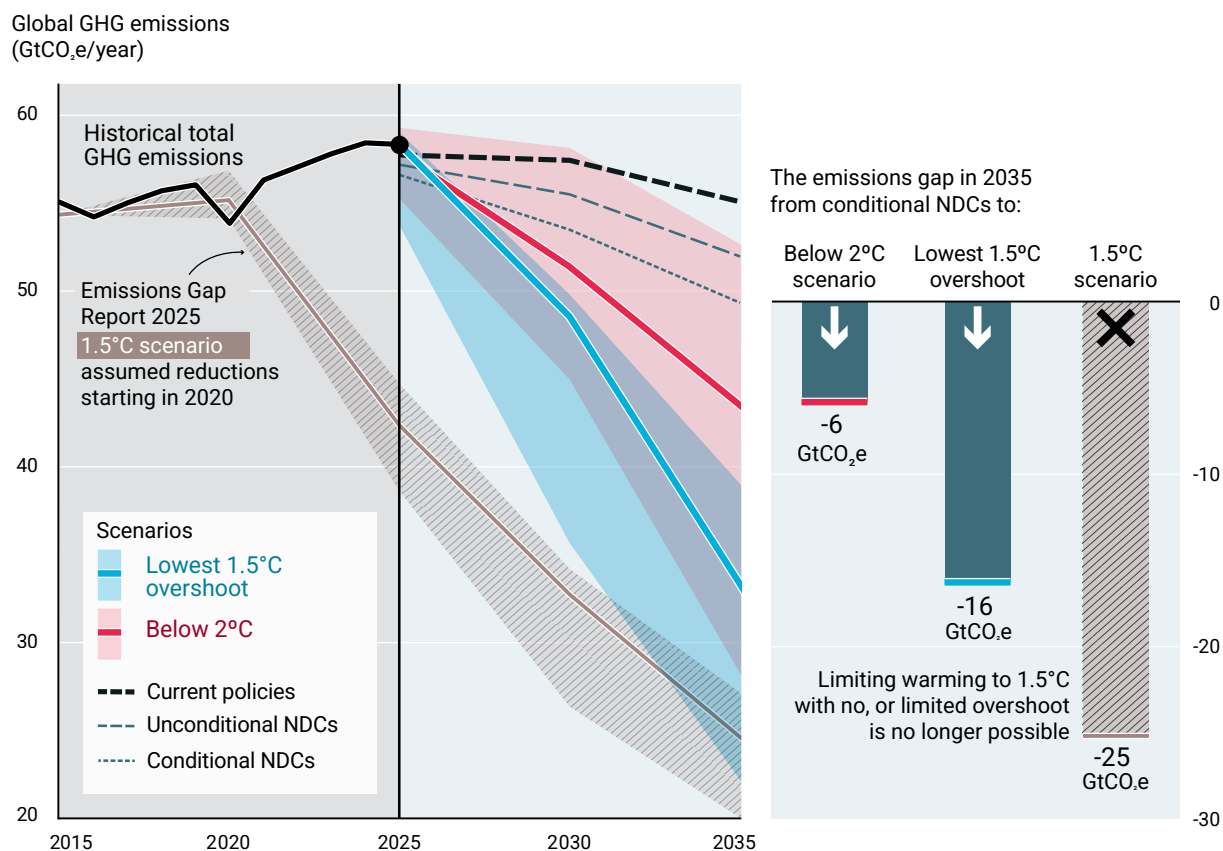


Table ES.2 Global total GHG emissions in 2030 and 2035, and estimated gaps under different scenarios

Scenario	Projected GHG emissions (GtCO ₂ e)	Estimated emissions gap to lowest 1.5°C overshoot scenario (GtCO ₂ e)	Estimated emissions gap to below 2°C scenario (GtCO ₂ e)
	Median and range	Median and range	Median and range
2030			
Current policies	57 (53–62)	9 (4–13)	5 (0–9)
Unconditional NDCs	55 (51–59)	7 (3–11)	3 (–1–7)
Conditional NDCs	53 (50–56)	5 (2–7)	1 (–2–3)
2035			
Current policies	55 (52–61)	22 (18–28)	10 (7–16)
Unconditional NDCs	52 (49–55)	19 (15–22)	7 (4–11)
Conditional NDCs	49 (47–52)	16 (14–19)	5 (3–7)

7. Temperature projections have increased slightly compared with last year – only the scenario based on current policies remains unchanged

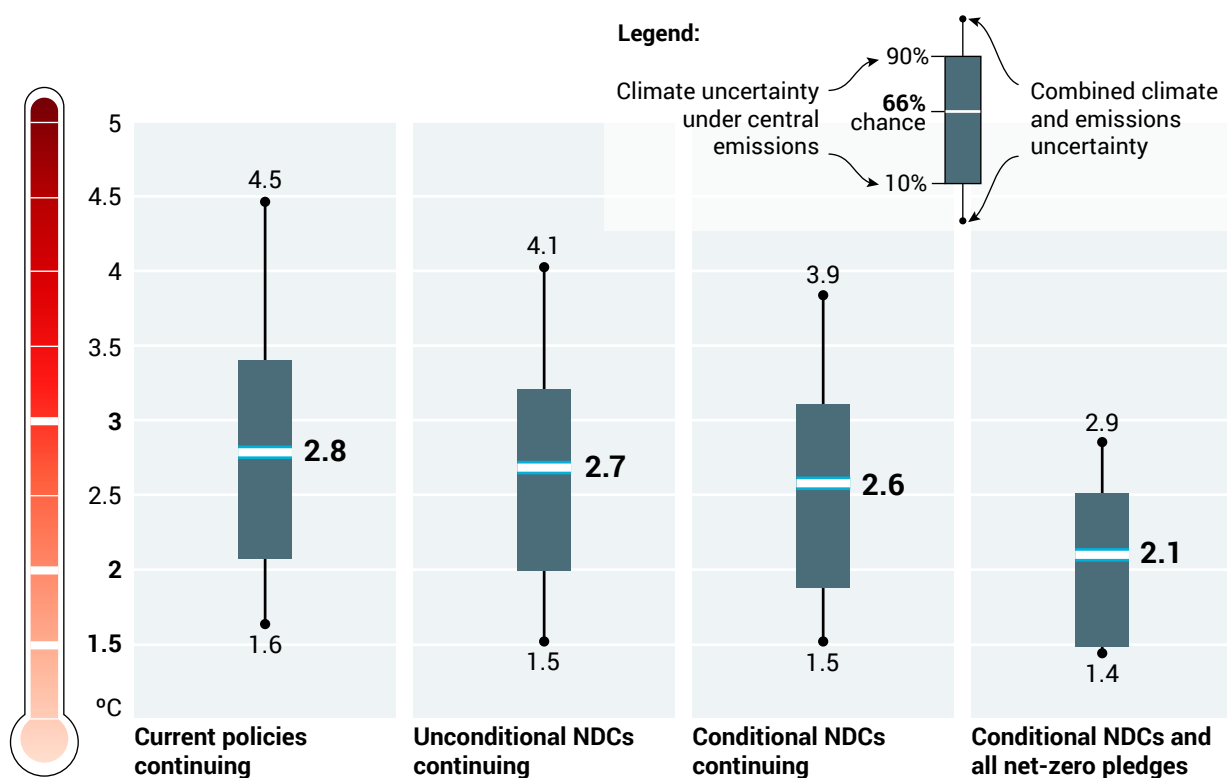
- ▶ If current policies continue, there is a 66 per cent chance that warming will be limited to 2.8°C by 2100, while continuing to increase thereafter (figure ES.5).
- ▶ If all NDCs are delivered and similar efforts continue, there is a 66 per cent chance that warming will be limited to 2.6°C by 2100. This is a worse outcome than expected last year, as a result of the formal withdrawal of the United States of America from the Paris Agreement and revised estimates of historical emissions. New NDCs submitted since last year have a near-zero impact on expected emissions and warming.
- ▶ In the most optimistic pledge-related scenario considered in the report, where all NDCs and net-zero targets are achieved, and similar efforts are maintained

thereafter, there is a 66 per cent chance that global warming will be limited to 2.1°C this century, 0.7°C below current policies. Again, this is worse than expected last year due to the withdrawal of the United States of America, and revised historical emissions estimates.

The most optimistic pledge-based scenario is the only case with a greater than 50 per cent chance of limiting warming this century to below 2°C – and a non-zero chance for returning to 1.5°C.

This shows that immediate and effective implementation of all pledges, including long-term net-zero targets, could significantly reduce expected warming. However, even the most optimistic pledge-based scenario results in around 0.25°C more peak warming than the lowest 1.5°C overshoot. This highlights the need to go beyond existing pledges, and to deliver on more ambitious pledges through accelerated action.

Figure ES.5 Projections of global warming under the pledge-based scenarios assessed in the report



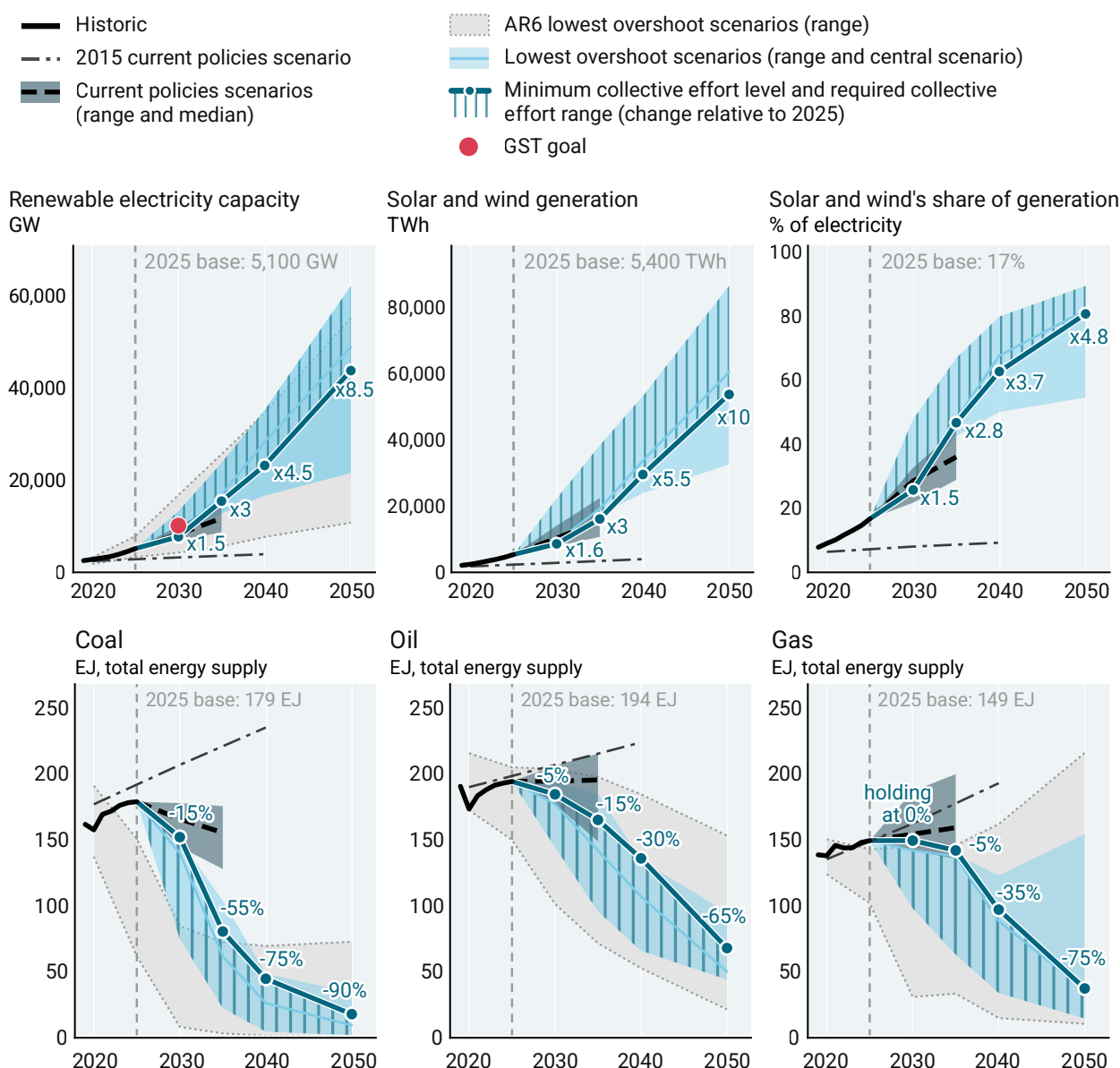
8. The world agreed to strong sectoral goals and actions in the first global stocktake. Most require urgent acceleration

- ▶ The first global stocktake underscored the need for deep, rapid and sustained reductions in GHG emissions to keep the temperature goal of the Paris Agreement within reach. To that end, Parties agreed to the collective tripling of renewable energy capacity and doubling of the annual rate of energy efficiency improvements by 2030, transitioning away from fossil fuels in energy systems, accelerating the uptake of zero- and low-emissions technologies, reducing non-CO₂ emissions, and halting and reversing deforestation and forest degradation.
- ▶ Significant progress has been made since the adoption of the Paris Agreement in 2015. Global solar and wind deployment has expanded far more rapidly than anticipated a decade ago. Global renewable electricity capacity grew three times faster than current policies scenarios anticipated in 2015, with solar photovoltaics build-out increasing seven times faster than anticipated.
- ▶ A continuation of these promising recent trends in the scale-up of renewables, supported by additional policies, would bring the world on track to achieve the global stocktake's goal of tripling renewable energy capacity by 2030, and increase the share of wind and solar in electricity generation to levels consistent with the lowest 1.5°C overshoot scenario.
- ▶ Despite these advances, progress across most global stocktake action areas remains insufficient. Recent rates of change across all indicators tracking absolute GHG emissions, including CO₂ emissions in energy systems, road transport emissions and non-CO₂ emissions, notably methane emissions, are heading in the opposite direction to the global stocktake targets. While current policies scenarios project that these emissions will stabilize by 2030 across some sectors, none show declines occurring at the pace and scale needed to minimize the magnitude and

duration of overshoot of 1.5°C. These trends highlight that scaling up zero- and low-carbon technology adoption alone will not be sufficient to achieve the global stocktake's outcome.

- ▶ Progress in transitioning away from fossil fuels and other emissions-intensive activities is lagging particularly far behind. Total energy supply from coal, oil and gas continues to rise globally, albeit at a slower rate than was projected in 2015. Looking ahead, while the implementation of current policies is set to trigger a peak and decline in coal before 2030, use of oil and gas will likely continue to increase this decade.
- ▶ Global efforts to halt deforestation by 2030 also remain significantly off track. Although permanent forest loss has slowed, the current rate of decline must accelerate by more than a factor of ten to meet the target of the first global stocktake.
- ▶ New global milestones beyond 2030 can help identify opportunities to strengthen collective ambition and action, while informing discussions during the second global stocktake on 2040 NDC targets. Figure ES.6 illustrates such milestones for selected global stocktake mitigation action areas aligned with the lowest 1.5°C overshoot scenario and pathways.
- ▶ The second global stocktake can build on the first by (1) reaffirming priority mitigation action areas that offer the most significant opportunities to bridge the emissions gap; (2) extending quantified goals to 2035 and 2040 to inform the next round of NDCs; and (3) making existing action areas more tangible through clearer and, where possible, quantified targets. This would help guide collective action and support implementation through clarifying related finance, technology and capacity-building needs. The thirty-first United Nations Climate Change Conference of the Parties (COP 31) Presidency's proposal to increase global electrification rates to 35 per cent by 2035 offers one example of further elaboration of an action area, with a level of effort assessed to align with the lowest 1.5°C overshoot scenario.

Figure ES.6 Global developments in selected mitigation action areas of the global stocktake and milestones beyond 2030 aligned with limiting the peak and duration of overshoot



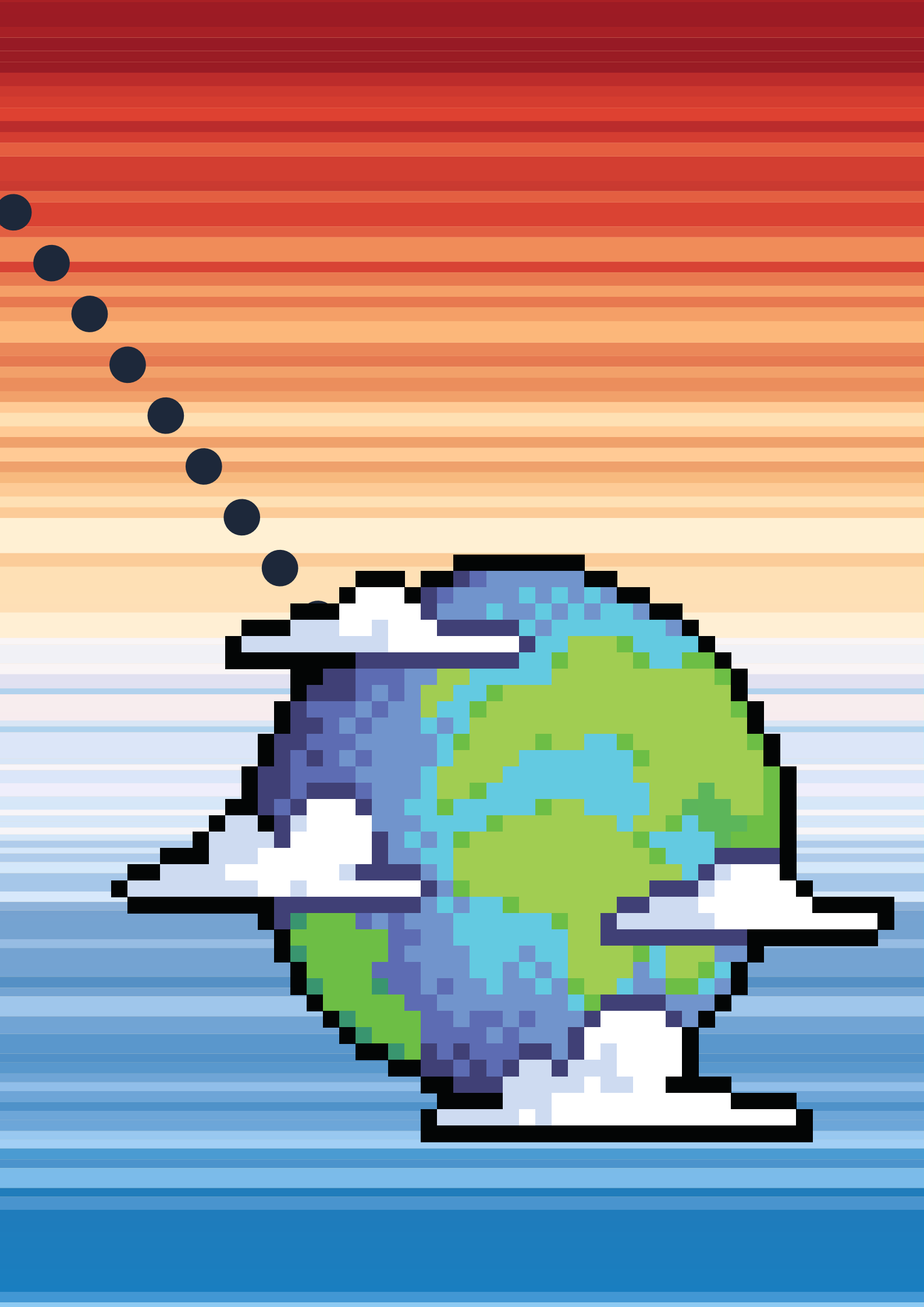
9. Expanded understanding of what works in climate policies can support and inform accelerated action

- Climate policies can and have reduced emissions. The challenge is how fast they can be scaled. Evidence from tracking of major structural shifts in national and sectoral emissions, causal policy evaluations, and sectoral case studies shows that implemented climate policies generally deliver emission reductions. However, successes remain concentrated in specific sectors, countries and periods. Bridging the emissions gap requires economy-wide and global replication and sustaining.

► A total of 63 major structural shifts in developed and developing countries, resulting in emission reductions of more than 5 per cent over the evaluation period, and relative to a no-policy baseline, have been identified to coincide with the introduction or strengthening of climate-related policies.

► More than 220 policy evaluations provide causal evidence that climate policies reduce emissions across a wide range of sectors and country contexts. For example, evaluated policies in the electricity sector have resulted in average emission reductions of 9 per cent over the evaluation periods relative to a no-policy baseline, with average reductions typically ranging from 2–13 per cent across policy instruments used.

- ▶ Only a few hundred of the thousands of climate policies in place have been rigorously evaluated. For carbon pricing, the evaluated share covers under a third of operating schemes. Studies cluster in Europe, North America and China, while developing and emerging economies remain significantly underrepresented. Studies focus on pricing, leaving the most widely used policy instruments globally including regulation, standards, public investment and subsidies, largely unassessed in the academic literature.
- ▶ The design of policy packages matters, and adding policies does not necessarily result in deeper emission reductions. Where large emission reductions have been detected, price signals often operate alongside regulation and subsidies addressing distinct market failures. This suggests that effective climate action requires coherent policy mixes tailored to development priorities and local conditions. Developing economies lean towards regulation, developed economies more often towards pricing.
- ▶ Based on available studies, the introduction of economic instruments, including carbon cap-and-trade schemes and carbon taxes, the instruments most frequently evaluated, have resulted in average emission reductions of 5–13 per cent across sectors over the evaluation period relative to a no-policy baseline. However, the estimated effects vary widely with design, sector and country context, and often the conditions under which an instrument was applied is as important as the instrument itself in emission reduction outcomes. Regulatory instruments can perform similarly, but limited evidence exists.
- ▶ Bridging the evidence gap around effective climate policy could support bridging the emissions gap. Governments can do this by (1) designing evaluation into new policies from the outset, with baselines and data access specified before implementation; (2) reporting achieved reductions systematically so effects can be compared and learned from across countries; and (3) funding evaluation capacity in regions where assessment is scarcest.



1 Introduction

Authors:

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1.1 The context – a new climate reality amid accelerating impacts and expanding capabilities

This seventeenth Emissions Gap Report is published at a time marked by defining contradictions. Climate change impacts are becoming more frequent and severe, while geopolitical pressures challenge collective action. In August 2026, global temperatures tied the record for the hottest month ever observed (Copernicus Climate Change Service 2026), and national temperature records were broken around the globe, including in more than ten European countries, with heavy tolls on heat-related deaths (Barnes *et al.* 2026; Robert Koch Institut 2026; Santé publique France, 2026; World Meteorological Organization [WMO] 2026). Yet capabilities to reduce emissions are expanding, and the clean energy transition is gathering momentum. Low-carbon technologies are becoming ever more cost-competitive and attractive, driven not only by climate reasons, but increasingly also by considerations of energy security, affordability and industrial competitiveness. Between accelerating climate impacts and expanding mitigation capabilities, this report once again asks how far collective action remains from the level required to achieve the long-term temperature goal of the Paris Agreement and minimize the worst risks of climate change.

The headline finding this year is sobering: the opportunity to bridge the 1.5°C emissions gap with “no or limited” overshoot¹ has been lost. Decades of insufficient mitigation action mean that a larger exceedance of 1.5°C based on multidecadal averages is now unavoidable (Copernicus Climate Change Service 2024; UNEP 2025; UNEP 2026; WMO 2026).

Exceedance of 1.5°C does not mark a single uniform state of risk. Every additional fraction of a degree of warming

and every additional year of warming above 1.5°C raises the risk of irreversible changes, including in ice sheets, permafrost carbon, ocean circulation and coral systems, and is associated with more frequent and severe heatwaves, floods, droughts, heat-related mortality, economic costs and socioeconomic losses (Masson-Delmotte *et al.* 2018; Lee *et al.* 2023; Oxera Consulting 2024; European Environment Agency 2025; Burke *et al.* 2026; Krol 2026; UNEP 2026).

The task now, therefore, is not only to ensure that global warming stays well below 2°C, but to minimize the duration and magnitude of overshoot and establish a credible return path to 1.5°C by the end of the century. This year’s report responds to this new reality by redefining the emissions gap against a “lowest possible” 1.5°C overshoot scenario, that assumes that stringent mitigation action starts from 2025, and is characterized by limiting peak warming to 1.7–1.8°C and returning global mean temperatures to or below 1.5°C by 2100 with a 50 per cent chance.

This year’s report again finds that global progress remains insufficient. Global greenhouse gas (GHG) emissions have not yet peaked (chapter 2), and while considerably more Parties have submitted new nationally determined contributions, current policies and pledges remain far from consistent with the Paris Agreement’s long-term temperature goal (chapters 3, 4 and 5).

The good news is that there is ample opportunity to accelerate action. The report identifies progress in areas identified by the first global stocktake, including its sectoral goals (chapter 5), and finds evidence that climate policies can achieve measurable emission reductions (chapter 6). Technological innovation and change and industrial policy have reinforced this. Solar photovoltaics, batteries and electric vehicles have consistently surpassed prior projections of cost reduction and deployment worldwide.

¹ Defined as exceedance of 1.5°C by up to 0.1°C (Masson-Delmotte *et al.* 2018).

The first full cycle of the Paris Agreement, from pledges to stocktake to new pledges, is now complete. It has bent the warming trajectory based on current policies projections from around 4°C before Paris to 2.8°C today, a shift that was by no means assured, though one that still falls well short of the Agreement's goal (UNEP 2025). New collective initiatives continue to be announced. At the Bonn climate meeting in June 2026, the incoming thirty-first United Nations Climate Change Conference of the Parties (COP 31) Presidency announced several proposed global goals, including to increase the share of final energy demand met by electricity from just over 20 per cent in 2024 to 35 per cent by 2035, to be advanced in Antalya.

With the second global stocktake process starting now and due to conclude in 2028, it is critical to ensure the best possible evidence base to inform this process. Yet the scientific and institutional foundations supporting climate decision-making are under pressure. Reductions in climate observation and monitoring capacity and funding risk weakening the shared evidence base on which international cooperation and the second global stocktake depends (Karl *et al.* 2026), while concerns over climate misinformation continue to grow. Threats to information integrity on climate change were described as one of the defining challenges of our time, at a declaration launched at COP 30 (Global Initiative for Information Integrity on Climate Change 2025). The continued uncertainty regarding the timing of the Seventh Assessment Report of the Intergovernmental Panel on Climate Change adds to these concerns and leaves open

an important question about the evidence base that will be available to inform the second global stocktake.

In response, this and subsequent Emissions Gap Reports will further expand their focus beyond tracking the emissions gap, to providing independent science-based policy-relevant information that helps identify and address knowledge gaps relevant to the second global stocktake. This year, in addition to assessing emissions pathways, gaps and overshoot scenarios, and providing new global benchmarks for emission reductions in 2030, 2035 and 2040 consistent with achieving the temperature goal of the Paris Agreement, it begins tracking progress towards the outcome of the first global stocktake, and examines policy packages that have successfully reduced emissions in practice. In doing so, it aims not only to assess where the world stands, but also to provide evidence and guidance on how faster implementation can be achieved (chapters 5 and 6).

The call to Governments remains fundamentally unchanged. What has changed is the context.

The opportunity to limit warming to 1.5°C without overshoot has been lost, but the future remains crucially dependent on decisions taken today. Every fraction of a degree matters. Every year of overshoot matters. Countries can still reduce peak warming, shorten the duration of overshoot, and keep the goals of the Paris Agreement within reach. Doing so requires faster, deeper and more immediate emission reductions.

Box 1.1 Approach and process behind this report

Since 2010, UNEP has published the Emissions Gap Report annually to inform international negotiations under the United Nations Framework Convention on Climate Change. The report assesses the gap between projected GHG emissions under countries' pledges and the emission reductions required to align with the Paris Agreement's long-term temperature goal. It examines pledged GHG emission reductions, the reductions still required, the consequences of inaction and the opportunities to accelerate progress. The report is based on a synthesis of the latest scientific literature, models and data.

As in previous years, the report has been prepared by an international team of leading experts. This year, 40 leading scientists from 25 institutions across 18 countries have been engaged in producing the report. The assessment process has been overseen by an international steering committee, and it has been transparent and participatory. Geographical diversity and gender balance have been considered to the extent possible. All chapters have undergone external review, and the assessment methodology and preliminary findings were made available to the Governments of the countries specifically mentioned in the report, to provide them with the opportunity to comment on the findings.²

² The following statement is included at the request of the State Department of the United States of America: "The United States has withdrawn from the Paris Agreement, and it gave notification of its withdrawal from the UNFCCC on February 27, 2026, which will take effect on February 27, 2027. The United States does not support the Emissions Gap Report, does not endorse or agree with its analysis or conclusions, and has not provided comments to this report."

2 Global emissions trends

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2.1 Introduction

This chapter assesses anthropogenic greenhouse gas (GHG) emissions trends up to and including 2025. It aims to describe recent emissions trends from multiple perspectives, including total emissions across gases (section 2.1), the largest emitters of GHGs (section 2.2), and sectors and fossil fuels (section 2.3).

Year-to-year emissions trends are influenced by both short and long-term drivers that shape energy supply, energy demand, economic activity and land-use change. Short-term

drivers include heatwaves and cold winters (which can drive up electricity use), droughts (which can lead to hydropower curtailment), and fuel supply disruptions (which can result in cuts to industrial output). Because these drivers are often temporary, it is necessary to look at longer-term trends in order to assess overall progress in curtailing emissions. In this longer view, emissions are influenced by structural drivers such as patterns of industrial development and investments in fossil or renewable energy capacity, and through policies. Section 2.2 of this chapter focuses on more recent trends, while section 2.3 takes a longer perspective on structural drivers.

Box 2.1 Data sources used in this chapter

The principal data sources used in this chapter are the Emissions Database for Global Atmospheric Research (EDGAR) (Crippa *et al.* 2026), the Global Carbon Budget (Friedlingstein *et al.* 2026b) and the International Energy Agency Greenhouse Gas Emissions from Energy data set (International Energy Agency [IEA] 2026d).

This chapter also uses national GHG inventories submitted by Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The biennial transparency reports (BTRs) have improved the scope and coverage of emissions data reporting. Considering BTR submissions up to 3 September 2026, national inventory emissions data are available for 103 of 195 parties to the UNFCCC. Of these, 70 are “complete” insofar as they cover the period 1990–2021 across the full scope of gases and sectors under the Paris Agreement, including 27 from non-Annex I countries that are not obliged to submit complete inventories under the

enhanced transparency framework. A total of 17 least developed countries (LDCs) and small island developing States have submitted partial or complete inventories, despite having flexibility to submit BTRs at their discretion. The United States of America, which remains a Party to the UNFCCC until the end of February 2027, is the only Annex I country that has not fulfilled its obligation to submit an inventory since 2024. Inventory data used in this chapter is compiled by Melo *et al.* (2026) for land use, land-use change and forestry (LULUCF) emissions, and Lamb (2026) for economy-wide emissions.

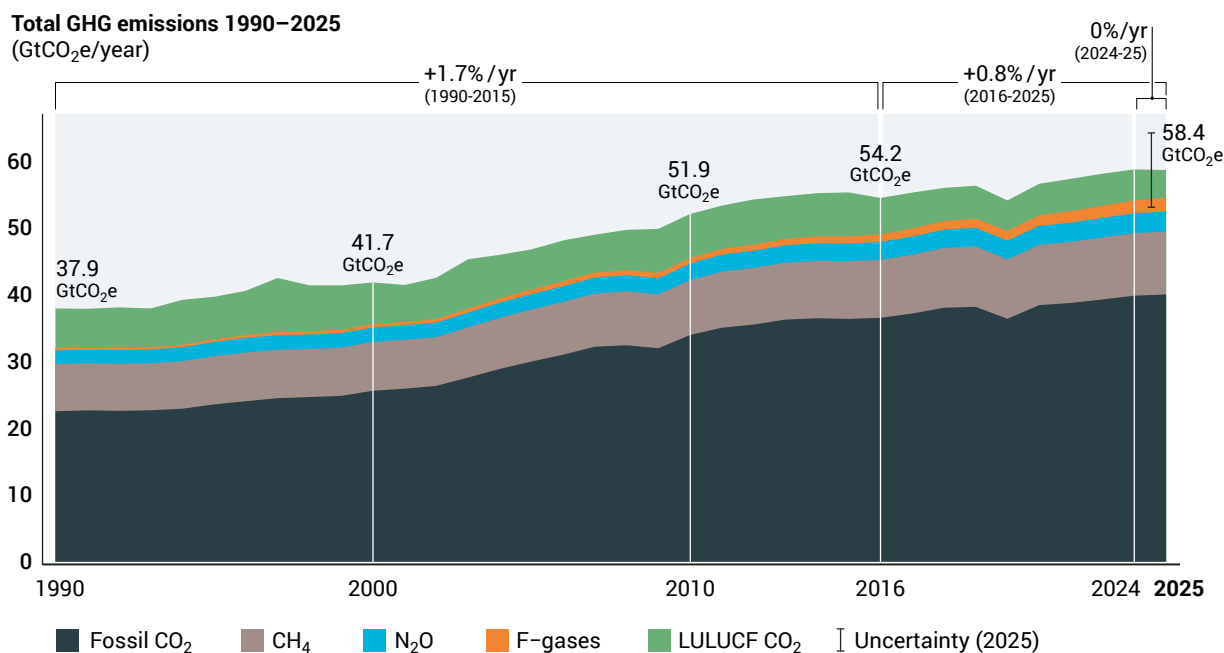
Emissions reported here follow a territorial accounting convention. Other methodological issues including the treatment of non-anthropogenic emissions and removals are detailed in box 2.1 in the Emissions Gap Report 2025 (United Nations Environment Programme [UNEP] 2025) and in [appendix A](#) of this chapter, which is available online.

2.2 Global emissions in 2025 were comparable to those in 2024

Between 2024 and 2025, global net GHG emissions are estimated to remain almost the same, declining only slightly by 0.1 gigatons of carbon dioxide equivalent (GtCO₂e) from the previous year to reach 58.4 GtCO₂e (range: ±5.5 GtCO₂e) (figure 2.1, table 2.1).¹ Due to the high aggregate uncertainty range and the provisional nature of emissions estimates for the

prior year, it is not possible to conclude on the overall direction of emissions in 2025. Emissions have steadily grown over the past decade since 2016 (0.8 per cent per year) and in the period between 1990 and 2016 (1.7 per cent per year). As long as anthropogenic GHG emissions are released, atmospheric GHG concentrations will continue to increase, ultimately driving warming and climate impacts. It is therefore important to note that while overall emission levels may have not changed in 2025, CO₂ concentrations will continue to rise.

Figure 2.1 Total net anthropogenic GHG emissions by gas, 1990–2025



Sources: Crippa *et al.* (2026); Friedlingstein *et al.* (2026b).

2.3 Emissions trends by greenhouse gas – fossil CO₂ continued to increase, but was offset by reductions in LULUCF CO₂

The main components of GHG emissions are CO₂ from fossil sources (fossil CO₂), CO₂ from LULUCF, methane (CH₄), nitrous oxide (N₂O) and fluorinated gas emissions (F-gases). Fossil CO₂ accounts for the majority of current emissions at 68 per cent of the total, followed by CH₄, LULUCF CO₂, N₂O and F-gases.

Across all available data sets, fossil CO₂ emissions increased in 2025. Estimates range from an increase of 0.7 per cent in the EDGAR data set (Crippa *et al.* 2026), which is used in this chapter, to 0.4 per cent reported by the International

Energy Agency (IEA 2026d), 1.1 per cent reported by the Energy Institute (2026) (energy sector only) and 1.1 per cent forecast by the Global Carbon Budget (Friedlingstein *et al.* 2026b). These growth rates are similar to the average over the past decade (appendix A, figure A.1). Differences in fossil CO₂ emissions estimates are due to variations in system boundaries, as well as differences in emission factors and the timing of updates in activity data (Andrew 2020).

Among the non-CO₂ gases, F-gas emissions grew the fastest at 8.6 per cent, followed by N₂O at 1.2 per cent (figure 2.1; table 2.1). CH₄ emissions remained almost the same in 2025. These rates of growth are comparable to those in previous years (appendix A, figure A.1), but since the non-CO₂ gases account for a small share of the total, their contribution to the overall trend is relatively less significant.

¹ Annual updates apply revisions to previously published data, which implies small changes compared to prior reporting in the Emissions Gap Report. Global GHG emissions in 2024 have been revised from the 57.7 GtCO₂e reported in last year's report to 58.5 GtCO₂e, primarily due to a methodological revision in the Global Carbon Budget's calculation of land-use change emissions.

Net CO₂ emissions from LULUCF accounted for an average of 4.8 GtCO₂ per year over the past decade, and 7 per cent of emissions in 2025. The 2026 Global Carbon Budget estimated a decrease in these emissions in 2025, which more than offsets the growth estimated for other gases (Friedlingstein *et al.* 2026b). This reduction in LULUCF CO₂ emissions from 2024 to 2025 was partially driven by a decline in biomass-burning (vegetation fires) emissions (Copernicus Atmosphere Monitoring Service 2025). In 2025, global wildfire carbon emissions also declined compared with the exceptionally active 2024 season, largely due to substantially lower fire activity in South America, Africa and parts of South-East Asia, likely connected to the ceasing of El Niño conditions (Friedlingstein *et al.* 2026b).

Recent methodological changes in the calculation of the Global Carbon Budget have revised LULUCF emissions upward compared to previous reporting, but there remains a steady and statistically significant decline of these emissions since the 1990s (Friedlingstein *et al.* 2026a;

Friedlingstein *et al.* 2026b). Of all emissions assessed here, those from the LULUCF sector are considered to have the highest uncertainties, both in terms of levels and trends (appendix A, figure A.2). The estimated LULUCF decline of about 0.5 GtCO₂e in 2025 slightly over-compensates for the increase in fossil CO₂ emissions. As LULUCF CO₂ is the least certain component of the Global Carbon Budget (with an uncertainty range of ±70 per cent), there is significant uncertainty in the overall direction of emissions last year.

National inventory-based estimates of LULUCF emissions differ from those calculated by global bookkeeping models due to well-established differences in system boundaries (see box 2.1 in UNEP 2025). Globally, national inventories sum up to net LULUCF CO₂ removals of -3.9 GtCO₂ from 2016 to 2023. However, they include negative fluxes that are not the result of direct management, but are a response to changing environmental conditions such as the influence of increased CO₂ concentrations, which have a fertilizing effect on biomass growth.

Table 2.1 Total global emissions by source

GtCO ₂ e	2016–2025 (average)	2023	2024	2025
GHG	56.3±5.6	57.8±5.6	58.5±5.6	58.4±5.5
Fossil CO ₂	38.2±3.1	39.2±3.1	39.8±3.2	40±3.2
LULUCF CO ₂ (global bookkeeping)	4.8±3.4	4.7±3.3	4.6±3.2	4.1±2.9
LULUCF CO ₂ (national inventory*)	-3.9±-2.7	-4.3±-3	–	–
CH ₄	9±2.7	9.2±2.8	9.3±2.8	9.3±2.8
N ₂ O	2.8±1.7	2.9±1.7	2.9±1.8	3±1.8
F-gases	1.5±0.46	1.8±0.54	1.9±0.57	2.1±0.62

Note: Non-CO₂ GHGs are converted to CO₂ equivalents using global warming potentials with a 100-year time-horizon from the Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC WGI AR6) (Forster *et al.* 2021). Annual updates apply revisions to previously published data, which implies small changes compared to prior reporting in the Emissions Gap Report (see appendix A for details).

* Inventory-based LULUCF CO₂ is excluded from total GHG emissions, but all other sources are included. The decadal average for LULUCF CO₂ is up to 2023 only. Uncertainties are based on a 90 per cent confidence interval, consistent with the IPCC WGI AR6 assessment (see appendix A).

Sources: Crippa *et al.* (2026), Friedlingstein *et al.* (2026b), Melo *et al.* (2026).

2.4 Emissions growth slowed down in the G20, with the United States of America being the major exception

Currently, the six largest emitters in terms of total GHG emissions are China, the United States of America, India, the European Union, the Russian Federation and Indonesia – noting that in per capita terms, India and Indonesia are much lower emitters. Preliminary estimates for 2025 (which exclude national-level LULUCF CO₂, for which data is only available up to 2023) show increases in emissions in the United States of America, Indonesia and China, and decreases in India, the Russian Federation and the European Union (figure 2.2; figure 2.3).

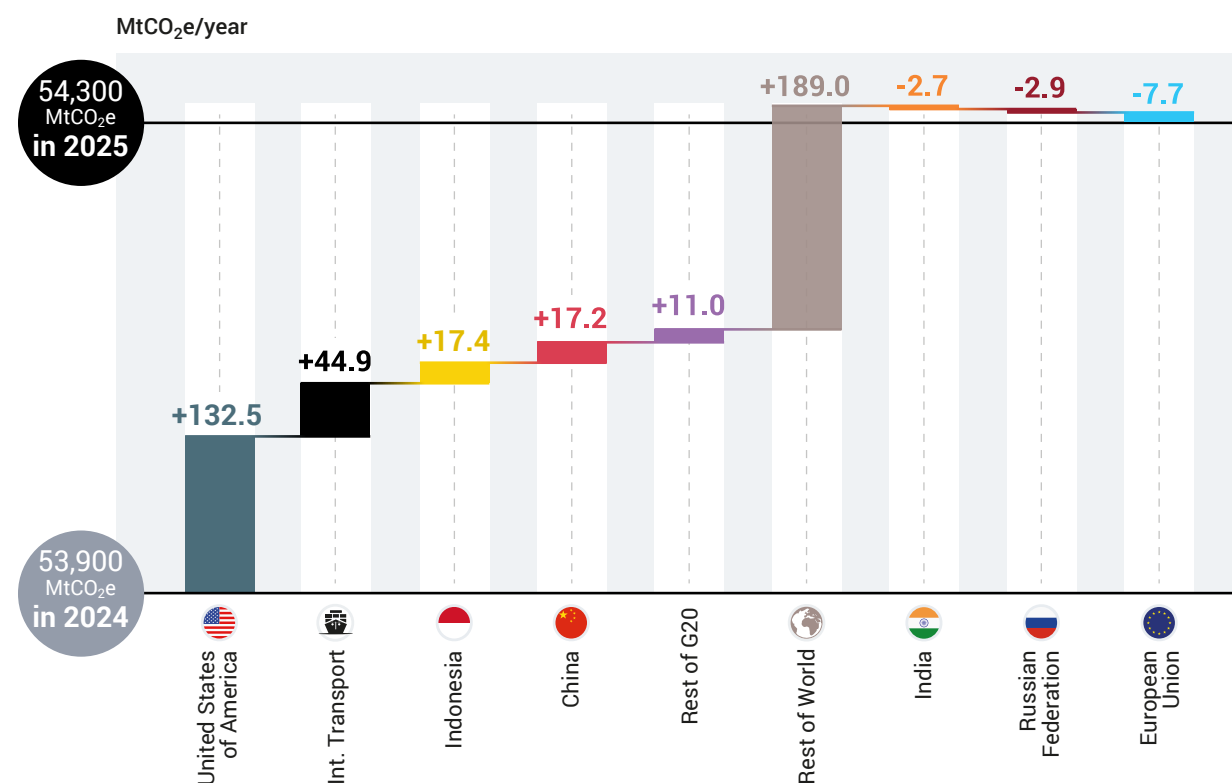
Data sets diverge on India’s emission trend in 2025. EDGAR (Crippa *et al.* 2026) and IEA (2026d) report a slight decrease, while the Energy Institute (2026) reports a slight increase. However, analyses agree that India’s emissions trend in 2025 breaks from a longer period of rapid growth, in part due to weather effects, but also from structural shifts towards renewables (Deng *et al.* 2026; IEA 2026d).

In terms of magnitude, the increase in the United States of America (133 megatons of CO₂ equivalent, MtCO₂e) far exceeded that of all other countries, and was driven by increased electricity demand and a rebound of coal power generation (Energy Institute 2026; IEA 2026b). The next largest estimated increases were Türkiye (24.4 MtCO₂e),

the Islamic Republic of Iran (18.9 MtCO₂e) and Indonesia (17.4 MtCO₂e). While the global emissions trends continued to be driven by G20 members, the contribution from the non-G20 members increased last year to 47 per cent of the total change in emissions. Despite this, the G20 members as a group (excluding the African Union) still accounted for

76 per cent of global GHG emissions excluding LULUCF in 2025. Collectively, G20 members increased their emissions by 0.7 per cent in 2025. LDCs – which include many African Union countries – remain a minor contributor to global emissions, at 3 per cent of the total (appendix A, figure A.4).

Figure 2.2 Contributions to the increase in GHG emissions (excluding LULUCF) in 2025 of the six largest emitters, the other G20 members, the rest of the world, and international transport

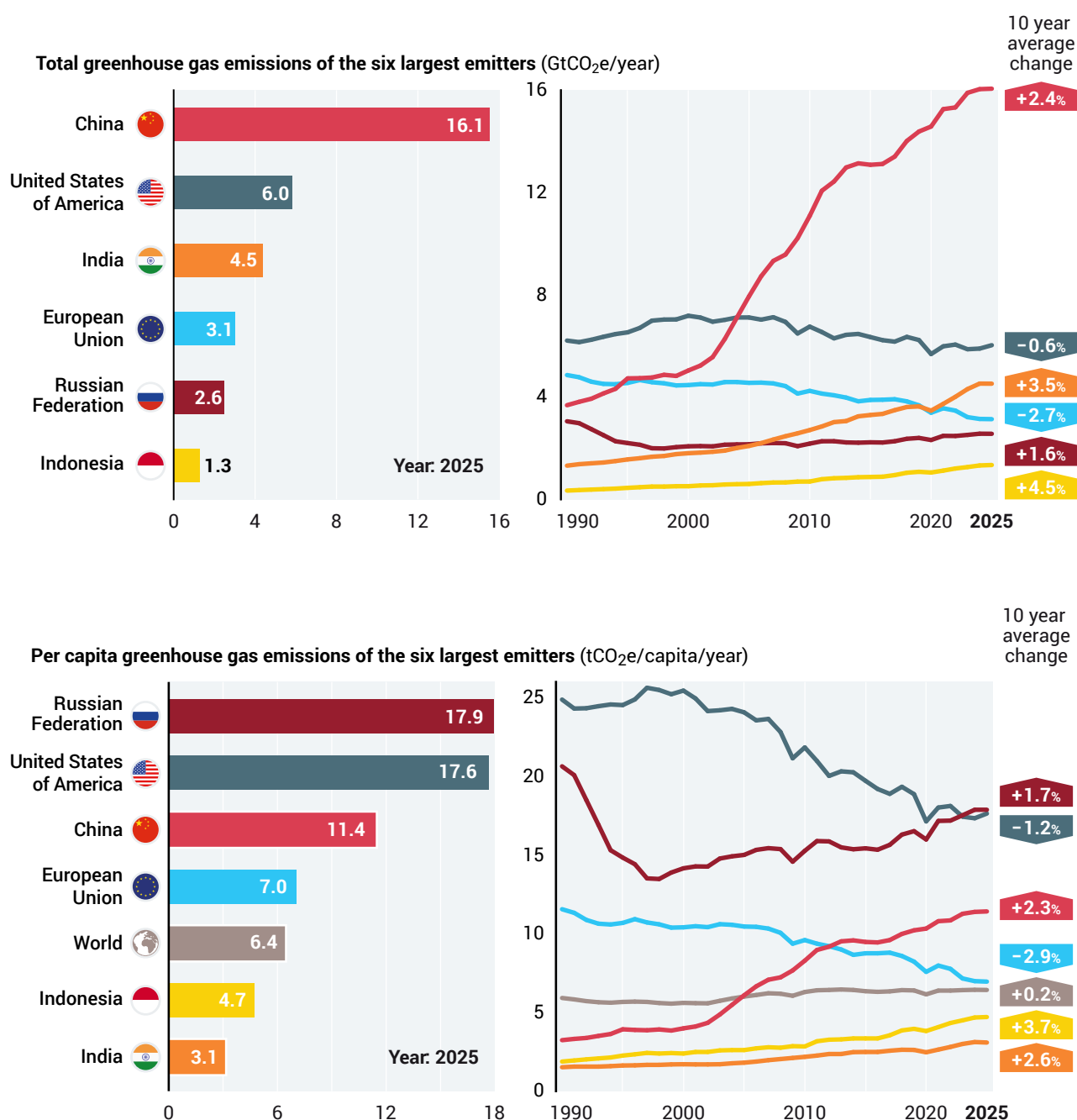


Source: Crippa et al. (2026).

Contributions by current, per capita and historical emissions differ across the largest emitters and world regions. Per capita GHG emissions are above the world average of 6.4 tons of CO₂ equivalent (tCO₂e) in the United States of America, the Russian Federation, China and the European Union, and remain significantly below it in Indonesia and India (figure 2.3). The average per capita emissions of LDCs is 1.5 tCO₂e. In terms of historical cumulative CO₂ emissions (including LULUCF), the United States of America has produced the most global CO₂ emissions to date, followed by China and the European Union (Friedlingstein et al. 2026b). The LDCs have only produced 0.5 per cent of historical cumulative emissions, despite being highly populous countries and regions.

Overall, while 63 countries decreased their emissions over the past decade (totalling -1.8 GtCO₂e per year from 2016 to 2025), these were outweighed by 124 countries increasing their emissions (totalling +7.1 GtCO₂e). Several countries with high per capita and historic emissions have still to peak in their emissions. Recent studies show a strong possibility that China could achieve peak emissions in the coming years, with clear signals across data sets that its emissions growth is slowing down as also reported in chapter 3 of this report (Crippa et al. 2026; Deng et al. 2026; Friedlingstein et al. 2026b).

Figure 2.3 Total and per capita GHG emissions of the six largest GHG emitters, excluding LULUCF



Note: Growth rates depicted on the right show the average annual change in emissions from 2016 to 2025.

Sources: Crippa *et al.* (2026); World Bank (2026).

2.5 Emissions by fuel and sector over the past decade indicate structural changes in the energy and transport sectors

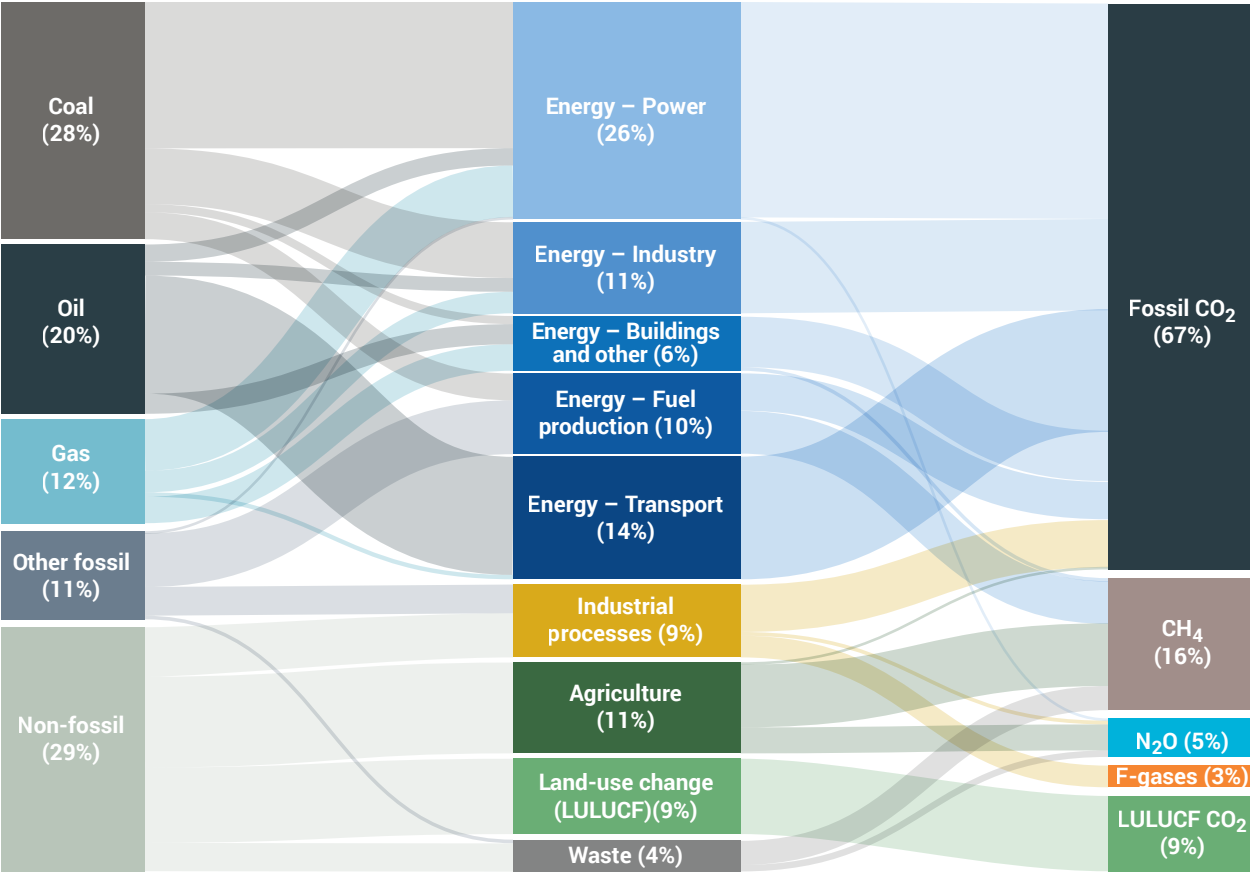
GHG emissions can be traced back to a variety of sectors, fuels and sources (figure 2.4). Taking into account both CO₂ and non-CO₂ emissions, fossil fuels are responsible for 71 per cent of average emissions from 2015 to 2024,

primarily due to their combustion in the power, industry and transport sectors, but also from venting and emissions leaks in oil and gas facilities, pipelines, and coal mine operations (Crippa *et al.* 2026; IEA 2026d). Over the past decade, emissions increased across all fossil fuels, with average annual emissions from gas growing at 2 per cent, followed by coal at 1.1 per cent and oil at 0.1 per cent (appendix A, figure A.3).

Non-fossil fuel emissions (29 per cent of average emissions from 2015 to 2024) are primarily associated with the agriculture, LULUCF, industrial processes and waste sectors (figure 2.4). Major subcomponents of these emissions

include livestock cultivation, deforestation, and a range of industrial processes, such as cement, metal and chemical production, and the production of F-gases for use as insulators and refrigerants.

Figure 2.4 Total net GHG emissions by fuel, sector and gas, 2015–2024 (%)



Note: Flows less than 1/500 of the total in each category are not shown. “Other fossil” refers to fossil sources that cannot be disaggregated further due to data limitations.

Sources: Crippa *et al.* (2026); Friedlingstein *et al.* (2026b); IEA (2026d).

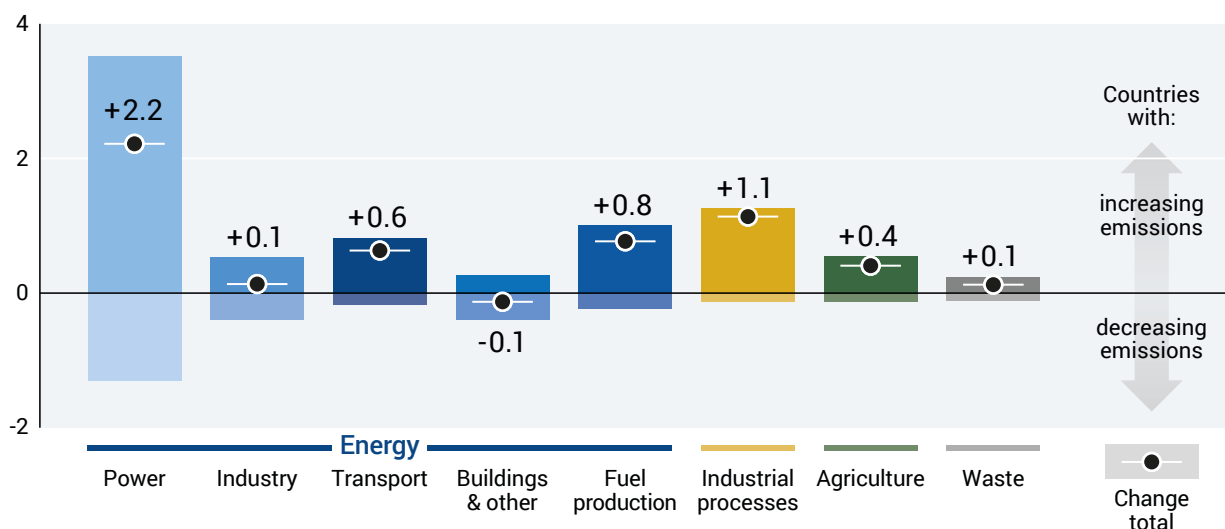
Emissions in different sectors are influenced by long-term structural drivers. Over the past decade, electricity production in the power sector has been a particularly important and dynamic driver of global emissions growth. The power sector accounts for about one quarter of global GHG emissions, primarily due to the combustion of coal, followed by a far smaller share from gas and oil (figure 2.4).

At the same time, it is undergoing a rapid transition in many countries. Over the past ten years, power sector emissions have increased in 93 countries, and decreased in 90, leading to a net change of +2.2 GtCO₂e (figure 2.5). Most developed countries have decreased power sector emissions, but examples of decreases have also been observed across all world regions (appendix A, figure A.7).



Figure 2.5 Change in GHG emissions by sector, 2016–2025 (GtCO₂e)

Change in greenhouse gas emissions by sector in the last decade (GtCO₂e, 2016-2025)



Note: The global change in sectoral GHG emissions disaggregated into countries with increasing versus countries with decreasing emissions. Overall emissions changed by +5.3 GtCO₂e during the same period, excluding the LULUCF sector.

Sources: Crippa *et al.* (2026).

Solar photovoltaics has been a major driver of power sector emissions trends, especially in recent years. Increases in electricity generation in 2025 were met almost entirely by growth of solar photovoltaics and other low-emissions sources of power, such as nuclear, wind and hydropower (Fulghum *et al.* 2026, IEA 2026b). The year 2025 was the first in which renewable power production as a whole (10,730 terawatt hours [TWh], 33.8 per cent of the total) exceeded that of coal power (10,476 TWh, 33.0 per cent) in the global electricity mix (Fulghum *et al.* 2026). This structural shift, combined with the rapid cost reductions of battery storage, is enabling a growing number of countries to produce increasing shares of electricity from renewable sources, insulating economies and livelihoods from global energy supply shocks (see box 2.2). The deployment of renewables as a whole has avoided significant global CO₂ emissions growth (Deng *et al.* 2026; Fulghum *et al.* 2026; IEA 2026b), with solar photovoltaics and wind contributing to 4.1 GtCO₂ of “avoided emissions” in 2025 (Fulghum *et al.* 2026). While global coal power capacity is still growing, projects that are proposed or under construction are limited to just 32 countries, with 95 per cent of current construction taking place in China and India. Moreover, actual coal capacity usage in 2025 decreased, due to displacement by renewables (Shearer *et al.* 2026). There is evidence that policies have accelerated power sector transformations away from fossil fuels in several countries globally (chapter 6).

The transport sector accounts for 14 per cent of global direct GHG emissions. Almost all transport emissions come from the combustion of oil and liquid fuels in vehicles, either in land-based transport systems (cars, trucks, etc.) or in aviation and shipping. To date, there has been only limited progress in reducing transport sector emissions, with decreases

over the past ten years observed in just 47 countries, and an overall net change of +0.6 GtCO₂e (figure 2.5). Still, there are emerging signs of transport sector electrification and decarbonization, but at rates and levels that are not yet sufficient to drive emission reductions at the global level (Crippa *et al.* 2026). Electric vehicles (battery electric and plug-in hybrid) accounted for a quarter of all new car sales in 2025, with a particularly strong market share in China (55 per cent) and the European Union (28 per cent), but also in emerging economies such as Nepal (68 per cent) and Viet Nam (41 per cent) (IEA 2026c). Many countries are actively supporting the adoption of a range of electric vehicle types – including cars, buses, trucks, and two- and three-wheelers – with subsidies, tax credits and import duty exemptions, with anticipated benefits for energy security, lower bills, air quality and climate mitigation (IEA 2026c).

Globally, barring the period of the COVID-19 pandemic, international transport emissions have been steadily increasing, with aviation showing a higher increase compared to shipping in 2025. This is mainly due to an increase in activity compounded by slow progress on decarbonizing these sectors. In the aviation sector, total passenger air travel demand increased by 5.3 per cent in 2025, while air cargo demand rose by about 3 per cent (International Air Transport Association [IATA] 2026). The share of Sustainable Aviation Fuels is less than 1 per cent of total aviation fuel consumption (IATA 2026), and their lifecycle emissions performance varies widely by feedstock and production pathway, with crop-based routes carrying indirect land-use change emissions that can offset much of the intended saving. Another increasing trend in the last few years is the growing energy demand and emissions from data centres and artificial intelligence.

Currently, data centres make up less than 1 per cent of total emissions, and are included in the power sector share reported above. Electricity consumption from data centres is projected to double to over 900 TWh by 2030, depending on the scale of expansion and progress on emission reduction strategies (IEA 2025; Xiao *et al.* 2025; Chien *et al.* 2026).

Overall progress in decarbonizing other sectors has been modest. Despite options being available, costs, political barriers and other feasibility constraints have resulted

in slow progress in reducing emissions from buildings, hard-to-abate industrial sectors, and shipping and aviation, indicating the need to accelerate efforts (Bachorz *et al.* 2025; Heinz *et al.* 2025; Meng *et al.* 2025; Kanchiralla *et al.* 2026). China is making significant progress in electrifying energy end uses, but progress has stalled in other countries and regions (UNEP 2024). Chapter 5 provides further analysis of progress towards key global sectoral climate milestones, while chapter 6 provides more detail on policies and their impacts.

Box 2.2 The impact of energy supply crises on energy transitions

Conflicts cost lives, drive humanitarian crises, and can cripple economies and livelihoods. They can also significantly impact energy supply by disrupting production, trade flows and demand. Historically, countries that have faced sudden energy supply shortages have responded by sourcing alternative supplies, increasing efforts to reduce consumption and implementing structural shifts to reduce energy dependence (Peters *et al.* 2012; Bastos *et al.* 2024; Zhou *et al.* 2025). At the same time, crises can temporarily impede the energy transition as countries divert resources from clean energy or climate plans, or further subsidize fossil imports (Wang *et al.* 2024; Höhne *et al.* 2026). Because structural adjustments take time, their effects are often not immediately visible.

Since 2022, at least two major conflicts have impacted the supply of fossil fuels. A fossil fuel supply crisis followed Russian Federation's 2022 invasion of Ukraine, which disrupted oil and gas supplies to Europe and led to substantial changes in the global energy market (Zhang *et al.* 2024).

The European Union's response to the 2022–2024 energy security crisis reduced gas consumption by 19 per cent, of which nearly 30 per cent was due to changes in household heating such as decreased demand and greater uptake of energy efficient heat pumps (Zhou *et al.* 2025). Policy frameworks such as REPowerEU brought structural transitions forward by years, scaling wind and solar installations and reducing fossil fuels' share in power generation to a record-low 28 per cent per cent (IEA 2025). Reductions in gas powered electricity were substituted by renewable sources, progressively reducing the European Union's structural dependency on gas. However, a significant portion of reductions were also associated with contraction of industrial production caused by high gas prices (Zhou *et al.* 2025), while several countries extended or temporarily reactivated coal plants to replace falling Russian pipeline gas (Falkner 2023). Overall, the European Union trend of emission reductions continued and even accelerated, illustrating that energy transitions can progress amid major supply disruptions (figure 2.4; [appendix A](#)).

The disruption to the Strait of Hormuz, which began in 2026, could prove more severe, as it affects significantly larger global trade volumes (IEA 2026f). The closure and disruption of traffic has led to an abrupt reduction in the global supply of oil and gas. Prior to February 2026, approximately 25 per cent of seaborne oil trade and 19 per cent of global liquefied natural gas trade passed through the strait (IEA 2026e). Disruptions to shipping through the strait are therefore likely to have both short-term and lasting effects on GHG emissions and their drivers.

The Strait of Hormuz closure and resulting energy shortage has already caused severe economic impacts through higher energy prices, which affect households and economic sectors including agriculture and small- and medium-sized manufacturing, particularly in fuel-importing countries (Rai 2026). Many Asian countries, for example, have already implemented demand-reducing measures, including government austerity measures, remote working and air-conditioning temperature limits (IEA 2026a), while others have expanded fuel subsidies or cut fuel taxes, straining public budgets (Höhne *et al.* 2026) (chapter 3).

Although, the full effects of the crisis remain uncertain for now, the fossil fuel supply shock relating to the Strait of Hormuz is likely to influence emissions in opposing directions: increasing them through fuel switching, revived coal use and increased fossil fuel subsidies, while reducing them through lower energy demand and accelerated deployment of renewables and electrification. The net effect on 2026 emissions cannot yet be determined, but the crisis strengthens the case for reducing dependence on fossil fuel imports and accelerating renewable energy investments.

Beyond their humanitarian and energy-system impacts, conflicts are also direct sources of emissions from military operations, the destruction of energy and civil infrastructure, and landscape fires (Vasylyshyn *et al.* 2025; Neimark *et al.* 2026).

3 Nationally determined contributions and policy developments: The global landscape and G20 insights

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3.1 Introduction

Significantly more nationally determined contributions (NDCs) have been submitted since the thirtieth United Nations Climate Change Conference of the Parties (COP 30). This chapter provides an overview of the status of the latest NDCs. It assesses their implications for projected global greenhouse gas (GHG) emissions, and looks at progress towards their achievement. Furthermore, it updates emissions projections based on recent climate policy developments and implementation in a period marked by geopolitical uncertainty. Sections 3.2 and 3.3 provide global updates and assessments, while sections 3.4 and 3.5 provide insights at G20 member level.

To give an indication of progress and ambition of policies and NDCs, both the global and G20 member assessments zoom in on the following three questions:

1. Do the new NDCs lower projected emissions in 2035 compared with 2030 targets?
2. How large are the implementation gaps in 2030, and are they narrowing?

3. How much do the new NDCs enhance ambition beyond current policies projections for 2035?

All emission estimates presented in this chapter include land use, land use-change and forestry (LULUCF) (see box 3.2).



Box 3.1 Coverage of G20 members

This report covers all G20 members, counting the European Union as one entity.¹ These include Argentina, Australia, Brazil, Canada, China, European Union, India, Indonesia, Japan, Mexico, Republic of Korea, Russian Federation, Saudi Arabia, South Africa,² Türkiye, United Kingdom and United States of America.³ The United States of America has withdrawn from the Paris Agreement, and also communicated its intention to withdraw from the United Nations Framework Convention on Climate Change

(UNFCCC) with effect by 27 February 2027 (United States of America, White House 2025; United States of America, White House 2026), thereby annulling all its national emissions reduction targets, including the NDC. The chapter therefore only includes information regarding historical emissions and emissions projections based on current policies for the United States of America. Where relevant, details regarding the implications of the withdrawal of the United States of America for global and G20-level assessments are provided.

Box 3.2 Terminology and data sources

In this report, “new NDCs” refers to NDCs included in the UNFCCC NDC 3.0 list (UNFCCC 2026a; UNFCCC 2026b), while “NDCs” or “active NDCs” refer to all NDCs that are currently effective and shown as “active” in the UNFCCC registry, regardless of whether the Party has submitted or announced a ‘new’ NDC. The cut-off date for the literature and data assessed in the report is 1 September 2026 unless otherwise noted. Country-level emissions include territorial emissions unless otherwise stated.

In contrast to the rest of the report (including chapters 2, 4 and other sections of chapter 3), section 3.4 on the national NDC implementation gap uses historical energy and industry emissions exclusively from the

latest national GHG inventories, including those in the Biennial Transparency Reports (BTRs), as compiled by PRIMAP-hist (Gütschow *et al.* 2026), the only scientific project that has continually been curating country-reported GHG emissions data (Gütschow *et al.* 2016). This methodological choice causes minor variations in country-level emission estimates, excluding LULUCF, between section 3.4 and chapter 2, which presents estimates by independent research groups. Historical carbon dioxide (CO₂) emissions from LULUCF in chapter 3 are also taken from the national GHG inventories (Joint Research Centre [JRC] 2026) to ensure that the emission estimates including LULUCF are comparable with the NDC targets as communicated by Governments.

3.2 NDC submissions have more than doubled since 2025, providing a stronger basis for assessment

The number of new NDCs has more than doubled since last year’s Emissions Gap Report (United Nations Environment Programme [UNEP] 2025), and their coverage of global GHG emissions has increased by about 12 per cent. As of 1 September 2026, 124 Parties have submitted new NDCs⁴

(Climate Watch 2026), accounting for about 75 per cent of global emissions, compared with 57 submissions covering 63 per cent of emissions at the cut-off date for the 2025 Emissions Gap Report. Overall, 167 Parties, accounting for about 83 per cent of global emissions, have an active NDCs.⁵ The new NDC submissions provide a more robust basis for assessing collective progress and ambition towards 2035.

¹ Individual European Union Member States that are G20 members include France, Germany and Italy.

² The Government of South Africa has confirmed that the country will step back from G20 engagements during the US presidency of the G20 (Africanews 2026). However, South Africa is still considered fully part of the G20.

³ The African Union is also a G20 member, but it does not have a collective NDC. Therefore, the assessment does not include commitments by the African Union as a whole. Conversely, the European Union is included in the assessment because it has its collective NDC.

⁴ These figures here and in this section all exclude the new NDCs of the 27 individual European Union Member States. There are 194 Parties (including the 27 European Union Member States) with active NDCs, and 143 Parties with new NDCs, when 27 new and active NDCs from the European Union Member States are included.

⁵ More specifically, there are 155 Parties (excluding the European Union Member States) with a GHG target, and 12 Parties with a non-GHG target, which can be mitigation actions only. One NDC, that of the United States of America, was withdrawn, Yemen submitted an NDC but is not a member of the Paris Agreement, the Islamic Republic of Iran submitted only an intended NDC, and Libya has not made any submission, leading to a total of 198 Parties (including the 27 European Union Member States).

The Paris Agreement stipulated that developed country NDCs contain economy-wide, absolute emission reduction targets while developing countries move over time towards economy-wide targets. More recently, the call in the global stocktake for Parties to submit “ambitious, economy-wide emission reduction targets, covering all GHGs, sectors and categories” (UNFCCC 2023). However, new NDCs have only modestly increased the number of Parties with GHG targets. Eight Parties included GHG targets in their new NDCs for the first time, bringing the total number of Parties with GHG targets in their NDCs to 155, up from 121 at the time the Paris Agreement was adopted (Climate Watch 2026).

The new NDCs increasingly use more robust and verifiable target formulations (for example, base-year or fixed-level targets), improving transparency and accountability, but they have not meaningfully broadened the scope of sectors and gases covered by the targets. Among the 155 active NDCs with a GHG target, 51 now contain emission reduction targets relative to a base year (such as Brazil, the Republic of Korea and Thailand), while another 14 have fixed-level targets that specify the emissions level in the target year (such as Indonesia, Mexico and South Africa). This is up from 35 and five respectively (Climate Watch 2026). There are still three Parties with an intensity target (India, Tunisia and Uzbekistan) and one Party with a trajectory target (China). While baseline-scenario targets still appear in a majority of NDCs (about 86), eight Parties switched from baseline-scenario targets to base-year targets in their new NDCs, a welcome move because from an accounting and transparency perspective, base-year and fixed-level targets are generally considered more robust than other types.

Gender equality and social inclusion is increasingly considered in the NDCs. According to analysis, 96 per cent of the countries assessed (84 of 134) integrate gender equality and social inclusion considerations into the planning and implementation processes of the NDCs (United Nations Development Programme [UNDP] 2026). Women are increasingly recognized as key stakeholders and agents of change, with commitments focused on empowerment, access to resources, skills and training, and links to sustainable development, just transitions and social justice. However, gender considerations remain more prominent in adaptation and resilience than in mitigation, with most actions concentrated in agriculture, rural electrification and water management. Further progress is needed to embed gender and social inclusion across all sectors, particularly in access to finance, measurable targets, implementation plans and accountability mechanisms (CARE Climate Justice Center 2025; United Nations Development Programme 2025; Huyer 2026).

3.3 Climate policy updates and new NDCs show limited enhanced global mitigation action and ambition

This section updates projected global GHG emissions in 2030 and 2035 under current policies and NDC scenarios. To give an indication of global progress and enhanced ambition of the new NDCs, it focuses on three main questions:

1. **Do the new NDCs lower projected global emissions in 2035 compared with 2030 targets?** As a minimum, enhanced global ambition would suggest that mitigation targets for 2035 are more stringent than for 2030.
2. **How large are the implementation gaps in 2030, and are they narrowing?** The implementation gap is defined as the difference between projected emissions under current policies and emissions consistent with full implementation of NDC targets. A narrowing 2030 gap would indicate that countries are making progress in aligning policies with their existing commitments.
3. **How much do the new NDCs enhance ambition beyond current policies projections for 2035?** This is assessed by comparing projected emissions under current policies in 2035 with emissions under the new NDCs. A substantial gap between the two would indicate that countries have adopted targets that require significantly stronger action than is currently reflected in existing policies.

3.3.1 The latest 2035 NDCs show relatively modest global emission reductions compared with 2030 targets

Full implementation of the new unconditional and conditional NDCs lowers expected global emissions in 2035 by 3.5 gigatons of CO₂ equivalent (GtCO₂e) and 4 GtCO₂e respectively, compared with 2030 targets (table 3.1). As chapter 4 shows, this is far from the global reductions needed to get on track to achieving the long-term temperature goal of the Paris Agreement.

As shown in table 3.1, the projected global emissions based on the full implementation of the unconditional and conditional targets in the NDCs in 2035 are 52 GtCO₂e and 49 GtCO₂e respectively, compared with 55 and 53 GtCO₂e in 2030.

Table 3.1 Summary of global emissions projections, the impact of new NDCs and the implementation gap

Scenario	Projected GHG emissions (GtCO ₂ e)		Emissions reduction of 2035 NDCs compared with 2030 targets (GtCO ₂ e)	Implementation gap* (GtCO ₂ e)	
	2030	2035		2030	2035
Current policies	57 (53–62)	55 (52–61)	–	–	–
Unconditional NDCs	55 (51–59)	52 (49–55)	3.5 (3–4)	2 (0–5)	3 (2–6)
Conditional NDCs	53 (50–56)	49 (47–52)	4 (3–4)	4 (2–7)	6 (5–8)

* Ranges are calculated based on individual studies.

Note: The NDC scenarios are adjusted in cases where countries' emissions under current policies are projected to be lower than their NDC target levels. In such cases, the lower current policies projections are used in the aggregation.

The NDC estimates provided in table 3.1 are based on updated NDC scenarios building on the same five modelling groups used in last year's report: Climate Action Tracker (Gonzales-Zuñiga *et al.* 2025), PBL Netherlands Environmental Assessment Agency (den Elzen *et al.* 2026; Hooijschuur *et al.* 2026a), JRC Global Energy and Climate Outlook (Keramidas *et al.* 2026), Climate Resource (Talberg *et al.* 2026), and the World Resources Institute (Climate Watch 2026). All modelling teams have analysed the new GHG emissions projections based on the new NDCs, with cut-off dates for new NDC submissions between January and April 2026, dependent on the study (see also chapter 4).

The current policies scenario GHG emission projections until 2035 also build on updates by the same five modelling studies used in the 2025 Emissions Gap Report: Climate Action Tracker (Gonzales-Zuñiga *et al.* 2025), PBL Netherlands Environmental Assessment Agency (Dafnomilis *et al.* 2025), JRC Global Energy and Climate Outlook (Keramidas *et al.* 2026), ELEVATE (Hooijschuur *et al.* 2026b), and the International Energy Agency (IEA) World Energy Outlook 2025 (IEA 2025b). The resulting estimates of global GHG emissions in 2030 and 2035 under current policies are 57 GtCO₂e and 55 GtCO₂e respectively (table 3.1). The updated NDC and current policy scenarios also form the basis for updating the emissions gap in chapter 4.

The aggregated projections of unconditional and conditional NDCs for all Parties have been adjusted in cases where countries' emissions based on existing policies are

projected to be lower than their NDC targets. In such cases, the current policy scenario projections are used. Among the G20 members, notable examples where current policies projections result in lower emissions than NDC targets include India, the Russian Federation and Türkiye (see section 3.4, figure 3.4). Without this adjustment, the projected 2030 emissions for the unconditional and conditional NDC scenario would increase by 4 GtCO₂e (median, range: 0–6.5) and 2 GtCO₂e (median, range: 0–4.5) respectively. For 2035, they would be 4.5 GtCO₂e (median, range: 0–7) and 2.5 GtCO₂e (median, range: 0–5) higher respectively. This means that current policies projections would be lower than the projections of emissions under unconditional NDCs.

Updates of emissions trends, policy updates and methodological improvements result in differences in the current policies and NDC projections compared with the findings of last year's report. These differences and the factors contributing to them are summarized in table 3.2. One of the major factors influencing all the estimates is that current policies and NDC scenarios have been harmonized with the updated global historical GHG emissions estimate of 2023, provided in chapter 2. This has increased all projections for 2030 and 2035 by 1.0–1.5 GtCO₂e.⁶ For 2030 emissions under current policies scenarios, the harmonization outweighs the projected decrease in emissions due to policy changes. This is also the primary factor behind the slightly higher 2035 emissions estimate under current policies compared with last year's report.

⁶ Like last year, a harmonization procedure has been implemented (adjusted based on the method described in box 4.1 of the Emissions Gap Report 2022). More specifically, the discrepancy between the historical emissions assumed in the scenarios of the model studies (mainly until 2023) and the historical emissions detailed in chapter 2 (with land-use emissions based on global book-keeping models) was addressed by applying the modelled absolute change between the harmonization year (2023) and the 2030 and 2035 projections from the NDC studies to the historical emissions database.

Table 3.2 Changes in GHG emission projections since 2025 (median estimates) and contributing factors

Projection year and scenario	EGR 2026	EGR 2025	Difference EGR 2026–2025*	Factors explaining differences between EGR 2026–2025 reports			
				Updated historical emissions until 2023 (harmonization)	Policy changes and NDC cancellation in USA	Policy changes and NDC updates in rest of world	Methodological updates (other factors)
2030							
Current policies	57.4	57.9	-0.5	1.0	Limited	-1.0	-0.5
Unconditional NDCs	55.5	52.7	2.8	1.5	1.7	Limited	-0.5
Conditional NDCs	53.5	50.6	2.8	1.4	1.7	Limited	-0.3
2035							
Current policies	55.0	54.4	0.6	1.0	Limited	-0.5	Limited
Unconditional NDCs	51.9	48.1	3.9	1.4	2.2	0.4	-0.1
Conditional NDCs	49.3	46.5	2.8	1.3	2.2	-0.3	-0.4

* Note that the sum of factors may not match the totals, due to rounding.

The 2030 median estimates of the NDC scenarios are about 3 GtCO₂e higher, and the 2035 estimates about 4 GtCO₂e and 3 GtCO₂e higher, than those of the 2025 Emissions Gap Report. In addition to the harmonization, the difference is primarily due to the annulment of the NDC of the United States of America following withdrawal from the Paris Agreement. The former NDC target of the United States of America has thus been replaced with an estimate based on its higher current policies scenarios, which has increased all NDC estimates for 2030 and 2035 (table 3.2).

The additional emissions reduction impact of the new NDCs compared to last year's assessment is limited, varying from 0.4 GtCO₂e (range: -0.8–1.1) for the unconditional NDCs and -0.3 GtCO₂e (range: -2.5–0.7) for the conditional NDCs (table 3.2). The reason is that last year, the underlying modelling studies assumed 2035 mitigation targets similar to 2030 NDC levels for countries that had not submitted a new NDC. This was an optimistic assumption for countries that still show increasing emissions (such as India), which counterbalanced the additional reduction impact of the new NDCs submitted since last year by other countries, including Indonesia, Mexico and the Republic of Korea.

3.3.2 The global implementation gaps remain largely unchanged

The implementation gap indicates how close or far countries – individually and collectively – are from achieving NDC targets based on policies in place. It is defined as the difference between projected emissions under current policies and emissions consistent with full implementation

of NDC targets. As 2030 gets closer, a narrowing global 2030 gap would indicate that, collectively, countries are making progress in aligning policies with their existing commitments.

As table 3.1 shows, the global implementation gap for **2030** is estimated to be around 2 GtCO₂e for the unconditional NDCs and 4 GtCO₂e for the conditional NDCs. The conditional gap is larger because conditional targets are more stringent and therefore lie further below current policies projections. The 2030 implementation gap has narrowed compared to last year. However, this is because the projected global GHG emissions under the NDC scenario are higher this year, as the NDC target of the United States of America has been replaced with current policies projections (see section 3.3.1). In other words, the narrowing reflects policy changes, not policy progress. Apart from these changes, the global implementation gap for 2030 has hardly changed.

The global implementation gap for **2035** can also be interpreted as how much the new NDCs enhance ambition beyond current policy trajectories. A substantial gap between the two would indicate that countries have submitted targets that require significantly stronger action than is reflected in existing policies. The implementation gap for 2035 is estimated at 3 GtCO₂e for the unconditional NDCs and 6 GtCO₂e for the conditional NDCs. As for 2030, the implementation gap has hardly changed from last year's assessment. For 2035, the gap widens by only 1 and 2 GtCO₂e for both cases compared to 2030, suggesting that the enhanced collective ambition of 2035 NDCs is weak.

3.4 Climate policy updates and new NDCs of G20 members indicate varied enhanced mitigation action and ambition

This section provides detailed updates for the G20 Member States. It starts with a status of the G20 NDCs (section 3.4.1), followed by updated emissions trajectories for each of the G20 members (section 3.4.2). It then focuses on the same three questions as section 3.3 but for individual G20 members, to give an indication of the progress and ambition of policies and NDCs:

1. Do the new NDCs lower projected emissions in 2035 compared with 2030 targets? (section 3.4.3)
2. How large are the implementation gaps in 2030, and are they narrowing? (section 3.4.4)
3. How much do the new NDCs enhance ambition beyond current policies projections for 2035? (section 3.4.5)

The section ends with examples of recent policy updates that could significantly impact emission projections for the six largest emitters of GHGs.

Box 3.3 Basis for the assessment of G20 members

Current policies projections draw on the recent literature for individual G20 members.

The assessment of the NDCs of G20 members is based on a synthesis of emissions projection studies conducted by independent research groups.⁷ The studies included in the assessment were mostly published in 2025 or later, to ensure recently adopted policies are accounted for in the emissions projections. A list of the studies, along with the criteria for their inclusion, assumptions made for

the assessment and methodological limitations of the assessment is available in [appendix B](#).

The evaluation of the conditionality of NDCs is based on the categorization of the World Resources Institute (Climate Watch 2026), whereby India and Indonesia have both unconditional and conditional NDCs, while for South Africa the upper end of the target range is considered as unconditional and the lower end as conditional.⁸ Based on its new NDC submission, Mexico is now only considered to have an unconditional NDC target for 2030.

3.4.1 Most G20 members have now submitted new NDCs

Table 3.3 provides an overview of the NDCs of the G20 members. A total of 14 of the 17 G20 members, counting the European Union as one, have submitted new NDCs with reduction targets for 2035 (table 3.3). Eight of these (denoted by asterisks in table 3.3) were submitted since the cut-off date for last year's Emissions Gap Report, including

China, the European Union and Türkiye, who announced their 2035 pledges in September 2025. Mexico is the only G20 member to have updated and strengthened its 2030 NDC in its new NDC submission (see section 3.4.4). Argentina has not submitted a new NDC, Saudi Arabia has submitted a new NDC which includes a target for 2040 but not for 2035, and the United States of America has withdrawn from the Paris Agreement.

⁷ For the United States of America, this section updates the assessment on current policies scenario projections.

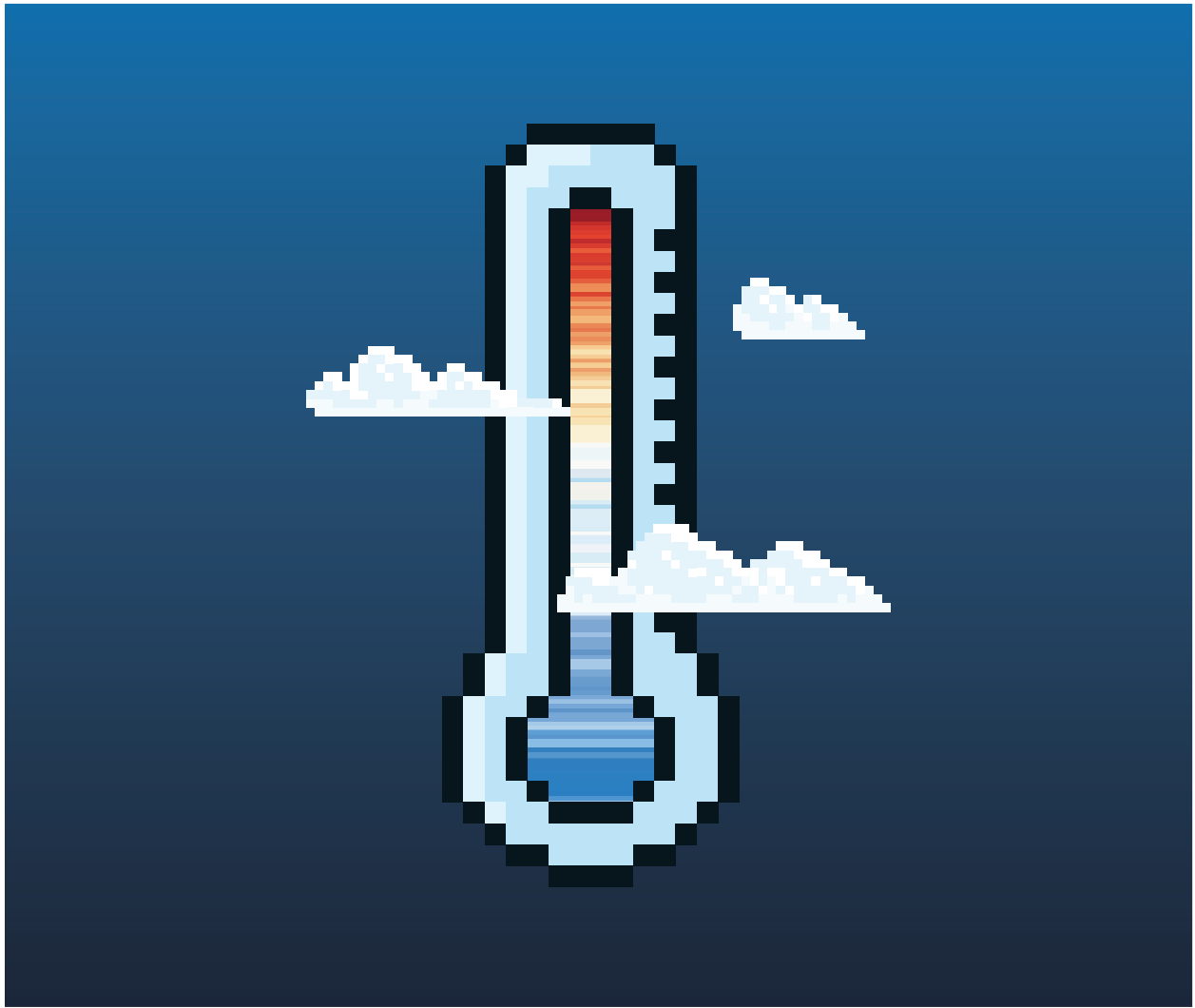
⁸ The 2035 NDC of South Africa continues to rely on the assumption that "implementation and ambition will be enabled by finance and technology and capacity building support", as stated in South Africa's first NDC (South Africa 2025). Meanwhile the first BTR explains that South Africa's 2030 NDC "does not have a conditional or unconditional component" (South Africa 2024). Therefore, this assessment assumed that the upper end of the range would be achieved largely by domestic sources, and the lower end by significant international support.

Table 3.3 NDC status and mitigation targets for 2035 in the new NDCs of G20 members

G20 member	NDC status and mitigation targets for 2035 in new NDCs
Argentina	No new NDC submitted.
Australia	Reduce GHG emissions by 62–70 per cent below 2005 levels by 2035.
Brazil	Reduction of its net GHG emissions by 59–67 per cent below 2005 levels by 2035, which is consistent with an emissions level of 1.05–0.85 GtCO ₂ e.
Canada	Reduce GHG emissions by 45–50 per cent below 2005 levels by 2035.
China*	By 2035, reduce economy-wide net GHG emissions by 7–10 per cent from peak levels, striving to do better. Increase the share of non-fossil fuels in total energy consumption to over 30 per cent. Expand the installed capacity of wind and solar power to over six times 2020 levels, striving to bring the total to 3,600 GW. Scale up the total forest stock volume to over 24 billion m ³ .
European Union*	Reduce net GHG emissions by 66.25–72.5 per cent from 1990 levels by 2035.
India*	Reduce GHG/gross domestic product (GDP) by 47 per cent from 2005 levels by 2035. Achieve about 60 per cent cumulative installed electric power capacity from non-fossil fuel-based energy resources by 2035 (conditional, depending on transfer of technology and international finance). Increase the carbon sink volume up to 3.5–4 GtCO ₂ e (cumulative) through forest and tree cover from 2005 levels.
Indonesia*	Reduce GHG emissions to 1787 million tons of CO ₂ equivalent (MtCO ₂ eq) (unconditional, reference scenario). Emissions will decline in 2035, with the projection of GHG emission levels reaching 1258–1489 MtCO ₂ eq (conditional, range of low-carbon scenarios).
Japan	Reduce GHG emissions by 60 per cent from 2013 levels by 2035.
Mexico*	Unconditional target set at net absolute emissions in the range of 404–364 MtCO ₂ e in 2035. Conditional target set at net absolute emissions in the range of 363–332 MtCO ₂ e.
Republic of Korea*	Reduce GHG emissions by 53–61 per cent from 2018 levels by 2035.
Russian Federation	Reduce GHG emissions by up to 65–67 per cent compared to 1990 levels by 2035.
Saudi Arabia*	New NDC includes only a target for 2040, not 2035. [†]
South Africa	Limit net GHG emissions to 320–380 MtCO ₂ e in 2035.
Türkiye*	Limit GHG emissions to 643 MtCO ₂ e in 2035.
United Kingdom	Reduce GHG emissions by at least 81 per cent from 1990 levels by 2035.
United States of America	No NDC.

Note: Countries denoted with an asterisk have submitted their 2035 NDCs after 30 September 2025.

[†] Saudi Arabia aims to reduce, avoid and remove GHG emissions by 335 MtCO₂e annually reached by 2040, based on a dynamic baseline.



3.4.2 Emissions trajectories of a majority of the G20 members remain misaligned with net-zero targets

Figure 3.1 shows emission trajectories implied by historical emissions and projections based on current policies, and NDC targets and net-zero targets for each G20 member as applicable (noting that France, Germany and Italy are only assessed as part of the European Union). It shows the direction required for G20 members to move from their current emission trajectories to their NDC targets for 2030 and 2035, and the extent to which further acceleration of emission reduction rates would be required to achieve the net-zero targets for each G20 member, as applicable. Based on the historical GHG emissions, nine G20 members⁹ have peaked their net emissions and since reduced their emissions by more than 1 per cent of peak emissions per

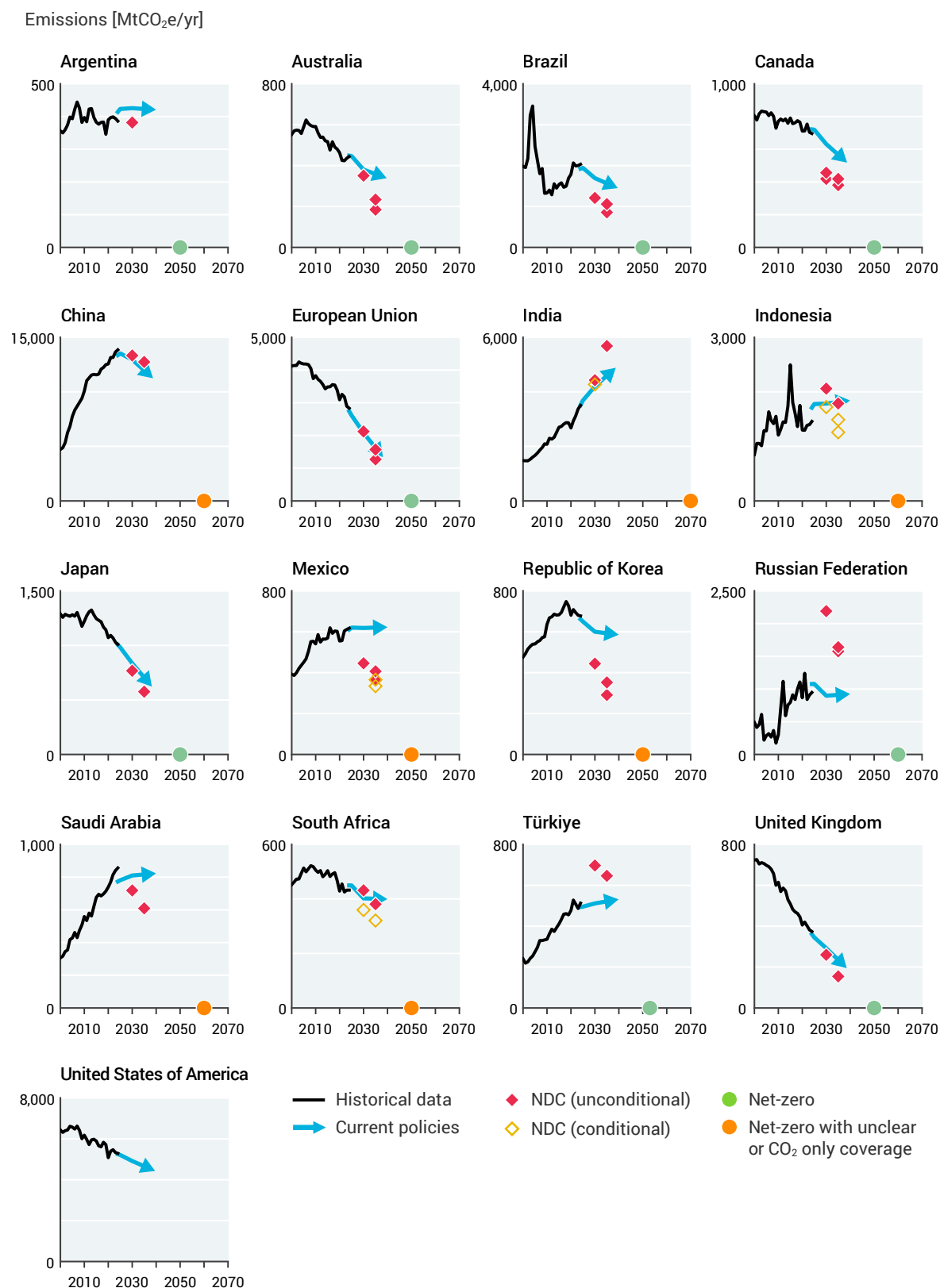
year on average for five or more years (figure 3.1). By 2035, a few more G20 members may have peaked their emissions under current policies, most notably China (figure 3.1). All G20 members except a few would need to accelerate their emission reduction rates based on current policies to achieve their net-zero targets.

It should be noted that this illustration does not consider the relative merits in terms of equity or fairness of the choices countries make regarding their NDCs, or their nationally determined pathways to net zero. Furthermore, per capita GHG emissions and projections continue to differ widely among G20 members (see [appendix B](#)).

In the following sections, the progress of G20 members towards their NDC targets is assessed in greater detail.

⁹ Australia, Canada, European Union, Japan, Republic of Korea, Russian Federation, South Africa, United Kingdom, United States of America.

Figure 3.1 G20 members' emissions trajectories implied by historical emissions, current policies, NDC targets and net-zero targets, as applicable



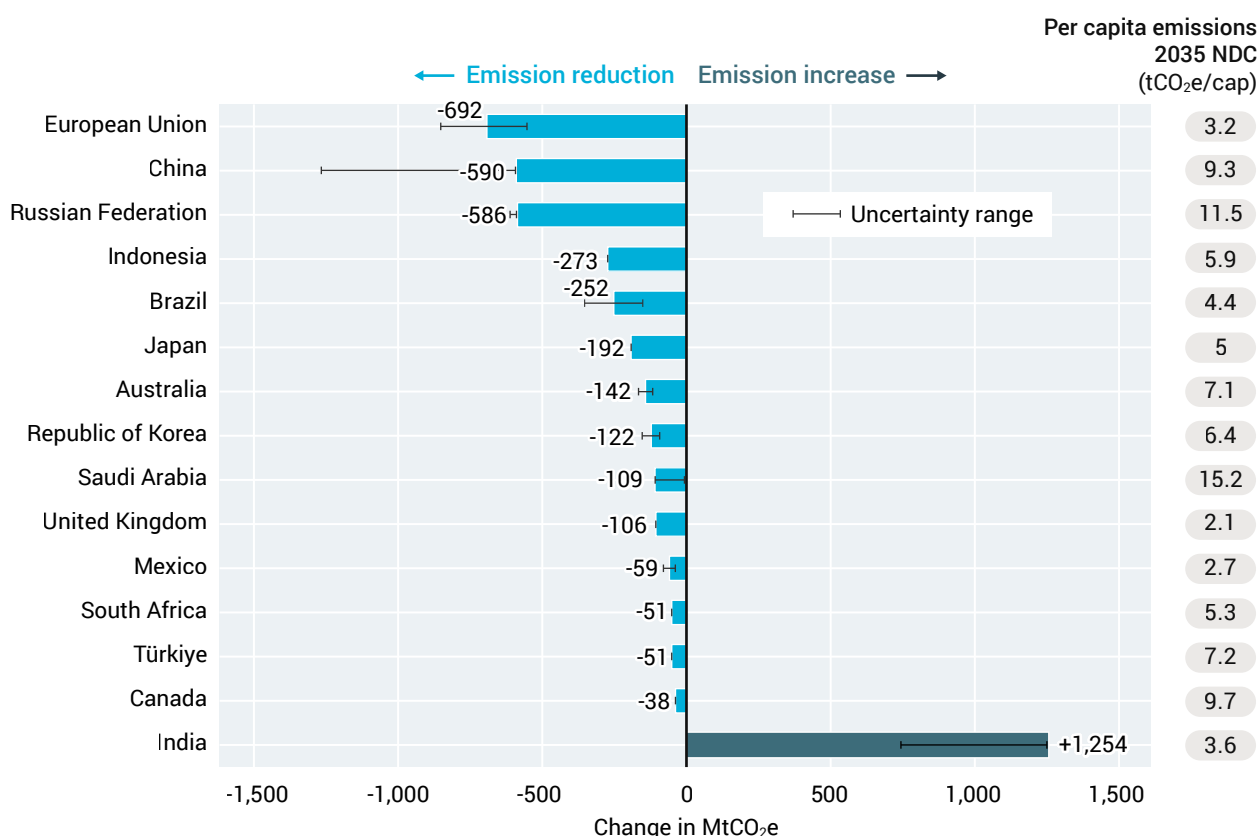
Note: All figures include emissions from LULUCF. For NDCs and trajectories under current policies, central estimates of independent studies are presented, unless otherwise stated. Median values are presented for the central estimates when there are more than five studies, otherwise mean values are presented. For NDCs, official values (with minimum and maximum values) are shown where available. Historical emissions are shown for the years 2000–2024, and trajectories under current policies (central estimates) are shown for the years 2024–2035. Because Saudi Arabia has only set a 2040 emission reduction target under its new NDC, the figure presents central estimate for 2035 by independent studies based on the NDC trajectories between 2030 and 2040. Japan also communicated a 2040 mitigation target in its new NDC, which is not shown here.

3.4.3 Almost all new G20 NDCs enhance ambition in 2035 compared with 2030 targets

Figure 3.2 compares the projected GHG emissions under 2030 and 2035 unconditional NDC targets for the 14 G20 members that have submitted such targets, to provide an indication of the impact of the new NDCs. A lower emission target for 2035 compared to 2030 suggests enhanced reduction impact. As the figure shows, the new NDC targets

for 2035 are below the 2030 targets for all G20 members except India. The European Union shows the largest absolute emission reduction by 2035 compared to 2030 under the new NDCs by about 690 MtCO₂e, followed by China (figure 3.2). While India is projected to continue increasing its economy-wide GHG emissions under its NDCs, its per capita emissions remain far lower than those of most other large emitters ([appendix B](#)).

Figure 3.2 GHG emissions in 2035 relative to 2030 levels resulting from the full implementation of the new NDCs of G20 members (MtCO₂e/yr) and associated per capita emissions (tCO₂e/yr)



Note: For NDCs, official values are shown when available. Otherwise, median values are presented when there are more than five studies, or mean values are presented. Error bars represent minimum and maximum values from all independent studies reviewed.

3.4.4 Less than half of the G20 members are on track to achieve their NDC targets for 2030

Overall, emissions projections for most G20 members remain broadly unchanged from last year's assessment, which implies that there is little progress towards closing the 2030 implementation gap at the G20 level. Six G20 members are assessed as likely to achieve their unconditional 2030 NDC targets with existing policies (figure 3.3, [appendix B.2](#); table B.3) based on independent studies (i.e. half or more of the reviewed studies assess that 2030 targets will be met): China, India, Indonesia, Russian Federation, South Africa and Türkiye (figure 3.3). For the European Union, two of the three independent studies indicated that it may narrowly miss its 2030 NDC under current policies (figure 3.3); the

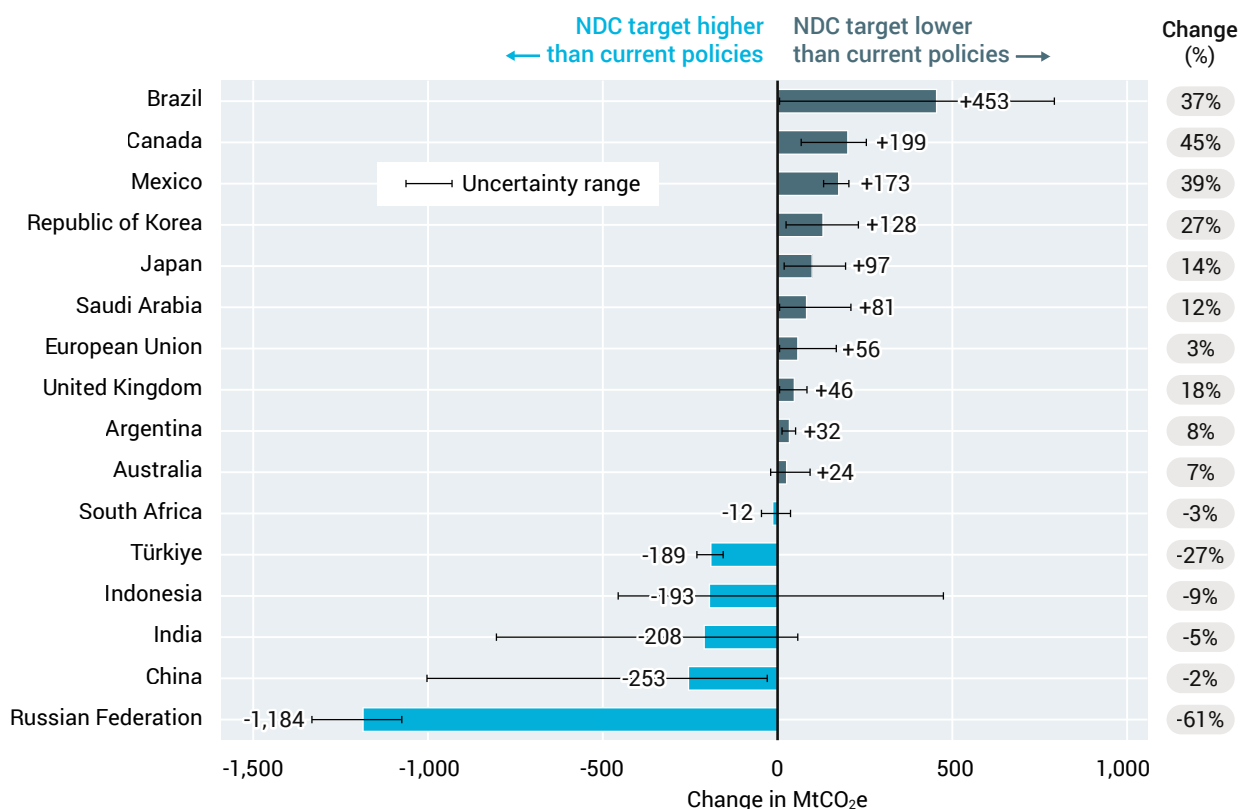
central estimates of current policies scenario projections from independent studies suggest the European Union could just achieve its 2030 NDC target (figure 3.1).

The remaining nine G20 members with 2030 NDCs are assessed less likely to achieve their unconditional NDC targets. Overall, the picture is unchanged from last year's assessment except for Mexico, which is now assessed to miss its 2030 unconditional NDC target; Mexico's new NDC substantially increased ambition, lowering projected target emissions in 2030 by round 200 MtCO₂e (Mexico, Secretariat of Environment and Natural Resources 2025; Ramírez and Cortés 2026). The projected emissions for the Russian Federation and Türkiye under current policies are more than 20 per cent below their unconditional NDC target

levels (based on central estimates). These countries have historically always set NDC target emission levels that are considerably above the current policies scenario projections (see past Emissions Gap Reports since 2015).

Two G20 members communicated both unconditional and conditional 2030 NDC targets. India is projected to achieve its conditional target, while Indonesia is projected to fall short under current policies.

Figure 3.3 GHG emissions in 2030 resulting from the full implementation of the new NDCs of G20 members compared with current policies projections, absolute (MtCO₂e/yr) and percentage (%) change



There have only been relatively small changes to the emissions projections under current policies for the G20 members since last year. For China, the latest projections from three annually updated studies continue to project that GHG emissions peak around 2025, gradually declining thereafter (figure 3.1) (Dafnomilis *et al.* 2025; Climate Action Tracker 2026a; Keramidas *et al.* 2026). For the United States of America, studies confirm that recent policy changes have significantly altered the projections, with 2030 emissions projections now estimated to be almost 0.9 GtCO₂e higher than projections based on policies in place under the previous administration (figure 3.1) (UNEP 2024).

Notable changes related to land-use emission estimates are observed for Indonesia and the Russian Federation. For Indonesia, lower projections of close to half a GtCO₂e/yr in both 2030 and 2035 are partly due to the latest studies reflecting the downward trend of LULUCF emissions in recent years. For the Russian Federation, projected emissions for 2030 and 2035 are more than half a GtCO₂e/yr lower compared to last year's assessment due to the updated national GHG inventory estimates for the LULUCF sector.

3.4.5 The new NDCs of G20 members indicate uneven ambition beyond current policies

It is still too early to assess whether countries are on track to meet their 2035 NDCs, based on currently implemented policies. For the new NDCs, it is more relevant to look at the extent to which 2035 targets are stronger than current policies projections as an indication of their ambition. Figure 3.4 compares 2035 emissions under the new unconditional NDCs with those expected based on current policies.

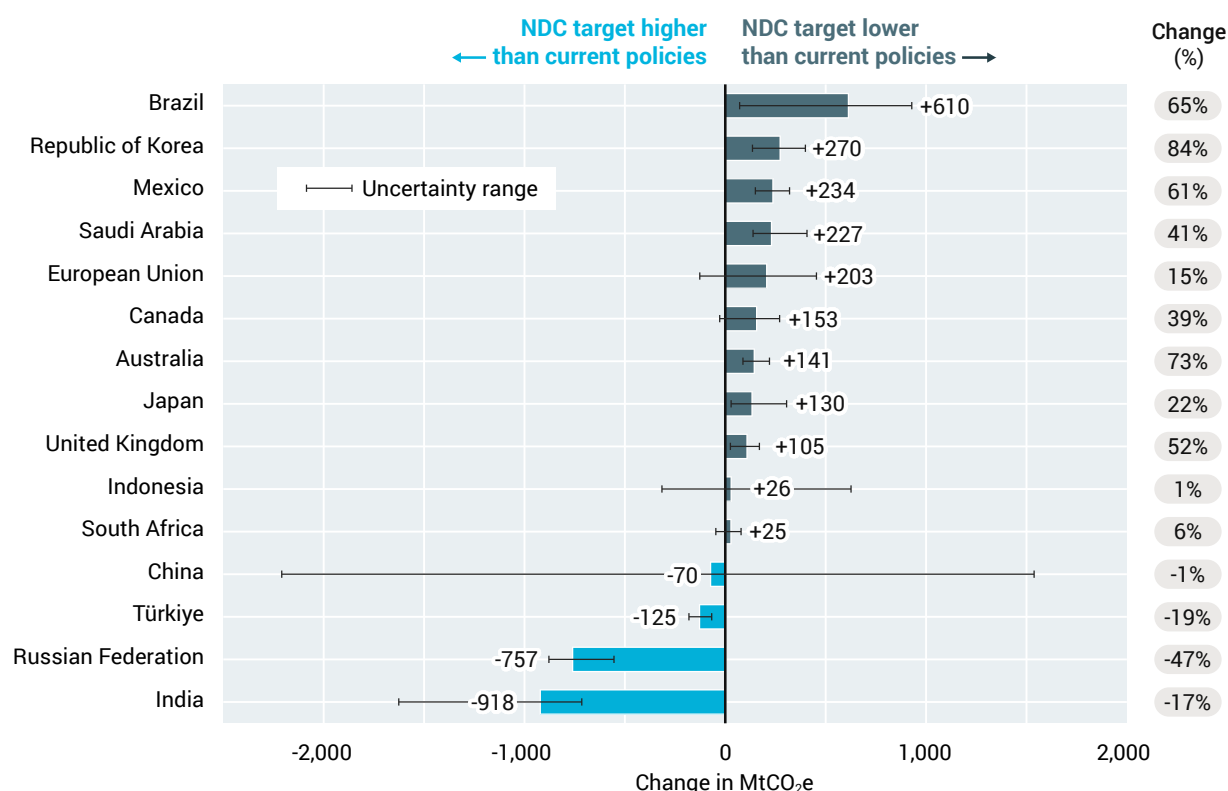
As the figure shows, some G20 members are already assessed to meet their 2035 NDC targets under current policies alone, i.e. they would not need any additional measures (figure 3.4). This is particularly evident for the Russian Federation and, to a lesser extent, Türkiye, where projected 2035 emissions under current policies are substantially below NDC target levels, suggesting limited effectiveness of their new 2035 NDCs (figure 3.4). For both these G20 members, projected emissions under current policies have consistently been significantly below NDC targets.

India also appears likely to achieve its 2035 target based on policies already in place. However, this should be interpreted differently, because India's NDC is formulated as an emissions-intensity target. Strong economic growth combined with improvements in the carbon intensity of the economy can lead to substantial emission reductions relative to GDP, while total emissions continue to grow. For some G20 members, the uncertainty ranges are large. This is notably the case for China, where the underlying modeling studies vary significantly in their emission projections for China from 2030

to 2035. For Brazil and Indonesia, which both have large land-use emissions, varying projections of future deforestation levels result in large uncertainty ranges. The relatively large uncertainty range for the European Union is due to variation in the projected emissions under current policies, either at the European Union level or European Union Member State level.

For many other G20 members, meeting the new targets for 2035 will require significant strengthening of policies (figure 3.4).

Figure 3.4 GHG emissions in 2035 resulting from the full implementation of the new NDCs of G20 members compared with current policies projections, absolute (MtCO₂e/yr) and percentage (%) change



Note: For central estimates, median values are presented when there are more than five studies, otherwise mean values are presented. For NDCs, official values are shown when available. Error bars represent minimum and maximum values from all independent studies reviewed.

3.5 New policies from major emitters generally support emission reductions, but implementation remains critical

This section highlights selected policies adopted since September 2025 of the six largest emitters of GHGs, as defined in chapter 2. The policies are selected if they are

expected to have a significant impact on future emissions or energy system transitions based on expert analyses, sectoral coverage, and the absence of major implementation barriers in the respective country or region (Roelfsema *et al.* 2022; Dafnomilis *et al.* 2026; NewClimate Institute 2026).¹⁰ Most recent policy developments support low-carbon transitions, although their ultimate impact will depend on effective implementation. An important exception is the United States

¹⁰ Expert analyses include feedback received from international policy analysts and researchers, policymakers, climate negotiators and climate scientists, as well as national policy and modelling experts (Dafnomilis *et al.* 2026). Cross-border implications of the climate policies presented in this section are not examined.

of America. The effects of some of the selected policies are already included in the current policies scenarios.¹¹

Brazil: Under the Nova Indústria Brasil industrial policy, Brazil aims to raise the combined share of biofuels and electric vehicles in the transport energy mix by 27 per cent by 2026 and 50 per cent by 2033; to increase the technological and sustainable use of biodiversity by industry by more than 10 per cent by 2026 and 30 per cent by 2033; and to reduce the emission intensity of industry – CO₂ per unit of value added – by 30 per cent by 2033 (Brazil, Ministry of Finance undated), in line with the sectoral targets of the National Climate Plan (Brazil, Ministry of the Environment and Climate Change Ministry of Science, Technology and Innovation and Executive Office of the President of the Republic 2025). Additionally, the fifth phase of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (2023–2027) pursues the elimination of illegal deforestation by 2030, with compensation for legally authorized clearing and associated emissions; an equivalent plan applies to the Cerrado biome (Brazil 2023).

China: In March 2026, the fifteenth Five-Year Plan was reviewed and approved by the National People's Congress (Patel and Liu 2026; Xinhua 2026). The fifteenth Five-Year Plan is the latest in the sequence of Five-Year Plans setting the strategic direction for the nation, including, among other aspects, climate policy planning, and which have managed to successfully moderate emissions over the last ten years (see also section 6.3). The plan explicitly states that between 2026 and 2030, China will reduce CO₂ emissions per unit of GDP by 17 per cent, promote the peak of coal and oil consumption, and replace 30 million tons of coal consumption with clean energy annually. The plan also aims for installed capacity of renewable power to reach 3.5 TW, with solar and wind capacity rising to 2.8 TW, over 50 per cent of total installed capacity, and 'new type' energy storage and pumped hydropower storage capacity reaching 300 GW and 160 GW respectively. For the first time, China formalized a dedicated tracking framework targeting 'super-pollutants', specifically mandating sulphur hexafluoride (SF₆) recovery in expansion grids and setting a 30 million ton reduction capacity for non-CO₂ gases, although the baseline is unclear (Institute For Governance and Sustainable Development 2026; Liu 2026).

European Union: The European Climate Law has been amended to establish a legally binding target of a 90 per cent net GHG reduction by 2040. The deal also includes the possibility to use high-quality international credits to reach the 90 per cent GHG emissions cut by 2040 compared to 1990 levels, with an adequate contribution of up to 5 per cent (European Commission 2026c). Additionally, the Carbon Border Adjustment Mechanism (CBAM) is fully operational as of January 2026 (European Commission 2026a). The CBAM puts a price on carbon emitted during the production of imported goods in carbon-intensive sectors. The European

Commission launched a programmatic overhaul of its Effort-Sharing Regulation and Carbon Farming frameworks, and legislative revisions to national targets and flexibilities under the European Union climate framework are expected, to realign individual Member State mandates with the 2040 net-zero glide path, in line with the Commission's work programme for 2026. The revision is expected to include the LULUCF sector (Carbon Gap 2026; European Parliament 2026). The new Emissions Trading Scheme for buildings and road transport fuels (ETS 2), the expansion of the existing ETS, the European Union's flagship climate policy as identified in section 6.3, has been postponed and will become fully operational in 2028 (European Commission 2026b).

India: India is in the process of scaling up its domestic Carbon Credit Trading Scheme (International Carbon Action Partnership 2026), which transitions older efficiency programmes such as the Perform, Achieve and Trade scheme, into a national carbon trading system. It is set to initially cover over 700 MtCO₂e, placing India among the world's largest emissions trading schemes. In the power sector, India's recently launched scheme the Pradhan Mantri Surya Ghar Muft Bijli Yojana provides subsidies and collateral-free loans for rooftop solar photovoltaic installations (Santosh, Meena and Patiyal 2025). The programme also has potential to generate gender-responsive benefits by improving energy access and affordability for women-headed households, and creating opportunities for women's participation in decentralized renewable energy value chains. It achieved over 1 million installations in its first year, with the eventual goal of connecting 10 million households by March 2027.

Indonesia: The National Electricity Master Plan 2024–2060 and Electricity Supply Business Plan 2034 outline targets for renewable energy and power sector expansion up to 2060, aiming for an intermediate goal of 75 GW of installed renewable capacity by 2035, up from 13.5 GW of currently installed capacity. However, substantial investment and policy efforts will be required to achieve the targets (Center for Research on Energy and Clean Air 2025; Hasan and Zahiruddin 2025).

United States of America: Most of the climate-related policies from the Inflation Reduction Act have been repealed under the One Big Beautiful Bill Act (United States of America 2025). Additionally, several long-standing Environmental Protection Agency regulations concerning power plant and vehicle emission standards, electric vehicle support, methane emissions, and renewable energy proliferation have also been rolled back. Recently, the Administration moved to completely repeal limits on GHG emissions emitted by fossil fuel-fired power plants, in "the largest deregulatory action of the USA power sector in history" (Hirji, Natter and Dlouhy 2026; Joselow and Friedman 2026). A significant number of these attempts are in a judicial state of uncertainty, as they are being challenged in courts.

¹¹ Including all policy rollbacks in the United States of America, the Nova Indústria Brasil industrial policy, and parts of the National Electricity Master Plan and Electricity Supply Business Plan for Indonesia.

Box 3.4 Government policy responses to the 2026 energy supply shock

The significant disruption the conflict in the Middle East has had on fuel markets has led to many Governments adopting emergency response measures. This has been true especially in the South-East Asia region, which relies heavily on fossil fuel imports from the Middle East. Table 3.4 provides a non-exhaustive list of emergency measures that Governments have enacted in response to the energy crisis, along with example countries that have enacted said measures. In reality, the number of measures implemented is, of course, much higher, and most countries have undertaken a combination of response measures.

Most emergency policies focus on near-term energy conservation and consumer support efforts, with the most widespread consumer support measure enacted by Governments being fossil fuel subsidies, tax cuts or fuel price caps in order to protect citizens from rising fuel prices (Gabbatiss 2026; IEA 2026a). In the context of enhancing energy security, countries have also adopted measures that could potentially have a more lasting impact, such as delaying coal plant closure or allowing older sites to operate at higher rates (Ratcliffe 2026).

Conversely, in a similar effort to boost energy independence and future stability, many Governments have enacted more structural policies, focusing mainly on improving energy efficiency, deploying renewable energy and increasing the electrification of their economies (Climate Action Tracker 2026b; IEA 2026b). Such measures, adopted by almost 30 Governments so far, including France, India and the United Kingdom, include energy efficiency grants for retrofits in buildings, electric vehicle support schemes and tax cuts

for renewable energy installations. If implemented as planned, these measures could significantly accelerate the transition away from fossil fuels. The evidence that clean energy transitions can be sustained amid geopolitical tensions and supply challenges are found also in the recent response from the European Union to the war between the Russian Federation and Ukraine. As mentioned in section 2.5, policy frameworks have pulled structural transition timelines forward by years, scaling renewable deployment and reducing fossil fuels down to a record-low 28 per cent of the European Union's power generation mix, causing the pre-existing trend of emission reductions to continue and even accelerate in the period 2022–2024.

It remains to be seen whether short-term consumer support and energy security measures, or more structural efficiency and electrification policies, will predominate over the medium term. While there is a risk that measures that delay the energy transition can become entrenched beyond the immediate crisis period, most recent analyses indicates that clean energy investment in 2026 will grow to US\$2.2 trillion, almost double that of fossil fuels, with investments in clean energy increasing by 7 per cent compared to 2025 in advanced economies and in China, and 4 per cent in other emerging markets (IEA 2025a; IEA 2026b). This is true even in regions that have seen major rollbacks in investment credits, such as the United States of America, where aggregate investment is still projected to remain near the upper end of the historical range, given the competitiveness of solar, batteries and wind alongside rising electricity demand (Bistline *et al.* 2026).

Table 3.4 Emergency measures implemented by Governments in response to the 2026 conflict in the Middle East that could potentially support or delay the energy transition in the short and long term

Measures that could potentially delay the energy transition	Measures that could potentially support the energy transition
Short term	
• Direct fossil fuel subsidies (e.g. Belgium, Brazil, France) • Reductions in fossil fuel taxes (e.g. Australia, Germany, India, Mexico) • Fuel price caps or price stabilization agreements (e.g. Japan, Mexico, Republic of Korea) • Allowing for higher rates of operation for coal power plants (e.g. Japan, Thailand)	• Promotion of public transport (e.g. Argentina, India, Pakistan) • Capping or taxing windfall profits of fossil fuel suppliers (e.g. Austria, India) • Incentives for lowering space heating/increasing space cooling limits (e.g. Malaysia, Singapore)
Long term	
• Delay of coal plant phase-outs (e.g. Italy, Republic of Korea) • Expansion of domestic fossil fuel production (e.g. Canada, United States of America)	• Support for fast electrification (e.g. Chile, France, Kingdom of the Netherlands) • Support for renewable energy expansion (e.g. European Union, Japan, Republic of Korea)

Source: Climate Action Tracker (2026b); Gabbatiss (2026); IEA (2026a); O'Sullivan and Marshall (2026); Organisation for Economic Co-operation and Development (2026); Ratcliffe (2026).

4 The global emissions gap

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4.1 Introduction

This chapter updates the assessment of the emissions gap, which is defined as the difference between the estimated global greenhouse gas (GHG) emissions resulting from the full implementation of the latest nationally determined contributions (NDCs), and the levels that would be required to cost-effectively limit warming in line with the temperature goal of the Paris Agreement.

After decades of insufficient emission reductions, the possibility of limiting warming to 1.5°C with less than 0.1°C overshoot has now been lost (United Nations Environment Programme [UNEP] 2026). Moreover, the old mitigation pathways that guided policymakers are now outdated and must be replaced. This chapter introduces new mitigation pathways, including an updated below 2°C scenario and a lowest 1.5°C overshoot scenario that minimizes the magnitude and duration of overshoot before returning warming to 1.5°C by 2100 (section 4.2). The scenarios will be updated every year in response to how successfully Parties have cut their emissions – and as the chances of keeping warming below 2°C also shrink.

The chapter then examines the emissions gap between the full implementation of the latest NDCs and the below 2°C and lowest 1.5°C overshoot scenarios (section 4.3). It also quantifies the gap that can no longer be bridged, showing the extent to which insufficient action has left 1.5°C with an overshoot of no more than 0.1°C out of reach. Finally, the chapter assesses the global warming implications of current policies, the latest NDCs and the full implementation of Parties' long-term goals, including net-zero targets (section 4.4).

4.2 Scenarios for assessing the emissions gap

The emissions gap assessment is based on four categories of scenarios: a current policies reference scenario; NDC scenarios; scenario extensions to the end of the century; and updated mitigation scenarios aligned with specific temperature limits, including the new lowest 1.5°C overshoot scenario (table 4.1).

These scenarios provide the foundation for estimating the emissions gaps and global temperature outcomes discussed in sections 4.3 and 4.4, respectively.

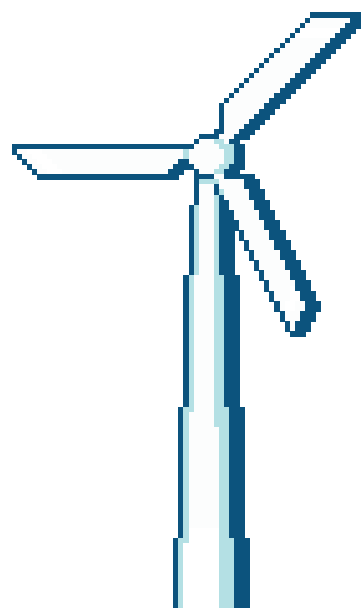


Table 4.1 Summary of scenarios for emissions gap assessment¹

Category	Scenario cases	Scenario description
Reference scenario	Current policies	This scenario projects global GHG emissions based only on policies adopted and implemented as of November 2025.
NDC scenarios	Unconditional NDCs	This scenario projects GHG emissions assuming full implementation of the most recent NDCs that do not depend on explicit external support (cut-off date: 1 September 2026). For the countries that do not yet have a new or existing NDC, it assumes the current policies scenario. It also assumes current policies, where this would lead to lower emissions than their NDCs.
	Conditional NDCs	In addition to the unconditional NDCs, this scenario encompasses the most recent NDC targets for which implementation is contingent on receiving international support, such as finance, technology transfer and/or capacity-building (cut-off date: 1 September 2026). For the countries that do not yet have a new or existing NDC, it assumes the current policies scenario. It also assumes current policies, where this would lead to lower emissions than their NDCs.
Scenario extensions*	Current policies continuing	This scenario follows current policies to 2035 and assumes a continuation of similar efforts thereafter.
	Conditional NDCs + all net-zero pledges	This is the most optimistic pledge-related scenario included. It assumes the achievement of the conditional NDCs until 2035 and all net-zero or other long-term low emissions development strategy (LT-LEDS) pledges (cut-off date: 1 September 2026) thereafter. The USA's former net-zero target is excluded.
Mitigation scenarios consistent with limiting global warming to specific levels	Below 2°C	This is an updated cost-effective pathway starting in 2025 and consistent with keeping global warming below 2°C throughout the twenty-first century with at least a 66% chance.
	Lowest 1.5°C overshoot scenario	This scenario represents the most recent global modelling to minimize the magnitude and duration of overshoot. It assumes stringent mitigation starting in 2025, keeping global warming to 1.7–1.8 °C throughout the entire century with a 66 per cent chance, and returning it to 1.5°C by 2100 with around a 50 per cent chance. Only pathways that meet specified technical, environmental and socioeconomic feasibility and sustainability criteria are included.

* Scenario extensions are used to explore the post-2035 implications for emissions of current policies, NDCs and net-zero pledges including LT-LEDS. For a technical discussion and details of the method, see UNEP (2023) and Rogelj *et al.* (2023).

4.2.1 New policies and pledges have a limited impact on future emissions

Current policies and NDC scenarios until 2035 are based on updated projections by the same five modelling studies that were assessed in the Emissions Gap Report 2025 (UNEP 2025), and have all been harmonized to historical 2023 emissions,² as explained in chapter 3.³ Under current policies, global GHG emissions are estimated to fall slightly

from 58 gigatons of carbon dioxide equivalent (GtCO_{2e}) in 2025 to 57 GtCO_{2e} in 2030 (median, with an inter-model range of 53–62), before falling further to 55 GtCO_{2e} in 2035 (median, with an inter-model range of 52–61). The median estimates have remained broadly unchanged since the Emissions Gap Report 2025.

The NDC scenarios include 67 new pledges submitted since the cut-off date for the Emissions Gap Report 2025. These

¹ Definitions used in emissions projections for policy-related scenario cases (reference scenarios, NDC scenarios, scenario extensions) have been aligned so that differences between estimates based on national GHG inventories and estimates based on global integrated assessment models are comparable, drawing on Gidden *et al.* (2023).

² As in previous years, this year's report corrects discrepancies in historical emissions across the modelling studies, and the scenario projections are harmonized with the historical emissions estimates in chapter 2.

³ The emissions projections of the current policies scenarios for all modelling studies account for the impact of policy rollbacks in the United States of America. Most studies have a policy cut-off date of November 2025.

new NDCs cover an additional 13 per cent of global emissions and bring the total to 124 new NDCs, covering 76 per cent of global emissions (chapter 3). Full implementation of both unconditional and conditional NDCs results in global GHG emissions of 53 GtCO₂e (median, range: 50–56) in 2030 and 49 GtCO₂e (median, range: 47–52) in 2035. The projected emissions are 2–3 GtCO₂e higher if only unconditional NDCs are implemented. Compared with the Emissions Gap Report 2025, the median NDC estimates are about 3 GtCO₂e higher, primarily because of the withdrawal of the United States of America’s NDC (about 1.5 GtCO₂e) and harmonization with higher estimates of historical emissions (about 1.5 GtCO₂e). The new NDCs submitted over the past year have a near-zero impact on projected future emissions (chapter 3).

4.2.2 Insufficient action means new scenarios for limiting warming are needed

Until last year, the gap analysis compared emissions under current policies and pledges with least-cost pathways consistent with limiting global warming to specific levels: 2°C, 1.8°C and 1.5°C (UNEP 2015; UNEP 2024) ([appendix C](#), table C.1). These pathways were drawn from the database accompanying the Intergovernmental Panel on Climate Change (IPCC) Working Group III Sixth Assessment Report (IPCC WGIII AR6) (Byers *et al.* 2022; Riahi *et al.* 2022). Having been developed in the 2015–2020 period, these pathways assumed immediate emission cuts starting from around 2020. In reality, global GHG emissions have continued to increase (chapter 2). Policies and technologies have also progressed in ways that differ from the near-term assumptions used for AR6. This means the AR6 scenarios – and the benchmarks derived from them – have become outdated.

This year’s assessment therefore draws on a new generation of pathways in which ambitious mitigation action starts from 2025, compiled through two international community efforts: the Scenario Compass Initiative (SCI), which collects and vets the latest global emission scenarios in annual updates (Riahi *et al.* 2026); and the Scenario Model Intercomparison Project (ScenarioMIP), which provides a set of new scenarios used by global Earth system models to simulate possible climates of the future (van Vuuren *et al.* 2026).

Within this new generation of pathways, there are 44 that hold warming below 2°C throughout the century with at least a 66 per cent chance (table 4.2). They describe a transition that starts gradually but nevertheless relies on an immediate peak and decline in emissions. This decade, emissions are projected to fall modestly by around 11 per cent by 2030 (range: 0–23), 24 per cent by 2035 (range: 9–51) and 37 per cent by 2040 (range: 26–73), all relative to 2025 levels (figure 4.1). Most of these pathways reach net-zero carbon dioxide (CO₂) emissions in the third quarter of the century (2073; range: 2047–2096), though around 25 per cent do not reach it before 2100. Roughly 50 per cent reach net-zero GHG emissions by the end of the century (2095; range: 2058–2100). In the majority of these pathways, warming peaks in 2050 or later, and then recedes only slightly. Fewer than 33 per cent of these pathways bring warming back to 1.5°C over the course of this century. Those pathways that do return rely on sustained net removals of CO₂ over a period of decades. These net removals are several times larger than those in pathways that achieve deeper emission cuts more quickly, and thus manage to limit overshoot of 1.5°C to lower peak warming levels. The GHG emissions in these updated pathways do not catch up with the reductions seen in the below 2°C scenario of previous reports until after 2040 (figure 4.1), because mitigation efforts start later and then accelerate to make up for lost time.

In addition to informing the Emissions Gap Report, the AR6 scenarios have underpinned policy-relevant benchmarks used at the highest level. This includes the requirement to cut emissions by 43 per cent by 2030 relative to 2019 levels, in order to limit warming to 1.5°C with no or limited overshoot (United Nations Framework Convention on Climate Change [UNFCCC] 2026). Today, however, emissions remain nearly 80 per cent above this 2030 benchmark. The latest scientific evidence on ambitious near-term mitigation action starting in 2025 indicates that it will now be impossible to limit warming to 1.5°C with no or limited overshoot, defined as a temporary exceedance of less than 0.1°C (Bertram *et al.* 2024; Grant *et al.* 2025; Hooijsschuur *et al.* 2025; Riahi *et al.* 2026). This calls for a new benchmark to assess the global emissions gap: the lowest 1.5°C overshoot scenario, introduced in section 4.2.3. Finally, progress on incorporating equity considerations into mitigation pathways (box 4.1) shows that while regional contributions shift when equity considerations are taken into account, global indicators such as emission benchmarks remain mostly stable (Pelz *et al.* 2026).

Table 4.2 Global total GHG emissions in 2030, 2035 and 2050 and global warming characteristics of different scenarios consistent with limiting global warming to specific temperature limits

Scenario	# scenarios	Global total GHG emissions (GtCO ₂ e)				Estimated temperature outcome			
		In 2030	In 2035	In 2040	In 2050	50% chance	66% chance	90% chance	Nearest IPCC WGIII AR6 scenario class
Below 2°C (66% chance)*	44	52 (45–58)	45 (28–53)	37 (15–43)	22 (3–30)	Peak: 1.7 (1.7–1.9)°C In 2100: 1.5 (1.2–1.8)°C	Peak: 1.9 (1.8–2.0)°C In 2100: 1.7 (1.3–2.0)°C	Peak: 2.2 (2.1–2.6)°C In 2100: 2.1 (1.7–2.6)°C	C3a
Lowest 1.5°C overshoot scenario**	8	49 (36–50)	33 (22–39)	20 (13–24)	6 (4–11)	Peak: 1.7 (1.6–1.7)°C In 2100: 1.3 (1.1–1.6)°C	Peak: 1.8 (1.7–1.8)°C In 2100: 1.4 (1.3–1.7)°C	Peak: 2.1 (2.0–2.2)°C In 2100: 1.8 (1.6–2.2)°C	C2
Around 1.5°C (50% chance in 2100 with no or limited overshoot – from EGR 2025)***	50	33 (26–34)	25 (20–27)	18 (14–22)	8 (5–13)	Peak: 1.5–1.6°C In 2100: 1.1–1.3°C	Peak: 1.6–1.7°C In 2100: 1.2–1.5°C	Peak: 1.9–2.1°C In 2100: 1.6–1.9°C	C1a

* Values represent the central pathway of each set and its full minimum–maximum range across the warming outcomes of the scenarios. Probabilities for below 2.0°C scenarios refer to peak warming at any time during the twenty-first century. When net-negative CO₂ emissions are achieved in the second half of the century, global warming can be reduced further from these peak warming characteristics, as illustrated by the “Estimated temperature outcome” columns.

** Values represent the medoid and the minimum–maximum range across the scenario. The lowest 1.5°C overshoot scenario is similar only to the lower part of the IPCC AR6 C2 scenario class.

*** Values represent the median and the twentieth–eightieth percentile range across scenarios. For the around 1.5°C scenarios, the probability applies to global warming in the year 2100, while the “no or limited overshoot” characteristic is captured by ensuring that projections do not exceed 1.5°C with more than 66 per cent probability during the twenty-first century – or, in other words, that the probability of warming being limited to 1.5°C throughout the century never falls below 33 per cent. This definition is identical to the C1a category definition used in the IPCC AR6 WGIII report.

Note: GHG emissions in this table have been aggregated with 100-year global warming potential values from AR6. Emission levels are harmonized to a common 2023 base; reductions are computed on each model's own emissions series.

Box 4.1 Progress towards integrating equity perspectives in global scenarios

Literature on global emission pathways has typically explored how global GHG emissions could be reduced in the most cost-effective way globally. The resulting least-cost emission pathways identify and deploy emission reductions where and when they are cheapest (Guivarch *et al.* 2022). This means that least-cost pathways, in isolation, do not yet inform equitable effort-sharing between countries (Guivarch *et al.* 2022), unless international financial transfers can be delivered to resolve mismatches between the cost-effective geographical allocation of emission reductions and differentiated equity expectations (Pachauri *et al.* 2022; Fujimori *et al.* 2026). The need to bridge equity and techno-economic perspectives is now broadly acknowledged among scientists and policymakers, and a research agenda to develop solutions has been scoped (Nikas *et al.* 2026; Pachauri *et al.* 2026). Scholarship is therefore advancing the integration of equity perspectives into global scenarios aligned with the long-term temperature goal of the Paris Agreement. Key areas in which new literature is emerging include alternative burden-sharing regimes and differentiated carbon pricing (Leimbach and Giannousakis 2019; Bauer *et al.* 2020), equitable allocation and international financing of mitigation investments (Pachauri *et al.* 2022; Fujimori

et al. 2026), redistribution mechanisms that address economic inequality (Emmerling *et al.* 2024) and welfare objectives that give greater weight to vulnerable countries (Biswas *et al.* 2026).

Recent research on integrating justice into global model scenarios highlights three advances. First, studies address the value judgements implicit in earlier models by changing the objective function itself, replacing the standard utilitarian welfare approach with prioritarian alternatives (Biswas *et al.* 2026). Second, they incorporate effort-sharing principles as a binding constraint on scenario modelling to test how such principles affect the feasible pathways and the international collaboration required to meet the Paris Agreement's long-term temperature goal (Pelz *et al.* 2026). This study found that while the integration of equity perspectives changed regional outcomes, global benchmarks typically remained stable. Third, studies link core model outputs to microsimulations at the subnational or household level. This enables analysis of climate policies across regions (Alonso-Elpelde *et al.* 2026) and in specific population groups, such as miners (Danneaux *et al.* 2026). See also box 5.2.

4.2.3 The lowest 1.5°C overshoot scenario still requires urgent action

As it is no longer possible to limit warming to 1.5°C with no or limited overshoot (Bertram *et al.* 2024; Grant *et al.* 2025; Hooijschuur *et al.* 2025; Riahi *et al.* 2026), this chapter adopts the lowest 1.5°C overshoot scenario as a benchmark for assessing the emissions gap.

The lowest 1.5°C overshoot scenario comprises pathways that minimize both the magnitude and duration of overshoot above 1.5°C, while still meeting a defined set of feasibility and sustainability guardrails. These pathways limit peak warming to 1.7–1.8°C with a likely (>66 per cent) chance, corresponding to warming of about 1.6–1.7°C with a 50 per cent chance. Box 4.2 explains the criteria and process used to define this scenario, with further technical details provided in [appendix C](#).

The temperature definition of the lowest 1.5°C overshoot scenario is guided by the Paris Agreement and subsequent decisions. The Paris Agreement's temperature goal is to hold the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts

to limit the temperature increase to 1.5°C (UNFCCC 2016). Through subsequent decisions, including those at the thirtieth Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 30) in 2025, Parties have reaffirmed their commitment to pursuing efforts to limit warming to 1.5°C (UNFCCC 2022; UNFCCC 2026), and to minimize the magnitude and duration of any potential overshoot of 1.5°C (UNFCCC 2026). In addition, the International Court of Justice (2025) has interpreted 1.5°C as the Parties' agreed primary temperature goal.

The Paris Agreement also states that NDCs will reflect Parties' highest possible ambition (UNFCCC 2016), subject to national circumstances and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. This differentiation does not displace the duty to mitigate in line with the highest possible ambition (Mayer 2021; Mayer 2024; Voigt *et al.* 2025; Rajamani *et al.* 2026). The lowest 1.5°C overshoot scenario therefore depends on high near-term ambition and reflects the scale, timing and stringency of global action needed to pursue efforts to limit the magnitude of an overshoot of 1.5°C as much as possible (Rogelj and Rajamani 2025; UNFCCC 2026).

Box 4.2 How the lowest 1.5°C overshoot scenario is derived

The lowest 1.5°C overshoot scenario is derived from the new generation of mitigation pathways developed by the SCI and ScenarioMIP (section 4.2.2). The scenario aims to minimize the magnitude and duration of overshoot above 1.5°C, before returning warming to no more than 1.5°C. It relies on immediate emission reductions starting in 2025. An important innovation in the scenario assessment, building on the community effort of the SCI, is that it explicitly includes a set of feasibility and sustainability guardrails ([appendix C](#)). Building on methods developed in IPCC AR6 and further applied in the SCI, the assessment considers whether the near-term pace of technology deployment is consistent with observed diffusion patterns and current project pipelines, and whether longer-term transformation pathways remain within key sustainability guardrails. The latter cover bioenergy demand, biodiversity and food security, including the implications of large-scale reliance on carbon removal. Feasibility thus focuses on the near-term technology trends and does not include other normative dimensions such as equity or political feasibility. Together, these guardrails provide greater confidence that the new scenarios reflect transitions that not only are consistent with climate goals but are also technically feasible and sustainable from a broader societal and environmental perspective.

The lowest 1.5°C overshoot scenario covers the coolest band of peak warming for which sufficient pathway evidence exists. The band is 0.1°C wide, chosen so that pathways from enough independent modelling frameworks fall within it to support robust conclusions. In the ensemble of pathways used for this report, the coolest band is a peak warming of 1.7–1.8°C (likely chance of >66 per cent), comprising eight pathways drawn from at least four modelling frameworks. All except one of the pathways in this band return warming below 1.5°C (with a 50 per cent chance) by 2100, which is what makes this the lowest band still consistent with pursuing efforts to limit warming to 1.5°C.

This assessment will be repeated annually to identify the lowest feasible overshoot band, based on the latest available scenario evidence. Continued delays in global mitigation action would progressively narrow the range of attainable low-warming outcomes, while increasing the minimum overshoot that is inevitable.

The impact of applying the feasibility and sustainability guardrails is illustrated in [appendix C](#), figure C.1, which also lists the vetting criteria, the feasibility and sustainability thresholds, and the counts of pathways before and after screening.

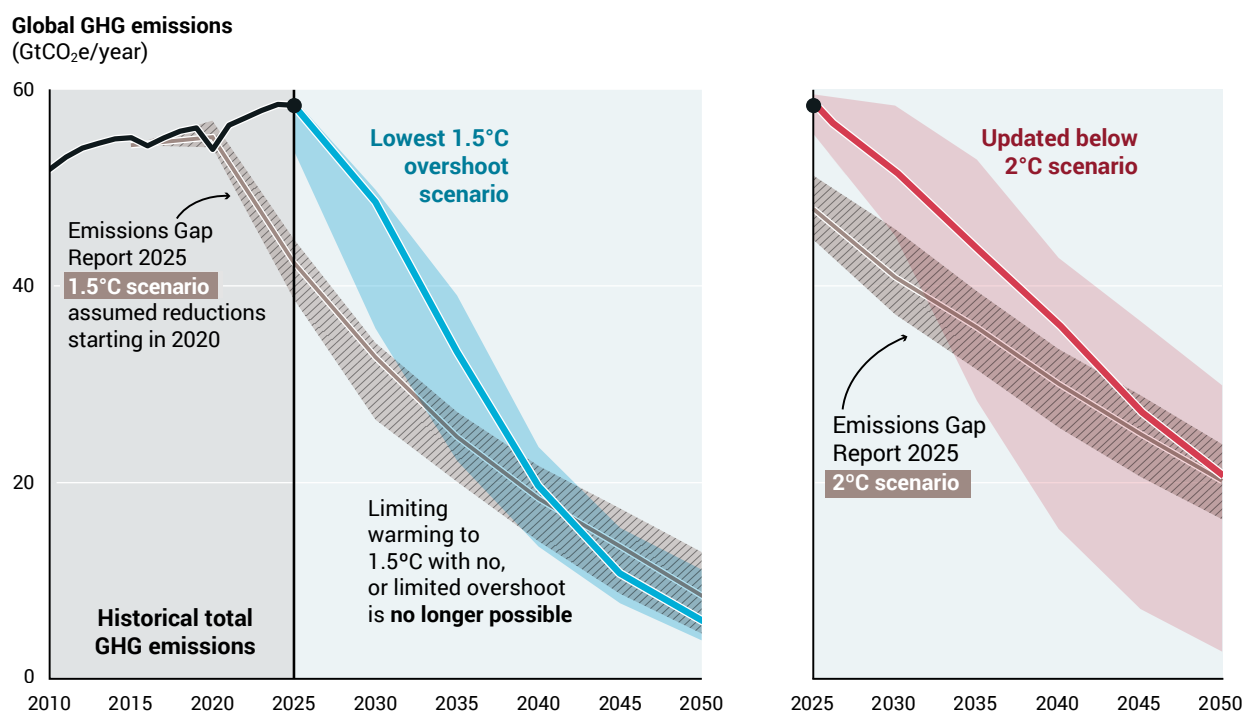
The lowest 1.5°C overshoot scenario requires immediate, deep, rapid and sustained reductions in global GHG emissions of 18 per cent (range: 15–36) by 2030, 45 per cent (range: 30–60) by 2035 and 69 per cent (range: 60–76) by 2040, all relative to 2025 levels.⁴ In addition, this scenario still reaches net-zero CO₂ emissions by 2050 (range: 2046–2057), around which time temperatures also peak (Riahi *et al.* 2026; van Vuuren *et al.* 2026). Achieving these emission reductions requires a rapid transition away from unabated fossil fuels, a continued global scale-up of wind and solar energy, electrification of end uses and deep cuts in methane emissions (see chapter 5).

The pace of emission reductions in the lowest 1.5°C overshoot scenario is faster than in the 1.5°C scenarios with “no or limited overshoot” assessed in IPCC AR6, reflecting the additional effort required to compensate for delayed action. Specifically, the AR6 scenarios assumed immediate emission cuts starting from around 2020, at an average rate of 5 per cent per year and reaching 43 per cent below

2019 levels by 2030. In contrast, the new scenarios assume reductions starting from 2025 at an average rate of 5.7 per cent per year (range: 3.4–8.7), reaching 45 per cent below 2025 levels by 2035. The emission trajectories of the new lowest 1.5°C overshoot scenario are therefore somewhat steeper, catching up with those of the AR6 pathways between about 2040 and 2050 (figure 4.1). However, even this faster pace of reductions cannot fully compensate for the higher emissions of recent years. As a result, the lowest 1.5°C overshoot scenario temporarily exceeds 1.5°C and reaches peak warming around 0.1–0.2°C higher than that of the “no or limited overshoot” pathways assessed in AR6 ([appendix C](#), figure C.2). Note that this temporary exceedance of 1.5°C could be even larger if Earth system feedbacks or other contributors to the climate response are stronger than expected (UNEP 2025). Consequently, even if emissions are cut in line with the lowest 1.5°C overshoot scenario, there is a 10 per cent chance that peak warming would exceed 2.1°C (range: 2.0–2.2).

⁴ Note that IPCC AR6 measured these benchmarks relative to 2019. The corresponding GHG emission reductions relative to 2019 are 14 per cent (range: 10–40) by 2030, 42 per cent (range: 30–63) by 2035 and 67 per cent (range: 58–77) by 2040. For the pathways that hold warming below 2°C, the corresponding reductions are 5 per cent (range: -4 to 21) by 2030, 19 per cent (range: 7–51) by 2035 and 33 per cent (range: 23–74) by 2040 relative to 2019 levels.

Figure 4.1 Comparison of Emissions Gap Report 2025 and Emissions Gap Report 2026 benchmark scenarios



Note: Left panel: the EGR 2025 scenario in line with limiting warming to 1.5°C with an overshoot of no more than 0.1°C, and the EGR 2026 lowest 1.5°C overshoot scenario. Right panel: the EGR 2025 scenario in line with 2.0°C, with reductions starting in 2020. For the below 2°C and lowest 1.5°C overshoot pathways, the shaded areas show the full minimum–maximum range across the pathways in each set, and the lines show the central pathway of each set (the medoid). For the 1.5°C pathways from EGR 2025, the shaded area shows the twentieth–eightieth percentile range with the median line, as published in EGR 2025. GHG emissions are aggregated with 100-year global warming potential (GWP) values of the IPCC AR6.

In addition to higher peak warming, the lowest 1.5°C overshoot scenario also creates a need for aggregate CO₂ removal from the atmosphere in order to return warming to 1.5°C. Reversing 0.1°C of global warming implies the net removal and permanent sequestration of about 220 GtCO₂. Reversing the 0.15°C of overshoot in the central lowest 1.5°C overshoot pathway would therefore imply roughly 330 GtCO₂ of removals.⁵ The ability to remove such large amounts of CO₂ from the atmosphere is uncertain because of socioeconomic and technological challenges to the scale-up of CO₂ removal measures and technologies (Schleussner *et al.* 2024).

The updated scenario evidence provides sobering but actionable insights. Decades of insufficient action have now measurably worsened the achievable climate outcomes for this century. The lowest peak warming supported by feasible and sustainable pathways is now around 1.7°C, which is

about 0.1°C higher than in equivalent pathways assessed in AR6. This additional warming has, in effect, been locked in by delay – and further delay would ratchet the warming even higher. At the same time, the scenario evidence is an important indication of what remains within reach. Holding warming well below 2°C is still robustly achievable, if emissions decline rapidly and substantially over the next decade. Pursuing efforts to limit warming to 1.5°C now takes the form of minimizing the magnitude and duration of overshoot. To achieve this, global GHG emissions must peak immediately and decline rapidly, reaching net-zero CO₂ emissions around mid-century, and sustaining net-negative emissions thereafter to bring warming back towards 1.5°C by 2100. If emissions do not start falling, only worse outcomes will be achievable. Ultimately, with continued delay, the temperature goal at the heart of the Paris Agreement will start slipping out of reach.

⁵ These values are calculated from the central IPCC AR6 estimates of the Transient Climate Response to Cumulative Emissions (TCRE) and the Zero Emissions Commitment. Uncertainties in the quantification of the TCRE might change the magnitude of this need. For example, the central 220 GtCO₂ estimate for 0.1°C overshoot reversal is accompanied by a 160–370 GtCO₂ likely (greater than 66 per cent probability) uncertainty range. The pathways themselves return warming to 1.5°C with less net CO₂ removal than indicated here, for reasons detailed in [appendix C](#).

4.3 The emissions gaps are still large

The emissions gap shows the shortfall between countries' collective ambition and achieving the temperature goal of the Paris Agreement. It is defined as the difference between estimated global GHG emissions resulting from the full implementation of the latest NDCs and emissions in updated mitigation pathways aligned with limiting warming to specific levels. Insufficient action to date means there is now an unbridgeable gap to pathways that limit warming to 1.5°C with overshoot of no more than 0.1°C. As such, the emissions gap is now measured relative to the lowest 1.5°C overshoot scenario, as well as to updated below 2°C pathways.

The sections that follow assess the gaps for 2035 (section 4.3.1) and 2050 (section 4.3.2).

4.3.1 Shrinking gaps for 2035 reflect worse outcomes

The latest NDCs are only sufficient to cut emissions by 11–15 per cent by 2035 relative to 2025 levels, depending on the conditionality of NDCs.⁶ Full implementation of conditional and unconditional NDCs is therefore estimated to result in an emissions gap in 2035 of 5 GtCO₂e (range: 3–7) to below 2°C pathways and of 16 GtCO₂e (range: 14–19) to lowest 1.5°C overshoot pathways (table 4.3, figure 4.2). These gaps are 2–3 GtCO₂e larger if only unconditional

NDCs are implemented. If instead only current policies are followed and NDCs are not achieved, the gaps to below 2°C and lowest 1.5°C overshoot pathways increase further to 10 GtCO₂e (range: 7–16) and 22 GtCO₂e (range: 18–28), respectively. This shows that, besides an ambition gap, an important implementation gap also persists (chapter 3; Fransen *et al.* 2023).

The updated below 2°C and lowest 1.5°C benchmarks used for this year's gap assessment reflect the failure to cut global emissions to date. This means the gap estimates are not directly comparable with earlier estimates. For example, last year's central estimate for the 2035 gap to pathways limiting warming to 1.5°C was 22 GtCO₂e. This year, the 25 GtCO₂e gap to the same 1.5°C scenario has become unbridgeable, considering current emissions and the limits to feasible and sustainable reductions. Consequently, the lower 16 GtCO₂e gap to the lowest 1.5°C overshoot scenario does not represent an improvement on last year's estimate. Instead, it reflects the worse outcomes built into the lowest 1.5°C overshoot scenario, in the form of higher peak warming. Similarly, the smaller gap to below 2°C pathways in this year's report does not represent an improvement in Parties' NDCs. Instead, it reflects an updated benchmark scenario with delayed mitigation (section 4.2.2), which risks higher costs as well as greater technological and transitional challenges, including a stronger reliance on CO₂ removal (Rogelj *et al.* 2018; UNEP 2020; Riahi *et al.* 2022).



⁶ These estimates assume current policies projections in cases where countries' emissions based on current policies are projected to be lower than their NDC targets. If the NDC projections are assumed, the projected emissions for the unconditional and conditional NDC scenarios would cut emissions by 3–11 per cent by 2035, relative to 2025 levels.

Table 4.3 Summary of emissions projections and global emissions gap

Scenario	Projected GHG emissions (GtCO ₂ e)	Estimated emissions gap to lowest 1.5°C overshoot scenario (GtCO ₂ e)	Estimated emissions gap to below 2°C scenario (GtCO ₂ e)
	Median and range	Median and range	Median and range
2030			
Current policies	57 (53–62)	9 (4–13)	5 (0–9)
Unconditional NDCs	55 (51–59)	7 (3–11)	3 (-1 to 7)
Conditional NDCs	53 (50–56)	5 (2–7)	1 (-2 to 3)
2035			
Current policies	55 (52–61)	22 (18–28)	10 (7–16)
Unconditional NDCs	52 (49–55)	19 (15–22)	7 (4–11)
Conditional NDCs	49 (47–52)	16 (14–19)	5 (3–7)
2040			
Current policies continued	54 (48–63)	35 (29–43)	17 (11–26)
Conditional NDCs + LT-LEDS*	41 (34–46)	22 (14–26)	4 (-3 to 9)
2050			
Current policies continued	50 (38–68)	44 (32–62)	28 (17–46)
Conditional NDCs + LT-LEDS*	24 (12–32)	18 (6–26)	2 (-10 to 11)

* LT-LEDS stands for long-term low emissions development strategy, and it typically refers to net-zero targets by mid-century or thereafter. The GHG emission ranges for 2050 show the minimum–maximum range across different projection-model assumptions and include the uncertainty in the 2030 and 2035 current policies and NDC assessments (see the Emissions Gap Report 2023, chapter 4, appendix C [UNEP 2023]). This means that the range captures the uncertainty about what emission levels current policies or NDCs will produce in 2030 and 2035, as well as the ambiguity in how this can be extended into the future. The gap numbers and ranges are calculated from the original, unrounded numbers, and may therefore differ from the numbers in the table, which are rounded to the nearest GtCO₂e. The gap numbers and ranges are calculated as the difference between the median, minimum and maximum GHG emission estimates of the current policies and NDC scenarios and the central GHG emission estimate of the mitigation scenarios in line with specific temperature limits and of the lowest overshoot scenario.

Note: GHG emissions have been aggregated with 100-year global warming potential values from AR6.

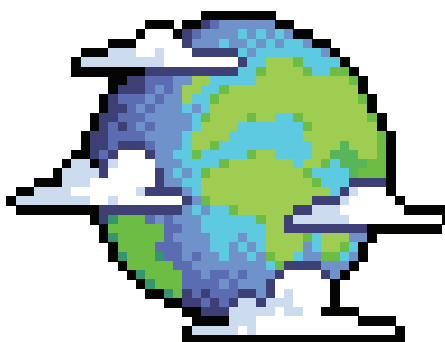
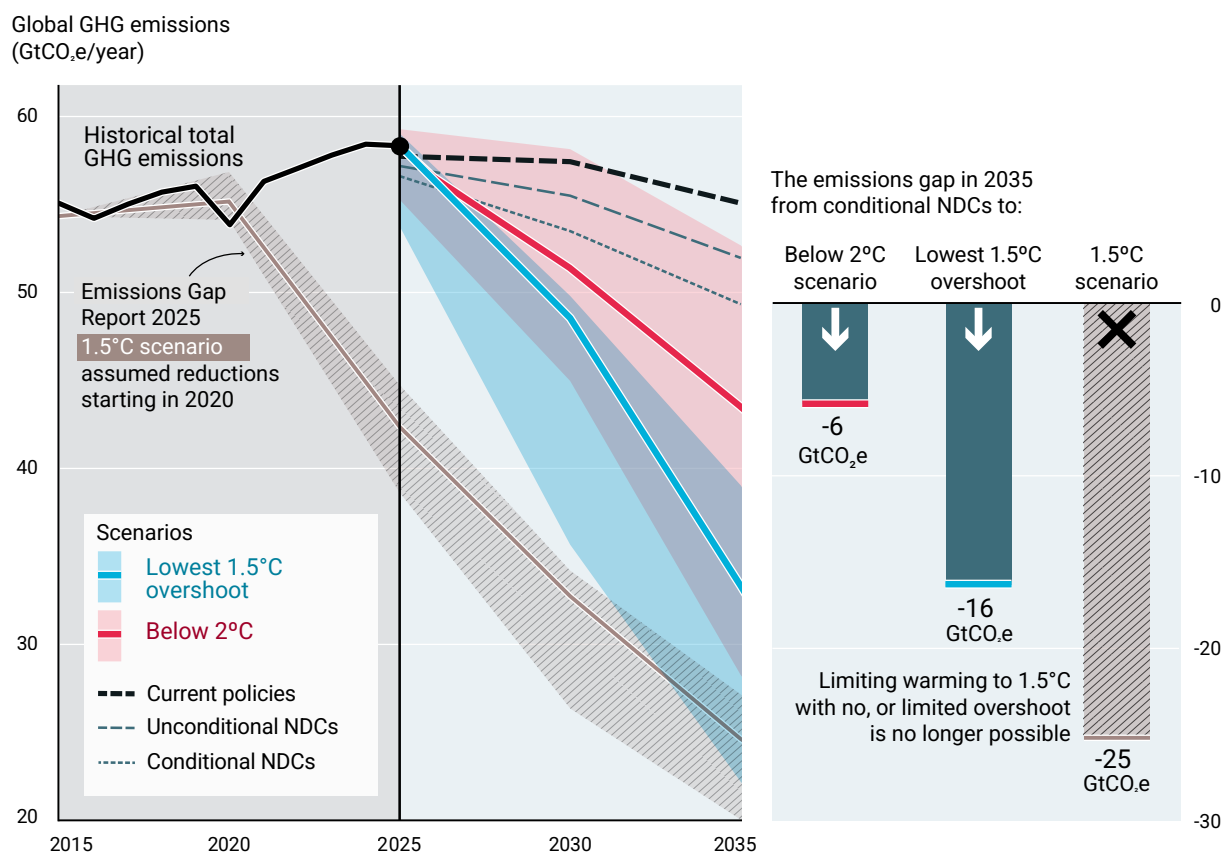


Figure 4.2 Global GHG emissions under different scenarios and the emissions gap in 2035 with respect to the below 2°C and lowest 1.5°C overshoot scenarios



Note: For the current policies and NDC scenarios, median estimates are shown. For the below 2°C scenario and the lowest 1.5°C overshoot scenarios, the shaded areas show the full minimum–maximum range across the pathways in each set, and the lines show the central pathway of each set (the median). GHG emissions are aggregated with 100-year GWP values of the IPCC AR6.

4.3.2 Current NDCs and net-zero targets are not enough to minimize overshoot

The emissions gap grows further after 2035, as mitigation pathways consistent with the lowest 1.5°C overshoot or with below 2°C involve continued deep reductions in global GHG emissions to 2050, whereas emissions are expected to fall only slowly after 2035 if global ambition continues in line with current policies or NDCs (table 4.3). In the conservative case of a continuation of current policies, the emissions gap reaches 28 GtCO₂e and 44 GtCO₂e in 2050, relative to pathways that hold warming below 2°C and the lowest 1.5°C overshoot, respectively.

The most optimistic case in the report, where all conditional NDCs and long-term net-zero targets are achieved, provides an alternative extreme. In this case, the gap to below 2°C pathways shrinks to 4 GtCO₂e in 2040 and 2 GtCO₂e in 2050, reflecting the assumed achievement of countries' LT-LEDs and other net-zero targets, which leads to a marked decline in projected emissions. This case should be interpreted cautiously, as most countries do not have NDCs, implementation plans or finance aligned with achieving their

long-term net-zero targets. Moreover, the gap from the most optimistic pledge-based scenario to lowest 1.5°C overshoot pathways remains very large, at 18 GtCO₂e in 2050. This highlights both the challenge of steering economies towards low-carbon futures and the necessity for Parties to go even further than currently planned, if the magnitude and duration of overshoot are to be kept to a minimum.

4.4 Temperature implications of the emissions gap show overshoot can be minimized with immediate action

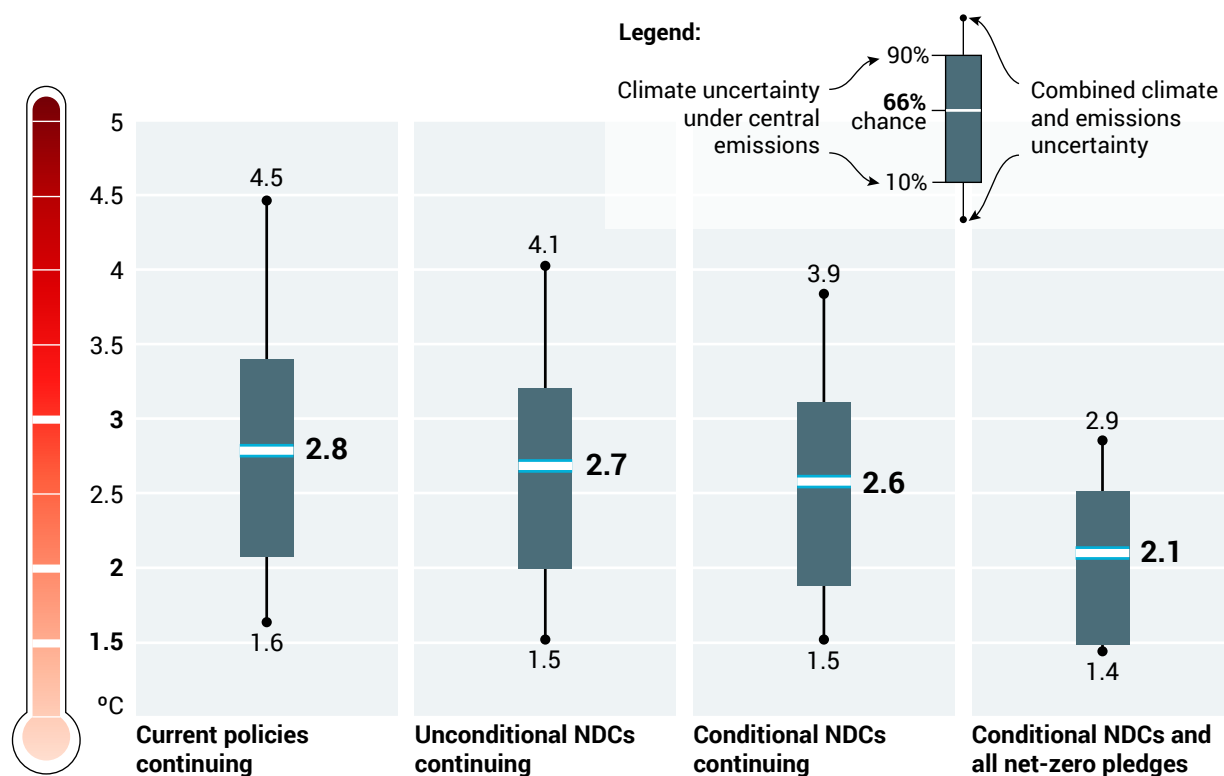
The temperature implications of the emissions gap are estimated by projecting emissions over the twenty-first century (Rogelj *et al.* 2023) and assessing their global warming implications with Finite Amplitude Impulse Response (FaIR), a reduced-complexity climate model calibrated to the IPCC WGIII AR6 (Nicholls *et al.* 2021; Kikstra *et al.* 2022; Smith 2022). Both projected emissions and the climate response are uncertain. The results depend on assumptions about the continuation of climate action, technological change and other long-term developments,

as well as on Earth system feedbacks (UNEP 2025). Figure 4.3 therefore presents the default estimate for warming at the sixty-sixth percentile climate response for a central emissions projection for each case, accompanied by a range. Although precise values remain uncertain, the overall conclusions are robust.

A continuation of the mitigation effort implied by current policies is only enough to keep warming below 2.8°C (range: 2.2–3.8) over the century with a 66 per cent chance

(figure 4.3).⁷⁸ There is also a 10 per cent chance that warming will exceed 3.4°C (range: 2.6–4.5). This level of warming could be reduced to approximately 2.7°C (range: 2.0–3.4) if unconditional NDCs are implemented by 2035 and similar efforts continue. Full implementation of conditional NDCs would limit warming to below 2.6°C (range: 1.9–3.3) with a 66 per cent chance. By 2050, the central estimates for these scenarios exceed 1.5°C by 0.4–0.5°C, with a 16–33 per cent chance that warming will already have exceeded 2°C.

Figure 4.3 Projections of global warming under the pledge-based scenarios assessed



Note: For each scenario, the sixty-sixth percentile of projected global warming for central projection of greenhouse gas emissions is shown, with the accompanying tenth–ninetieth percentile range for these emissions. The whiskers show the combined uncertainty across GHG emissions projections and Earth system response uncertainty for each scenario.

Relative to last year’s edition (Rogelj, den Elzen and Tong 2025), these central estimates show an increase of approximately 0.2–0.3°C in the warming projections for NDC-related cases because updated emissions from NDCs are 3–4 GtCO₂e higher for 2035 than in the Emissions Gap Report 2025 (section 4.2). About half of the higher global warming estimate is due to the United States of America’s abandonment of its NDC, while the other half is due to harmonization with higher estimates of historical emissions.

In contrast, new NDCs submitted since last year make virtually no difference to projected emissions and warming.

The most optimistic pledge-related scenario combines the full implementation of conditional NDCs with all available net-zero pledges. Under this scenario, warming remains below 2.1°C (range: 1.8–2.4) over the course of the century with a 66 per cent chance. This central estimate is about 0.2°C higher relative to last year’s assessment, the main

⁷ The ranges reflect uncertainty in estimates of emissions under current policies in 2030 and 2035, as well as differences in assumptions about how those policies are extended to 2100 (Rogelj *et al.* 2023). Uncertainty in the climate response is represented by the probabilities associated with each temperature outcome.

⁸ Central projections assume that the stringency of climate policy continues to increase broadly in line with economic growth.

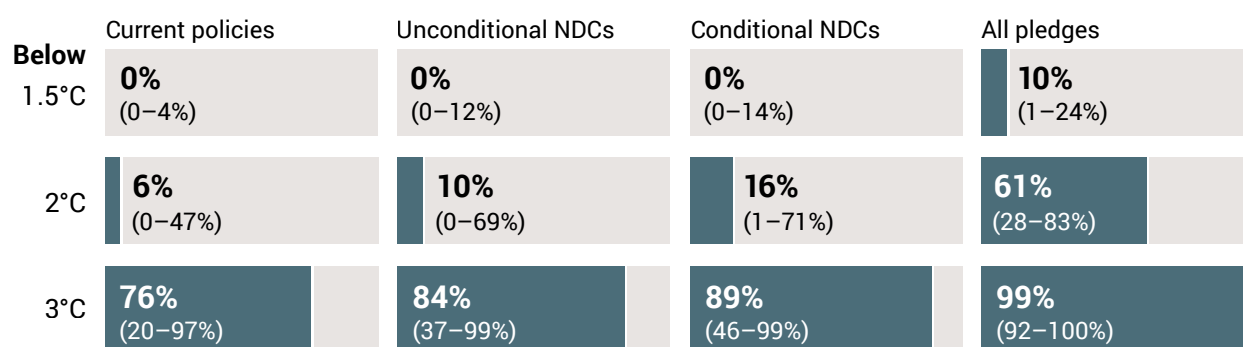
driver being the withdrawal of the United States of America from the Paris Agreement. Irrespective of this upward revision, the most optimistic pledge-related scenario remains the only scenario in which the central estimate of global warming stabilizes before 2100. Global temperatures continue to rise beyond the twenty-first century in all other policy- and pledge-related scenarios. The most optimistic pledge-related scenario is also the only case with a non-zero chance of limiting warming to 1.5°C over the course of this century and a greater than 50 per cent chance of staying below 2°C (figure 4.4).

The temperature projections show that immediate and effective implementation of existing NDCs could reduce warming by up to 0.2°C relative to current-policies projections. Continued progress towards pledged net-zero targets could reduce warming by a further 0.6°C. However, even the most optimistic pledge-related scenario results in around 0.25°C more warming than the lowest 1.5°C

overshoot pathways. This highlights the need both to close the implementation gap between current policies and existing NDCs and net-zero pledges, and to strengthen NDCs or exceed existing commitments.

The new lowest 1.5°C overshoot scenario therefore illustrates both the potential for and the limits of increased ambition. With immediate, deep, rapid and sustained emission cuts, it would still be possible to limit peak warming to 1.7–1.8°C with a 66 per cent chance. If these emission cuts are combined with an ambitious and sustainable scale-up of CO₂ removal, then warming could be returned to 1.5°C by the end of the century. On the other hand, continued delay in cutting global GHG emissions would further worsen the climate outcomes still achievable. For every five years of delay in starting to cut emissions, around another 0.1°C of warming will be locked in. Continued insufficient emission reductions over the next decades could make warming of 2°C inevitable, putting the Paris Agreement at risk of failure.

Figure 4.4 Likelihood of limiting global warming to below specific temperature limits



5

Collective progress towards the mitigation action areas of the first global stocktake

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5.1 Introduction

The first global stocktake (GST), which concluded at the twenty-eighth United Nations Climate Change Conference of the Parties (COP 28) in 2023, identified a set of priority actions to accelerate emission reductions and keep the temperature goal of the Paris Agreement within reach. These action areas span nearly all of the major emitting sectors, ranging from tripling global renewable energy capacity and doubling the rate of energy efficiency improvements, to transitioning away from fossil fuels in energy systems and accelerating the deployment of zero- and low-emission technologies, to reducing non-carbon dioxide (CO₂) emissions, to halting and reversing deforestation. Together, they provide a common framework for assessing collective progress towards the deep, rapid and sustained emission reductions needed this decade and beyond.

While chapter 4 focuses on global greenhouse gas (GHG) emissions and the emissions gap, this chapter examines progress across the mitigation action areas identified in the GST outcome. Looking beyond aggregate emissions helps reveal where sectoral transitions are advancing rapidly, where progress remains slow, and where additional effort is most urgently needed.

The chapter assesses whether recent collective efforts and current policies projections are consistent with the GST outcome and the lowest 1.5°C overshoot scenario and pathways presented in chapter 4, and explains what is needed in the coming decades to align with both. More specifically, it first examines how key indicators have evolved since the adoption of the Paris Agreement in 2015, and assesses progress towards the mitigation action areas of the GST with a focus on 2030 (section 5.2). Then, relying on the latest scientific evidence, it identifies the collective

minimum effort needed in 2035, 2040 and 2050 to minimize exceedance of 1.5°C across each GST action area (section 5.3). Finally, it considers how the second GST, starting at COP 31, could provide strengthened guidance on collective mitigation efforts needed and support enhanced ambition in the next generation of nationally determined contributions (NDCs) (section 5.4).

5.2 Developments since the adoption of the Paris Agreement are clear, yet progress towards the outcome of the first GST is uneven and insufficient overall

The world is on a markedly different trajectory today than it was at the time of the adoption of the Paris Agreement. Yet progress is still far from sufficient to achieve the long-term temperature goal of the Paris Agreement, as the previous chapters of this report have amply shown. This section starts by highlighting some of the progress made to date since 2015, followed by an overview of global progress across all nine mitigation action areas identified in paragraphs 28 and 33 of the first GST outcome (see figure 5.2, United Nations Framework Convention on Climate Change [UNFCCC] 2024). The methodology for the assessment is described in box 5.1, and equity considerations are covered in box 5.2.

5.2.1 Developments to date in renewables and total energy supply from fossil fuels outpaced expectations in 2015

To explore developments to date in selected mitigation action areas of the GST relating to renewable energy and energy supply from fossil fuels, current policies projections made in 2015 are compared with recent historical data

(figure 5.1). Not all mitigation action areas (see section 5.2.2) are covered in this 2015 projections dataset. For example, more nascent mitigation technologies – such as sustainable aviation fuels or low-carbon hydrogen – are emerging, but 2015 projections are unavailable. Similarly, data uncertainties and definitions prohibit an assessment of how net anthropogenic land use, land-use change and forestry (LULUCF) emissions would have developed in the absence of the Paris Agreement (Roman-Cuesta *et al.* 2025).

As figure 5.1 shows, there are several remarkable examples of progress that exceeded expectations of these 2015 current policies projections. By 2025, renewable electricity capacity increased three times as much as was expected. Underpinning that growth was an increase in solar photovoltaic capacity that rose seven times more than expected, and wind capacity that grew 2.5 times as much as expected. This rapid expansion in capacity also means that the share of solar and wind in electricity generation in 2025 increased four times more than was expected in 2015 (figure 5.1 and figure 5.3).

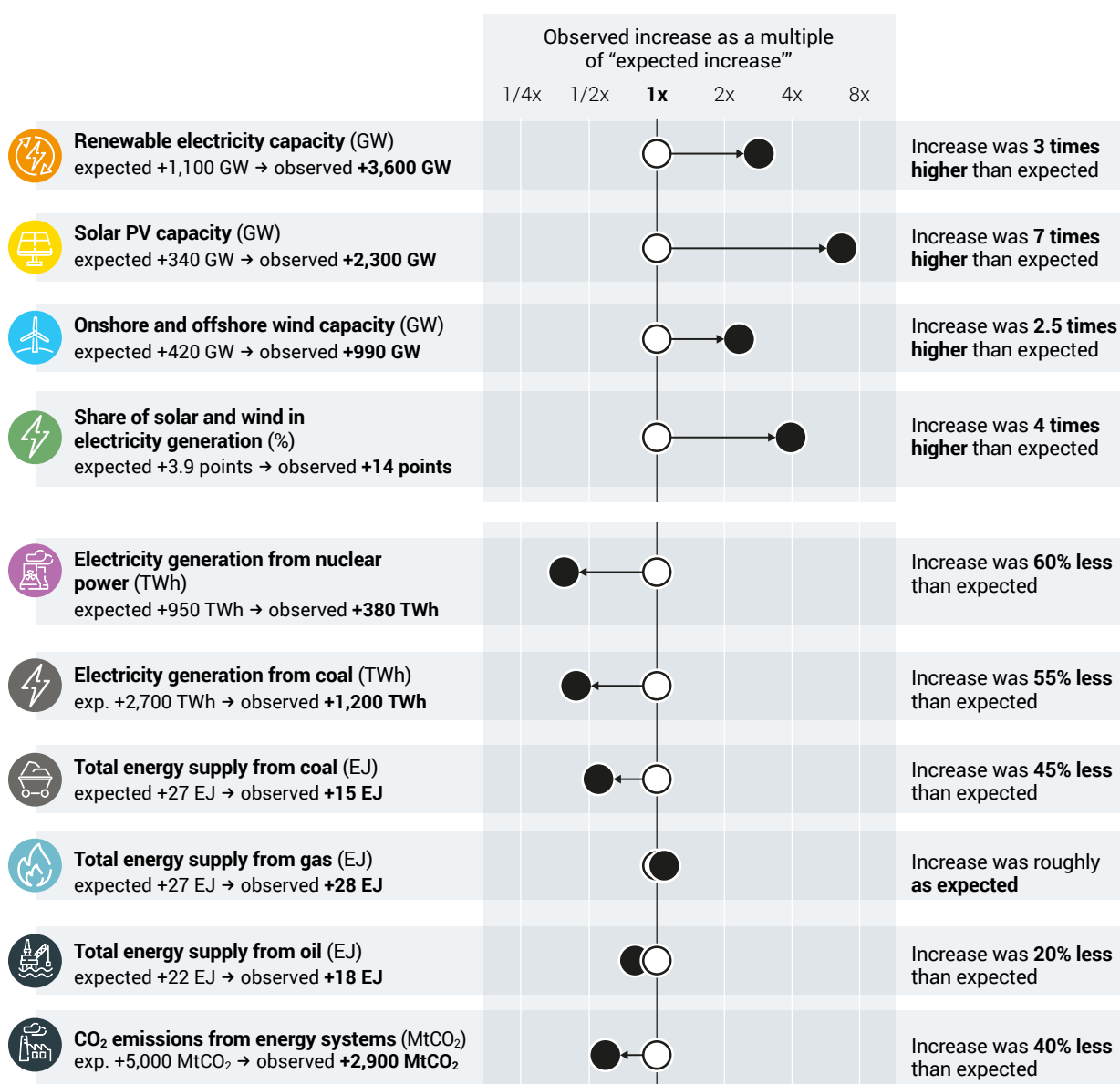
Although total energy supply from fossil fuels has continued to grow, the rate has been slower than projected under current policies in 2015. The biggest differences are observed for coal. Total energy supply from coal continued to increase over the last decade, but this rise was 45 per cent smaller than anticipated in 2015. Similarly, only around half of the expected growth in electricity generation from coal materialized. Growth in total energy supply from oil over the same period was 20 per cent lower than projected, while total energy supply from gas increased broadly in line with 2015 projections (figure 5.1 and figure 5.7).

Together, these changes contributed to an increase in CO₂ emissions from energy systems (excluding industrial processes) that was 40 per cent less than expected (figure 5.1).

The differences between observed outcomes and the current policies projections made in 2015 are likely attributable to a range of interacting factors whose individual effects are difficult to isolate. In addition to the adoption of additional climate policies (chapter 6), technological advances, the COVID-19 pandemic and evolving geopolitical developments have likely affected the pace and direction of recent changes.



Figure 5.1 Development of key GST indicators over the last decade compared with projections made in 2015



Notes: This figure compares expected increases, as projected by the IEA World Energy Outlook 2015 (IEA 2015), to actual observed increases over the years 2013–2025. A ratio of 1 means that the actual, observed increase was exactly as expected. Detailed methods are available in [appendix D](#).

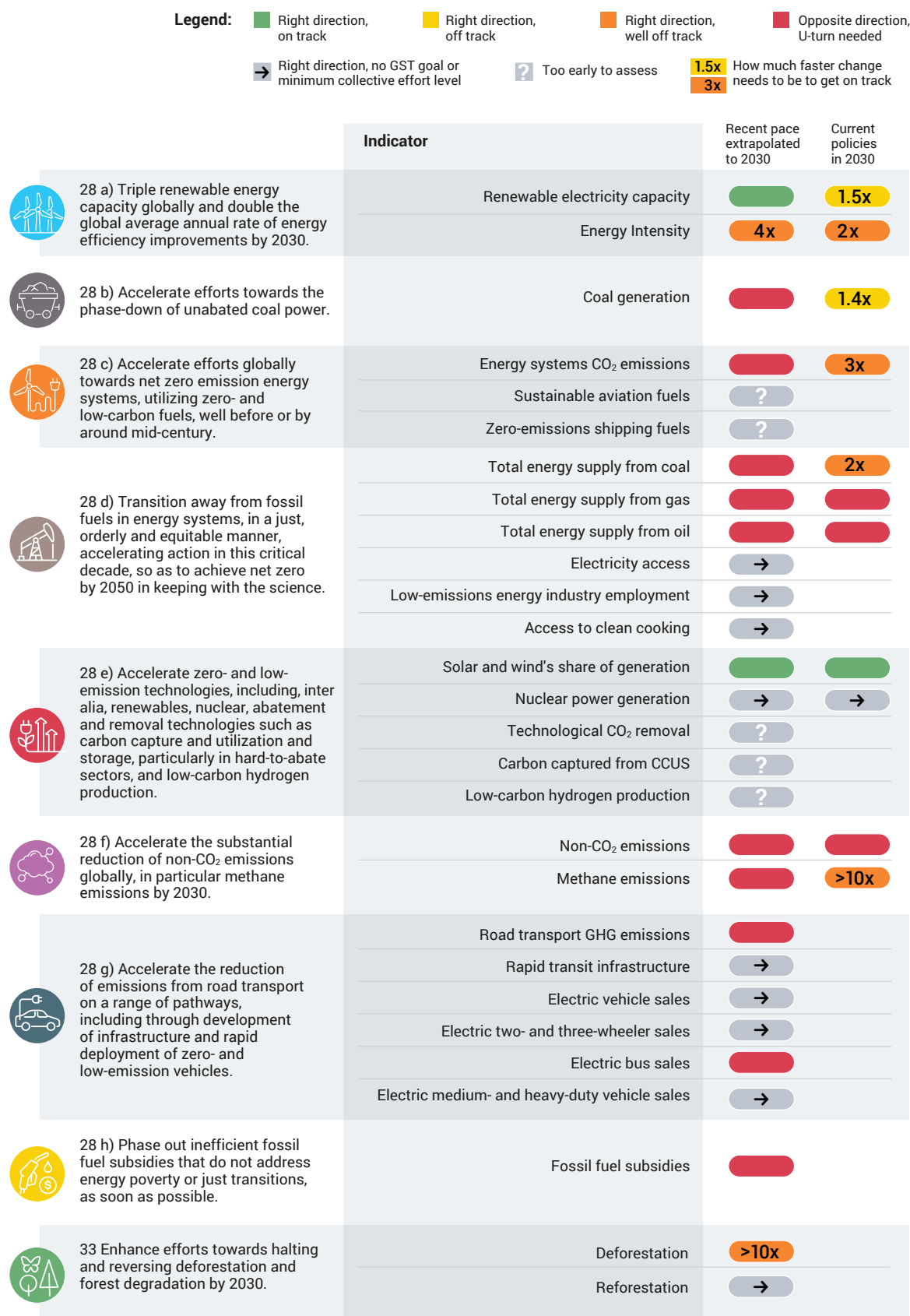
Sources: Data from the current policies scenario projections made in 2015 are from IEA (2015). See box 5.1, footnote 3 for historical data.

5.2.2 Across the GST action areas, only renewables are on track for 2030

Looking ahead, there are promising signs of global progress in a few areas, most notably in the deployment of zero- and

low-carbon technologies. Recent rates of change indicate that two indicators measuring the scale-up of renewables are on track for 2030 – though continued adoption and implementation of supportive policies will be required to sustain such growth (figure 5.2).

Figure 5.2 Recent progress towards the GST's goals and minimum collective effort levels in 2030



Notes: Detailed methods for inferring indicators and goals from the GST, deriving minimum collective effort values from the lowest 1.5°C overshoot scenario, calculating acceleration factors, and assigning categories of progress to indicators can be found in [appendix D](#).

Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios and footnote 3 for historical data.

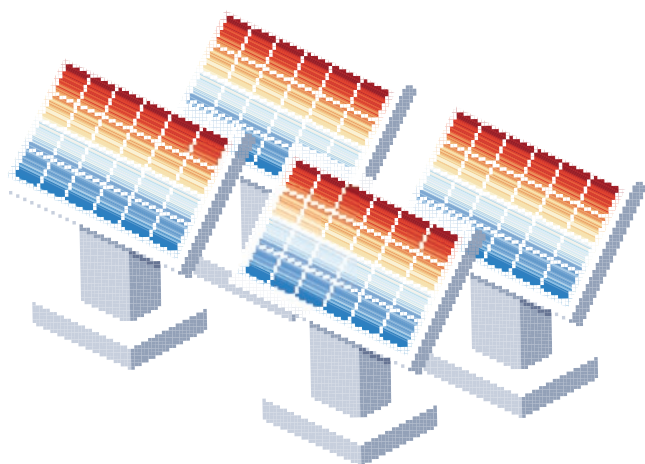
Collective efforts to triple renewable electricity capacity by the end of this decade are particularly encouraging. Current policies scenarios suggest that Governments will likely need to implement additional supportive measures to sustain the recent pace of global renewable electricity build-out through 2030. However, if countries collectively put these new policies in place and current global trends continue, installed capacity is on track to reach 11,500 GW by the end of this decade, achieving the GST goal of tripling capacity (UNFCCC 2024) and falling comfortably within the required collective effort range (see box 5.1). Rapid expansion in solar photovoltaic and wind capacity has driven much of this growth and is, in turn, reshaping electricity generation. Since 2019, the share of solar and wind in electricity generation has grown exponentially by an average rate of roughly 13 per cent per year. Sustaining this pace through 2030 would put the world squarely on track to reach shares consistent with the lowest 1.5°C overshoot scenario set. This finding is supported by current policies scenarios, which also project that the share of solar and wind in electricity generation fall within the required collective effort range for 2030 (figure 5.2 and figure 5.3).

Electric vehicle adoption represents another area of notable progress. Since 2019, the share of electric vehicles in light-duty vehicles sales has increased exponentially at an average of 43 per cent per year globally. Today, approximately one in four passenger cars sold globally is electric, compared with less than 5 per cent at the start of this decade (figure 5.2 and figure 5.9). Across all energy supply and end-use sectors, employment in low-emissions energy industries has also expanded, increasing by 1.4 million workers annually and reaching nearly 40 million jobs worldwide in 2024 (figure 5.2).

Despite these advances, collective mitigation efforts across most GST action areas are not proceeding at a pace and scale commensurate with the lowest 1.5°C overshoot scenario set (figure 5.2).

Progress in transitioning away from fossil fuels and other emissions-intensive activities is lagging particularly far behind. Total energy supply from coal, gas and oil, for example, has continued to increase over the past six years, despite the need for these sources to peak and decline sharply. Looking ahead to 2030, current policies scenarios project that while total energy supply from coal may begin to fall, total energy supply from gas and oil is likely to continue increasing. Production- and consumption-based fossil fuel subsidies have also risen, up from roughly US\$660 billion in 2018 to US\$920 billion in 2024 (figure 5.2 and figure 5.7). And collective efforts to halt deforestation, the largest source of net anthropogenic LULUCF emissions (Friedlingstein *et al.* 2026), are similarly insufficient. Although permanent tree cover loss has slowed in recent years, the rate of decline would need to accelerate by more than a factor of ten to achieve zero deforestation by 2030 (figure 5.2).

Finally, recent rates of change across all indicators tracking absolute GHG emissions, including CO₂ emissions from energy systems, GHG emissions from road transport and economy-wide non-CO₂ emissions, including methane (CH₄) emissions, are heading in the opposite direction of the GST outcome and lowest 1.5°C overshoot scenario set (figure 5.2, figure 5.6, figure 5.8 and figure 5.9). While current policies scenarios project that, across some sectors, these emissions will stabilize by 2030, none show declines occurring at the pace and scale needed to minimize the magnitude and duration of overshoot of 1.5°C – a finding that underscores that scaling up zero- and low-carbon technology adoption alone will not prove sufficient to collectively achieve the GST outcome.



Box 5.1 Methodology for tracking collective progress towards the mitigation action areas of the GST outcome

This chapter tracks global progress across the nine mitigation action areas identified in paragraphs 28 and 33 of the first GST outcome (UNFCCC 2024). Indicators were inferred directly from these paragraphs of the COP 28 decision, as were time-bound, quantified goals wherever possible ([appendix D](#), table D.1). But for those action areas that indicate only a general direction of travel, required collective effort ranges, including minimum collective effort levels, were derived from the lowest 1.5°C overshoot scenario set used in chapter 4 ([appendix D](#), table D.3),¹ given the first GST’s emphasis on delivering GHG emission reductions in line with 1.5°C pathways.

To evaluate whether collective efforts are on track for 2030, two complementary approaches are used. First, recent rates of change estimated are extrapolated to 2030, assuming current trends continue unchanged. Second, current policies scenarios’ projections for 2030 are used to estimate the impacts of recently adopted policies and anticipated technological developments that may not yet be reflected in recent observed trends.² Both these extrapolated and projected values for 2030 are then compared against GST goals for the same year or, where the GST only indicates a general direction of travel, to minimum collective effort levels derived from the lowest 1.5°C overshoot scenario set.

The assessment draws on a wide range of historical datasets,³ extending on earlier work by Boehm *et al.* (2025), selecting the most reliable and complete source for each indicator. Several indicators beyond those available in integrated assessment model (IAM) scenario data are included here, representing important diversity in the information the chapter calls upon, both in the aggregate findings and in the selection of indicators that map to each action area.

Additionally, the chapter examines what the lowest 1.5°C overshoot scenario set implies for selected indicators spanning each GST action area in 2035, 2040 and 2050. More specifically, it reports a required collective effort range for each indicator that reflects the diversity of possible futures that these lowest overshoot pathways model, and avoids unrealistic tradeoffs between indicators. The least ambitious bound of this range represents the minimum collective effort level. Both the required collective effort range, as well as the minimum collective effort level, are expressed as changes from observed 2025 levels.

Finally, figures 5.3–5.9 visualize these required collective effort ranges alongside those from the Intergovernmental Panel on Climate Change *Sixth Assessment Report* (IPCC AR6) scenarios,⁴ to illustrate where the mitigation action space has narrowed in recent years. The full methodological approach is described in further detail in [appendix D](#).

¹ Data from the lowest 1.5°C overshoot scenario set are from the Scenario Compass Initiative (Huppmann 2026; Riahi, Clarke *et al.* 2026) and ScenarioMIP-CMIP7 (Riahi, van Vuuren *et al.* 2026; Van Vuuren *et al.* 2026).

² Data from the latest current policies scenarios are from ELEVATE (Dafnomilis *et al.* 2026; Hooijschuur *et al.* 2026), Global Energy and Climate Outlook 2025 (Keramidas *et al.* 2026), and NGFS (Richters *et al.* 2024). Note that these current policies scenarios overlap in source and vintage with the current policies scenario in chapter 4, and they also provide the internally consistent sectoral detail that the current policies scenario in chapter 4 does not (figure D.1, [appendix D](#)).

³ Historical data are from International Renewable Energy Agency (2026) for renewable electricity capacity, solar photovoltaic capacity and wind capacity; IEA (2026a) for primary energy intensity of GDP, the share of electricity in total final consumption, electricity generation from coal, coal capacity, share of coal in electricity generation, total energy supply from coal, total energy supply from gas, total energy supply from oil, share of solar and wind in electricity generation, electricity generation from nuclear power, electricity generation from solar and wind, low-carbon hydrogen production, and carbon captured from carbon capture, usage and storage; Crippa *et al.* (2026) for CO₂ emissions from energy systems, non-CO₂ emissions, methane emissions, GHG emissions from transport and road transport, and direct and indirect CO₂ emissions from industry and buildings, with indirect emissions allocated using IEA (IEA 2026c); the International Air Transport Association (IATA) (Thomsen, Mistry and Block 2023; IATA 2026) for the share of sustainable aviation fuels in global aviation fuel supply; Baresic *et al.* (2025) for the share of zero-emissions fuels in maritime shipping fuel supply; IEA *et al.* (2026) for populations without access to electricity and to clean cooking; IEA (2025b) for employment in low-emissions energy industries; Edwards *et al.* (2026) for technological CO₂ removal from bioenergy with carbon capture and storage, and direct air carbon capture and storage; the Institute for Transportation and Development Policy (2026) for the number of kilometres of rapid transit per 1 million inhabitants; IEA (2026b) for the share of electric vehicles in light-duty vehicle sales, the share of electric vehicles in the light-duty vehicle fleet, the share of electric vehicles in medium- and heavy-duty commercial vehicle sales, and the share of electric vehicles in two- and three-wheeler sales; International Institute for Sustainable Development and Organisation for Economic Co-operation and Development (2025) for fossil fuel subsidies; Hansen *et al.* (2013), Sims *et al.* (2025) and Turubanova *et al.* (2018) for deforestation; and Potapov *et al.* (2022) and Richter *et al.* (2024) for reforestation. For the comparison of expected increases under projections made in 2015 with actual, observed increases (figure 5.1), two indicators use different historical data sources: (1) the share of solar and wind in electricity generation is from Ember (2026), because the IEA (2026a) data used elsewhere in the chapter start in 2015 but the latest historical reference for these 2015 projections is 2013; and (2) CO₂ emissions from energy systems are from IEA (2025c) and IEA (2026), because the current policy scenario projections made in 2015 for this indicator (IEA 2015) include CO₂ emissions from fuel combustion only, while the Crippa *et al.* (2026) data used elsewhere in the report include CO₂ emissions from energy and industrial processes.

⁴ Data from the IPCC AR6 scenarios are from Byers *et al.* (2022). The scenario range presented in the figures follows the lowest overshoot definition from chapter 4, which, applied to the AR6 scenarios, selects those with peak warming at or below 1.7°C at the sixty-seventh percentile (below 1.6°C at the fiftieth percentile).

Box 5.2 The effect of equity considerations in IAMs when establishing global mitigation goals

As box 4.1 in chapter 4 sets out, IAM scenarios typically rely on global and intertemporal least-cost optimization, a normative modelling choice that is common in scenario research (Rubiano Rivadeneira and Carton 2022; Zimm *et al.* 2024). This raises two concerns, particularly when global decarbonization pathways are used to establish collective mitigation goals. First, least-cost optimization allocates mitigation effort where and when it is cheapest, rather than where responsibility- or capability-based considerations may indicate, which can constrain development opportunities in poorer regions in the absence of international support (Höhne, den Elzen and Escalante 2014; Kartha *et al.* 2018; Klinsky and Winkler 2018; Dooley *et al.* 2021; Pachauri *et al.* 2022).

Second, reallocating effort across regions on equity grounds may also alter the global distribution of mitigation across sectors and activities, in which case sectoral milestones would reflect implicit distributional assumptions. Efforts to represent these considerations more explicitly in global integrated assessment modelling are ongoing (Bauer *et al.* 2020; Brutschin *et al.* 2025; Fujimori *et al.* 2026; Pelz *et al.* 2026). Recent results are reassuring for the indicators considered here. Applying responsibility- and capability-based fair-share approaches while minimizing reliance on climate finance leaves many indicators, including global renewable energy deployment, close to least-cost scenarios, even as mitigation efforts shift to higher-responsibility regions. Fossil phase-out is the main exception: global fossil primary energy declines more rapidly than in least-cost scenarios, because faster transitions in developed regions more than offset slower phase-outs elsewhere (Pelz *et al.* 2026).

5.3 New global milestones beyond 2030 are needed

New global milestones extending beyond 2030 are needed. New NDCs with mitigation targets for 2035 have been submitted (chapters 3 and 4), and the second GST process is intended to inform targets for the next round of NDCs with mitigation targets for 2040.

Furthermore, the outlook across all GST action areas has changed substantially since COP 28. As chapter 4 showed, scenarios from the IPCC AR6 are now outdated, as are most assumed stringent GHG emission reductions beginning in 2020, and those scenarios holding global warming to 1.5°C with a maximum overshoot of 0.1°C are no longer feasible

(chapter 4, United Nations Environment Programme [UNEP] 2026). At the same time, the rapid decline in the cost of key zero- and low-carbon technologies has created opportunities for faster transitions in several of the GST action areas.

Drawing on the latest scientific evidence, including the lowest 1.5°C overshoot scenario set that accounts for these developments, this section examines the collective effort ranges required to minimize the magnitude and duration of overshoot of 1.5°C across a subset of indicators covering all GST action areas. These ranges are intended to serve as inputs to inform Parties' discussions about efforts to enhance global ambition, and establish new milestones for the near term (2035 and 2040) and the longer term (2050).

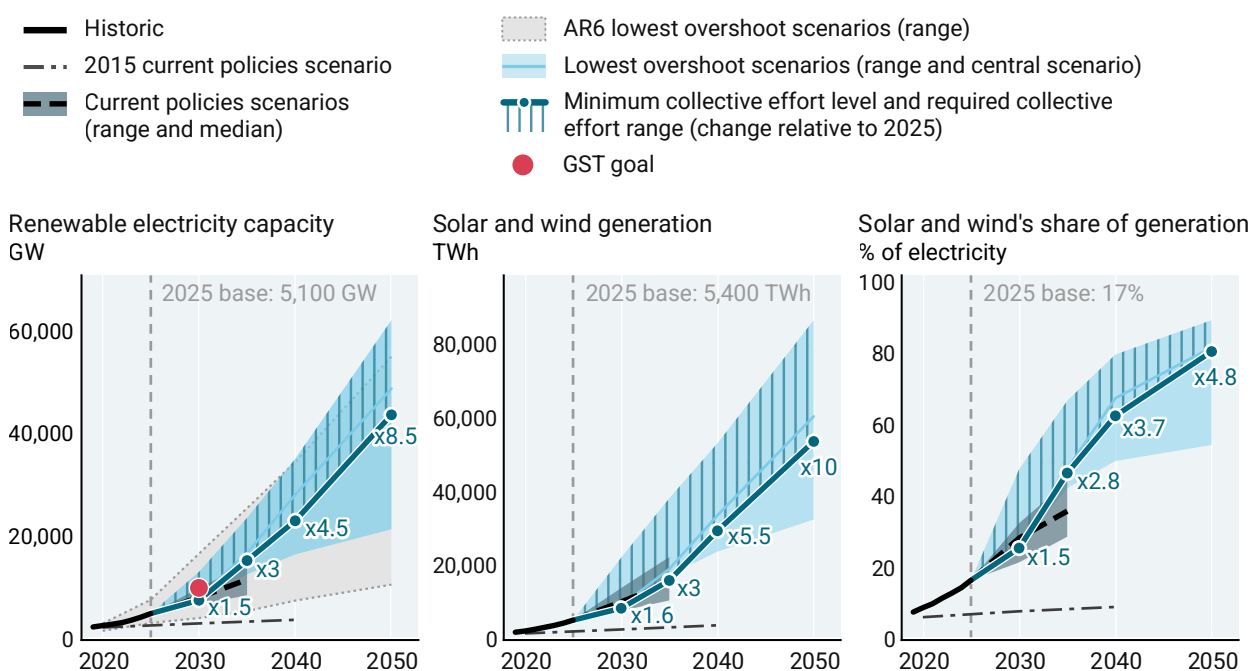
5.3.1 Rapid scale-up of renewable electricity capacity and generation must continue beyond 2030 (GST paragraphs 28a and 28e)

Maintaining the recent momentum in global renewable energy capacity expansion is essential to meet growing energy demand while reducing emissions. Progress has far outpaced current policies projections made in 2015 (section 5.2.1). Nevertheless, the lowest 1.5°C overshoot scenario set requires total renewable electricity capacity, as well as electricity generation from solar and wind, to increase to at least three times the 2025 level by 2035. By 2040, total renewable electricity capacity must reach at least 4.5 times, and electricity generation from solar and wind

at least 5.5 times, relative to 2025. The share of electricity supplied by solar and wind must also rise rapidly, reaching nearly 47 per cent by 2035, 63 per cent by 2040 and 81 per cent by 2050 (figure 5.3). Achieving the quantified 2030 GST goal (UNFCCC 2024) is therefore a crucial stepping stone towards meeting the required collective effort range in subsequent years.

A rapid scale-up of renewable electricity capacity was also projected in the IPCC AR6 scenarios that required stringent emission reductions starting in 2020. However, due to insufficient action over the past five years, renewable capacity must now reach the upper end of the range of AR6 scenarios to minimize 1.5°C overshoot (figure 5.3).

Figure 5.3 Global progress in scaling up renewable electricity capacity and generation



Notes: Detailed methods for translating paragraph 28a's "tripling renewable energy capacity globally" into a time-bound, quantified goal for 2030 can be found in table D.1 of [appendix D](#).

Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

5.3.2 Collective efforts to improve energy efficiency and accelerate electrification progress are too slow (GST paragraph 28a)

Parties agreed to collectively double the global average rate of energy efficiency improvements by 2030 (UNFCCC 2024). Meeting this goal means increasing the rate of energy intensity improvements from 2 per cent a year in 2022 to 4 per cent per year each year until 2030, where energy intensity is defined as primary energy over gross domestic product (GDP) (Xiao *et al.* 2024; IEA 2025a).

Recent progress on this primary energy intensity of GDP measure is slow, and current policies scenarios are also not in line with the agreed GST goal for 2030. The lowest 1.5°C overshoot scenario set requires at least a 30 per cent reduction in primary energy intensity of GDP below 2025 levels by 2035, at least 40 per cent by 2040, and 55 per cent by 2050 (figure 5.4).

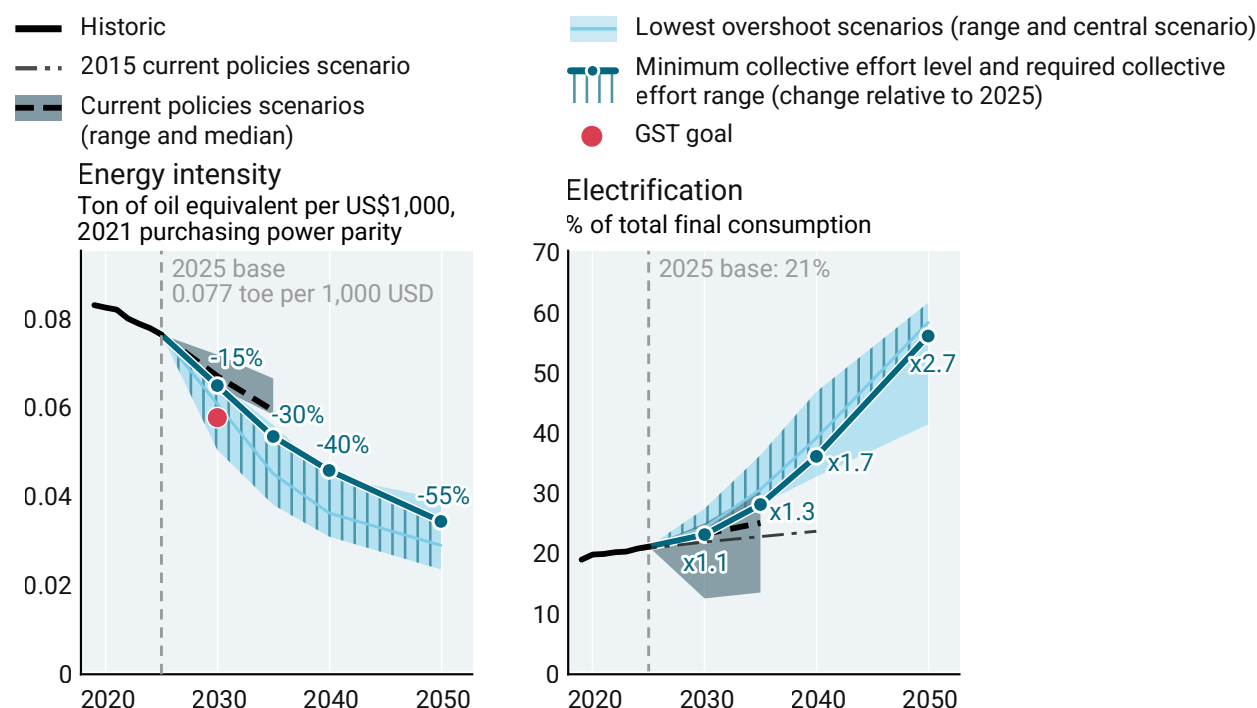
Electric technologies, such as electric vehicles and heat pumps, can contribute substantially to improving energy efficiency (Monschauer *et al.* 2022). The share of electricity in total final consumption (electrification) is moving in

the right direction, but relatively slowly at the global level, increasing by 3.1 percentage points (+17 per cent in relative terms) from approximately 18 per cent in 2015 to 21 per cent in 2025 (figure 5.4).

The minimum collective effort required to align with the lowest 1.5°C overshoot scenario set is for that share to increase by at least 7 percentage points above the 2025 level to at least 28 per cent by 2035. Note that here, electrification is measured as a share of total final consumption, including non-energy use, due to data availability. This scope is slightly different to that used for the COP 31 Presidency's proposed goal of reaching 35 per cent electrification by 2035, which excludes non-energy use. The Presidency's 35 per cent goal is roughly equivalent to 32 per cent in the metric used here, and sits within the required collective effort range (COP 31 Presidency 2026; UNFCCC 2026).

Electrification shares will need to increase further to at least 36 per cent by 2040, and at least 56 per cent by 2050, to fall within the required collective effort range. Achieving the proposed 35 per cent by 2035 goal would keep these longer-term electrification pathways within reach, while not putting undue pressure on other action areas (figure 5.4).

Figure 5.4 Global progress in improving energy intensity and accelerating electrification



Notes: Detailed methods for translating paragraph 28a's "doubling the global average annual rate of energy efficiency improvements" into a time-bound, quantified goal for 2030 can be found in table D.1 of [appendix D](#). Additionally, this chapter follows Spencer *et al.* (2024) in defining energy efficiency as the primary energy intensity of GDP.

Electricity share is defined here as the share of electricity in total final consumption, including non-energy use.

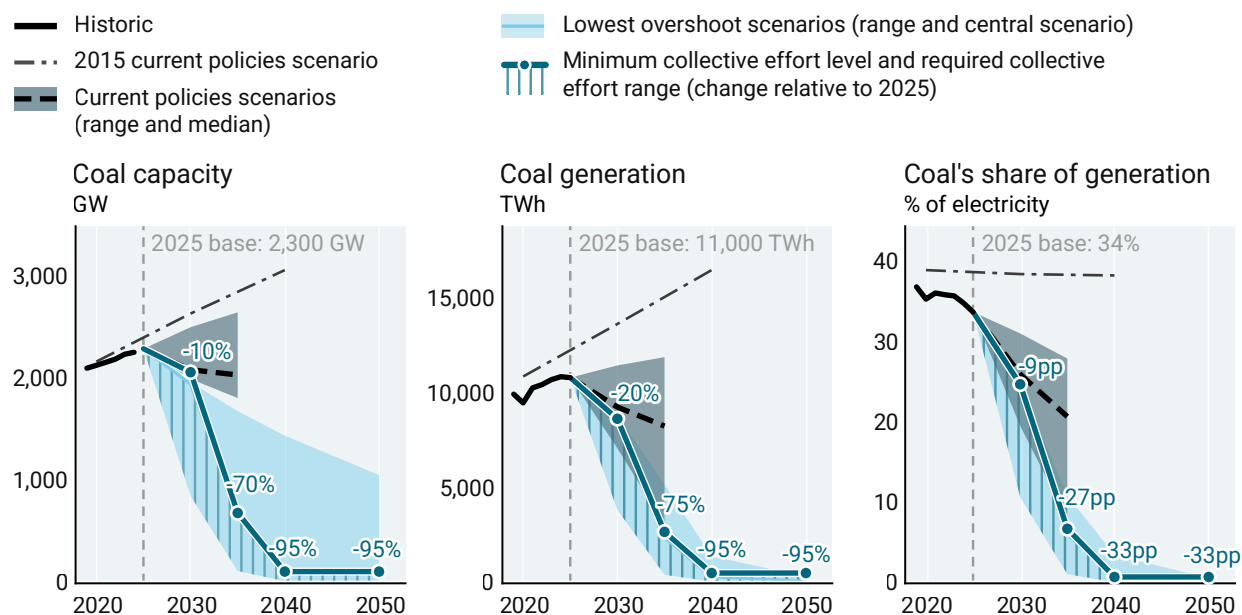
Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

5.3.3 Electricity generation from coal set to peak but needs to decline far faster (GST paragraph 28b)

Data from 2025 and the current policies scenarios indicate that existing policies are sufficient to drive a peak in coal power and reduce its role in the energy system, broadly projecting a decline through 2030, in stark contrast with the increase that was expected a decade ago. Looking forward, the minimum collective effort level entails a drop

in electricity generation from coal of at least 75 per cent below 2025 levels by 2035, and at least 95 per cent by 2040, and sustained through 2050. Critically, the majority of lowest 1.5°C overshoot scenarios that illustrate the full range of collective effort required foresees a reduction of 97 per cent or more – an effective phase-out of electricity generation from coal by mid-century. The scale and pace of reductions are reflected in a similarly rapid reduction in coal capacity and declining share of coal in electricity generation (figure 5.5).

Figure 5.5 Global progress in phasing down coal power



Notes: While the GST outcome prioritizes “accelerating efforts towards the phase-down of unabated coal power”, data for electricity generation from coal, as well as the share of coal in electricity generation, include both abated and unabated generation, and do not disaggregate the two.

Pp: percentage points

Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

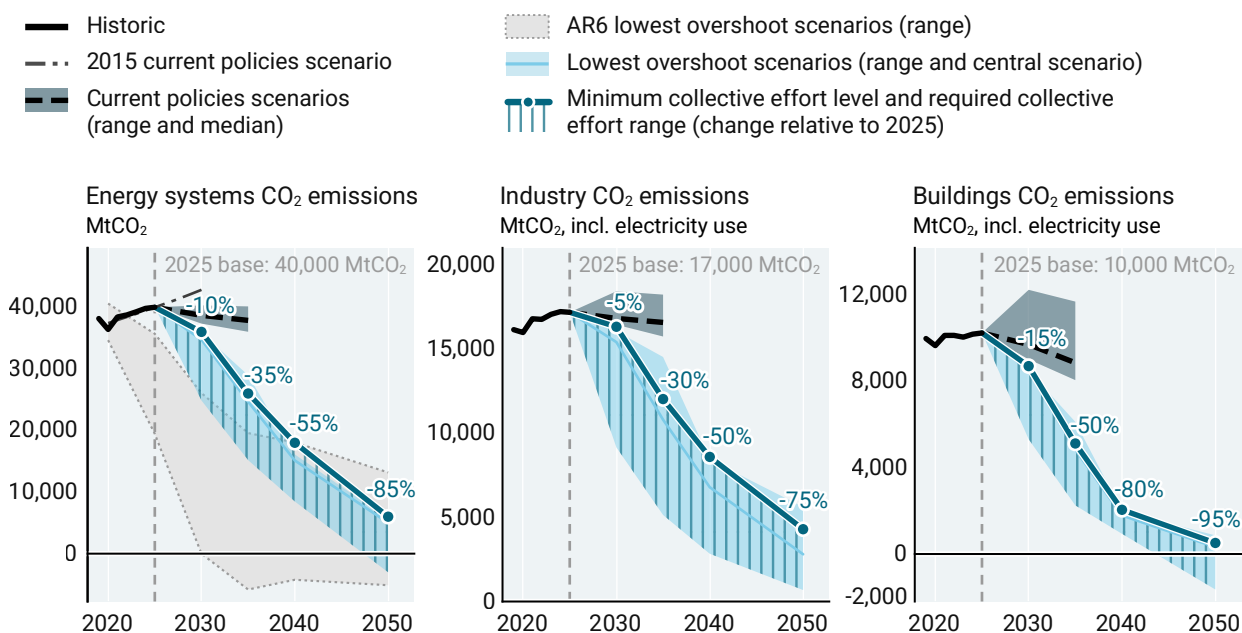
5.3.4 Projected declines in energy systems' CO₂ emissions need to accelerate to reach net zero well before or around mid-century (GST paragraph 28c)

Parties agreed to accelerate efforts towards net-zero energy systems, utilizing zero- and low-emission fuels well before or around mid-century (UNFCCC 2024). Under current policies scenarios, growth in CO₂ emissions from energy systems is expected to slow and could begin to reverse in the next 5–10 years, contrasting with earlier expectations of continued growth. To align with the lowest 1.5°C overshoot scenario set, CO₂ emissions from energy systems must decline by at least 35 per cent below 2025 levels by 2035, 55 per cent by 2040 and 85 per cent by 2050 (figure 5.6). To achieve net zero, any remaining emissions will need to be balanced through CO₂ removal.

Reaching these reductions will require rethinking energy use across key sectors. Under current policies, direct and indirect CO₂ emissions from industry and buildings, which account for a significant share of energy-related emissions, are projected to plateau (industry) or decline only slowly (buildings) through 2035. Yet the lowest 1.5°C overshoot scenario set requires emission reductions of at least 50 per cent below 2025 levels in industry, and at least 80 per cent below 2025 levels in buildings by 2040 (figure 5.6).

Scenarios used in the last five years from the IPCC AR6 report that achieved 1.5°C with no or minimal overshoot saw CO₂ emissions from energy systems declining from 2020, with some scenarios already reaching net negative in the 2030s (figure 5.6). Insufficient action to date means that those scenarios are no longer possible. However, the action required from today to minimize overshoot of 1.5°C remains very similar in terms of the pace and scale of reductions.

Figure 5.6 Global progress in reducing energy system emissions



Sources: See box 5.1, footnote 1 for data from the lowest overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

5.3.5 The transition away from fossil fuels, including efforts to phase out inefficient fossil fuel subsidies, is lagging behind (GST paragraphs 28d and 28h)

Parties agreed to transition away from fossil fuels in energy systems, and to phase out inefficient fossil fuel subsidies.

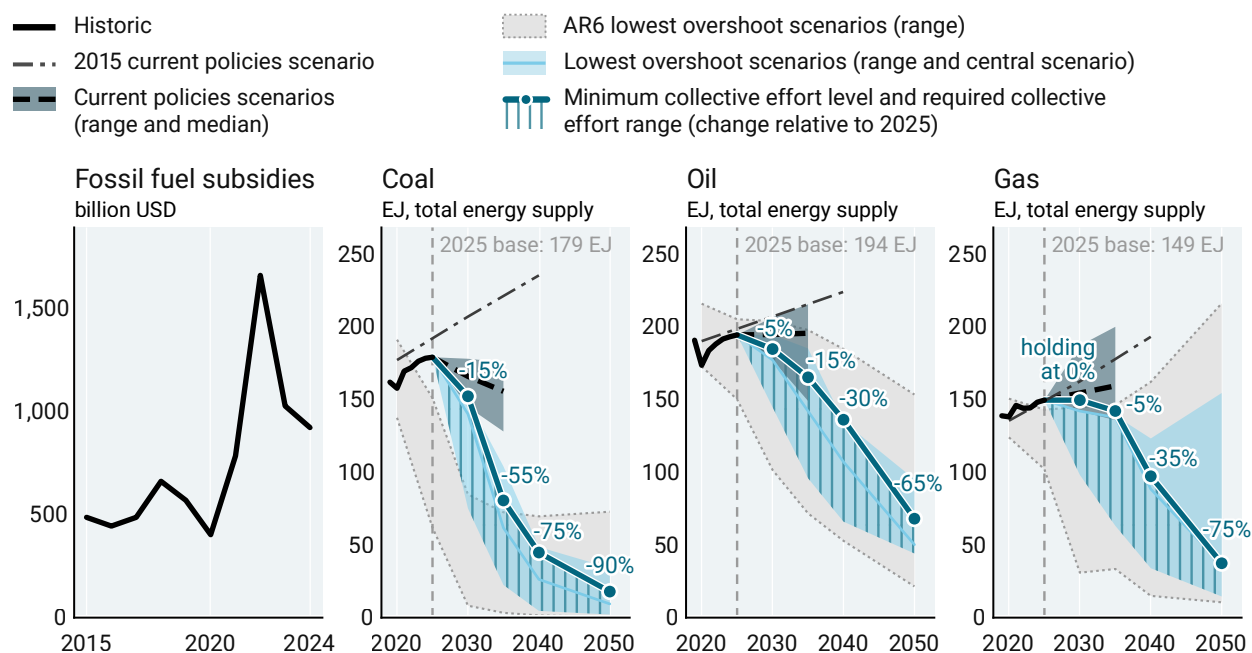
Total energy supply from coal, oil and gas are at their highest levels ever, but are set to decrease slightly (coal) and increase slightly (oil and gas) under current policies, contrasting with the expectation of continued increase in all three back in 2015 (figure 5.7).

The option to reduce coal use with action starting in 2020 is now no longer possible. To align with the lowest 1.5°C overshoot scenario set, rapid reductions from 2025 are

required. Total energy supply from coal must decline by at least 55 per cent below 2025 levels by 2035, 75 per cent by 2040, and 90 per cent by 2050. Similarly, total energy supply from oil must also decline by at least 30 per cent by 2040 and 65 per cent by 2050 relative to 2025 levels. Total energy supply from gas sees a slightly slower decrease before 2035 relative to oil, but then must also decline by at least 35 per cent by 2040 and at least 75 per cent by 2050 (figure 5.7).

Despite the goal of phasing out inefficient fossil fuel subsidies that do not address energy poverty or just transition, both production- and consumption-based subsidies reached a record high following the energy crisis in 2021/22 (figure 5.7), and could increase again with measures taken in response to the 2026 energy supply shocks (see boxes 2.2 and 3.4) (Do and Picciariello 2026).

Figure 5.7 Global progress in transitioning away from fossil fuels and phasing out inefficient fossil fuel subsidies



Notes: While the GST outcome prioritizes “phasing out inefficient fossil fuel subsidies that do not address energy poverty or just transitions, as soon as possible”, available data on fossil fuel subsidies do not distinguish those that are efficient from those that are inefficient.

Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

5.3.6 Reducing non-CO₂ emissions this decade and beyond is critical to minimizing peak warming (GST paragraph 28f)

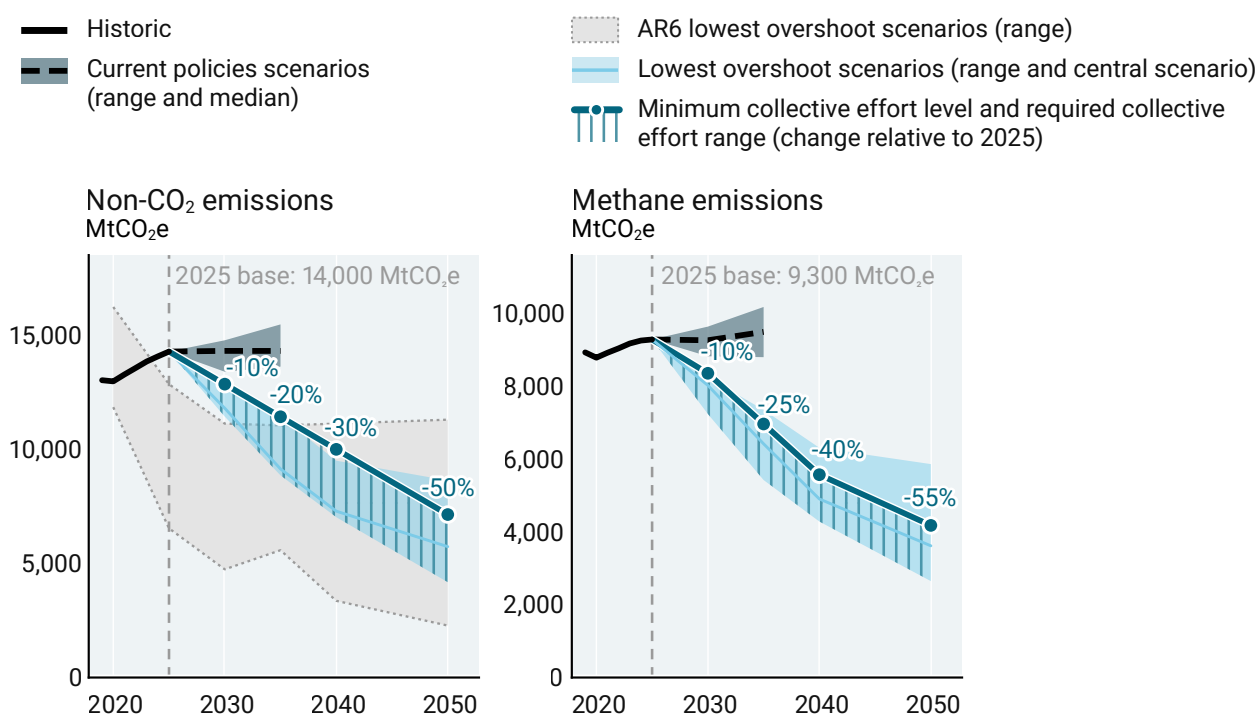
The first GST calls for a substantial reduction in non-CO₂ emissions, particularly CH₄, by 2030 (UNFCCC 2024). Reducing CH₄ emissions is especially important to reduce peak warming, because CH₄ has a high global warming potential but remains in the atmosphere for a relatively short time (Ravishankara *et al.* 2021).

Despite this goal, non-CO₂ emissions, of which CH₄ accounts for about two thirds, have continued to increase over the past five years, reaching a record high in 2025 (figure 5.8).

However, current policies scenarios suggest that this growth could end, with both total non-CO₂ and CH₄ emissions projected to stabilize over the next decade (figure 5.8).

The rapid reductions in non-CO₂ emissions envisioned in pathways that limited warming to 1.5°C with no or limited overshoot, which assumed emissions would begin falling from 2020, are no longer achievable, but future reductions needed to minimize overshoot remain largely unchanged. The required collective effort range implies that non-CO₂ emissions decrease by at least 20 per cent below 2025 levels by 2035 and 30 per cent by 2040. Similarly, CH₄ emissions on their own must decline by at least 25 per cent by 2035 and 40 per cent by 2040 (figure 5.8).

Figure 5.8 Global progress in reducing non-CO₂ emissions



Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

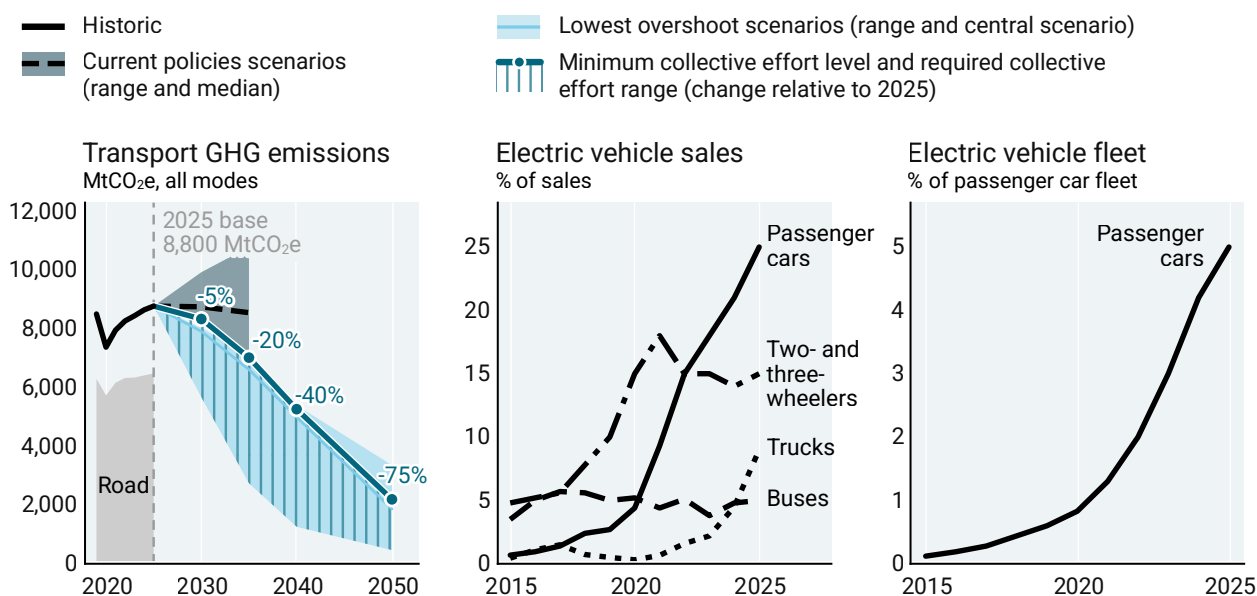
5.3.7 Electric vehicle sales are increasing rapidly, but so too are road transport emissions (GST paragraph 28g)

After rising steadily in the wake of the COVID-19 pandemic, GHG emissions from transport are set to stabilize under the most recent current policies scenarios. Following this peak, the lowest 1.5°C overshoot scenario set shows these emissions declining from 2025 levels by at least 20 per cent by 2035 and at least 40 per cent by 2040 (figure 5.9). Transforming the transport sector to achieve these reductions entails a multipronged approach that calls for lowering the need for motorized travel entirely (“avoid”), shifting to less carbon-intensive, shared and more active transport modes (“shift”), and reducing GHG emissions from vehicles on the road, for example through electrification (“improve”) (Shukla *et al.* 2022).

Given that road transport accounts for nearly three-quarters of the entire transport sector’s GHG emissions, the GST outcome specifically underscores the need to decarbonize road transport, and to that end acknowledges that a range of pathways will be needed, including the rapid deployment of zero- and low-emission vehicles (UNFCCC 2024).

Progress towards this action area of the GST is somewhat mixed. Globally, electric vehicles’ share of passenger car sales continue to rise rapidly, reaching roughly 25 per cent of all sales in 2025 (figure 5.9) – a jump driven largely by continued, substantial growth in China, as well as recent expansion across emerging markets in Asia and Latin America (IEA 2026b). But despite their increasing share of sales, electric vehicles comprised just 5 per cent of the global passenger car fleet in 2025 (figure 5.9). Achieving greater progress here will require dedicated actions to phase out internal combustion engine vehicles already on the roads, rather than simply displacing them to emerging and developing economies (Morfeldt, Davidsson Kurland and Johansson 2021; Petroni *et al.* 2024). A similar approach will also prove critical for electrifying other modes of road transport, including global electric bus, truck, and two- and three-wheeler fleets, as sales of these electric vehicles also advance, albeit more slowly than electric passenger cars sales (figure 5.9).

Figure 5.9 Global progress in reducing emissions from transport



Sources: See box 5.1, footnote 1 for data from the lowest 1.5°C overshoot scenario set, footnote 2 for data from the latest current policies scenarios, footnote 3 for historical data, and footnote 4 for data from the AR6 scenarios.

Making progress on implementing avoid- and shift-based measures is equally important, but data limitations make it difficult to assess collective efforts to date. While available data show that the number of kilometres of rapid transit per 1 million inhabitants has steadily increased since 2020 additional datasets are needed to comprehensively measure gains on this front – for example, on avoided transport demand and public transit ridership.

5.3.8 Halting and reversing deforestation and forest degradation requires both immediate and sustained action

Recognizing the critical role of forests in regulating the global climate system (Shukla *et al.* 2022), Parties emphasized the importance of enhancing efforts to halt and reverse deforestation and forest degradation by 2030 in the first GST outcome (UNFCCC 2024). Although collective efforts are moving in the right direction, they remain well off track to meet this goal.

Global deforestation rates⁵ have declined over the past decade, falling from a recent peak of roughly 11 million hectares (Mha) in 2017 to 7 Mha in 2025. However, progress has been uneven, with several small upticks in permanent forest loss occurring during this ten-year period, including a rise to 8.4 Mha in 2023. As a result, the average annual rate of deforestation dropped only slightly between 2019 and 2025, at just 0.082 Mha/yr. To reach zero deforestation by 2030 and prevent any additional permanent forest loss through 2050, the pace of decline must accelerate more than ten-fold.

Forest degradation, while not necessarily resulting in complete and permanent forest loss, remains a significant contributor to GHG emissions. By one estimate, logging, drought, edge effects associated with deforestation, and fires degraded nearly 40 per cent of the Amazon Basin between 2001 and 2018. The resulting CO₂ emissions were comparable to those from deforestation during the same period (Lapola *et al.* 2023). Despite its significance, forest degradation remains difficult to define and measure globally on annual timescales. Therefore, a robust assessment of global progress made in halting and reversing forest degradation is not yet possible.

5.4 Considerations for the second GST

Opportunities remain for countries to accelerate efforts across the first GST action areas and get on track this decade, which would be an important stepping stone towards the reductions required beyond 2030 as outlined in

this chapter. Any further delays in implementation, however, will limit the scale of mitigation opportunities available and, consequently, reduce possible GHG emission reductions in the near term. Had the transition away from fossils begun in earnest in 2020, for example, total energy supply from coal and gas could have fallen as low as 8 exajoules (EJ) and 31 EJ in 2030, respectively (figure 5.7). But the lowest 1.5°C overshoot scenario set indicates that the lowest 1.5°C levels that total energy supply from coal and gas can now reach are 75 EJ and 98 EJ by the end of this decade. Such missed opportunities risk even greater overshoot of 1.5°C – and, consequently, the increasingly frequent and severe climate impacts triggered by higher levels of peak warming.

To deliver the deep, rapid and sustained reductions in GHG emissions that are consistent with the lowest 1.5°C overshoot scenario set, collective mitigation efforts through 2030 need acceleration, alongside preparations for actions needed in subsequent decades. This chapter points to the following considerations regarding the updating and extension of the priority areas of the first GST:

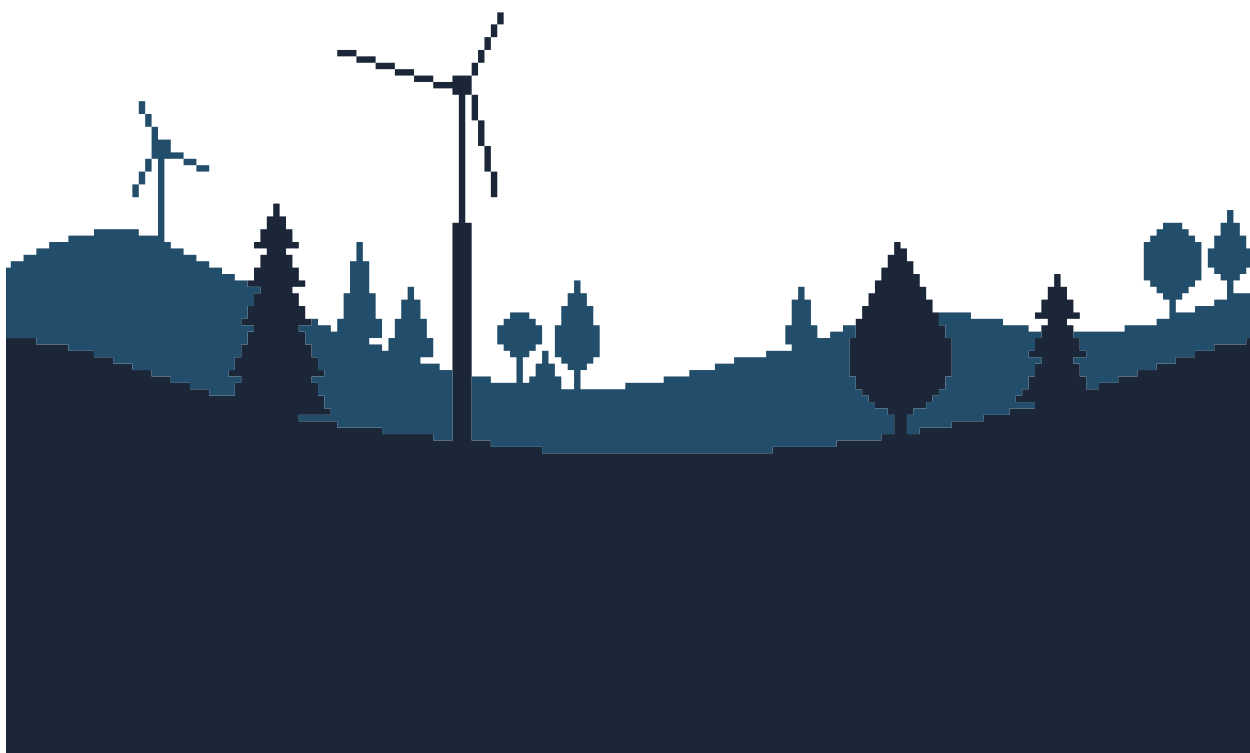
► **The action areas identified in the first GST remain salient priorities for global cooperation on mitigation.** Transitioning away from fossil fuels in energy systems, scaling up zero- and low-carbon technologies, and halting deforestation, for example, continue to represent some of the most significant opportunities collectively available to bridge the global GHG emissions gap. Additionally, where time-bound, quantified goals can be inferred from this COP 28 decision, updated scenarios confirm that they are technically feasible and their ambition levels are sufficient to minimize the magnitude and duration of overshooting 1.5°C. Tripling global renewable energy capacity, for example, falls within the required collective effort range for 2030 (figure 5.3), as does doubling the worldwide average annual rate of energy efficiency improvements by the end of this decade (figure 5.4).

► **Extending the time horizon of GST mitigation goals beyond 2030 could help inform discussions about future ambition.** Looking ahead to 2035 and 2040 can provide greater clarity on the pace and scale of transformation required across sectors. Such longer-term mitigation milestones, reflecting the range of collective effort required in the lowest 1.5°C overshoot scenario set, may serve as useful inputs for discussions under the second GST process that is envisaged to inform the fourth updating and enhancement of NDCs.

⁵ Deforestation refers to the permanent conversion of forests to new, non-forest land uses. Historical data available from Global Nature Watch approximates deforestation as all tree cover losses (Hansen *et al.* 2013) attributed to permanent agriculture, hard commodities, settlements, infrastructure development and shifting cultivation (Sims *et al.* 2025) in humid tropical primary forests (Turubanova *et al.* 2018), as these are likely to represent long-term land-use change.

► **Further elaboration of existing GST action areas could support their implementation.** Quantifying the scale and pace of change associated with agreed directions of travel, such as phasing down unabated coal power and accelerating the deployment of zero- and low-emission technologies, can guide collective efforts and help clarify associated needs for finance, technology and capacity-building. Greater specificity at the sectoral level may similarly support the development of practical transition strategies that are aligned with the collective effort levels needed to accelerate the substantial reduction of non-CO₂ emissions this decade or reach net-zero emission energy systems well before or by around mid-century. The COP 31 Presidency's proposal to increase global electrification rates to 35 per cent by 2035 (COP 31 Presidency 2026; UNFCCC 2026) is consistent with the lowest 1.5°C overshoot scenario set, and presents one example of further elaboration of these GST action areas.

► Insufficient mitigation action to date has made it impossible to limit global warming to 1.5°C with no or limited overshoot (UNEP 2026), but the broad direction of change needed across sectors to limit the magnitude and duration of overshoot remains largely unchanged. Progress across several GST action areas, most notably in the deployment of renewable energy, has accelerated in recent years, supported by cost declines of these zero- and low-carbon technologies that have continued to exceed expectations. Sustaining and expanding this momentum, while strengthening action in areas where progress has stalled or is heading in the opposite direction of what is required, will be essential to keeping the long-term temperature goal of the Paris Agreement within reach.



6 What works in climate policy and how action can be accelerated

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6.1 Introduction

The previous chapters of this report have stressed the urgency of accelerating climate mitigation action and the scale and speed required to bring the world on track to the lowest 1.5°C overshoot scenario. Bridging the emissions gap requires learning from real-world experience. Therefore, this chapter asks: what can be learned from policies already implemented? For which policies is there credible evidence of emission reductions, under what conditions and for which emitters? Evidence on outcomes supports accountability by identifying which instruments underperform and why; it informs decisions on scaling up effective measures under fiscal and political constraints; and it strengthens policies' political durability, since measures with clear, quantifiable benefits are harder to roll back and may help build public support for more ambitious action. With limited finance and political attention, and multiple competing priorities, Governments need systematic learning to adapt and scale effective measures and to reform or phase out ineffective ones.

The chapter draws on a growing scientific evidence base in climate policy evaluation. Emission trends alone show where reductions occurred, not whether policy caused them. The focus is therefore on studies that estimate emission reductions from implemented policies relative to a no-policy baseline, or counterfactual, typically constructed from pre-policy trends or comparable jurisdictions. This is a higher bar than simply observing emission reductions after a policy was introduced, since emissions may have declined for unrelated reasons. Sections 6.2 and 6.4 build on a recent study (Stechemesser *et al.* 2024) that uses national and sectoral emission data to assess whether climate policies are associated with significant emission

reductions. Because such studies use aggregate data to estimate what emissions might have been in the absence of policy, they cannot fully rule out the influence of other factors (Arvanitopoulos *et al.* 2026). To complement this evidence, section 6.3 synthesizes 220 evaluations of specific climate policies that compare similar firms, sectors or regions with and without a policy to enable assessment of policies' causal effects on emissions. Together, these studies provide the chapter's main evidence on which climate policies have reduced emissions in practice (see boxes 6.2 and 6.3 for details on the methodological approach). Because even rigorous estimates rarely explain why a policy succeeded or failed, or whether it would work elsewhere, section 6.3 also includes qualitative case studies that discuss the success and failure of policies in light of their specific design and context. Section 6.4 concludes by discussing how policy mixes and their sequencing may shape outcomes.

The chapter considers all climate-related policies, recognizing that countries reduce emissions for different reasons, including air pollution and energy security. It focuses only on implemented policies. This is conservative because it captures measures that have proven feasible but may miss politically challenging ones that could be more cost-effective. Lastly, policymakers care about outcomes beyond emissions, such as the impact of climate-related policies on innovation, competitiveness, jobs, affordability and the welfare of diverse income and gender population groups. Assessing these outcomes is beyond the scope of the chapter. However, they are discussed where doing so helps explain whether and why policies worked and were implemented. Future work could synthesize evaluations of such outcomes, including those related to the innovation and investment policies needed to meet the targets discussed in chapter 5.

6.2 Sharp shifts in national emission levels are associated with specific policies

Mitigation policies have multiplied since 1990, but remain uneven across sectors and instrument types. Since international climate negotiations began in the 1990s, climate policies have expanded across countries and sectors (box 6.1). Figure 6.1 shows the cumulative number

of new policy adoptions and strengthening of existing policies by instrument type in 41 countries from 1998 to 2022. As the figure shows, instrument choice varies. Regulatory measures, including emission standards and technology mandates, are the most common policy instruments in all sectors except transport, while subsidies are also widespread. Carbon pricing and fuel taxes are concentrated in developed economies, and are most prevalent in transport.



Figure 6.1 Cumulative number of new policy adoptions and strengthening of existing policies in 41 countries, by instrument type (1998–2022)



Note: Strengthening is defined as a substantial increase in the stringency of an existing instrument (Stechemesser *et al.* 2024). Weakening or repeal of policies is not shown.

Source: Authors' compilation based on data from Stechemesser *et al.* (2024), which combines the Organisation for Economic Co-operation and Development (OECD) Climate Actions and Policies Measurement Framework database with the International Energy Agency Policies and Measures Database, the NewClimate Institute Climate Policy Database, and the International Programme for Action on Climate (IPAC) Dashboard.

Box 6.1 Recent trends in climate-related policies

The OECD Climate Actions and Policies Measurement Framework database documents more than 3,500 climate-related policies, and tracks the adoption and stringency of 86 climate policies across 127 countries between 1990 and 2025 (Nachtigall *et al.* 2022; OECD 2025b). According to the database, the number and stringency of climate policies increased markedly from 1990 to 2025, particularly after the Paris Agreement (Nachtigall *et al.* 2022). However, this momentum has weakened since 2021, raising questions about countries' ability to narrow the implementation gap.

Following the Paris Agreement, countries significantly strengthened institutional frameworks, notably through climate targets and governance arrangements. The number of countries with net-zero emission targets increased from one in 2015 to more than 100 in 2025, although only a few of these are enshrined in law (United Nations Environment Programme 2024; OECD 2025a).

Progress has been uneven across policy instrument types and sectors. Advances have been strongest in

energy-related sectors, including buildings, electricity, industry and transport. The agriculture, forestry and other land use (AFOLU) and waste sectors have seen more limited progress, although protected areas expanded sharply in many countries. Regulatory instruments (such as building codes and energy-efficiency mandates) and information-based instruments (such as labelling schemes) remain among the most widely used climate policies. Carbon pricing, including carbon taxes and cap-and-trade schemes, and subsidies for low-carbon technologies have also become more widespread, but their expansion has been comparatively slower.

Considerable scope remains for all countries to strengthen the coverage, stringency and effectiveness of climate policies to bridge the implementation gap (see chapter 3). Developed economies have increasingly shifted from adopting new policies to strengthening existing ones, whereas emerging and developing economies have primarily advanced their climate policy frameworks through the adoption of new measures (OECD 2025a).

6.2.1 Large emission reductions associated with specific policies across countries and sectors

The large number of implemented climate-related policies provides a substantial body of experience across different instruments and sectors. Drawing on the global, cross-sectoral analysis of Stechemesser *et al.* (2024), this section investigates major emission reductions associated with climate-related policy interventions. The underlying data and methods are publicly available and consistent with sector-specific findings (Koch *et al.* 2022; Stetter, Buser and Finger 2026).

The approach outlined in box 6.2 identified 69 large emission reductions across countries and sectors, in which emissions fell at least 5–13 per cent below counterfactual trajectories. Of these, 63 coincided with the introduction or strengthening of a climate-related policy within two years (figure 6.2). These reductions cannot be explained by socioeconomic developments, weather conditions or country-specific time trends captured by the model. Of the 63 cases, 48 occurred in developed economies and 15 in developing or

transitioning economies. This distribution reflects not only where policies have succeeded but also differences in policy coverage and the availability of data.

By construction, the detected shifts represent the largest observed emission reductions. Across all 69 cases, emissions were on average about 19 per cent below the counterfactual: 23 per cent in buildings (24 cases), 13 per cent in transport (19 cases), 18 per cent in industry (16 cases) and 26 per cent in electricity (10 cases). Together, these interventions are estimated to have reduced emissions by approximately 0.6–1.8 gigatons of carbon dioxide (CO₂) equivalent (Stechemesser *et al.* 2024).

These findings are suggestive rather than causal, but they indicate that climate policies can be associated with substantial emission reductions across diverse national and sectoral contexts. However, achieving the lowest 1.5°C overshoot scenario will require reductions of this magnitude to be replicated at an unprecedented speed and scale across countries and sectors.

Box 6.2 Methods I – Detection of cross-country shifts in emissions

Evaluating climate policies is challenging. Observed changes in emissions may reflect not only policy, but also broader trends like technological progress and economic shocks. Assessing a policy's impact therefore requires estimating what would have happened without it, using a hypothetical no-policy baseline, or counterfactual. All methods in this chapter face this challenge to varying degrees; none observes the counterfactual directly, and each reconstructs it under certain assumptions.

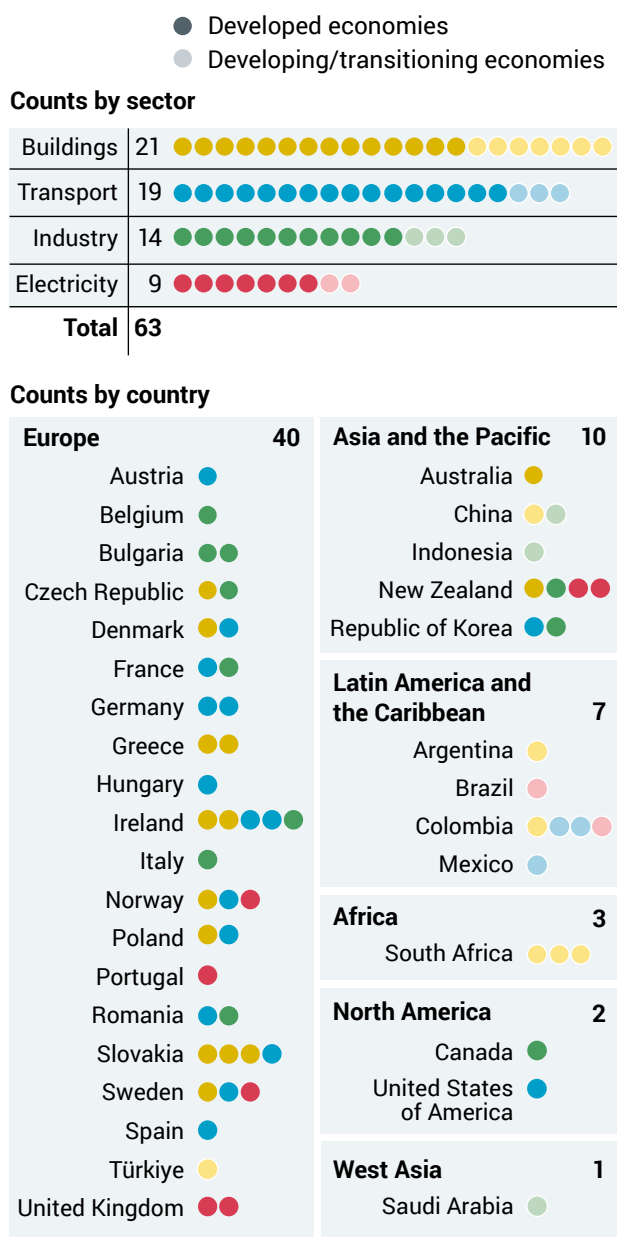
Section 6.2 draws on the statistical approach of Stechemesser *et al.* (2024). Using the emission data presented in chapter 2, the method estimates a counterfactual emission trajectory from pre-existing emission trends and a control group of similar countries. It then identifies large deviations from this trajectory (typically exceeding 5–13 per cent), applying conservative statistical procedures to limit false detections. Detected shifts in emissions are matched with the comprehensive Climate Actions and Policies Measurement Framework

database of climate-related policies to identify candidate policies introduced around the time of each shift. Section 6.4 then uses the identified shifts to compare the same policy across jurisdictions with different combinations of accompanying policies, to ask whether it is more often associated with shifts and whether shifts are larger when combined with other policies.

The approach alone does not establish causality, and it may overlook some policies that take time to produce results. Instead, it identifies instances where policy changes coincide with unusually large emission reductions, generating hypotheses about which policies may have contributed and under what conditions. These hypotheses can then be tested using more detailed quasi-experimental analyses based on firm-, facility- or household-level data. Such analyses generally provide stronger causal evidence but are often limited in generalizability beyond the evaluated scheme and period (see section 6.3).



Figure 6.2 Large policy-associated emission reductions identified in 63 cases across 33 countries, concentrated in Europe (2000–2020)



Note: Each circle represents an individual case of a reduction in a country's sectoral emissions of at least 5–13 per cent, relative to a model trend and to a control group of countries. The method accounts for socioeconomic developments, weather and country-specific sector trends. Smaller or more gradual policy effects are not detected, so a low count does not necessarily mean that a country's policies were ineffective.

Source: Adapted from Stechemesser *et al.* (2024)

6.3 Evaluations of specific policies point to emission reductions vary by sector, scheme and context

Complementing the assessment in section 6.2, which identifies observed emission reductions associated with climate-related policies, this section synthesizes evidence on the causal effects of policies on sectoral or economy-wide greenhouse gas (GHG) emissions. In particular, it uses evidence from 220 studies that evaluate specific policies and use statistical methods to estimate their causal effects on emissions across sectors, policy instruments and schemes. This provides a second line of quantitative evidence on the extent to which climate-related policies have reduced emissions (box 6.3). Qualitative evidence from case studies (boxes 6.4–6.6) contextualizes these findings by highlighting the importance of policy sequencing, institutions and implementation context.

The policy evaluation literature is expanding rapidly, with 182 of the 220 studies published after 2019. However, the evidence base remains uneven across regions, sectors and policy instruments. About half of all studies examine policies in China, while only a small number of policies in high-income countries, such as the European Union Emissions Trading System (ETS), have been evaluated extensively.

The literature is also heavily concentrated on economic instruments, with more than half of the studies assessing cap-and-trade systems.

Important evidence gaps remain. Most of the thousands of climate-related policies implemented globally have received little or no rigorous evaluation, and only a small fraction have at least two independent evaluations.¹ The median treatment period in the set of studies synthesized is five years, highlighting the need for continuous and long-term evaluations in the future. AFOLU policies, as well as widely used instruments – such as regulations, standards, public investments and subsidies – are underrepresented in the evaluation literature. These gaps are particularly consequential in developing countries, where policymakers must often make decisions with limited empirical guidance from comparable contexts. In practice, they may cautiously adapt high-income country models, rely on theory and expert judgement, or learn from peer countries facing similar circumstances. Each approach involves trade-offs between evidence certainty, learning potential and implementation speed. Deliberate investment in evaluation capacity and funding, especially in developing economies, would help generate more relevant evidence and support more effective climate policies.

Box 6.3 Methods II – Meta-analysis of causal evaluations

This section systematically identifies and synthesizes studies that estimate the causal effects of national and regional climate mitigation policies on emissions. Studies were identified through a comprehensive literature search using machine-learning-assisted screening, and human reviewers made all final inclusion decisions (see [appendix E](#) for details). Although not exhaustive, the 220 evaluation studies identified here form the largest data set of evaluations of climate-related policies synthesized to date and are part of an ongoing collection effort (Miersch *et al.* 2026). Each study's internal validity is assessed using a framework adapted from the Cochrane ROBINS-I tool (Sterne *et al.* 2016). Comparable estimates of percentage changes in emissions relative to a no-policy counterfactual are then extracted and combined in a meta-analysis that corrects for publication bias.

The counterfactual trajectory is estimated using experimental and quasi-experimental designs that compare observed outcomes with carefully constructed control

groups or pre-policy trends. These methods address confounding more credibly than simple before-and-after comparisons, as emissions respond to many other forces – including economic cycles, fuel prices, technological change and concurrent policies – that may explain any post-implementation change. Comparing regulated firms, sectors or jurisdictions with otherwise similar unregulated ones accounts for the common influences that both groups share, so any remaining difference in emissions can more plausibly be attributed to the policy.

Section 6.3 presents estimates of average emission reductions and the contexts where they have been largest. Although the methods are designed to identify causal effects of specific policy instruments, the estimates rely on assumptions, such as the absence of policy spillovers to control groups. The resulting estimates are specific to the policies, periods and contexts evaluated, and reflect studies concentrated in a subset of countries and instruments.

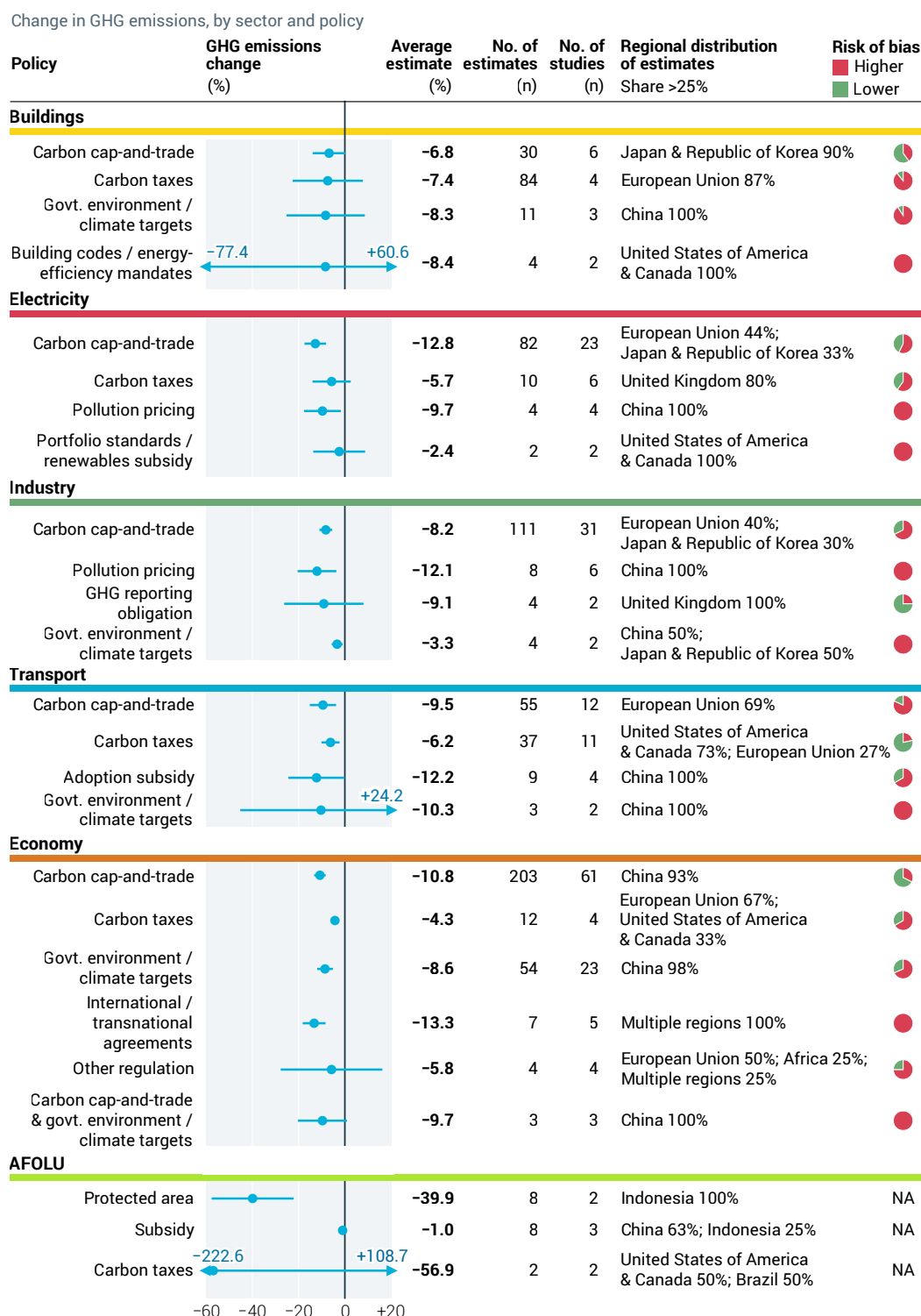
¹ Additional ex-post evaluations may exist, particularly in the grey literature, but the review conducted here indicates that the large majority of climate-related policies remain unevaluated.

Figure 6.3 synthesizes the emission reduction estimates from the 220 evaluation studies by sector and policy instrument type (see figure E.1 in [appendix E](#) for a synthesis by policy scheme). Economic instruments, including cap-and-trade schemes and carbon taxes, are the most evaluated instruments and reduce emissions by 5–13 per cent on average across sectors relative to a no-policy baseline over each study's treatment period (median of five years). These averages mask important variation across design and country contexts; estimated reductions for individual cap-and-trade schemes range from about 6 per cent for the Tokyo ETS and 8 per cent for the European Union ETS to 11 per cent for the China ETS pilots. This

variation is largely attributable to implementation context (Döbbeling-Hildebrandt *et al.* 2024). Nevertheless, the evidence is sufficient to support their efficacy. Government environmental and climate targets have reduced emissions by 3–10 per cent on average across sectors relative to a no-policy baseline over each study's treatment period (median of six years), depending on the sector, noting that there are wide uncertainty bands. Other rigorously evaluated schemes with relatively large estimated effects include low-carbon city policies, which reduce emissions by about 8 per cent. However, these have been implemented only in China (see figure E.1 in [appendix E](#)), and the transferability of the estimates will depend on stringency and context.



Figure 6.3 Policy impacts on emissions across sectors



Note: The figure shows Policies evaluated, by sector, with the number of studies and estimates (one study may provide several estimates); average change in GHG emissions caused by the policies over each study's evaluation period (median: five years), as a percentage of emissions without the policy. Negative values are reductions. Bars show 95 per cent confidence intervals; regional distribution of estimated effects within each sector-policy combination. Regions contributing 25 per cent or less of a combination's estimates are omitted.

Note: All studies compare emissions with and without the policy using statistical methods designed to estimate its effect. Averages are estimated using a multilevel random-effects meta-analysis model adjusted for the tendency of studies that find an effect to be published more often, and they describe evaluated policies only. Averages for AFOLU rest on different data (OECD 2025c) and are estimated using a fixed-effects model with standard errors approximated from the sample size, and should therefore be treated with caution. Study quality was appraised with an adapted version of the Cochrane ROBINS-I tool, which provides a checklist for non-experimental study designs. Details are in [appendix E](#).

Source: Authors' meta-analysis of 220 studies using data compiled by Miersch *et al.* (2026)

Other policies may also have large effects, but evidence on sector-specific instruments is limited: building codes, clean-vehicle adoption subsidies in transport, renewable portfolio standards in electricity and GHG reporting obligations have each been evaluated by only a few studies. On average, these policies are estimated to reduce emissions, but the uncertainties are large, and more evaluations are needed.

Across sectors, electricity shows the largest reductions at about 9 per cent on average relative to a no-policy baseline over each study's evaluation period (median of five years), with average impacts typically ranging from 2–13 per cent across the policy instruments used. As noted in chapter 2, power-sector emissions have fallen in 106 countries over the last decade, and the evaluations suggest that climate-related policies drove part of this decrease. Building policies show the lowest average reductions, consistent with the slow progress on building emissions reported in section 2.6.

The average emission reductions reported here provide a broad overview of how instrument types perform, but design, stringency and context shape whether and how much emissions fall (OECD 2025c). The case studies on the European Union ETS (box 6.4), industrial decarbonization in China (box 6.5) and renewable energy expansion in Morocco (box 6.6) illustrate this. Evaluations of both the European Union ETS and China's pilot schemes generally find significant emission reductions. Yet the European Union ETS ambition increased only gradually, so as to overcome resistance from regulated firms, and evaluations covering the recent period of substantially higher prices are only

beginning to emerge. For China, most evaluations cover the regional pilots launched in 2013, with few assessing the national scheme that started in 2021. Other potentially successful policies, especially in lower- or lower-middle-income countries, have never been evaluated. The Morocco case highlights how the favourable technological, political and social conditions created a window for ambitious renewable energy expansion.

The case studies jointly highlight four points. First, climate-related policies are frequently driven by objectives beyond emission reductions, including energy security, competitiveness and air pollution – concerns that have become even more prominent in the current geopolitical context (see also boxes 2.2 and 3.4). Evidence on these other objectives remains limited, despite their importance in policy decisions. Second, the effectiveness of carbon pricing depends heavily on context, including the energy mix, availability of low-emission fuels and technologies, energy-efficiency, and access to finance (see also Döbbeling-Hildebrandt *et al.* 2025). Third, declining renewable energy costs support faster deployment (chapter 5), but realizing this potential often requires supportive institutions, regulatory reforms, effective auction design, appropriate ownership arrangements and access to finance, particularly in developing countries. Finally, climate policies are typically implemented as packages rather than in isolation. Well-designed policy packages can enhance effectiveness, but adding instruments indiscriminately may create overlaps that reduce it (see section 6.4).



Box 6.4 Case study: European Union Emissions Trading System

Launched in 2005, the European Union ETS was the world's first large carbon cap-and-trade policy. It remains the largest by market value and trading revenue (China's national ETS covers more emissions by volume), and it covers some 12,000 installations and roughly 40 per cent of European Union GHG emissions. Over successive phases, it evolved from a largely experimental system into the European Union's flagship climate policy.

The ETS started with a design that was low-ambition but politically feasible, initially producing neither large environmental benefits nor considerable economic costs, but creating path dependency and a basis for later stringency (Leipprand, Flachsland and Pahle 2020). Generous free allocation of permits and compensation mechanisms overcame cost concerns and opposition from industry and individual countries. Over time, positive feedback loops within the policy process supported successive increases in stringency: expanded sectoral coverage, increased auctioning, a steadily declining cap and strengthened market stability (Perino *et al.* 2022; Sato *et al.* 2022; Sitarz *et al.* 2024). European Union institutions, business associations, research institutes, think tanks and non-governmental organizations reinforced the supporting coalition, and a community of experts emerged with ownership of the instrument and an interest in improving it, even when their specific interests differed (Leipprand, Flachsland and Pahle 2020). Notably, firms abated emissions while allowance prices were relatively low (around US\$20 per ton of CO₂ equivalent), suggesting forward-looking responses to a credibly tightening cap rather than to spot prices (Fuss *et al.* 2018; Bayer and Aklin 2020).

Emissions from covered installations have roughly halved since 2005, but isolating the ETS's contribution is challenging; emissions had been falling before 2005 through structural economic change, and shocks such as the 2009 recession also reduced activity and emissions. An emerging firm-level literature has made progress.

Comparing regulated firms with closely matched unregulated ones before and after the ETS shows reductions in emissions, or in the carbon intensity of production, across a range of settings – France (Colmer *et al.* 2025), Norway (Klemetsen, Rosendahl and Jakobsen 2020), Lithuania (Jaraitė and Di Maria 2016) and other countries (Dechezleprêtre, Nachtigall and Venmans 2023) – with effects clearer in some than others (Calel 2020).

On average, these reductions came without detrimental effects on production, employment or economic performance (Jaraitė and Di Maria 2016; Marin, Marino and Pellegrin 2018; Löschel, Lutz and Managi 2019; Klemetsen, Rosendahl and Jakobsen 2020; Dechezleprêtre, Nachtigall and Venmans 2023; Colmer *et al.* 2025). These reductions were achieved through investment in cleaner technology, evidenced by increased low-carbon patenting among regulated firms (Calel and Dechezleprêtre 2016; Calel 2020), and through a shift towards cleaner producers, with air-quality co-benefits (Basaglia, Grunau and Drupp 2024), although averages can mask heterogeneous effects across firms and subsectors. Most studies find no significant relocation of emissions outside the European Union (Martin *et al.* 2014; aus dem Moore, Großkurth and Themann 2019; Koch and Basse Mama 2019; Naegele and Zaklan 2019; Borghesi *et al.* 2020; Dechezleprêtre *et al.* 2022), though recent trade-based evidence detects some leakage (Wang and Kuusi 2024).

The ETS has been supported by a progressively broader and deeper European Union climate policy mix. Regulatory instruments – such as renewable energy and efficiency targets and energy market reforms – have been essential in energy policy and in non-ETS sectors such as transport and buildings (Oberthür and von Homeyer 2023). Renewable energy policies also helped lower the cost of achieving emission reductions under the ETS and accelerated the transformation of the power sector (Leipprand, Flachsland and Pahle 2020).

Box 6.5 Case study: Industrial decarbonization in China

China is the world's largest emitter of industrial CO₂, and over the last decade, a combination of climate, energy, environmental and industrial policies has contributed to moderating emission growth. Policies were motivated by China's commitments to peak CO₂ emissions before 2030 and achieve carbon neutrality before 2060, and by energy security, severe urban air pollution and overcapacity in heavy industry.

Energy-saving targets in China's Five-Year Plan were set centrally and cascaded to provinces and firms, first operated through the Top-1,000 Energy-Consuming Enterprises Programme (2006) and then through the Top-10,000 Energy-Consuming Enterprises Programme (2012), which covered 60 per cent of national energy use. Implementation was supported by administrative oversight and performance incentives for public officials, while the prominent role of state-owned enterprises facilitated policy implementation in some sectors (Thurbon *et al.* 2023). Evidence covers only the Top-1,000 Energy-Consuming Enterprises Programme over 2001–2011: targeted firms cut energy use by 12–16 per cent (but mainly by reducing production rather than improving efficiency), and about 40 per cent of the reduced output shifted to uncovered sister firms, leaving an economy-wide saving of around 4 per cent (Chen *et al.* 2025). Electricity pricing, subsidy cuts and coal tax reform also raised the cost of energy-intensive production, although causal evidence on these measures is scarce.

Carbon pricing came later. Seven regional emissions trading pilots were launched in 2013 and helped establish the emissions-monitoring and permit systems that the national ETS later used. Studies estimate that regulated firms reduced emissions by approximately 17 per cent over 2013–2015 through efficiency gains and fuel switching, and not only by reducing output (Cui *et al.* 2021). In the electricity sector, where the Government sets power prices, regulated coal plants showed no efficiency gains, and reductions came from reduced production (Cao *et al.* 2021). The difference lies in the sector and the degree of price regulation, not in the instrument. Because pilot provinces were simultaneously subject to the Top-10,000 targets, air pollution controls and local coal caps, it is difficult to isolate the effects of the ETS pilots alone.

The national market covered only electricity from 2021; in March 2025, it was extended to steel, cement and aluminium, reaching over 60 per cent of national CO₂ emissions, or around 8 billion tons (International Carbon Action Partnership undated). Monitoring and verification rules have since been tightened (China, Ministry of Ecology and Environment 2025). Evidence on the market's own effect is limited, although at least one study finds that power plants short of permits cut emissions relative to those with surplus permits (Lyu *et al.* 2026).

Industrial policy has also aimed to green the economic structure. Cities used subsidies, tax incentives and land discounts to attract solar manufacturing, stimulating production, panel exports and patenting, while also lowering air pollution (Banares-Sanchez *et al.* 2026). Domestic content requirements for wind turbines and batteries created short-run inefficiencies but, over time, helped build a competitive, world-leading battery sector (Lewis 2016; Barwick *et al.* 2025). Research and development support helped wind and solar reach the technological frontier (Nahm 2017). These policies reinforce each other, collectively enabling green industrialization.

Overall, climate policy in China has been a sequence of tools rather than a single tool. Binding targets, combined with performance incentives for public officials, delivered quick reductions, partly by cutting production; pricing and carbon markets followed once monitoring systems existed; and industrial policy moved the economy towards green industries. Much of what made this work – a centralized state, state ownership of many large emitters and performance management systems for public officials – is absent from the international databases used to compare climate policies, and the specific policy approaches may not be directly transferable to other countries. For other emerging markets, the experience suggests that it can be effective to build enforcement and monitoring before pricing, to regulate whole business groups rather than single factories where industry is organized in that way and to design policies that work together. The extent to which these lessons can be adapted elsewhere will depend on national circumstances, including institutional capacity, market structures and regulatory frameworks.

Box 6.6 Case study: Renewable energy expansion in Morocco

Morocco's 2009 National Energy Strategy set targets of 42 per cent renewable electricity capacity by 2020 and at least 52 per cent by 2030 to cut fossil fuel imports, strengthen energy security and support development (Usman and Amegroud 2019). Renewable capacity was then around 14.9 per cent of the total and came almost entirely from hydropower (Deutsche Gesellschaft für Internationale Zusammenarbeit and International Renewable Energy Agency 2021). By 2023, renewables exceeded 40 per cent of capacity (45.5 per cent in 2025) and met around 21 per cent of electricity demand. The 2020 target was missed, but renewable capacity grew by over 80 per cent (Benbba *et al.* 2024). The National Energy Strategy provided targets and investment signals, but deployment relied on favourable solar and wind resources, political commitment, international finance, institutional capacity and supporting infrastructure (Boussetta and Et-Taleby 2024; El Hafdaoui, Khallaayoun and Al-Majeed 2025).

Despite this build-out, Morocco's GHG emissions rose from 76.92 million tons of carbon dioxide equivalent (MtCO₂e) in 2009 to 108.74 MtCO₂e in 2024, and per-capita CO₂ emissions from 2.4 to 2.8 tons over the same period (Crippa *et al.* 2024). No counterfactual estimate exists, but renewable expansion likely avoided additional electricity-sector emissions, while growth in demand, transport and industrial activity, together with continued fossil fuel use, prevented absolute reductions (El Hafdaoui *et al.* 2026; Erraitab, Benhdach and El Khammal 2026; Saqib *et al.* 2026).

In 2014, Morocco imported more than 97 per cent of its energy, a vulnerability compounded by the post-2008 fuel-price surge, large energy subsidies and rapidly growing electricity demand (Schinko *et al.* 2019). Renewables thus served both climate and energy-security objectives, although Morocco remains import-dependent (Benbba *et al.* 2024).

Several conditions aligned. Exceptional solar and wind resources attracted concessional finance from the World Bank, European Investment Bank and African Development Bank Group, while long-term power purchase agreements and subsidy reform provided revenue certainty and investor confidence, turning targets into bankable projects (Carafa *et al.* 2016; Schinko *et al.* 2019; Usman and Amegroud 2019). Morocco's stable monarchy provided leadership, long-term targets and specialized institutions such as

the Moroccan Agency for Sustainable Energy that could coordinate large projects (Rignall 2016; Cantoni and Rignall 2019), and renewables' association with modernization, jobs and infrastructure built public support (Rignall 2016; Terrapon-Pfaff *et al.* 2019).

The policy mix combined institutional reform, targets, public investment and subsidy reform. Law 13-09 (2010) ended the state electricity monopoly and enabled private investment, competitive auctions and green finance (El Ghazi, Sedra and Akdi 2021; Mathieu and Valenzuela 2024); legislation in 2015 created an independent grid regulator (Ersoy *et al.* 2022); and Law 57-09 (2010) created agencies, notably the Moroccan Agency for Sustainable Energy, to plan, tender and co-invest in projects such as the Noor Ouarzazate Concentrated Solar Power Project (Vidican 2016; El Hafdaoui, Khallaayoun and Al-Majeed 2025). Progress towards the targets came chiefly through auctions under public-private partnerships, backed by state power purchase agreements and concessional finance, yielding low bid prices that mirror experience in other developing countries (Ersoy *et al.* 2022; Kitzing *et al.* 2022) and attracting 48 per cent of the climate finance in the Middle East and North Africa region in 2003–2023 (Watson, Schalatek and Évéquoz 2024). The transition thus relied on procurement and de-risking rather than on feed-in tariffs or carbon pricing (Steinbacher 2019). The missed 2020 target reflects regulatory delays, financing risks and infrastructure limits (Boulakhbar *et al.* 2020; El Hafdaoui *et al.* 2026).

Morocco's experience suggests that lower-middle-income, fossil fuel-importing countries may be able to accelerate renewable energy deployment through a coordinated package of ambitious targets, strong state capacity, regulatory stability, dedicated institutions and concessional finance. The potential for replicability is only partial, however, given Morocco's context of political stability, abundant solar and wind resources, proximity to European markets and relatively strong institutions (World Bank 2018; Berahab and Emran 2026). While some communities gained jobs and services, others raised concerns over land acquisition, water use, limited participation and unequal benefits, particularly in rural Amazigh communities (Cantoni and Rignall 2019; Ryser 2019; Terrapon-Pfaff *et al.* 2019). Morocco thus offers transferable principles, not a blueprint.

6.4 Synthesis – what the evidence implies for effective policy mixes

Climate-related policies are rarely implemented in isolation. Most are part of larger policy packages. Combining policies can be synergistic. For example, pairing carbon pricing with clean-innovation support addresses both emission and knowledge externalities at lower cost than either instrument alone (Acemoglu *et al.* 2012). Combining policies can also involve trade-offs: where power-sector emissions are capped under an ETS, renewable subsidies may lower allowance prices rather than emissions (Fankhauser, Hepburn and Park 2010; Perino, Ritz and van Benthem 2025). Although evidence on individual instruments is growing, ex-post evidence on policy mixes remains scarce.

More policies do not necessarily result in larger emission reductions. Stechemesser *et al.* (2024) show that around 43 per cent of instances of large industrial emission reductions in developed economies were associated with pricing policies, while only 14 per cent were associated with policy mixes. This suggests that in some sectors, reductions are more closely associated with instrument choice than with the number of policies. Electricity in developed economies shows a similar pattern, whereas standalone subsidies and regulation appear more effective in developing economies.

Effectiveness may also depend on how policies are combined, sequenced and implemented. Wu *et al.* (2026) find that mature, more stringent cap-and-trade schemes (e.g. the European Union ETS) conflict most with subsidies. By contrast, under less stringent schemes with limited coverage (e.g. China before 2021), renewable subsidies can increase effectiveness, because abatement in uncovered sectors outweighs distortions. As coverage expands, such subsidies may need to be phased out, highlighting the potential importance of sequencing and dynamic policy-mix design (Meckling, Sterner and Wagner 2017; Dolphin *et al.* 2023).

Complementary combinations also vary across sectors and country groups, although mixes associated with large reductions frequently include pricing instruments (Stechemesser *et al.* 2024). Pricing may be particularly complementary in transport and buildings, where household decisions are shaped by documented behavioural biases (Anderson and Sallee 2016; Myers 2019; Gillingham, Houde and van Benthem 2021). In transport, pricing appears most complementary in developed economies (Koch *et al.* 2022), whereas regulation dominates in developing economies. In European Union agriculture, large reductions are associated with broad multi-instrument packages featuring regulatory standards (Stetter, Buser and Finger 2026). These patterns are descriptive. Evidence for developing economies is based on fewer observations and may reflect differences in policy adoption and data availability, rather than in effectiveness.

The evidence reviewed in this chapter demonstrates that climate-related policies have contributed to substantial emission reductions across a range of sectors and countries, and under diverse policy approaches and national circumstances. However, these successes remain concentrated in specific sectors, countries and periods, while the emission reductions required to meet the long-term temperature goal of the Paris Agreement must be achieved across countries and sustained over decades.

Bridging the emissions gap will be supported by continued learning from policy experience across diverse national contexts, alongside the accelerated deployment and strengthening of climate action, consistent with national circumstances and development priorities. Expanding policy evaluations, particularly in underrepresented countries and sectors, would strengthen the evidence base and support more effective, evidence-based decisions. Integrating evaluation into policy design and systematically tracking outcomes can therefore support mutual learning and improved policy effectiveness.

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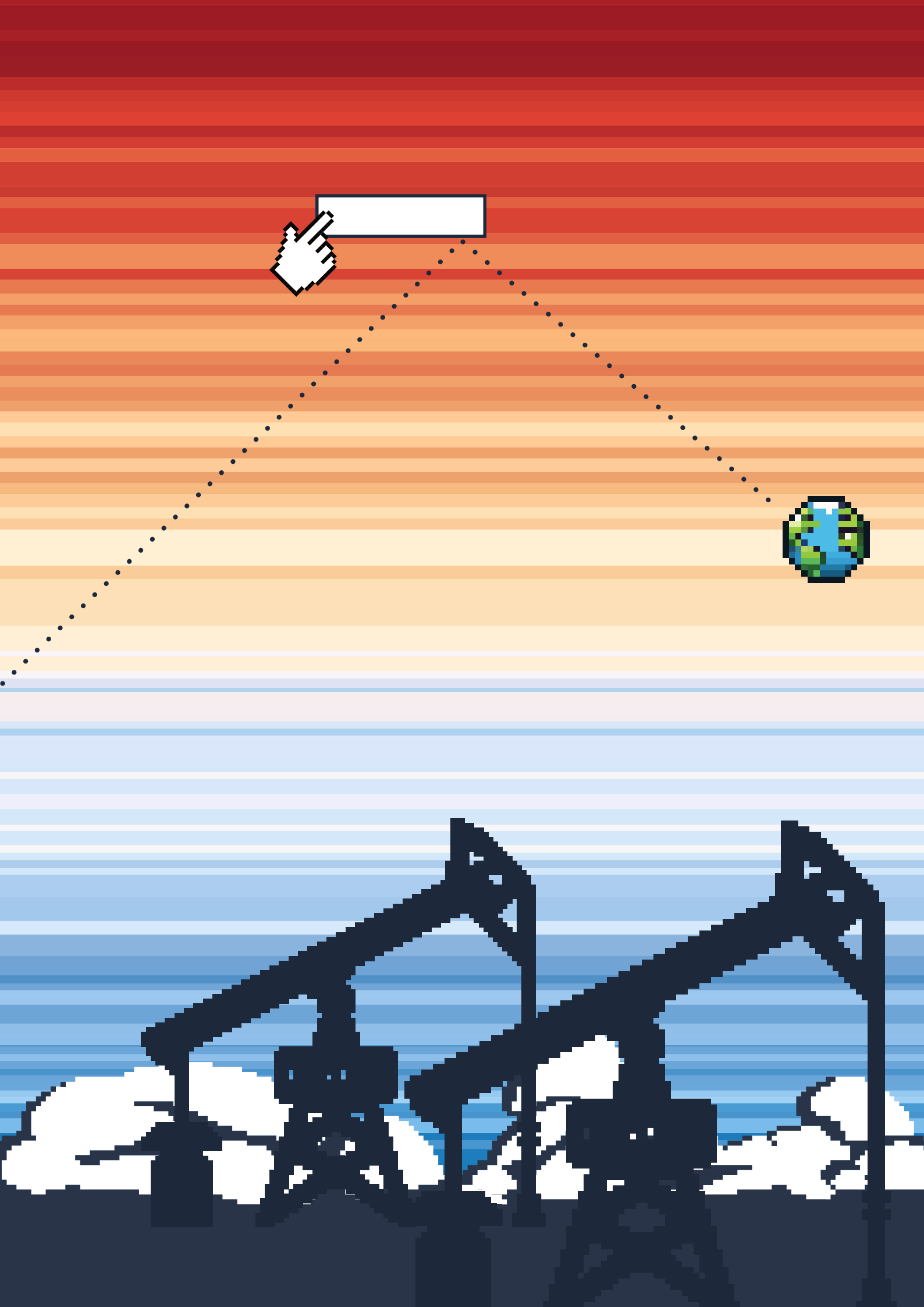
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Special thanks to UNEP's funding partners. For more than 50 years, UNEP has served as the leading global authority on the environment, mobilizing action through scientific evidence, raising awareness, building capacity and convening stakeholders. UNEP's core programme of work is made possible by flexible contributions from Member States and other partners to the Environment Fund and UNEP Planetary Funds. These funds enable agile, innovative solutions for climate change, nature and biodiversity loss, and pollution and waste.

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