Emissions Gap Report 2025: Chapter 4 – The emissions gap in 2030 and 2035

[8-9 pages total, 5600-6300 words]

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4.1 Introduction

The assessment of the emissions gap — the difference between the estimated global greenhouse gas (GHG) emissions that would arise from a full implementation of the most recent country pledges, and emissions under least-cost pathways in line with limiting global warming to specific temperature levels, is updated in this chapter. Over the next decade, pledges refer to the Nationally Determined Contributions (NDCs) submitted by countries under the Paris Agreement. In the longer term, pledges also include targets that are part of Long-Term Low-Emission Development Strategies (LT-LEDS) submitted under the Paris Agreement or net-zero targets announced in other forums. The implementation gap—the discrepancy between the pledged and actual GHG emission under current policies—is also examined in this chapter.

In this context, the key questions answered by this chapter are,

- What are the implications of the new NDC submissions (cut-off date: TBC) for:
    - The emissions gap in 2035?
    - Global warming projections?
    - Relationship between current and new NDCs and emissions projections for 2030/35?
- What are the implications for the Paris Agreement Long-Term Temperature Goal of limiting global warming to well below 2°C while pursuing to limit it to 1.5°C? What would this require and what are the implications of delayed action?

4.2 Scenarios for assessing the 2030 and 2035 emissions gap

The emissions gap assessment is based on five categories of scenarios: a current policies reference scenario, NDC scenarios, the strongest pledge scenario, and least-cost mitigation scenarios aligned with specific temperature targets or reflecting the strong near-term emissions reductions (Table 4.1). These form the foundation for estimating the emissions gap and the resulting global temperature outcomes discussed in Sections 4.3 and 4.4, respectively.

Table 4.1 Summary of scenarios for gap assessment and global warming projections

Category	Scenario cases	Cut-off year	Scenario description
Reference scenario	Current policies	2024	This scenario projects GHG emissions until 2035 of climate mitigation policies adopted and implemented as of November 2024.
NDC scenarios	Unconditional NDCs	2024	This scenario projects GHG emissions of a full implementation of the most recent NDCs (including new NDC submissions) that do not depend on explicit additional support (cut-off date: July 2025). For 2035, new NDC submissions are considered (where available). Beyond 2035, a continuation of effort is assumed with similar ambition. For the countries without a new NDC the continuation already starts by 2030.[1]
	Conditional NDCs	2024	Additional 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: July 2025). When extended beyond 2030 it follows the same

[1] This extension follows the same approach as used in previous UNEP Emissions Gap Reports, as described in the peer-reviewed literature in Rogelj et al. (2023) and documented in detail in Appendix C.1 of the 2023 UNEP Emissions Gap Report.

			approach as the unconditional scenario.
Mid-century scenario extensions	Current policies continuing	2024	This scenario projects GHG emissions to 2030 or 2035 per the current policies scenario and assumes mitigation policies continue similar reduction efforts when extended beyond.[1]
	Conditional NDCs plus all net-zero pledges	2024	This is the most optimistic scenario included in this analysis. It assumes the conditional NDC scenario until 2035 and subsequently the achievement of all net-zero or other LT-LEDS pledges.
Mitigation scenarios consistent with limiting global warming to specific levels	Below 2°C	N/A	A least-cost pathway starting from 2020 and consistent with keeping global warming below 2°C throughout the twenty-first century with at least a 66 per cent chance.
	Below 1.8°C	N/A	Least-cost pathway starting from 2020 and consistent with holding global warming below 1.8°C throughout the twenty-first century with at least 66 per cent chance.
	1.5°C (with no or limited overshoot)[2]	N/A	Least-cost pathway starting from 2020 and ensuring that global warming is kept below 1.5°C with at least a 33 per cent chance throughout the entire century and is brought back below 1.5°C with at least a 50 per cent chance by 2100.

[2] 1.5°C scenarios have a lower probability of keeping warming below 1.5°C throughout the century than the 66% probability of *Below 1.8°C* or *Below 2°C* scenarios, which is why they are qualified as having "no or limited overshoot". The "no or limited overshoot" characteristic is captured by ensuring that the probability of warming being limited to 1.5°C throughout the entire 21st century is never less than 33%, identical to the C1a category definition used by the IPCC AR6 WG III report. Aligned with the definitions used in the IPCC 1.5°C Special Report and IPCC AR6, the probability of returning warming to 1.5°C is set to 50%, noting that because of the limit to peak warming, a strengthening of this to higher probabilities (such as 66% in line with the definitions of the other mitigation scenarios) would have limited effect on the emissions milestones in 2030, 2035, and through to mid-century. It would affect assumed emissions and removals levels in the second half of the century, where a higher probability of returning warming to 1.5°C with at least 66% probability would imply a larger deployment of net negative emissions through carbon dioxide removal.

			This pathway reaches net-zero GHG emissions in the second half of the century.
Mitigation scenario reflecting strong near-term emissions reductions	Strong near-term reduction scenario	2023	Pathway assuming emissions reductions start in 2025. Before 2025, the scenario follows the current policies scenario.[3] The median peak warming in this scenario is higher than 1.5°C (see Section 4.2.4).

4.2.1 Current policies scenarios

The data for this scenario are based on updated GHG emissions projections by the same five modelling studies that were assessed in the 2024 UNEP Emissions Gap Report, i.e. Climate Action Tracker (2024) , PBL (den Elzen et al., 2023; Nascimento et al., 2024), JRC- GECO (Keramidas et al., 2025), ELEVATE (Hooijschuur et al., 2025)[4] and the IEA World Energy Outlook (IEA, 2023, 2024). These studies provide updated estimates that use a policy cut-off date of November 2024 and apply the most recent AR6 100-year GWP values. The resulting estimate of global GHG emissions in 2030 and 2035 under current policies for those five studies is 56 $GtCO_2e$ (median with inter-model range of 50–62) and 53 $GtCO_2e$ (median, range: 50-63), respectively (Figure 4.3). This median 2030 estimate is about 0.5 $GtCO_2e$ and 3 $GtCO_2e$ lower than the median estimates of the 2024 UNEP Emissions Gap Report, respectively, mainly due to the impact of updated recent emissions trends and policies and methodological updates of the contributing studies. Extending beyond 2035, the Current Policies scenario assumes a continuation of efforts at a level of ambition consistent with the reductions by 2035 (see footnote 1).

4.2.2 Updated NDC and Current pledges scenarios

Note to reviewers: All numbers are placeholders based on the NDCs submitted by the cutoff date of July 2025, and will change for final report.

The updated NDC scenarios encompass the most recent versions of the unconditional and conditional NDCs submitted by the UNFCCC parties and reflect the updates available as of July 2025. These updates are based on findings from four modeling exercises conducted by Climate Action Tracker (2024), PBL (den Elzen et al., 2023; Nascimento et al., 2024), JRC-GECO (Keramidas et al., 2025) and Climate Resource (Burdon et al., 2023; Meinshausen et al., 2022). In addition, scenario estimates of a recent study by the World Resource Institute (WRI, 2025) were also added, but this addition has only a limited impact on the

[3] Scenarios provided by the ELEVATE project (Hooijschuur et al., 2025). Specifically, scenarios keep cumulative CO_2 emissions from 2020 onwards to no more than 650 $GtCO_2$ from 2020 to the time of net zero emissions and to 400 $GtCO_2$ from 2020 to 2100, in line with the remaining carbon budget estimates for 1.5°C (67%, 400 $GtCO_2$) and 1.5°C (33%, 650 $GtCO_2$).

[4] The REMIND model results were missing in the ELEVATE database, and included from the Network for Greening the Financial System (NGFS) study (Richters et al., 2024) instead.

median estimates. The unconditional and conditional NDC scenarios estimates result in a median of global GHG emissions in 2030 of 55 $GtCO_2e$ (with a range of 53 to 57) and 51 $GtCO_2e$ (and a range of 50 to 54), respectively, which are about the same as the median estimates of the 2024 UNEP Emissions Gap Report. Extending beyond 2030, the NDC scenarios assume full implementation of the new NDC submissions (if available). For 2035, new NDC submissions are considered (where available). Beyond 2035, a continuation of effort is assumed with similar ambition. For the countries without a new NDC the continuation already starts by 2030. The additional reductions for the countries with new NDC submissions (submitted until the end of February 2025) result in about a 1.4 $GtCO_2e$ (inter-model range of 1.2 to 1.6) reduction in 2035 compared to the 2030 emissions based on NDCs that were submitted by 1 September 2024 (see Chapter 3), noting that by July 2025 only a small share of global emissions was covered by new NDCs. Ultimately, unconditional NDC scenarios estimate median global GHG emissions in 2035 of 52 $GtCO_2e$ (with a range of 50 to 56) and of 50 $GtCO_2e$ (with a range of 45 to 52) when considering all conditional elements of NDCs.

Box 4.1 - Global methane mitigation and the progress of the Global Methane Pledge

The Global Methane Pledge (GMP) was launched in November 2021 at COP26 as the first global high level political commitment to reduce anthropogenic methane (CH4) emissions, and with the aim to jointly reduce these globally by 30 percent between 2020 and 2030. As of April 2025, 159 countries and one region (the European Union) have signed the GMP, covering 57 percent of current global emissions. Some of the countries have submitted Methane Action Plans (MAPs) to the CCAC, while many more have mentioned measures to control CH4 emissions in their Nationally Determined Contributions (NDCs) submitted to the UNFCCC. In an assessment of the progress of the GMP at half-term using IIASA's GAINS model (UNEP/CCAC, 2025; Höglund-Isaksson et al., 2020; Gomez-Sanabria et al., 2022), global anthropogenic CH4 emissions are estimated to have continued to increase by an estimated two percent since 2020, extending to five percent by 2030 and 12 percent by 2050 without further implementation of CH4 control measures than prescribed by current legislation (CLE scenario in Figure 1). This scenario assumes energy sector and population drivers consistent with an SSP2 middle-of-the-road scenario (IIASA, 2025; Riahi et al., 2017) and agriculture sector drivers consistent with the FAO Business-as-usual scenario (FAO, 2018). Depending on how generously we interpret the mentioned plans for methane mitigation, which are often rather vaguely formulated in the MAPs and NDCs, the plans translate into global emissions being between one and eight percent lower (NDC low and NDC high ambition scenarios in Figure 1) in 2030 than in 2020. This is an improvement on the 2020 level, however not enough to meet the GMP target for 2030. With existing control technology there is room for a higher ambition level. If implemented globally ("MTFR" scenario), CH4 emissions could drop by 33 percent between 2020 and 2030 and by 37% by 2050. Combining a maximum uptake of existing CH4 control technologies with simultaneous deep decarbonization of the energy system such as described by SSP1 energy system drivers (IIASA, 2025), a reduction by 44 percent in 2050 is possible. Adding the effect of demand-side measures, e.g., the world switching to healthier and more sustainable diets with less red meat and more plant-based protein (Kanter et al., 2020; Willett et al., 2019) and halving the generation of food waste (UNEP, 2021), global anthropogenic CH4 emissions could be more than halved between 2020 and 2050.

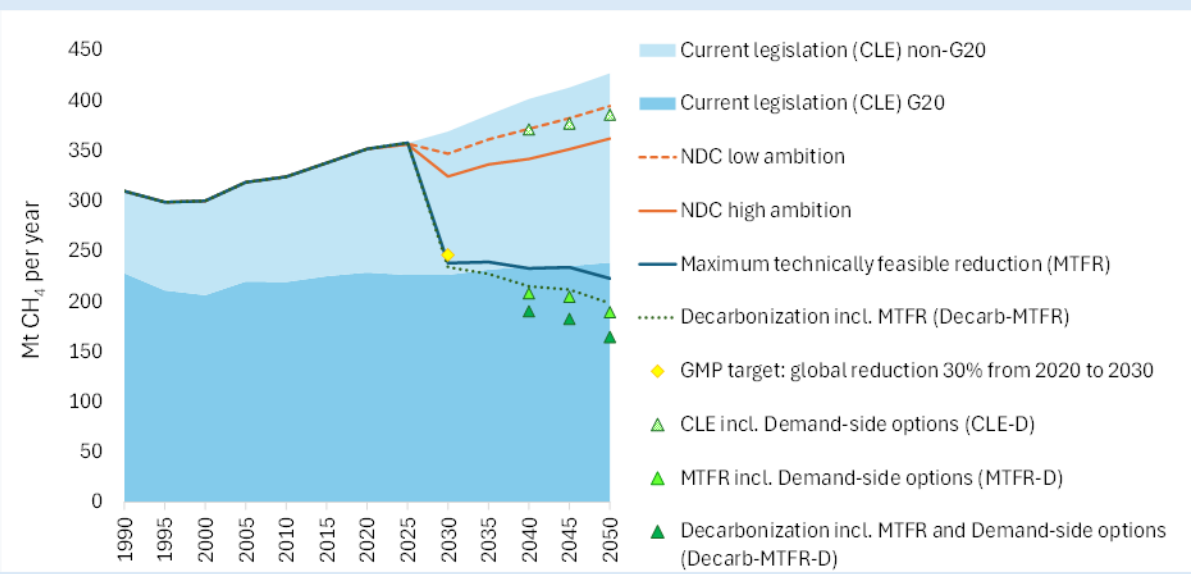


Figure 1: Global anthropogenic CH_4 emissions in a Current Legislation scenario (CLE) and with uptake of CH_4 control measures as outlined in the Methane Action Plans and the Nationally Determined Contributions submitted by countries to the CCAC and the UNFCCC as of April 2025 (NDC low ambition and NDC high ambition), with Maximum technically feasible reduction (MTFR), and MTFR combined with deep decarbonization of the energy systems (Decarb-MTFR). The Global Methane Pledge target is indicated by a diamond, while impacts on emissions from implementation of Demand-side options are indicated by triangles. Current legislation emissions are illustrated for two groups of countries: G20 countries (includes formal G20 countries plus all of European Union (27 United Nations Member States), Norway, Switzerland, Iceland, and New Zealand), and non-G2O countries.

Box 4.2 - Progress in climate policy **[Note to reviewers: this Box might be moved to Chapter 5]**

Progress has been made since Paris, as seen in the GHG emissions projections of various scenarios of the UNEP Emissions Reports since 2015 (Figure 4.2). Progress since the Paris Agreement is particularly notable in current policy scenarios. Globally, at the time of Paris, GHG emissions under current policies were projected to rise to 64 $GtCO_2e$ by 2030, about a quarter above 2015 levels. Now, however, global GHG emissions are expected to reach 57 $GtCO_2e$, representing a reduction of 7 $GtCO_2e$ and bringing them close to 2015 levels.

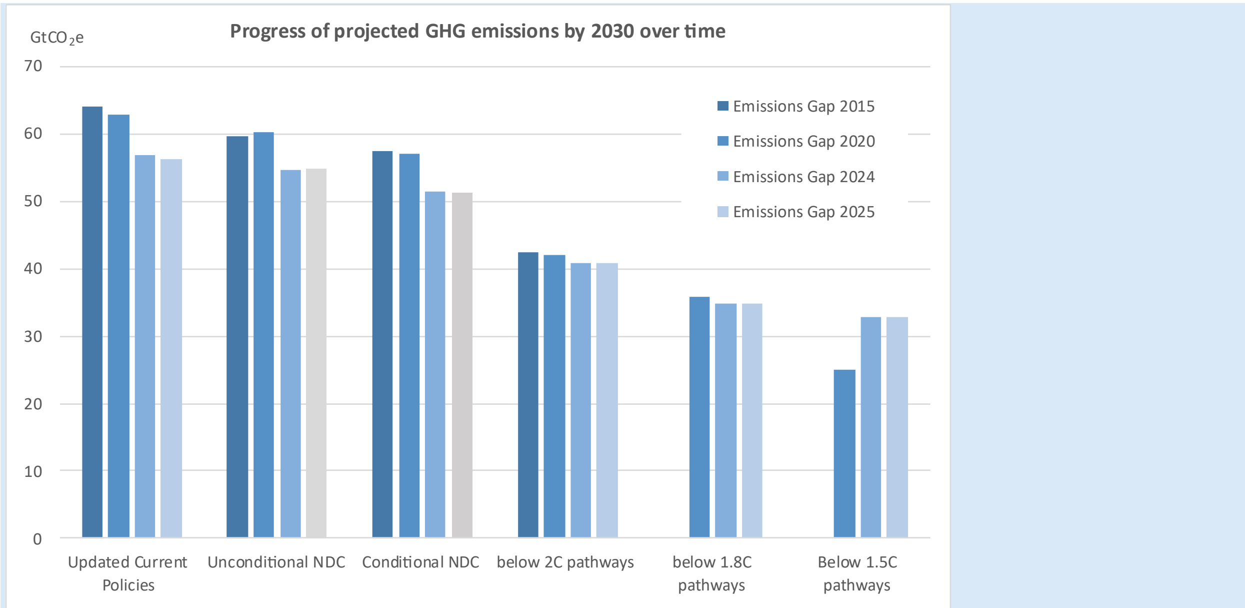
This decline is driven by (i) strengthened climate policies, which have led to declining emissions in industrialized countries over the past two decades and a leveling off of emissions growth in China; (ii) the rapid expansion of solar and wind energy, the fastest-growing energy sources globally; and (iii) macroeconomic developments, including lower economic growth projections.

NDC reduction targets have been strengthened over the years, particularly before and after the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) in Glasgow (2021). Global emissions projections for both NDC scenarios show similar reductions to those in current policy scenarios, with projections even falling below 2015 levels.

Projections for unconditional NDCs have decreased by 5 $GtCO_2e$, while those for conditional NDCs have dropped by 6 $GtCO_2e$. As a result, the current implementation gap for 2030 stands at 2 $GtCO_2e$ for unconditional NDCs and 5 $GtCO_2e$ for conditional NDCs—an improvement compared to 2015, when the gaps were 5 $GtCO_2e$ and 7 $GtCO_2e$, respectively.

Despite this progress, the emissions gap remains substantial. The two-degree emissions gap has narrowed by 3 to 4 $GtCO_2e$ since 2015. Additionally, our scientific understanding of the 1.5°C scenario has evolved over time. **[If space allows, a similar discussion can be added on progress in temperature projections, but the numbers are less comparable over time.]**

Figure 4.1 Greenhouse gas emission projections from scenarios of the UNEP Emissions Gap report 2015, 2020 , 2024 and 2025. **Note to reviewers: Projections for the 2020 and 2024 reports have been corrected for method updates since the UNEP Emissions Gap report 2022 (see Table 4.2). The NDC scenario will be updated.**



4.2.3 Scenarios keeping warming below specified temperature limits

The gap analysis uses a set of least-cost mitigation pathways that lead to different peak global warming outcomes relative to pre-industrial levels. They are categorised based on warming levels that can inform progress towards the Paris Agreement long-term temperature goal of holding warming well below 2°C while pursuing to limit it to 1.5°C. The underlying emissions trajectories are drawn from the IPCC AR6 WG III database (Kikstra et al., 2022; Riahi et al., 2022) and grouped according to characteristics as described in Table 4.1. Their corresponding temperature projections are based on the IPCC AR6 Working Group I physical science assessment (Kikstra et al., 2022; Nicholls et al., 2021) and consistent with recent updates to the remaining carbon budget (Forster et al., 2025). Below 2°C and Below 1.8°C scenarios keep warming below their respective limits while allowing for a 1-in-3 chance that warming exceeds them throughout the century. In line with definitions applied by the IPCC 1.5°C Special Report (Rogelj et al., 2018) and the IPCC AR6 WG III assessment (Riahi et al., 2022), 1.5°C scenarios allow for a larger chance that warming exceeds 1.5°C (a 2-in-3 chance) over the course of the century. By 2100, these odds are reduced again, as these pathways have a 1-in-2 chance of returning warming below 1.5°C in 2100 by achieving net-zero GHG emissions in the second half of the century, which implies that global net negative CO_2 emissions are achieved prior to that (Rogelj et al., 2021).

4.2.4 Strong near-term reduction scenario

The temperature pathways in the preceding section are based on the IPCC AR6 scenario database (Kikstra et al., 2022; Riahi et al., 2022) and assume ambitious climate policy to start from 2020 onwards. However, because of a lack of progress in global emissions reductions in the past five years, the full extent of emissions reductions between 2020 and 2030 in the 1.5°C scenarios presented above cannot be achieved anymore. Continued lock-in of carbon-intensive infrastructure and less time available for making the reductions are the main reasons why delay reduces the likelihood that the gap will be closed. To provide a benchmark that accounts more closely for the present situation, this year's report also includes a set of scenarios that start emissions reductions from a more recent year.

This strong near-term reduction scenario assumes current policies until 2025 and starts deep emissions reductions thereafter with the aim to limit cumulative CO_2 emissions from 2020 until net zero to 650 $GtCO_2$ and from 2020 to 2100 to 400 $GtCO_2$ (Hooijschuur et al., 2025). In line with the IPCC AR6 WG1 assessment of the physical science basis, these amounts of cumulative emissions are consistent with a 33% and 67%, respectively, of limiting warming to 1.5°C (see Figure 4.1). Following these strong near-term emissions reductions, 2030 and 2035 emissions benchmarks can be derived (Table 4.2). Central estimates of global warming under this strong near-term reduction scenario will, by design, be higher than 1.5°C and therefore imply a certain minimum amount of net negative CO_2 emissions that are required to pursue limiting warming to 1.5°C in the long term. These amounts are also estimated (Table 4.2, Figure 4.1, and discussion in Section 4.4).

Figure 4.2 GHG emissions of strong near-term emission reduction scenarios and net carbon dioxide removal requirements for pursuing to limit warming to 1.5°C. Carbon dioxide removal requirements are shown to scale.

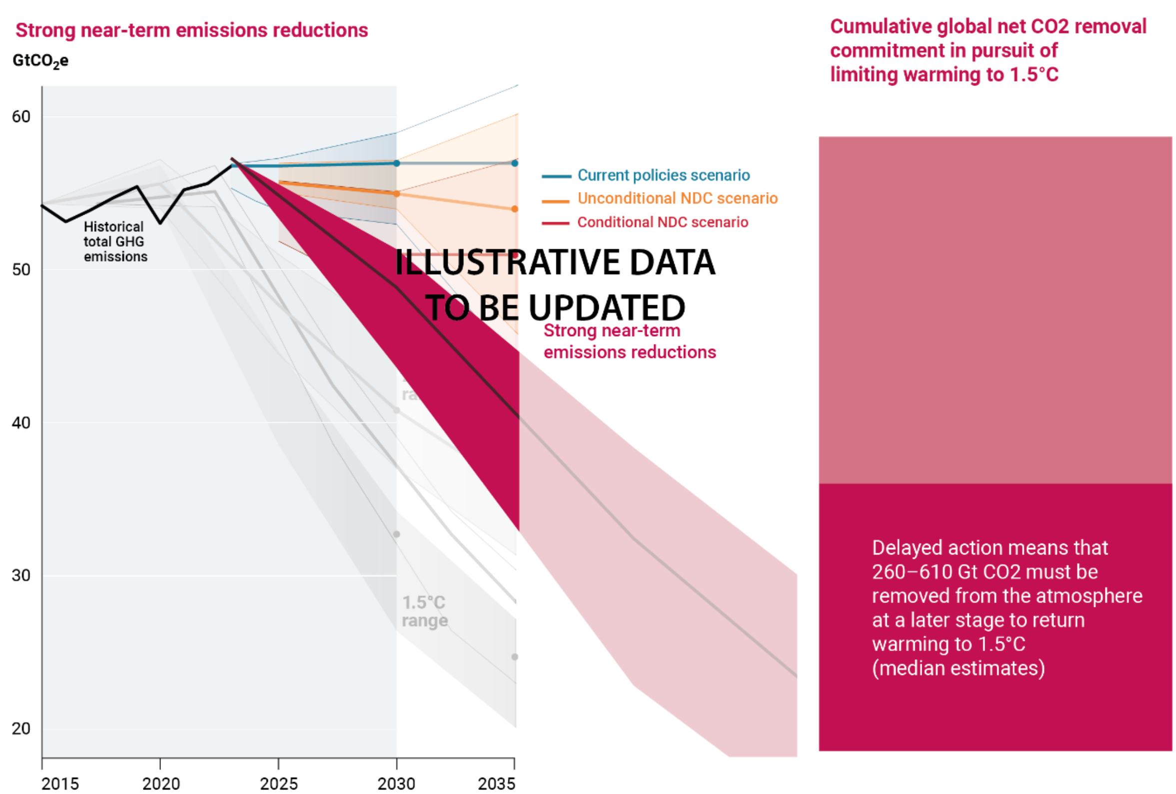


Table 4.2 Global total GHG emissions in 2030, 2035 and 2050 and global warming characteristics of different scenarios consistent with limiting global warming to specific temperature limits

Scenario	# scenarios	Global total GHG emissions [$GtCO_2e$]			Estimated temperature outcome			
		In 2030	In 2035	In 2050	50% chance	66% chance	90% chance	Nearest IPCC scenario class
Below 2.0°C (66% chance)*	195	41 (37-46)	36 (31-39)	20 (16-24)	Peak: 1.7-1.8°C In 2100: 1.4-1.7°C	Peak: 1.8-1.9°C In 2100: 1.6-1.9°C	Peak: 2.2-2.4°C In 2100: 2.0-2.4°C	C3a
Below 1.8°C (66% chance)*	139	35 (28-41)	27 (21-31)	12 (8-16)	Peak: 1.5-1.7°C In 2100: 1.3-1.6°C	Peak: 1.6-1.8°C In 2100: 1.4-1.7°C	Peak: 1.9-2.2°C In 2100: 1.8-2.2°C	N/A
Around 1.5°C (50% in 2100 with no or limited overshoot)*	50	33 (26-34)	25 (20-27)	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
Strong near-term emission reductions**	6 (4)	44 (32-51)	32 (23-40)	10 (9-29)	Peak: 1.6-1.8°C In 2100: 1.2-1-6°C	Peak: 1.7-1.9°C In 2100: 1.3-1.7°C	Peak: 2.1-2.3°C In 2100: 1.7-2.2°C	N/A

* Values represent the median and 20th to 80th percentile range across scenarios. Probabilities refer to peak warming at any time during the 21st century for the below-1.8°C and below-2.0°C scenarios. When achieving net negative CO_2 emissions in the second half of the century, global warming can be further reduced from these peak warming characteristics, as illustrated by the ‘Estimated temperature outcome’ columns. For the around-1.5°C scenarios, the probability applies to the global warming in the year 2100, while the “no or limited overshoot” characteristic is captured by ensuring projections do not exceed 1.5°C with more than 67% probability over the course of the 21st century or, in other words, that the lowest probability of warming being limited to 1.5°C throughout the entire 21st century is never less than 33%. This definition is identical to the C1a category definition used by the IPCC AR6 WG III report. The UNEP Emissions Gap Report analysis uses scenarios that assume immediate action from 2020 onwards.

** Ranges show the minimum maximum values across the number of scenarios available. Only 4 scenarios provided temperature projections to 2100.

Note: GHG emissions in this table have been aggregated with 100-year GWP values of the IPCC AR6.

4.3 The emissions gaps in 2030, 2035 and 2050

4.3.1 The 2030 and 2035 emissions gaps

Note to reviewers: All numbers in this section are placeholders based on the NDCs submitted by the cutoff date of July 2025, and will change for final report.

The emissions gap illustrates the disparity between countries’ mitigation pledges and the emission levels that scientific evidence indicates are necessary. It 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 those under least-cost pathways consistent with the Paris Agreement’s long-term temperature goal—limiting global warming to well below 2°C while pursuing efforts to limit it to 1.5°C above pre-industrial levels.

The emissions gap in 2030 for the least-costs pathways based on the IPCC AR6 scenario database remain almost unchanged compared with last year’s assessment. Full implementation of unconditional NDCs is estimated to result in a gap with below 2°C pathways of about 14 $GtCO_2e$ annually (range: 12–16 $GtCO_2e$), and 22 $GtCO_2e$ (range: 20–24 $GtCO_2e$) with 1.5°C pathways. If, in addition, conditional NDCs are fully implemented, these gaps are reduced by approximately 3-4 $GtCO_2e$.

As the 2030 gap between NDCs and cost-effective 1.5°C pathways can’t be closed because of delayed emissions reductions until 2025, we estimate a new gap relative to a ”strong near-term reduction” scenario, with characteristics described in Table 4.2. Full implementation of unconditional NDCs is estimated to result in a gap with below ”strong near-term reduction” pathway of about 11 $GtCO_2e$ annually (range: 9–13 $GtCO_2e$).

The emissions gap in 2035 for the least-costs pathways based on the IPCC AR6 scenario database increases further. For the unconditional NDCs continued it results to median estimates for the 2035 gap of 16 – 27 $GtCO_2e$ for 2°C and 1.5°C pathways, and 20 $GtCO_2e$ for the "strong near-term reduction" pathway.

4.3.2 The 2050 emissions gaps

Note to reviewers: All numbers in this section are placeholders based on the NDCs submitted by the cutoff date of July 2025, and will change for final report.

By mid-century, the results indicate an even larger emissions gap than those found for 2030 and 2035. In the most conservative case of current policies continued, the emissions gap grows to 36 – 48 $GtCO_2e$ in 2050, relative to least-cost pathways that limit warming to 2°C and 1.5°C, respectively.

The most optimistic case of this report, where all conditional NDCs and long-term net-zero targets are achieved, provides an alternative extreme. In this case, both the gap and surrounding uncertainties shrink to -1, 7 and 11 $GtCO_2e$ compared with least-cost pathways limiting warming to 2°C, 1.8°C and 1.5°C, respectively (see table 4.3). However, this most optimistic case should be interpreted cautiously because most countries do not have NDCs, implementation plans or finance that are aligned with achieving their long-term net-zero targets. This highlights both the challenge of steering economies from past trends towards sustainable, low-carbon futures and the opportunity and the necessity of improved, strengthened and ambitious new NDCs for 2035 as they are the near-term steps that will determine the likelihood and credibility of long-term pledges being implemented and achieved.

Figure 4.3 GHG emissions under different scenarios and the emissions gap in 2030 and 2035 [TO BE UPDATED]

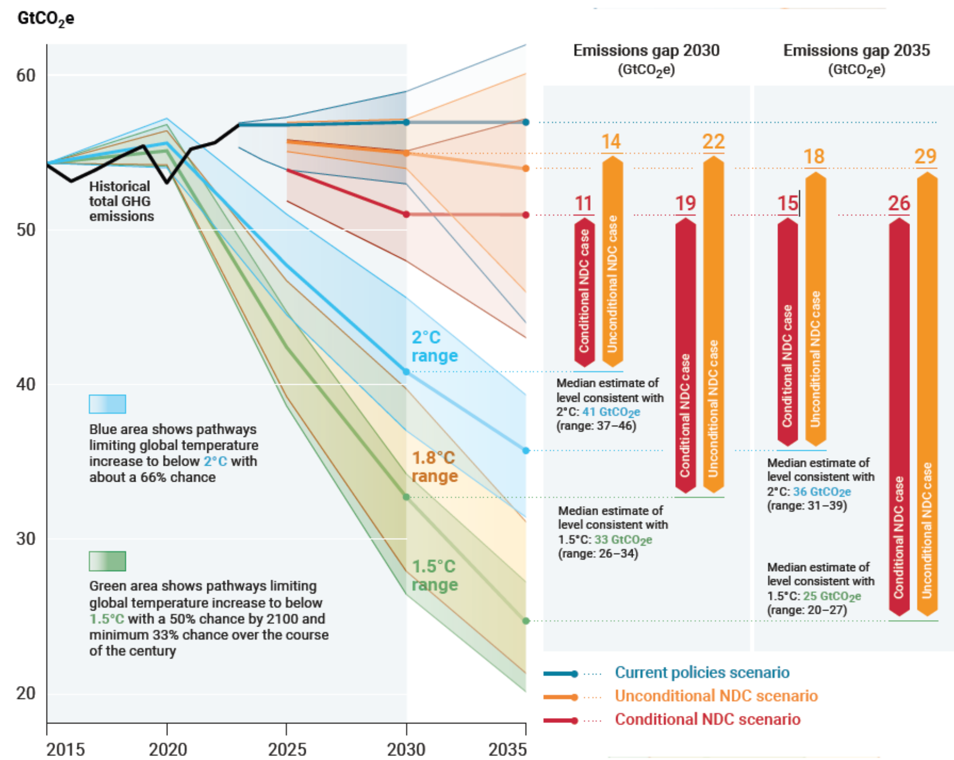


Table 4.3 Global total GHG emissions in 2030, 2035 and 2050 and estimation of associated emissions gaps under different scenarios.

Note to reviewers: preliminary estimates, all based on the NDCs submitted by the cutoff date of July 2025, and numbers will change for final report.

	Projected GHG emissions ($GtCO_2e$)	Estimated emissions Gaps ($GtCO_2e$)			
Scenario	Median and range	Strong near-term reductions	Below 2.0°C	Below 1.8°C	Around 1.5°C
2030					
Current policies	56 (50–62)	12 (6–18)	15 (9–21)	21 (15–27)	23 (17–29)
Unconditional NDCs	55 (53–57)	11 (9–13)	14 (12–16)	20 (18–22)	22 (20–24)
Conditional NDCs	51 (51–54)	8 (7–10)	10 (10–13)	16 (16–19)	18 (18–21)
2035					
Current policies continued	53 (50–63)	21 (18–31)	17 (14–27)	26 (23–36)	28 (26–38)
Unconditional NDCs continued	52 (50–56)	20 (18–24)	16 (14–20)	25 (23–29)	27 (25–31)
Conditional NDCs continued	50 (45–52)	18 (13–20)	14 (9–17)	23 (18–25)	25 (20–28)
Conditional NDC + all LT-LEDS	43 (38–49)	11 (7–17)	8 (2–13)	16 (11–22)	19 (13–24)
2050					
Current policies continued	56 [25–68]	46 (14–58)	36 (4–48)	44 (12–56)	48 (16–60)
Conditional NDC + all LT-LEDS	19 [6–30]	9 (-5–20)	-1 (-14–10)	7 (-6–18)	11 (-2–22)

Notes:

LT-LEDS stand for Long-Term Low Emission Development Strategies and typically refers to targets that set net-zero targets by mid-century or thereafter.

The greenhouse gas emissions ranges for 2035 and 2050 show the minimum-maximum range across different projection-model assumptions and including 2030 current policy/NDC assessment uncertainty (see 2023 UNEP Emissions Gap Report, Chapter 4 Appendix C). That means that the uncertainty in knowing precisely which emissions current policies or NDCs will result in for 2030 and the ambiguity in how this can be extended into the future is captured by this range. The gap numbers and ranges are calculated based on the original numbers (without rounding), and these may differ from the rounded numbers in the table. Numbers are rounded to full $GtCO_2e$. The gap numbers and ranges are calculated as the difference between the median and minimum and maximum estimates for GHG emissions of the current polies and NDC scenarios and the median estimate for GHG emissions of the least-costs scenarios in line with specific temperature limits. GHG emissions have been aggregated with 100-year GWP values of the IPCC AR6

4.4 Temperature and other implications of the emissions gap

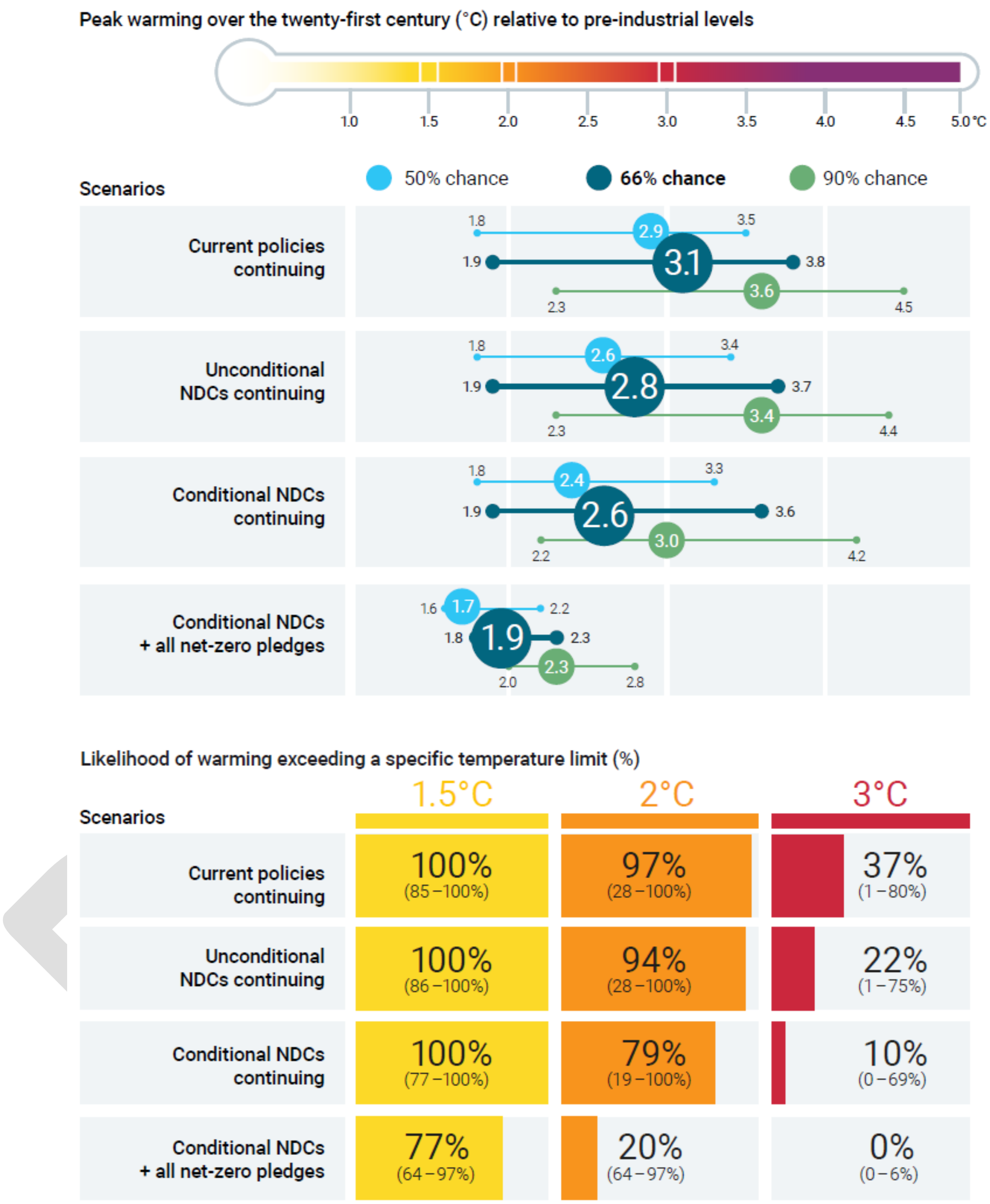
4.4.1 Global warming projections of various scenarios

As in previous years, temperature implications of the emissions gap are estimated by projecting emissions over the 21st century and assessing their global warming implications with a reduced-complexity climate model FaIR that is calibrated to the IPCC AR6 assessment (Kikstra et al., 2022; Nicholls et al., 2021; Smith, 2023). Projections until the end of the century are inherently uncertain and subject to scenario assumptions, such as the level at which climate action continues or how technology costs develop. These uncertainties are reflected in the large ranges around the central warming projections indicated below.

Note to reviewers: Temperature projection data will be updated for the SOD, as the 2030 and 2035 assessment of current policies and NDCs is consolidated. Scenarios for which temperature implications will be assessed are:

i. **Extension of Current Policy until 2035**
ii. **Extension of NDCs in 2035 in absence of LTS thereafter**
iii. **Scenarios with conditional NDCs and all LTS thereafter.]**

Figure 4.4 Global warming implications of different scenarios
[TO BE RETAINED AS VISUAL WITH UPDATED DATA]



4.4.2 Insufficient action leads to overshoot

Inadequate climate action over the past decades means that global warming is approaching 1.5°C (Forster et al., 2025; WMO, 2025). The current strong near-term reduction scenario still implies a high likelihood that 1.5°C will be exceeded over the course of this century and leads to a central global warming estimate that is about 0.2°C higher than 1.5°C (Table 4.2, range: 1.6–1.8°C), which translates in holding warming to 1.7 – 1.9°C with 66% chance over the course of the century and returning it to 1.3 – 1.7°C with a 66% chance by 2100. This peak is reached around the 2050s, and GHG emissions in the second half of the century will determine whether global warming will stabilize or gradually reverse after this peak. The broader question arises what this situation means for the Paris Agreement's goal to pursue efforts to limit warming to 1.5°C and mitigation measures in the short and long term.

The Paris Agreement sets neither a target nor an expiration date for its long-term temperature goal, which means that also when global warming reaches or exceeds 1.5°C relative to preindustrial levels, the Paris Agreement's aim to pursue limiting warming to 1.5°C remains. Exceedance therefore does not render the goal obsolete; instead, it necessitates enhanced mitigation to limit overshoot magnitude and duration (Rogelj and Rajamani; Schleussner et al., 2024). The temperature goal continues to shape national mitigation pathways and legal standards of due diligence to limit magnitude and extent of temperature overshoot (Rogelj and Rajamani, 2025).

What are some of the mitigation consequences of a potential 1.5°C overshoot in the context of the Paris Agreement? First, the likelihood and magnitude of exceeding 1.5°C is strongly determined by the ambition of near-term emissions reductions. Ambitious new NDCs, and their effective implementation, are therefore an essential response to the realisation that global warming is approaching 1.5°C. This expectation is already part of the Paris Agreement architecture, however, and therefore can be acted upon without delay. Subsequent NDCs that set out emissions reduction targets under the Paris Agreement over the next decade are required to represent Parties' highest possible ambition[5].

Second, pursuing to limit warming to 1.5°C after an initial exceedance of the 1.5°C limit comes with additional requirements that are needed to durably reverse global warming. Such reversal can only be achieved by permanently removing carbon dioxide from the atmosphere (Arias et al., 2021; Schleussner et al., 2024). To first order, the amount of carbon dioxide that causes 0.1°C of global warming is similar to the net amount of permanent carbon dioxide removal required to reverse 0.1°C of global warming (Arias et al., 2021), although unresolved uncertainties about how the climate system responds under such condition mean that this should only be seen as first-order approximation (MacDougall et al., 2020; Palazzo Corner et al., 2023). With the Paris Agreement's mitigation goal of reaching net zero greenhouse gas emissions in the second half of the century[6] some of this reversal is already part of the Paris Agreement's ambition. Indeed, achieving such net zero greenhouse gas emissions would result in a gradual reversal of global warming (Arias et al., 2021).

[5] Paris Agreement, Article 4.3: *"Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."*

[6] Paris Agreement, Article 4.1: *"In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty."*

Pursuing the Paris Agreement goal of limiting warming to 1.5°C while following the current strong near-term reduction scenario implies that after mid-century a net amount of 260–610 GtCO_2 should again be removed from the atmosphere to bring global warming back to 1.5°C in the long term (Figure 4.2). This value assumes central estimates of climate sensitivity and other Earth system characteristics and the median overshoots reported in Table 4.2. Given the uncertainties around these estimates, an important possibility remains that markedly larger amounts of carbon dioxide removal will be required to stabilize, let alone reverse, global warming after an overshoot (Schleussner et al., 2024). Each year of further delay in global emissions reductions will further increase carbon dioxide removal requirements for returning global warming to 1.5°C.

A total amount of 425 GtCO_2 lies well within sustainable potentials of carbon dioxide removal (Deprez et al., 2024). However, the negative emission technologies that deliver carbon dioxide removal also face major challenges, including high energy and water demands, land-use competition, significant costs, and technological uncertainties (Fuhrman et al., 2021; Lane et al., 2021; Meckling and Biber, 2021; Rosa et al., 2020; Smith et al., 2016; Wei et al., 2021). Meanwhile, an overreliance on carbon dioxide removal in the near and longer term also risks delaying the broader energy transition (Ampah et al., 2024). This dual reality underscores two imperatives: the necessity of carbon dioxide removal deployment to counter unavoidable emissions, get to net zero and reverse global warming in the long term, and the urgency of early, aggressive mitigation to minimize overshoot.

Box 4.3 - Earth system feedbacks and overshoot

Earth system feedbacks affect and are affected by the exceedance of critical temperature limits such as the 1.5°C limit. First, uncertainty in the Earth system response means that the level of global warming consistent with a given path of global GHG emissions cannot be estimated with exact precision. For example, even an emissions pathway that results in a central estimate of global warming of about 1.5°C also simultaneously has a possibility of about 5 to 10% that global warming ends up much higher around 2°C. The magnitude by which 1.5°C of global warming would be exceeded therefore not only depends on the amount of past and future GHG emissions, but also on the strength of reinforcing feedbacks.

On the other hand, because many Earths system feedback scale with either CO2 concentrations or global warming, exceeding 1.5°C can also result in stronger amplifying feedbacks being triggered. For global warming between 1.5°C and 2°C, one such feedback would be the accelerated thawing of permafrost that would amplify global warming as a result of the methane and carbon dioxide emissions that are being released in the process.

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ANNEX

Note to reviewers: The following tables will be updated and added to the chapter Annex

Extra table. Global projections under the policy scenarios assessed in this chapter, and exceedance probabilities for alternative temperature limits.

Maximum warming over 21st century (peak) (°C)			
Scenario	**66% likelihood**	**50% likelihood**	**90% likelihood**
Current policies continuing	To be updated	To be updated	To be updated
Unconditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDC + all LT-LEDS	To be updated	To be updated	To be updated
Warming in 2050 (°C)			
Scenario	**66% likelihood**	**50% likelihood**	**90% likelihood**
Current policies continuing	To be updated	To be updated	To be updated
Unconditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDC + all LT-LEDS	To be updated	To be updated	To be updated
Warming in 2100 (°C)			
Scenario	**66% likelihood**	**50% likelihood**	**90% likelihood**
Current policies continuing	To be updated	To be updated	To be updated
Unconditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDCs continuing	To be updated	To be updated	To be updated
Conditional NDC + all LT-LEDS	To be updated	To be updated	To be updated

	Likelihood of limiting warming to below a specific warming limit (%)				
Scenario	**1.5°C**	**2°C**	**2.5°C**	**3°C**	**4°C**

Current policies continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Unconditional NDCs continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Conditional NDCs continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Conditional NDC + all LT-LEDS	To be updated	To be updated	To be updated	To be updated	To be updated

	Likelihood of limiting warming to below a specific warming limit in the year 2100 (%)				
Scenario	**1.5°C**	**2°C**	**2.5°C**	**3°C**	**4°C**
Current policies continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Unconditional NDCs continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Conditional NDCs continuing	To be updated	To be updated	To be updated	To be updated	To be updated
Conditional NDC + all LT-LEDS	To be updated	To be updated	To be updated	To be updated	To be updated