

No more hot air ... please!

With a massive gap between rhetoric and reality,
countries draft new climate commitments

Executive Summary



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Executive summary

Emissions Gap Report 2024

Executive summary

All eyes on the next nationally determined contributions

The deadline for countries to submit their next nationally determined contributions (NDCs) with mitigation targets for 2035 is only a few months away, at the time of writing. The fifteenth Emissions Gap Report has a special focus on what is required from these NDCs to maintain the possibility of achieving the long-term temperature goal of the Paris Agreement of limiting global warming to well below 2°C, while pursuing 1.5°C relative to pre-industrial levels. Its core message is that ambition means nothing without action – unless global emissions in 2030 are brought below the levels implied by existing policies and current NDCs, it will become impossible to reach a pathway that would limit global warming to 1.5°C with no or limited overshoot (>50 per cent chance), and strongly increase the challenge of limiting warming to 2°C (>66 per cent chance). The next NDCs must deliver a quantum leap in ambition in tandem with accelerated mitigation action in this decade.

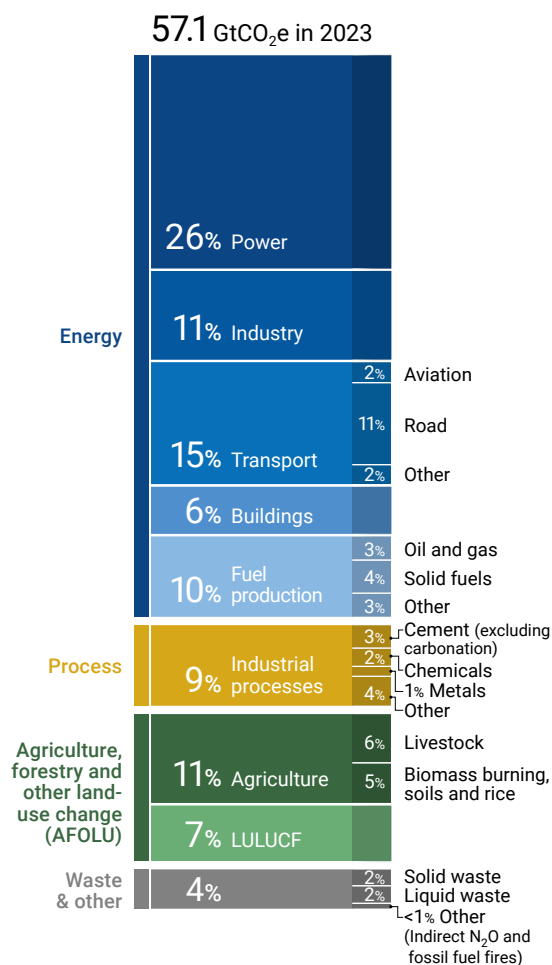
The magnitude of the challenge is indisputable. At the same time, there are abundant opportunities for accelerating mitigation action alongside achieving pressing development needs and Sustainable Development Goals. Technology developments, particularly in wind and solar energy, continue to exceed expectations, lowering deployment costs and driving their market expansion. The updated assessment of sectoral emission reduction potentials included in this year’s report shows that the techno-economic emission reduction potential based on existing technologies and at costs below US\$200 per ton of carbon dioxide equivalent (tCO₂e) remains sufficient to bridge the emissions gap in 2030 and 2035. But this will require overcoming formidable policy, governance, institutional and technical barriers as well as an unprecedented increase in the support provided to developing countries along with a redesigning of the international financial architecture.

1. Global greenhouse gas emissions set a new record of 57.1 GtCO₂e in 2023, a 1.3 per cent increase from 2022 levels

The increase in total greenhouse gas (GHG) emissions of 1.3 per cent from 2022 levels is above the average rate in the decade preceding the COVID-19 pandemic (2010–2019), when GHG emissions growth averaged 0.8 per cent per year. The rise is in all sources of GHGs, except land use, land-use change and forestry (LULUCF) CO₂, and across all

sectors. In 2023 the power sector (i.e. electricity production) continued to be the largest global contributor to emissions at 15.1 GtCO₂e, followed by transport (8.4 GtCO₂e), agriculture (6.5 GtCO₂e) and industry (6.5 GtCO₂e) (figure ES.1). Emissions from international aviation, which dropped significantly during the COVID-19 pandemic, showed the highest growth at 19.5 per cent in 2023 from 2022 levels (compared with an average annual growth of 3.1 per cent from 2010 to 2019) clearly indicating a near bounce-back to pre-COVID-19 levels. Other sectors that grew rapidly in 2023 (i.e. at a rate of more than 2.5 per cent) include fugitive emissions from fuel production (oil and gas infrastructure and coal mines), road transportation, and energy-related industry emissions.

Figure ES.1 Total GHG emissions in 2023



2. There are large disparities between the current, per capita and historic emissions of major emitters and world regions

- ▶ GHG emissions across the G20 members also increased in 2023 and accounted for 77 per cent of global emissions. If all African Union countries are added to the G20 total, more than doubling the number of countries from 44 to 99, total emissions increase by just 5 percentage points to 82 per cent. The six largest GHG emitters accounted for 63 per cent of global GHG emissions. By contrast, least developed countries accounted for only 3 per cent (table ES.1).

- ▶ Despite significant changes in the past 20 years, large disparities remain between the current average per capita and the historical emissions of major emitters and world regions (table ES.1). For example, average per capita GHG emissions are close to three times higher than the world average of 6.6 tCO₂e in the United States of America and the Russian Federation, while they remain significantly below it in the African Union, India and least developed countries. Consumption-based emissions also remain highly unequal.

Table ES.1 Total, per capita and historical emissions of selected countries and regions

	Total GHG emissions in 2023	Change in total GHG emissions, 2022–2023	Per capita GHG emissions in 2023	Historical CO ₂ emissions, 1850–2022
	MtCO ₂ e (% of total)	%	tCO ₂ e/capita	GtCO ₂ (% of total)
China	16,000 (30)	+5.2	11	300 (12)
United States of America	5,970 (11)	-1.4	18	527 (20)
India	4,140 (8)	+6.1	2.9	83 (3)
European Union (27 countries)	3,230 (6)	-7.5	7.3	301 (12)
Russian Federation	2,660 (5)	+2	19	180 (7)
Brazil	1,300 (2)	+0.1	6.0	119 (5)
African Union (55 countries)	3,190 (6)	+0.7	2.2	174 (7)
Least developed countries (45 countries)	1,720 (3)	+1.2	1.5	114 (4)
G20 (excl. African Union)	40,900 (77)	+1.8	8.3	1,990 (77)

Note: Emissions are calculated on a territorial basis. LULUCF CO₂ emissions are excluded from current and per capita GHG emissions but are included in historical CO₂ emissions based on the bookkeeping approach. Some countries in the African Union are also least developed countries.

3. Progress in ambition and action since the initial NDCs plateaued and countries are still off track to deliver on the globally insufficient mitigation pledges for 2030

- ▶ Of the parties to the Paris Agreement, 90 per cent have updated or replaced their initial NDC from the time of adoption of the Paris Agreement. However, most of this improvement came in the lead-up to the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) in 2021. Despite requests from the last three COPs to further strengthen 2030 targets, only one country has strengthened its target since COP 28.
- ▶ Under current policies, global 2030 emissions are projected to be 57 GtCO₂e (range: 53–59), which is slightly higher than last year's assessment, and

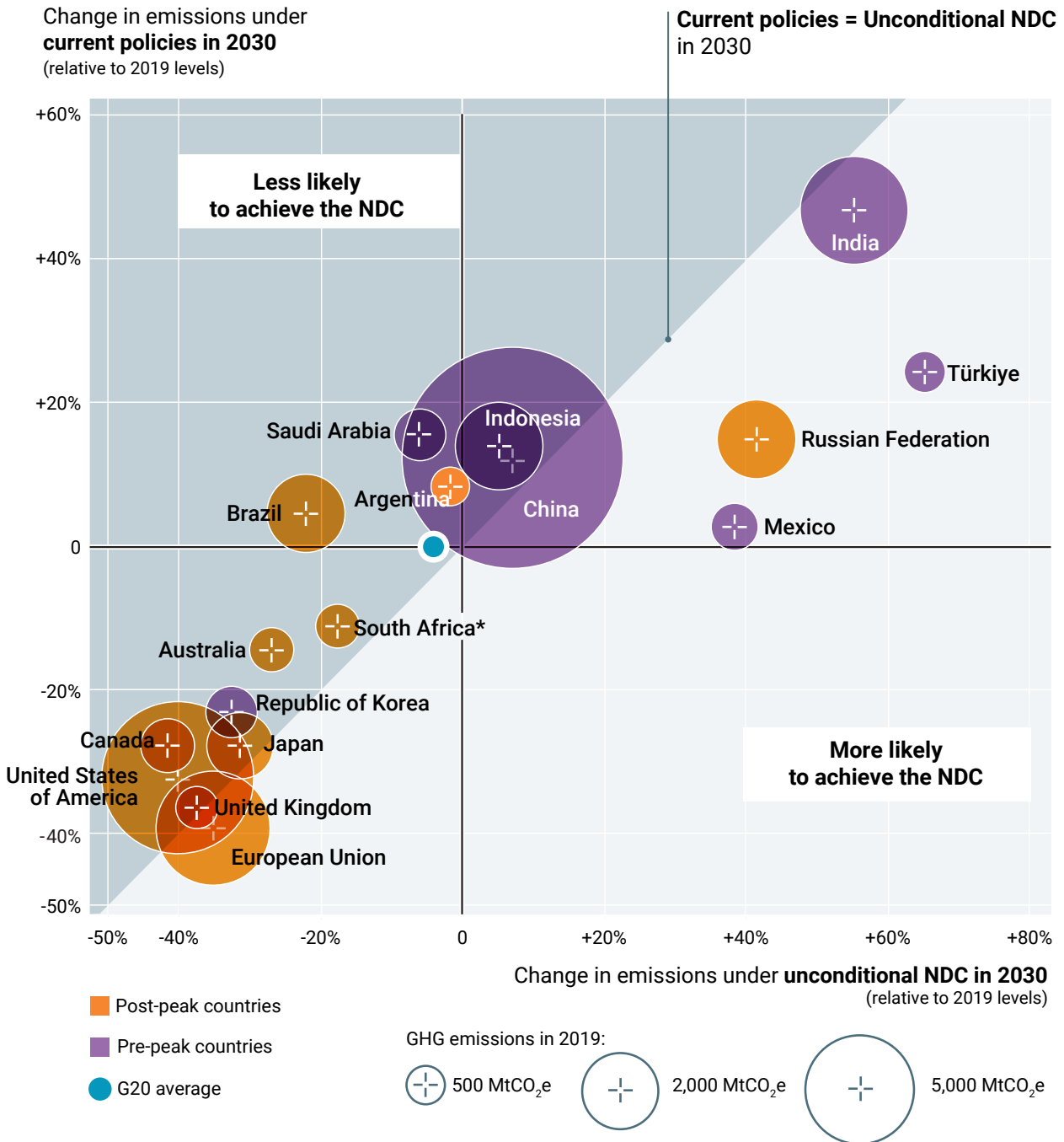
around 2 GtCO₂e (range: 0–3 GtCO₂e) above the unconditional NDCs and 5 GtCO₂e (range: 2–9 GtCO₂e) above the conditional NDCs (table ES.2). This gap in implementation of policies to achieve the NDCs for 2030 is about the same as in last year's assessment.

- ▶ Collectively, the G20 members are also still assessed to miss their NDC targets for 2030, with current policy projections exceeding NDC projections by 1 GtCO₂e in 2030. Eleven G20 members are assessed to be off track to achieve their NDC targets with existing policies, and the G20 members projected to meet their NDC target based on current policies currently are those that did not strengthen, or only moderately strengthened, their target levels in their most recent NDCs. Further, collectively the NDC targets of the G20 is far from the average global percentage reductions required to align with 2°C and 1.5°C scenarios (figure ES.2).

► The adoption and implementation of additional and more stringent policies are thus required across countries and sectors to achieve the NDC targets for 2030. While climate policy has advanced in many countries, there is still a lack of studies that evaluate

their effects on GHG emissions in 2030, and it is therefore not possible to assess whether the G20 members' new policies (adopted between June 2023 and June 2024) are likely to significantly affect global emissions in 2030.

Figure ES.2 The landscape of current NDC targets and implementation gaps for the G20 members collectively and individually by 2030, relative to 2019 emissions



Note: * Conditional NDC

4. Implied emissions trajectories of the G20 members towards net zero show reasons for concern

- ▶ As at 1 June 2024, 101 parties representing 107 countries and covering approximately 82 per cent of global GHG emissions had adopted net-zero pledges either in law (28 parties), in a policy document such as an NDC or a long-term strategy (56 parties), or in an announcement by a high-level government official (17 parties). All G20 members except Mexico and the African Union (collectively) have set net-zero targets. Overall, however, limited progress has been made since last year's assessment on the key indicators of confidence in net-zero implementation, including legal status, the existence and quality of implementation plans and the alignment of near-term emissions trajectories with net-zero targets.
- ▶ Peaking GHG emissions is a prerequisite to achieving net zero. Seven G20 members have not yet peaked emissions, defined as having reached maximum emissions at least five years before the year for which the latest inventory data is available (China, India, Indonesia, Mexico, Saudi Arabia, Republic of Korea, and Türkiye). For these countries, efforts to peak emissions earlier and at a lower level with rapid reductions thereafter will facilitate achievement of their net-zero targets. For most of the ten G20 members where emissions have already peaked (Argentina, Australia, Brazil, Canada, European Union, Japan, Russian Federation, South Africa, United Kingdom of Great Britain and Northern Ireland, United States of America), their rate of decarbonization would need to accelerate – in some cases dramatically – after 2030 to achieve their net-zero goals, unless they accelerate action now and overachieve their 2030 NDC targets. For these countries, accelerating progress in the near term will reduce cumulative emissions while avoiding reliance on unfeasibly rapid decarbonization rates later. The current NDCs and net-zero targets that countries have set themselves suggest a much narrower window of time between peaking and net zero for the countries that have not yet peaked than for those that have.

5. The emissions gap in 2030 and 2035 remains large compared both with pathways limiting warming to 1.5°C and to 2°C

- ▶ The emissions gap is defined as the difference between the level of global GHG emissions resulting

from full implementation of the most recent NDCs, and levels under least-cost pathways aligned with the Paris Agreement temperature goal.

- ▶ The emissions gaps in 2030 and 2035 have remained unchanged since last year's assessment (figure ES.3 and table ES.2), as there have been no submissions of new NDCs with significant implications for global emissions, no updates to the quantifications of their implications, and no updates to the least-cost pathways. To get on track to limiting warming to below 2°C, annual emissions in 2030 need to be 14 GtCO_{2e} (range: 13–16 GtCO_{2e}, >66 per cent chance) lower than what current unconditional NDCs imply, and 22 GtCO_{2e} (range: 21–24 GtCO_{2e}, >50 per cent chance) lower for a warming limit of 1.5°C. For 2035, these gaps increase by 4 GtCO_{2e} for a 2°C warming limit, and 7 GtCO_{2e} for a 1.5°C limit. If conditional NDCs are also fully implemented, the gaps in 2030 and 2035 for both temperature limits are reduced by around 3 GtCO_{2e} (figure ES.3).
- ▶ The full implementation of unconditional and conditional NDCs reduces expected emissions in 2030 by 4 and 10 per cent, respectively, compared with 2019 levels, whereas a 28 per cent reduction is needed for 2030 emissions to be aligned with 2°C and a 42 per cent reduction for 1.5°C. These estimates are also equivalent to those in last year's assessment. NDCs for 2035 need to reduce global emissions by 37 and 57 per cent below 2019 levels to be compatible with 2°C and 1.5°C, respectively.
- ▶ Unless global emissions in 2030 are brought below levels resulting from current policies and from the full implementation of the current NDCs, it will become impossible to get to a pathway that limits global warming to 1.5°C with no or limited overshoot (>50 per cent chance), and strongly increase the challenge of limiting warming to 2°C. Starting from the global emissions implied by the current unconditional NDCs for 2030 would double the required rate of annual emission cuts between 2030 and 2035, relative to immediately enhanced action. Specifically, if action in line with 2°C or 1.5°C pathways were to start in 2024, then global emissions would need to be reduced by an average of 4 and 7.5 per cent every year until 2035, respectively. If enhanced action that goes beyond current unconditional NDCs is delayed until 2030, then the required annual emission reductions rise to an average of 8 per cent and 15 per cent to limit warming to 2°C or 1.5°C, respectively.

Figure ES.3 Global GHG emissions under different scenarios and the emissions gap in 2030 and 2035

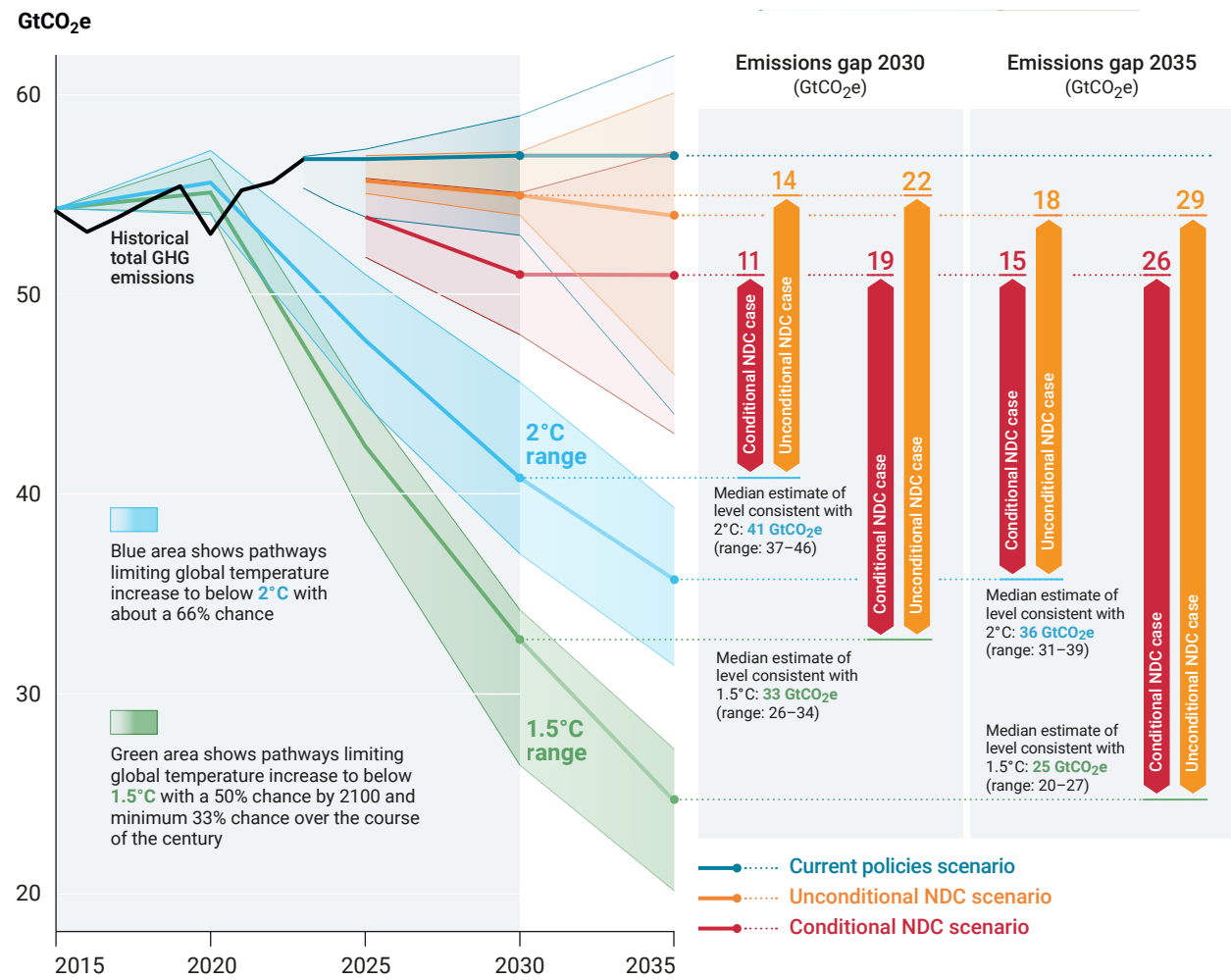


Table ES.2 Global total GHG emissions in 2030, 2035 and 2050, and estimated gaps under different scenarios

Scenario	Projected GHG emissions (GtCO ₂ e)	Estimated emissions gaps (GtCO ₂ e)		
		Median and range	Below 2.0°C	Below 1.8°C
2030				
Current policies	57 (53-59)	16 (12-18)	22 (18-24)	24 (20-26)
Unconditional NDCs	55 (54-57)	14 (13-16)	20 (19-22)	22 (21-24)
Conditional NDCs	51 (48-55)	11 (7-14)	17 (13-20)	19 (15-22)
2035				
Current policies continued	57 (44-62)	21 (9-26)	30 (18-35)	32 (20-37)
Unconditional NDCs continued	54 (46-60)	18 (10-24)	27 (19-33)	29 (21-35)
Conditional NDCs continued	51 (43-57)	15 (8-22)	24 (17-30)	26 (19-33)
Conditional NDCs + all net-zero pledges	43 (38-49)	8 (2-13)	16 (11-22)	19 (13-24)
2050				
Current policies continued	56 (25-68)	36 (4-48)	44 (12-56)	48 (16-60)
Conditional NDCs + all net-zero pledges	19 (6-30)	-1 (-14-10)	7 (-6-18)	11 (-2-22)

6. Time lost since 2020 increases global warming projections and reduces the feasibility of bridging the gap

- ▶ The assessment of the emissions gap in 2030 and 2035 is founded on least-cost pathways consistent with limiting warming to 1.5°C, 1.8°C and 2°C. These assume strong mitigation action starting in 2020, resulting in deep GHG reductions this decade. However, following the COVID-19-induced reduction in emissions, global GHG emissions, including methane, have continued to increase.
- ▶ The lack of action and time lost has implications. It has reduced the remaining carbon budget, which in 2024 is estimated at 900 GtCO₂ for limiting warming to below 2°C (>66 per cent chance) and to 200 GtCO₂ to stay below a 1.5°C limit (>50 per cent chance). If the emissions gap is still bridged by 2030, additional cumulative CO₂ emissions in the order of 20–35 Gt will be emitted during 2020–2030 compared with the Paris-aligned pathways. This would result in warming that is about 0.01 to 0.02°C higher than indicated by the original pathways.
- ▶ Importantly, inaction reduces the chance of bridging the emissions gap in 2030 because of continued lock-in of carbon-intensive infrastructure and less time available to realize the emission reductions required. It further adds risks of temperature overshoot and compounds increasingly severe climate impacts, some of which are irreversible.

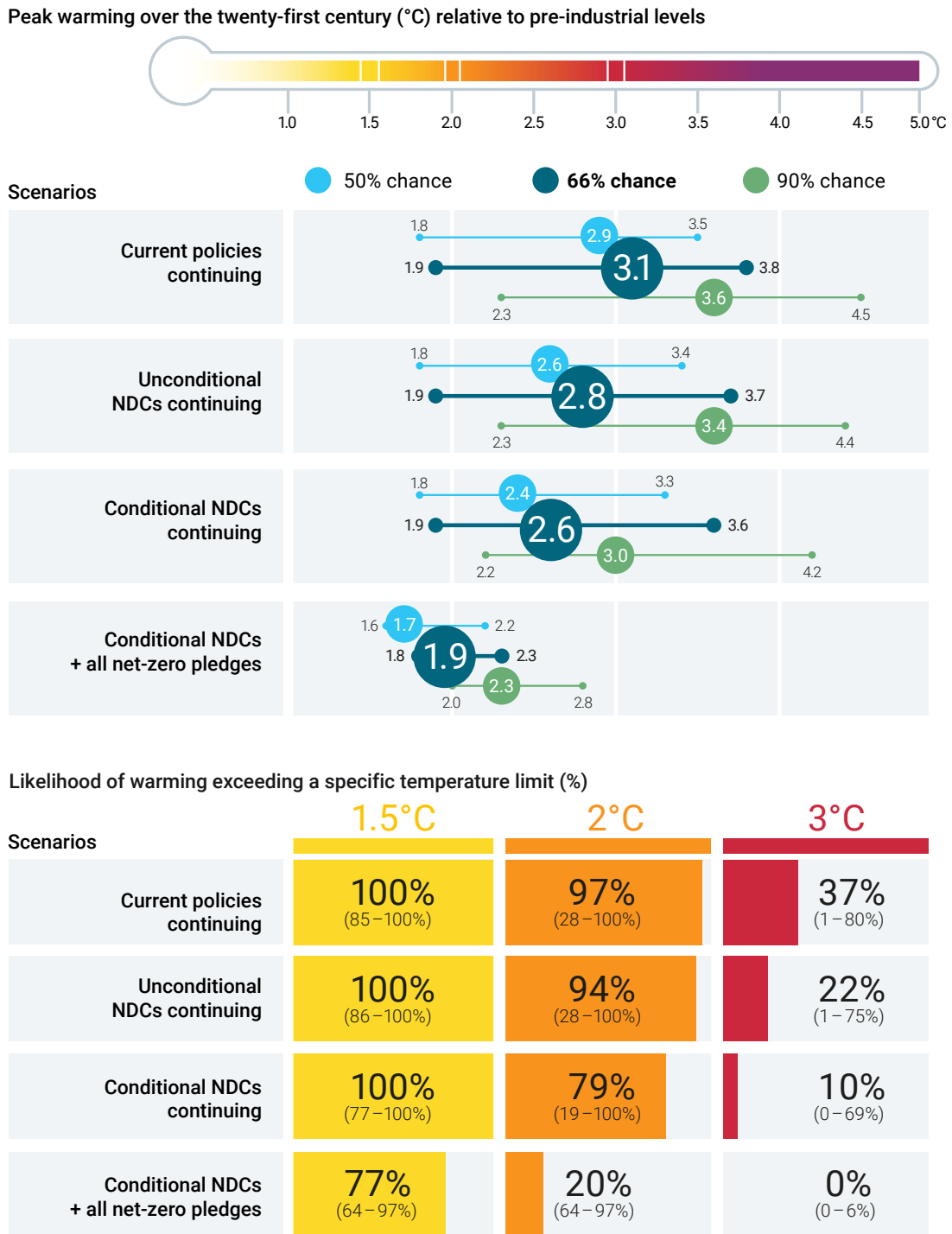
7. Immediate action matters: temperature projections based on the conditional NDC scenario are 0.5°C lower than those based on existing policies

- ▶ A continuation of the mitigation effort implied by current policies is estimated to limit global warming to a maximum of 3.1°C (range: 1.9–3.8) over the course of the century. The full implementation and continuation of the level of mitigation effort implied

by unconditional or conditional NDC scenarios lower these projections to 2.8°C (range: 1.9–3.7) and 2.6°C (range: 1.9–3.6), respectively. All with at least a 66 per cent chance (figure ES.4).

- ▶ Under these three scenarios, central warming projections indicate that the chance of limiting global warming to 1.5°C would be virtually zero (figure ES.4). By mid-century, they imply global warming well above 1.5°C and with up to a 1-in-3 chance that warming already exceeds 2°C by then. As well, warming is expected to increase further after 2100 as CO₂ emissions are not yet projected to reach net-zero levels under these scenarios.
- ▶ The only scenario that gets closer to the temperature goal of the Paris Agreement is the most optimistic scenario, which assumes that all the most stringent pledges currently made by countries – in other words the conditional NDCs and all net-zero pledges, including those made as part of long-term low-emissions development strategies – are fully implemented. This scenario is estimated to limit warming over the course of the century to 1.9°C (range: 1.8–2.3, >66 per cent chance). This is also the only pledge-based scenario in which global warming is stabilized over the course of this century.
- ▶ These projections highlight the crucial impact of immediate action on likely temperature outcomes, and the need for enhanced support to enable countries achieving the conditional elements of their NDCs. Projections based on the implementation and continuation of the conditional NDC scenario lower peak warming by about 0.5°C compared with those based on current policies. Further, fulfilling near-term conditional NDCs enhances the likelihood of achieving net-zero pledges, which further reduces global warming projections by around 0.5°C. These results emphasize the critical importance of not just achieving but overachieving pledged emission reductions for 2030 in tandem with a quantum leap in ambition in the next NDCs.

Figure ES.4 Projections of global warming under the pledge-based scenarios assessed



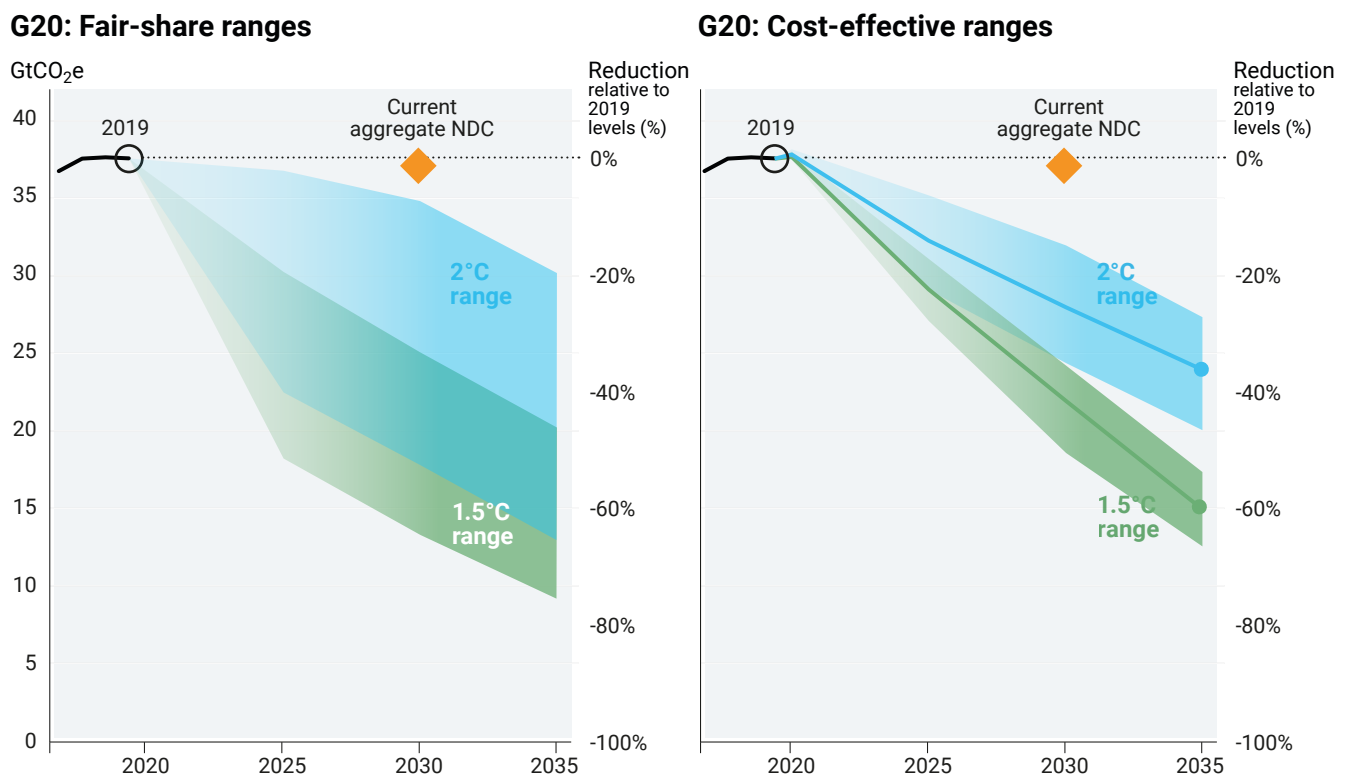
8. The G20 has a key responsibility in closing the emissions gap. It is both cost-effective and fair for the G20 to reduce emissions faster than the global average

- ▶ The Paris Agreement provides flexibility in translating global goals and milestones into national implementation. Global models can inform our

understanding of what is required in terms of national contributions in the next NDCs to get to pathways consistent with the temperature goal of the Paris Agreement. At the same time, national decarbonization scenarios can improve our understanding of feasibility at the individual country level. Both approaches may include considerations of equity and fairness in their development and assessment.

- ▶ Illustrative findings show that the G20 members excluding the African Union must go further and faster: current NDC targets for the G20 collectively are neither aligned with cost-effective nor with fair-share pathways consistent with the temperature goal of the Paris Agreement (figure ES.5).
- ▶ The G20 is a very heterogeneous group of countries, also based on historical, current and per capita emissions. This means that some G20 members will need to cut their emissions faster than others. In addition, stronger international cooperation and support, including through enhanced climate finance, will be essential for ensuring that the opportunities and efforts of meeting global mitigation and development goals can be realized fairly across G20 members and globally.
- ▶ National decarbonization scenarios that achieve national development priorities alongside ambitious mitigation action are emerging for many countries. Several indicate that it is possible – both for G20 members that have peaked emissions and those who are yet to peak – to reduce emissions in 2030 beyond their current NDC targets and to set far higher national ambition for 2035. Such studies can inform interpretations of how countries can reflect the highest possible ambition in their next NDCs, in accordance with article 4 of the Paris Agreement.
- ▶ Different approaches can give very different perspectives on what a fair and ambitious NDC would entail. Given these differences, transparency and clarity from individual countries around how their next NDC reflects the highest possible ambition and considers fairness can enable a better-informed evaluation of the next round of NDCs.

Figure ES.5 Illustrative fair-share and cost-effective mitigation ranges consistent with different temperature limits for the G20 collectively, excluding the African Union and excluding LULUCF



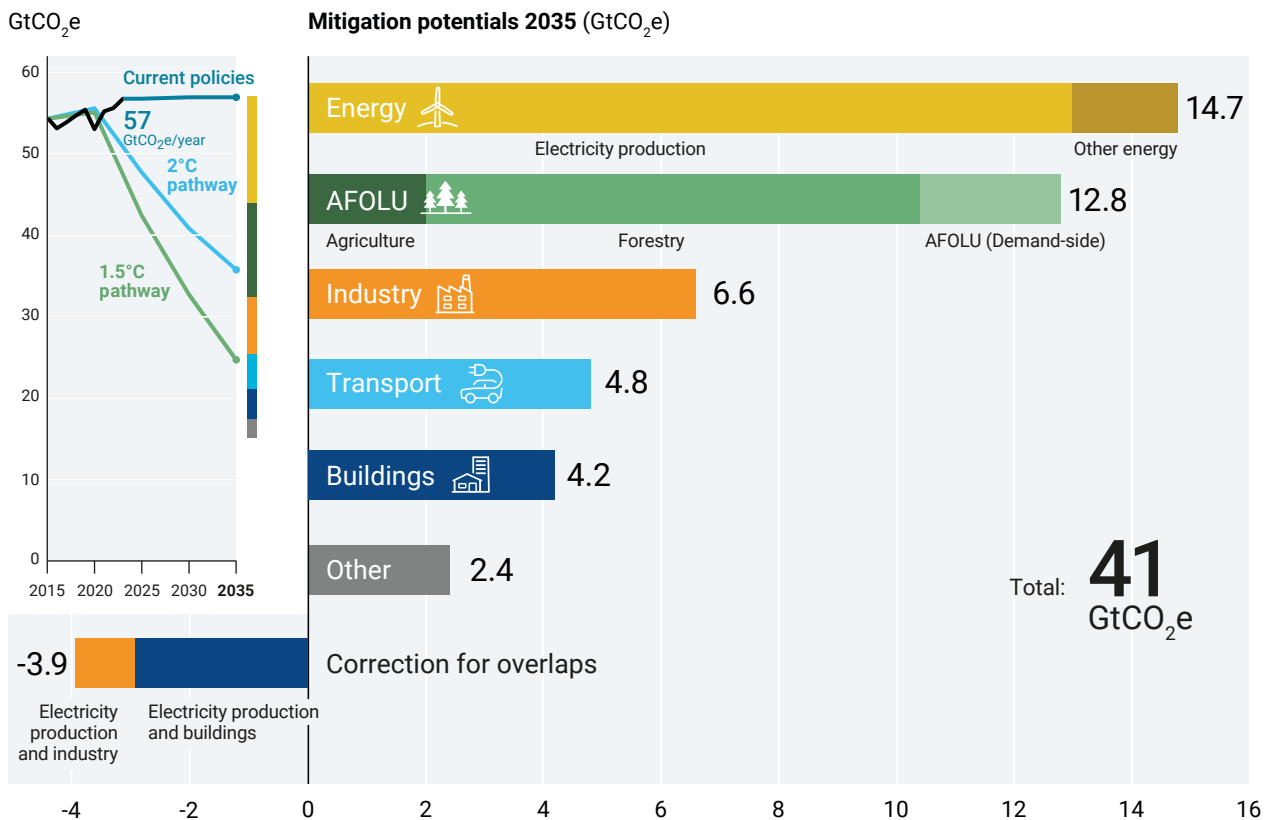
9. Emission reduction potentials for 2030 and 2035 are substantial, but time is short and realizing the potentials requires overcoming persisting challenges and massively boosting policies, support and finance

- ▶ Progress towards detailed sectoral benchmarks identified in the literature to be consistent with
- ▶ An updated assessment of sectoral GHG emission reduction potentials shows that the techno-economic

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- ▶ mitigation potential at costs below US\$200/tCO₂e is sufficient to bridge the emissions gap identified for 2030 and 2035. The potential is assessed at 31 GtCO₂e/year in 2030 (range: 25–35) and 41 GtCO₂e/year in 2035 (range: 36–46) (figure ES.6).
- ▶ Remarkably, increased deployment of just two proven and cost-competitive options – solar photovoltaic and wind energy – makes up 27 per cent of the total emission reduction potential in 2030 and 38 per cent in 2035. In forestry, reduced deforestation, increased reforestation and improved forest management present readily available low-cost options with large emission reduction potentials of about 19 and 20 per cent of the total potential in 2030 and 2035, respectively. Other important and readily available mitigation options include demand-side measures, efficiency measures, and electrification and fuel switching in the buildings, transport and industry sectors.
- ▶ Realizing these mitigation potentials, even partially, requires rapid and unprecedented policy action globally, employing a whole-of-government approach that emphasizes sustainable and climate-resilient development, effectively addresses barriers and catalyses public and private sector action.
- ▶ Mitigation measures that are designed and deployed in response to the needs of multiple stakeholders and that maximize socioeconomic and environmental co-benefits and reduce trade-offs have a much greater chance of being successful and scaled up.
- ▶ Realizing the mitigation potentials will also require a substantial increase in investment. Overall, alignment with 1.5°C scenarios is assessed to require at least a sixfold increase in mitigation investment – accompanied by a shift in investment patterns, focusing on mitigation activities and directing international funding towards emerging market and developing economies outside of China. These regions face pressing development needs, yet investment growth has stagnated since the 2008 global financial crisis.
- ▶ Only a small share of these investments would be incremental, as considerable investments would be needed each year to meet the growing demand for energy and other development needs, especially in emerging market and developing economies. The estimated global incremental investment for a net-zero transition is US\$0.9 trillion to US\$2.1 trillion per year between 2021 and 2050, which is substantial but manageable in the broader context of the close-to-US\$110 trillion global economy and financial markets.

Figure ES.6 Overview of annual mitigation potentials by 2035 by sector up to US\$200/tCO₂e



What are the implications for the next NDCs?

The Paris Agreement, along with subsequent COP decisions, sets the framework, requirements and expectations for the next NDCs, which are to contain targets and measures for 2035 and to be communicated by February 2025. These should reflect the latest science, demonstrate progress from previous NDCs and explain how they reflect the highest possible ambition and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. The outcome of the first global stocktake at COP 28 urges countries to align their NDCs with limiting global warming to 1.5°C and long-term low-emissions development pathways towards just transitions to net zero. It calls for countries to set sector-specific global mitigation efforts, including the tripling of renewable energy capacity by 2030, doubling of the global average annual rate of energy efficiency improvements by 2030, transitioning away from fossil fuels in energy systems, and conserving, protecting and restoring nature and ecosystems – encouraging parties to contribute to these in a nationally determined manner.

In accordance with other recently developed guidelines for the next round of NDCs, this year's assessment suggests that countries should consider the following suggestions as they prepare their next NDCs:

- ▶ Meet the highest standards: including all gases listed in the Kyoto Protocol, covering all sectors, setting specific, quantitative targets in relation to a base year and being explicit about conditional and unconditional elements.
- ▶ Detail how national plans that prioritize national development and progress towards the Sustainable Development Goals, including resilience, adaptation and just transition, are consistent with ambitious efforts to reduce emissions.
- ▶ Be transparent and clear about how the NDC submission reflects both a fair share and the highest possible ambition, given the requirement for all countries to make pledges that reflect their level of development, their historical emissions and their current contribution to global warming via both territorial and consumption emissions.
- ▶ Include detailed implementation plans that pursue options for accelerating mitigation action now and significantly more ambitious mitigation targets for 2035. These should consider sectoral benchmarks and all mitigation options and potentials relevant in national contexts. They should also explain how the plans contribute to tripling renewable capacity deployment and doubling annual energy efficiency rates by 2030 and to transitioning away from fossil fuels. And they should describe mechanisms for review and accountability.
- ▶ Use the NDCs to be explicit about conditional and unconditional elements, with emerging market and developing economies providing details on the means of implementation they need, including institutional and policy change, as well as international support and finance required to achieve ambitious NDC targets for 2035.

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