



Joint Technical Note by United Nations Environment Programme (UNEP) and the United Nations Framework Convention on Climate Change (UNFCCC)

A comparison of the findings of the UNEP Emissions Gap Report 2023 and the UNFCCC Nationally Determined Contribution (NDC) Synthesis Report 2023

Summary

This note provides an overview and comparison of the projections of global greenhouse gas (GHG) emissions and global warming levels reported in the 2023 editions of the [UNEP Emissions Gap Report](#) and the [UNFCCC Nationally Determined Contribution \(NDC\) Synthesis Report](#). As the note shows, the two reports present fully consistent messages despite differences in approaches and modelling choices. A key difference between the two reports is that the UNEP Report is an assessment report, which implies that it is based on consideration of all the latest scientific studies and modeling results focused on updates from key countries, whereas the UNFCCC report presents an analysis covering all countries (but without providing country-by-country detail). Both reports confirm that there continues to be a large gap in 2030 between the emissions resulting from full implementation of current country pledges and what science tells us is required to limit warming to well below 2°C and 1.5°C. Both reports are also consistent in clearly indicating that currently the world is far from a path that would limit global warming to well below 2°C or 1.5°C over the course of this century. Further details are provided in the summary table.

Comparison of global greenhouse gas (GHG) emission levels and projections

Estimates of **global GHG emissions in 2019** are closely aligned across the two reports. The Emissions Gap Report estimates of total global GHG emissions in 2019 are 53.7 gigatons of CO₂ equivalent (GtCO₂e) (excluding emissions and removals from land use, land-use change and forestry (LULUCF)) and 56.9 GtCO₂e (including LULUCF emissions). These estimates are slightly higher than those of the UNFCCC NDC Synthesis Report of 52.6 GtCO₂e and 56.3 GtCO₂e respectively. The UNFCCC report estimates remain almost unchanged compared with the 2022 edition of the report.

There are only slight differences between the two reports in projected **trajectories of global GHG emissions**, assuming the full implementation of the latest NDCs of all Parties to the Paris Agreement. For projected global GHG emissions in 2030, the difference is less than 1 GtCO₂e, which is well within the uncertainty ranges of the reports. Overall, the GHG emissions trajectory ranges are very similar in the two reports.

The **estimated aggregate effect on 2030 emissions of the new and updated NDCs** submitted since the twenty-seventh session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 27) is somewhat higher in the UNFCCC report than in the UNEP report. This is due to differences in emissions data, NDC assessments and methodological choices underlying the respective reports. An important methodological difference between the two reports is that the UNFCCC NDC Synthesis Reports assume that emissions in 2030 will be at the level stated in NDCs, regardless of whether projected emissions assuming full implementation of the NDCs are higher than those projected based on



policies currently in place. In contrast, the UNEP Emissions Gap Reports estimates, which are based on the findings of several studies, assume that current policy projections will be met, if these are lower than the NDC targets. If these differences are accounted for, estimates of future emission levels across the two reports are very similar.

Comparison of global warming projections

A key difference between the two reports is that the Emissions Gap Report reports global warming estimates with a 66 per cent probability over the course of the 21st century along with minimum-maximum ranges that consider a variety of emission projection uncertainties, whereas the NDC Synthesis Report provides a best-estimate with a 50 per cent probability of limiting warming to a specific level along with 5 to 95 percentile ranges. Global warming projections with a 50 per cent probability are always lower than projections with 66 per cent probability for similar scenarios. To enable like-with-like comparisons, the Emissions Gap Report also includes global warming projections for other probabilities (i.e., 50 per cent and 90 per cent). For similar likelihoods, central estimates are quite similar across the UNEP and UNFCCC reports (see the summary table).

There are significant differences in the global warming projection approaches of the two reports. The Emissions Gap Report explores structural modelling uncertainties more systematically than the NDC Synthesis Report, and this leads to much wider ranges around the central estimates. There are several other differences in approaches between the two reports, including:

- a. Different post-2030 extension methods
- b. Different climate emulators: the Emissions Gap Report uses [FaIR](#), while the UNFCCC NDC Synthesis Report uses [MAGICC](#). All other things assumed equal, using FaIR would result in slightly lower median warming projections compared with MAGICC. Both emulators are accurately calibrated to the IPCC AR6 WG1 physical science assessment with future warming projections differing by about 0.1°C (see [Box 7.1 Cross-Chapter Box 7.1](#) in IPCC AR6 WG1).
- c. The UNFCCC analysis does not limit emissions at ‘current policy’ estimates, so that if an NDC target is situated above a ‘current policy’ projection level, the NDC target emission level is nevertheless assumed to be achieved.

Summary table: Comparison of key estimates in the 2023 editions of the UNEP Emissions Gap Report (EGR) and the UNFCCC NDC Synthesis Report

	UNFCCC NDC or LT-LEDS Synthesis report	UNEP Emissions Gap Report 2023	Discussion / Reason for difference
Current emissions, excl. LULUCF (2019)	52.6 GtCO ₂ e	53.7 GtCO ₂ e	Small difference
Current emissions, incl. LULUCF (2019)	56.3 GtCO ₂ e	56.9 GtCO ₂ e	Small difference arising from the use of national inventory-based LULUCF estimates (UNFCCC) and global bookkeeping model results (UNEP EGR).
Aggregate impact on global GHG emissions in 2030 of new and updated NDCs submitted since COP 27	~0.8 GtCO ₂ e. The UNFCCC includes methodological updates, new inventory data, and new NDC quantifications.	~0.1 GtCO ₂ e. UNEP includes quantification of impacts based on new and updated NDCs only. The	Only partially comparable as a result of the differences in what is included and how it is included. For example, the updated NDC of Türkiye is still above the current



		impact mainly results from the updated NDCs of Mexico, and Türkiye, and the United Arab Emirates. The difference between UNEP EGR 2022 and EGR 2023 is 0.2 GtCO ₂ e.	policies scenario estimate for 2030, so it is not estimated to lead to further reductions in global GHG emissions in 2030 in the UNEP EGR, whereas the UNFCCC report assumes emissions will be at the level stated in NDCs, even if emissions are projected to be lower under current policies than under the NDCs.
The implementation gap, i.e. the difference between emissions under current policies and NDC scenarios	Not quantified. UNFCCC does not estimate emissions based on “current policies”.	1.5 GtCO ₂ e for unconditional NDCs and 5 GtCO ₂ e for conditional NDCs.	Not quantified by UNFCCC. Indicates how close countries are in aggregate to achieve their NDC targets.
Unconditional NDCs in 2030	Total incl. LULUCF: 55.4 GtCO ₂ e (range: 54.0-56.9) Total excl. LULUCF: 53.4 GtCO ₂ e (range: 51.9-54.8)	Total incl. LULUCF: 55.1 GtCO ₂ e (range: 53.8-57.1) Total excl. LULUCF: 53.2 GtCO ₂ e (range: 51.5-54.8)	Small difference. The UNEP EGR estimates are slightly lower, but all estimates are within the uncertainty ranges of both reports. Differences in single country estimates (like China and India) are one reason for this difference - with a difference of more than 3 GtCO ₂ e for China’s unconditional pledge alone across the different estimates in the UNEP EGR. Also, compensating differences are in play, as UNFCCC does not cap emission estimates at “current policy” scenarios, which results in up to 3-4 GtCO ₂ e differences. UNFCCC also includes NDCs of all countries, whereas the UNEP EGR includes all NDCs (until COP 26), and for the updated NDCs since COP 26, it focuses on G20 members, as well as other key countries.
Conditional NDCs in 2030	Total incl. LULUCF: 51.9 GtCO ₂ e (range: 50.4–56.9) Total excl. LULUCF: 49.9 GtCO ₂ e (range: 48.3-51.4)	Total incl. LULUCF: 51.7 GtCO ₂ e (range: 50.0-55.3) Total excl. LULUCF: 49.9 GtCO ₂ e (range: 47.7-53.0)	Very Similar. Similar reasoning as for unconditional NDCs. Slightly stronger improvement in UNFCCC, as unconditional emissions were not capped by “current policy” scenarios and differences in methodological choices.
Emissions gap in 2030 with respect to 2°C pathways (67% probability) assuming full implementation of all unconditional NDCs	15.1 Gt CO ₂ e (range: 11.1-18.5)	14 GtCO ₂ e (range: 13-16)	Similar and within the uncertainty range of UNFCCC. Methodological choices (UNFCCC reports the 5-95% range across a Monte Carlo uncertainty analysis) explain the wider range reported by UNFCCC. Exclusion of scenarios that peak below 1.8°C in the case of the UNEP EGR. Inclusion of benchmarks.
Emissions gap in 2030 with respect to 1.5°C pathways assuming full implementation of all unconditional NDCs	22.9 GtCO ₂ e (range: 21.3-27.9)	22 GtCO ₂ e (range: 21-24)	Very similar and within the uncertainty range of UNFCCC.



Reduction of these gaps if conditional NDCs are also fully implemented	~ -3.4 GtCO _{2e}	-3 GtCO _{2e}	Very similar. Slightly stronger reduction in the UNFCCC report due to inclusion of higher emissions in unconditional cases (as emissions are not capped by “current policy” scenarios).
Projected global warming over the 21st century (peak warming) with a 66% probability assuming that all the unconditional NDCs are fully achieved and that the mitigation efforts implied by those are continued over the century	Not provided in the report, but if it was stated it would be: 2.6-3.0°C (range of 67% percentile warming for different emission implementations). The UNFCCC report provides the 5%-95% uncertainty of peak warming for unconditional NDCs with 1.7°C to 4.1°C.	2.9°C (range: 2.0-3.7°C)	Similar. The UNEP EGR’s central estimate with a 66% probability is within the range of the UNFCCC report estimate. The range in the UNEP EGR is wider. The methodological approaches are different, which makes a stronger difference in the tails of the distribution – even though the median projection (see below) is very similar. The full 5%-95% uncertainty range reported by UNFCCC encompasses the UNEP EGR report 66% percentile estimate.
Projected global warming over the 21st century (peak warming) with a 66% probability assuming that all the conditional NDCs are fully achieved and that the mitigation efforts implied by those are continued over the century	Not provided in the report, but if it was stated it would be: 2.3-2.5°C (range of 66% percentile warming for different emission implementations).	2.5°C (range 1.9-3.6°C)	Similar, except that stated ranges under UNEP EGR are much wider for methodological reasons. The central 66% percentile value of 2.5°C is within the range of the UNFCCC report. The methodological difference of including (UNFCCC) or excluding (UNEP EGR) “hot air” plays less of a role under the stronger conditional targets.
Median peak warming projections for unconditional 2030 NDCs (50% probability)	2.4-2.8°C (median range)	2.6°C (range: 1.8-3.4)	Very similar. UNEP EGR and UNFCCC estimates match well. Compensating effects can be at play, i.e., different climate emulators; different treatment of “hot air”; different post-2030 extension methods.
Median peak warming projections for conditional 2030 NDCs (50% probability)	2.1-2.3°C (range of medians for different emission implementations)	2.3°C (range: 1.7-3.3)	Similar. UNEP EGR estimates are slightly higher. Compensating effects can be at play, i.e., different climate emulators; different treatment of “hot air”; different post-2030 extension methods.