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Nationally determined contributions under the Paris Agreement

Synthesis report by the secretariat

Summary

This report synthesizes information from the 166 latest available nationally determined contributions communicated by 193 Parties to the Paris Agreement and recorded in the registry of nationally determined contributions as at 23 September 2022.

Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
ACE	Action for Climate Empowerment
AR	Assessment Report of the Intergovernmental Panel on Climate Change
CH_4	methane
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COP	Conference of the Parties
GHG	greenhouse gas
GWP	global warming potential
GWP-100*	global warming potential values with a 100-year time-horizon
HFC	hydrofluorocarbon
IEA	International Energy Agency
INDC	intended nationally determined contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LT-LEDS	long-term low-emission development strategy(ies)
LULUCF	land use, land-use change and forestry
N_2O	nitrous oxide
NAP	national adaptation plan
NDC	nationally determined contribution
NF_3	nitrogen trifluoride
PFC	perfluorocarbon
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
SDG	Sustainable Development Goal
SF_6	sulfur hexafluoride
SLCP*	short-lived climate pollutant
SR1.5	Intergovernmental Panel on Climate Change Special Report on Global Warming of 1.5 °C
SSP	Shared Socioeconomic Pathway

* Used exclusively in figures.

I. Executive summary

1. This report has been prepared in response to the request from CMA 3[1] for the secretariat to annually update the NDC synthesis report.[2] This version of the NDC synthesis report synthesizes information from the 166 latest available NDCs, representing 193[3] Parties to the Paris Agreement, including the 142 new or updated NDCs communicated by 169 Parties, recorded in the NDC registry[4] as at 23 September 2022, covering 94.9 per cent of the total global emissions in 2019, which are estimated at 52.6 Gt CO_2 eq without LULUCF.[5] A total of 39 Parties have communicated new or updated NDCs since 12 October 2021 (the cut-off date for submissions covered in the previous version of this report), 24 of which after COP 26.

2. The COP and CMA guidance[6] on the information necessary for clarity, transparency and understanding of NDCs was used as a framework for synthesizing the relevant information contained in the communicated NDCs, which was supplemented by the synthesis of other information included in the NDCs but not covered by the guidance. The synthesized information is presented for all the represented Parties taken together.

3. Almost all[7] Parties (95 per cent) provided the information necessary to facilitate clarity, transparency and understanding of their NDCs in accordance with the COP guidance, with almost all Parties (94 per cent) that submitted new or updated NDCs already applying the relevant further CMA guidance.

4. All Parties provided information on mitigation targets or mitigation co-benefits resulting from adaptation actions and/or economic diversification plans. The mitigation targets range from economy-wide absolute emission reduction targets to strategies, policies, plans and actions for low-emission development. In their NDCs:

(a) Most Parties (90 per cent) provided quantified mitigation targets, expressed as clear numerical targets, while the rest (10 per cent) included strategies, policies, plans and actions for which there is no quantifiable information as components of their NDCs;

(b) Most Parties (80 per cent) communicated economy-wide targets, covering all or almost all sectors defined in the 2006 IPCC Guidelines, with an increasing number of Parties moving to absolute emission reduction targets in their new or updated NDCs;

(c) In terms of GHGs, all NDCs cover CO_2 emissions, most cover CH_4 (91 per cent) and N_2O (89 per cent) emissions, many (53 per cent) cover HFC emissions and some cover PFC and SF_6 (36 per cent) and NF_3 (26 per cent) emissions;

(d) Many Parties (50 per cent) provided information on mitigation co-benefits resulting from their adaptation actions and/or economic diversification plans, mostly in combination with other targets;

(e) Most of the Parties (74 per cent) that submitted new or updated NDCs have strengthened their commitment to reducing or limiting GHG emissions by 2025 and/or 2030, demonstrating increased ambition in addressing climate change.

5. Almost all Parties (92 per cent) communicated an NDC implementation period of until 2030, while a few (8 per cent) specified an implementation period of until 2025, 2035, 2040

[1] Decision 1/CMA.3, para. 30.

[2] See document FCCC/PA/CMA/2021/8/Rev.1 for the previous version, published in October 2021.

[3] The Holy See deposited its instrument of accession to the Paris Agreement on 4 September 2022 and, in accordance with Article 21, para. 3, of the Paris Agreement, it entered into force on 4 October 2022. As this was after 23 September 2022, the Holy See is not considered in this report.

[4] Available at https://unfccc.int/NDCREG.

[5] Unless otherwise noted, in this report global GHG emission totals exclude emissions from forestry and other land use or LULUCF but include emissions from international maritime transport and international aviation.

[6] Decisions 1/CP.21, para. 27; and 4/CMA.1 and annex I.

[7] The following terms are used in this report according to the percentage of Parties whose NDCs mention particular information: “a few” for less than 10 per cent; “some” for 10–40 per cent; “many” for 41–70 per cent; “most” for 71–90 per cent; and “almost all” for more than 90 per cent.

or 2050. Many Parties (55 per cent) identified 1 January 2021 as their starting date for NDC implementation; some others (31 per cent) indicated that they started implementing their NDC in or before 2020; and a few Parties (3 per cent) mentioned starting implementation in 2022.

6. Almost all Parties (93 per cent) provided quantified information on their mitigation targets and reference points. Of the Parties that submitted new or updated NDCs, most (84 per cent) updated the basis for defining their targets, including reference points and/or 'business as usual' scenarios. Such updates lead to higher-quality NDCs and, for some Parties, to significant changes in the estimated emission levels for 2025 and 2030.

7. Most Parties (81 per cent) provided information on voluntary cooperation under Article 6 of the Paris Agreement. Almost all of them (76 per cent) stated that they plan to or will possibly use at least one type of voluntary cooperation, with the use of cooperative approaches most frequently communicated. At the same time, some Parties (30 per cent) have set qualitative limits on their use of voluntary cooperation for achieving their mitigation targets, such as using units that adhere to certain standards and guidelines to ensure, for example, additionality, permanence or avoidance of double counting of emission reductions.

8. Of the Parties that communicated new or updated NDCs, the share that indicated planned or possible use of at least one type of voluntary cooperation has increased from 49 to 82 per cent since their previous NDCs. Similarly, the share of those Parties that have set qualitative limits on their use of voluntary cooperation has sharply increased from 19 to 32 per cent since their previous NDCs.

9. Total global GHG emissions (without LULUCF) taking into account implementation of the latest NDCs are estimated to be around 53.4 (51.8–55.0) Gt CO_2 eq in 2025[8] and 52.4 (49.1–55.7) Gt CO_2 eq in 2030,[9] which are:[10]

(a) In 2025, 53.7 per cent higher than in 1990 (34.7 Gt CO_2 eq), 12.6 per cent higher than in 2010 (47.4 Gt CO_2 eq) and 1.6 per cent higher than in 2019 (52.6 Gt CO_2 eq);

(b) In 2030, 50.8 per cent higher than in 1990, 10.6 per cent higher than in 2010 and 0.3 per cent lower than in 2019, as well as 1.9 per cent lower than the estimated level for 2025, indicating the possibility of global emissions peaking before 2030.

10. In comparison, the total GHG emissions of the Parties that communicated new or updated NDCs are estimated at 45.6 Gt CO_2 eq for 2019, and the total GHG emission levels resulting from implementation of their NDCs are estimated to be around 46.4 (44.9–47.8) Gt CO_2 eq in 2025 and 45.6 (42.7–48.6) Gt CO_2 eq in 2030. These emission levels are about 3.8 (3.3–4.3) per cent lower for 2025 and 9.5 (9.2–9.7) per cent lower for 2030 than the estimated levels for these years according to their previous NDCs. In absolute terms, the projected emission levels for 2025 and 2030 for this group of Parties are now lower than according to their previous NDCs by 1.8 (1.5–2.1) Gt CO_2 eq and 4.8 (4.3–5.2) Gt CO_2 eq respectively. Compared with the 2010 level, total GHG emissions of these Parties are estimated to be 12.3 (8.8–15.9) per cent higher by 2025 and 10.5 (3.4–17.6) per cent higher by 2030; while, compared with the 2019 level, their total GHG emissions are estimated to be 1.6 per cent higher (with a range from 1.6 per cent lower to 4.8 per cent higher) by 2025 and approximately the same as in 2019 (with a range from 6.5 per cent lower to 6.4 per cent higher) by 2030.

11. In comparison, the total GHG emission levels resulting from implementation of the NDCs presented in the previous version of this report were estimated to be around 54.7 (52.7–56.7) Gt CO_2 eq in 2025 and 54.9 (51.5–58.3) Gt CO_2 eq in 2030, which are about 2.4 (1.8–

[8] Unless otherwise noted, for this report GWP values with a 100-year time-horizon from the AR6 have been used. For NDCs that include estimates of GHG emissions calculated using other GWP values (e.g. from previous ARs), a conversion has been applied. For further information, including on estimation methods and approaches, see document FCCC/PA/CMA/2021/8/Add.3.

[9] Unless otherwise noted, in this report the average of the quantification is followed by a range that represents the minimum and maximum values after aggregation, since several Parties presented conditional and unconditional elements of their NDCs and, in some cases, ranges of values for both.

[10] Percentages are the average of the changes in the lower- and higher-end emission quantifications.

3.0) and 4.7 (4.8–4.7) per cent higher for 2025 and 2030 respectively than the estimated emission levels indicated in this version of the report.

12. The projected total global GHG emission level taking into account full implementation of all latest NDCs (including all conditional elements) implies an even stronger possibility of global emissions peaking before 2030 than estimated in the previous version of this report, with the lower bound of the 2030 emission level (49.1 Gt CO_2 eq) estimated to be up to 6.6 per cent below the 2019 emission level (52.6 Gt CO_2 eq) and 5.1 per cent below the lower bound of the estimated 2025 emission level (51.8 Gt CO_2 eq). However, in order to achieve that peaking, the conditional elements of the NDCs need to be implemented, which depends mostly on access to enhanced financial resources, technology transfer and technical cooperation, and capacity-building support; availability of market-based mechanisms; and absorptive capacity of forests and other ecosystems.

13. The total global GHG emission level in 2030 taking into account implementation of all latest NDCs is estimated to be 10.6 (3.6–17.5) per cent above the 2010 level[11] and 0.3 per cent below the 2019 level (with a range from 6.6 per cent below to 6.0 per cent above), which is lower than the level for 2030 presented in the previous version of this report (15.9 per cent above the 2010 level and 4.7 above the 2019 level). This shows that Parties to the Paris Agreement are increasing the ambition of their climate action in accordance with Article 4, paragraphs 3 and 11, of the Paris Agreement and in response to the relevant call in the Glasgow Climate Pact.[12]

14. The contribution of Working Group III to the AR6[13] concludes that, in scenarios of limiting warming to 1.5 °C (with over 50 per cent likelihood by 2100) with no or limited overshoot, GHG emissions are reduced by 43 (34–60) per cent by 2030 relative to the 2019 level. For the subgroup of scenarios in which net zero emissions are also achieved in line with Article 4, paragraph 1, of the Paris Agreement, the emission reductions are slightly less, at 41 (31–59) per cent by 2030; and for the subgroup of scenarios in which net zero emissions are not achieved this century, the near-term emission reductions by 2030 tend to be slightly stronger, at 48 (35–61) per cent. In scenarios of keeping warming likely below 2 °C (with over 67 per cent likelihood) with mitigation action starting in 2020, emissions in 2030 are 27 (13–45) per cent below the 2019 level.[14]

15. Full implementation of all latest NDCs (including all conditional elements) is estimated to lead to a 3.6 (0.7–6.6) per cent emission reduction by 2030 relative to the 2019 level; while implementation of all latest NDCs excluding any conditional elements is estimated to result in 3.1 (0.2–6.0) per cent higher emissions in 2030 than in 2019.

16. The absolute difference in the level of emissions by 2030 according to the latest NDCs and these IPCC scenarios[15] is sizeable, despite progress compared with the level according to the INDCs as at 4 April 2016. The difference between the projected emission levels that do not take into account implementation of any conditional elements of NDCs and the emission levels in the scenarios of keeping warming likely below 2 °C (with over 67 per cent likelihood) by 2030 is estimated to be 16.0 (12.0–19.4) Gt CO_2 eq. In relation to the scenarios of limiting warming to 1.5 °C (with over 50 per cent likelihood) and achieving net zero emissions this century, the gap is even wider, at an estimated 23.9 (22.2–28.8) Gt CO_2 eq. However, assuming full implementation of all latest NDCs, including all conditional

[11] According to the SR1.5 (see footnote 23 below), to be consistent with global emission pathways with no or limited overshoot of the 1.5 °C goal, global net anthropogenic CO_2 emissions need to decline by about 45 per cent from the 2010 level by 2030, reaching net zero around 2050. For limiting global warming to below 2 °C, CO_2 emissions need to decrease by about 25 per cent from the 2010 level by 2030 and reach net zero around 2070.

[12] Decision 1/CMA.3, para. 29.

[13] IPCC. 2022. Summary for Policymakers. *In*: PR Shukla, J Skea, R Slade, et al. (eds.). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press. Available at https://www.ipcc.ch/report/ar6/wg3/.

[14] The categories of scenarios referred to in this paragraph are "C1", "C1a", "C1b" and "C3a" respectively in table SPM.2 of the contribution of Working Group III to the AR6.

[15] The differences are calculated between emission levels according to the NDCs and under IPCC scenario categories "C1a" and "C3a" respectively.

elements, the gap is slightly narrowed, towards 12.5 (8.5–15.9) Gt CO_2 eq in relation to the aforementioned 2 °C scenarios and towards 20.3 (18.7–25.3) Gt CO_2 eq in relation to the aforementioned 1.5 °C scenarios.

17. Taking into account implementation of NDCs up until 2030, projected global mean temperatures are subject to significant uncertainty owing to the range of emission levels estimated for 2030 resulting from implementation of NDCs (including whether conditional elements are implemented or not), the range of illustrative emission extensions beyond 2030 and inherent climate system uncertainties. The best estimate of peak temperature in the twenty-first century (projected mostly for 2100 when temperature continues to rise) is in the range of 2.1–2.9 °C depending on the underlying assumptions.

18. In the context of the carbon budget consistent with 50 per cent likelihood of limiting warming to 1.5 °C (500 Gt CO_2), cumulative CO_2 emissions in 2020–2030 based on the latest NDCs would likely use up 86 per cent of the remaining carbon budget, leaving a post-2030 carbon budget of around 70 Gt CO_2, which is equivalent to approximately two years of projected total global CO_2 emissions by 2030. Similarly, in the context of the carbon budget consistent with a likely chance of keeping warming below 2 °C (estimated by the IPCC to be 1,150 Gt CO_2 from 2020 onward), cumulative CO_2 emissions in 2020–2030 based on the latest NDCs would likely use up around 37 per cent of the remaining carbon budget. For comparison, total global CO_2 emissions between 1850 and 2020 are estimated by the IPCC[16] to have amounted to 2,390 (2,150–2,630) Gt CO_2.

19. The information in paragraphs 9–16 and 18 above implies, despite some progress since the previous version of this report, an urgent need for either a significant increase in the level of ambition of NDCs between now and 2030 or a significant overachievement of the latest NDCs, or a combination of both, in order to attain the cost-effective emission levels suggested in many of the scenarios considered by the IPCC for keeping warming likely below 2 °C or limiting it to 1.5 °C. If emissions are not reduced by 2030, they will need to be substantially reduced thereafter to compensate for the slow start on the path to net zero emissions. The AR6 identifies net zero CO_2 emissions as a prerequisite for halting warming at any level.

20. Many Parties (44 per cent) provided information on long-term mitigation visions, strategies and targets for up until and beyond 2050. Their total GHG emission level is estimated to be 36.6 (34.9–38.4) Gt CO_2 eq in 2030, which is 2 per cent (with a range from 3 per cent lower to 7 per cent higher) higher than their 2010 emission level and 6 (2–11) per cent lower than their 2019 emission level.[17]

21. Mindful of the inherent uncertainty of such long-term estimates, the information indicates that these Parties' total GHG emission level could be 64 (59–69) per cent lower in 2050 than in 2019 and their annual per capita emissions would be 2.4 (2.1–2.7) t CO_2 eq by 2050. Under scenarios of limiting warming to likely below 2 °C (with over 67 per cent likelihood), annual per capita emissions are 2.2 (1.4–2.9) t CO_2 eq; hence the estimated long-term per capita emissions of these Parties are at a level consistent with 2 °C scenarios. However, for scenarios of limiting warming to 1.5 °C (with 50 per cent likelihood by 2100) and achieving net zero emissions this century, annual per capita emissions by 2050 are required to be two to three times lower, at 0.9 (0.0–1.6) t CO_2 eq.[18]

22. Almost all Parties (97 per cent) explained their approach to NDC preparation and implementation. Many (57 per cent) linked their NDCs to their commitment to transitioning to a sustainable and/or low-carbon and resilient economy, taking into account social, environmental and economic factors as well as the SDGs. In addition, many Parties (46 per

[16] IPCC. 2021. Summary for Policymakers. *In*: V Masson-Delmotte, P Zhai, A Pirani, et al. (eds.). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press. Available at https://www.ipcc.ch/report/ar6/wg1/.

[17] For more details on projected collective GHG emission levels based on long-term mitigation visions, strategies and targets in NDCs and LT-LEDS, see document FCCC/PA/CMA/2022/8.

[18] Per capita emission levels were calculated on the basis of the AR6 Working Group III scenario database (available at https://data.ece.iiasa.ac.at/ar6/) for the categories "C3a" and "C1a" respectively.

cent) indicated that they have integrated their NDC targets, goals and policies into national legislative, regulatory and planning processes as a means of ensuring implementation.

23. Many Parties (64 per cent) highlighted policy coherence and synergies between their domestic mitigation measures[19] and development priorities, which include the SDGs and, for some that submitted new or updated NDCs, LT-LEDS and green recovery from the coronavirus disease 2019 pandemic.

24. Most Parties (79 per cent) referred to formal arrangements in place for domestic stakeholder consultation. Almost all of those Parties (93 per cent) indicated that they conducted consultations and engagement in an inclusive and participatory manner. Many of those Parties (60 per cent) specifically referenced gender-sensitive consultations.

25. Parties are increasingly[20] recognizing gender integration as a means to enhance the ambition and effectiveness of their climate action. Most Parties (75 per cent) provided information related to gender in their NDCs and some (39 per cent) affirmed that they will take gender into account in implementing them.[21] Of the Parties that referenced gender in their previous NDCs, some (20 per cent) elaborated more on the topic in their new or updated NDCs. Some (38 per cent) included information on how gender had been or was planned to be mainstreamed in NDC implementation.

26. Some Parties (29 per cent) described the role of local communities and the role, situation and rights of indigenous peoples in the context of their NDCs, describing the specific vulnerabilities of indigenous peoples that are particular to their circumstances, the importance of drawing on indigenous and local knowledge to strengthen climate efforts, and arrangements to enable greater participation in and contributions to climate action by indigenous peoples.

27. Almost all Parties (97 per cent) provided information on using one or more ACE elements[22] to promote implementation of mitigation and adaptation activities, and in their new or updated NDCs Parties generally communicated more clearly and in more detail on general principles, past achievements, future commitments, and needs and gaps in relation to ACE.

28. Most Parties (80 per cent) included an adaptation component in their NDC and some of the adaptation components (13 per cent) were designated as adaptation communications. Parties provided information in particular on adaptation-related research; vulnerabilities; adaptation measures, in particular NAPs and sectoral actions; contingency measures; synergies with mitigation and other global frameworks; and monitoring and evaluation of adaptation.

29. In comparison with Parties' previous NDCs, more of the NDCs contain adaptation information. The adaptation components of the NDCs, where included, indicate increased focus on national adaptation planning, in particular on the process to formulate and implement NAPs. The new or updated NDCs include, in comparison with the same Parties' previous NDCs, more information on time-bound quantitative adaptation targets and the associated indicator frameworks, more specific links between adaptation efforts and efforts towards the SDGs, and more specific information on synergies and co-benefits between adaptation and mitigation.

30. In terms of adaptation priorities, the NDCs illustrate that Parties continue to focus on freshwater resources; food production and nutrition security; terrestrial and wetland

[19] In this report, (domestic) mitigation measures refers to specific domestic policies and actions that contribute to achieving mitigation objectives identified in NDCs, including adaptation actions and economic diversification plans with mitigation co-benefits.

[20] The share of Parties that referred to gender and consider it a cross-cutting issue in the new or updated NDCs has increased significantly since their previous NDCs.

[21] For more information on gender under the UNFCCC, see https://unfccc.int/topics/gender/workstreams/chronology-of-gender-in-the-intergovernmental-process.

[22] ACE denotes work under Article 12 of the Paris Agreement; its objective is to empower all members of society to engage in climate action through education, training, public awareness, public participation, public access to information, and international cooperation on these issues (the six ACE elements).

ecosystems; key economic sectors and services; human health; disaster risk management; urban areas and human habitats; coastal and low-lying areas; ocean ecosystems; and livelihoods and poverty.

31. Almost all Parties (97 per cent) outlined domestic mitigation measures as key instruments for achieving mitigation targets for their NDCs and/or for priority areas, such as energy supply, transport, buildings, industry, agriculture, LULUCF and waste. However, Parties indicated measures in industry (47 per cent), the second largest source of global GHG emissions with the second highest annual growth rate of GHG emissions among the priority areas, much less frequently than for other priority areas (74–92 per cent).

32. Most Parties (74 per cent) communicated one or more quantitative mitigation targets specific to priority areas or sub-areas, which support and underpin their overall mitigation targets. Such quantitative mitigation targets were provided most frequently for energy supply (57 per cent), followed by LULUCF (43 per cent) and cross-cutting or other (42 per cent), and were much less frequently indicated for the other priority areas (5–19 per cent).

33. Domestic mitigation measures for renewable energy generation (88 per cent) were most frequently mentioned by Parties, followed by measures for improving energy efficiency of buildings (70 per cent) and for afforestation, reforestation and revegetation (54 per cent). Some Parties (21 per cent) communicated quantitative targets for the share (ranging from 15 to 100 per cent) of renewable energy in electricity generation by 2030; and many of those target shares (13 per cent) fall within or above the SR1.5[23] range of 47–65 per cent consistent with 1.5 °C pathways. For the Parties that communicated new or updated NDCs, renewable energy generation continued, as in their previous NDCs, to be the most frequently indicated mitigation option, with the share of Parties indicating this option sharply increasing since their previous NDCs from 59 to 91 per cent.

34. Parties identified mitigation options with high net emission reduction potential costing less than USD 20/t CO_2 eq, which are projected in the contribution of Working Group III to the AR6 to account for more than half of the total emission reduction potential required for being on 1.5 °C pathways by 2030, including (with estimated net emission reduction potential indicated in parentheses):

(a) Solar energy (3.3 Gt CO_2 eq/year), with many Parties (49 per cent) communicating corresponding measures;

(b) Wind energy (3.08 Gt CO_2 eq/year), with some Parties (35 per cent) indicating corresponding measures;

(c) Reduced conversion of forests and other ecosystems (2.28 Gt CO_2 eq/year), with some Parties (36 per cent) reporting corresponding measures;

(d) Energy efficiency improvement in industry (1.14 Gt CO_2 eq/year), with some Parties (27 per cent) identifying corresponding measures.

35. Of the Parties that communicated new or updated NDCs after the adoption of the Glasgow Climate Pact, the shares that indicated mitigation options relevant to those referred to in paragraphs 36–38 of that decision (see para. 190(a–e) below) were 14–225 per cent higher than the corresponding shares of the 193 Parties in the latest available NDCs. In particular, the shares of those Parties that indicated phasing down unabated coal power generation and phasing out inefficient fossil fuel subsidies and reforming fossil fuel subsidies were more than triple the corresponding shares of the 193 Parties.

36. Many (50 per cent) Parties considered mitigation co-benefits resulting from their adaptation action and/or economic diversification plans. In their new or updated NDCs more Parties reported on mitigation co-benefits of adaptation action and economic diversification plans, including information on specific projects, measures and activities with the resulting

[23] IPCC. 2018. *IPCC Special Report on the Impacts of Global Warming of 1.5 °C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*. V Masson-Delmotte, P Zhai, H-O Pörtner, et al. (eds.). Geneva: World Meteorological Organization. Available at www.ipcc.ch/sr15.

co-benefits, compared with the information in their previous NDCs. Similarly, more Parties provided information on their consideration of social and economic consequences of response measures, and of just transition and/or economic diversification.

37. Adaptation actions and economic diversification plans with mitigation co-benefits include afforestation and reforestation activities, climate-smart agriculture, reducing food waste, vertical farming, adapting coastal ecosystems, conservation plans for protected areas, nature-based solutions, increasing the share of renewable sources in energy generation, improving energy efficiency, carbon dioxide capture and storage, fuel switch and fuel price reforms in the transport sector, and moving to circular economy for better waste management.

38. An increasing number of Parties (40 per cent) are targeting ocean-based climate action. Some Parties (26 per cent) include an ocean-based climate target, policy or measure. Ocean-related measures reported in the NDCs relate more often to adaptation than to mitigation, there has been an increase in adaptation measures identified related to fisheries and aquaculture and relatively few Parties mentioned offshore renewable energy as a mitigation solution.

39. Almost all Parties mentioned some or all means of implementation in their NDCs, although the structure and depth of that information varied significantly. While some Parties included a dedicated section on means of implementation or separate sections on finance, technology and/or capacity-building, many mentioned or referred to aspects of means of implementation in other sections of their NDCs.

40. Many Parties (44 per cent) provided quantitative estimates of financial support needs for NDC implementation. In their new or updated NDCs some Parties provided quantitative estimates of financial support needs, with some (34 per cent) of them providing updated quantitative estimates and others (15 per cent) providing estimates for the first time.

41. Many Parties (58 per cent) identified certain types of technology that they intend to use for implementing adaptation and mitigation actions, most frequently related to the energy, agriculture, water and waste sectors. Technology needs mentioned by Parties were mainly (42 per cent) of a cross-cutting nature addressing both adaptation and mitigation, followed by those focused on mitigation (33 per cent) or adaptation (25 per cent). Since the previous version of this report, the share of Parties (4 per cent) referring in their NDCs to policy and regulatory measures for promoting low-carbon and climate-resilient technologies towards implementing net zero strategies and decarbonization pathways at the national and sectoral level has grown.

42. Most Parties (74 per cent) identified capacity-building as a prerequisite for NDC implementation. Capacity-building needs for formulating policy, integrating mitigation and adaptation into sectoral planning processes, accessing finance and providing the information necessary for clarity, transparency and understanding of NDCs were identified. In the new or updated NDCs, compared with in their previous NDCs, more Parties expressed capacity-building needs for adaptation.

II. Mandate

43. In accordance with the Paris Agreement, each Party is to prepare, communicate and maintain successive NDCs that it intends to achieve and each successive NDC will represent progression reflecting the Party's highest possible ambition. Moreover, a Party may at any time adjust its existing NDC with a view to enhancing the level of ambition.[24] The communicated NDCs are to be recorded in the NDC registry, maintained by the secretariat.

44. COP 21 invited Parties to communicate their first NDC no later than when the Party submits its respective instrument of ratification, acceptance or approval of or accession to the Paris Agreement. A Party is also considered to have satisfied this provision, unless the Party

[24] Article 4, paras. 2, 3 and 11, of the Paris Agreement.

decides otherwise, if it had communicated an INDC prior to becoming a Party to the Paris Agreement.[25]

45. COP 21 requested Parties whose INDC pursuant to decision 1/CP.20 contains a time frame:

(a) Up to 2025: to communicate by 2020 a new NDC and to do so every five years thereafter pursuant to Article 4, paragraph 9, of the Paris Agreement;

(b) Up to 2030: to communicate or update by 2020 their NDC and to do so every five years thereafter pursuant to Article 4, paragraph 9, of the Paris Agreement.[26]

46. CMA 3 requested Parties to revisit and strengthen the 2030 targets in their NDCs as necessary to align with the Paris Agreement temperature goal by the end of 2022, and urged Parties that have not yet communicated new or updated NDCs to do so as soon as possible in advance of CMA 4.[27]

47. In addition, CMA 3 requested the secretariat to annually update the NDC synthesis report and to make it available to the CMA at each of its sessions.

III. Introduction

A. Background

48. The secretariat notified Parties on 22 April 2022 of its plan to base the 2022 version of the NDC synthesis report on the NDCs recorded in the registry as at 23 September 2022.

49. Any other information relevant to Parties strengthening their 2030 targets that was not included in those NDCs will be provided, to the extent possible, in an addendum to this report. As at 23 September 2022, no such further information had been communicated to the secretariat.

B. Scope

50. This report synthesizes information from the 166 latest available NDCs, representing 193 Parties to the Paris Agreement,[28] recorded in the NDC registry as at 23 September 2022. A total of 39 Parties have communicated new or updated NDCs since 12 October 2021 (the cut-off date for submissions covered in the previous version of this report), 24 of which after COP 26.[29]

51. The 166 NDCs comprise 142 new or updated NDCs from 169 Parties[30] and 24 NDCs from Parties that have not communicated new or updated NDCs in response to paragraphs 23–24 of decision 1/CP.21.

[25] Decision 1/CP.21, para. 22.

[26] Decision 1/CP.21, paras. 23–24.

[27] Decision 1/CMA.3, paras. 28–29.

[28] The European Union and its 27 member States communicated one joint NDC in accordance with Article 4, paras. 16–18, of the Paris Agreement, which for this report has been counted as one NDC representing 28 Parties and reflecting the inclusion of particular information by all of them.

[29] Argentina, **Australia**, Bahrain, **Bolivia (Plurinational State of)**, **Brazil**, **Central African Republic**, Chad, China, Comoros, **Côte d'Ivoire**, **Democratic Republic of the Congo**, **Dominica**, **Egypt**, **El Salvador**, **Gabon**, Ghana, **Guatemala**, **Haiti**, **India**, **Indonesia**, Iraq, Japan, **Mozambique**, Nauru, New Zealand, **Niger**, Pakistan, **Republic of Korea**, Saint Kitts and Nevis, Saudi Arabia, **Serbia**, **Sudan**, **Switzerland**, **Uganda**, **United Arab Emirates**, **United Kingdom of Great Britain and Northern Ireland**, Uzbekistan, **Vanuatu** and Venezuela (Bolivarian Republic of) (the Parties in bold submitted their new or updated NDCs after COP 26).

[30] Albania, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon,

52. Under the Paris Agreement, in communicating their NDCs, Parties are to provide the information necessary for clarity, transparency and understanding in accordance with decision 1/CP.21 and any relevant decisions of the CMA.[31]

53. For first NDCs, including those communicated or updated by 2020, this information may cover, as appropriate, quantifiable information on the reference point (including, as appropriate, a base year); time frames and/or periods of implementation; scope and coverage; planning processes; assumptions and methodological approaches, including for estimating and accounting for anthropogenic GHG emissions and, as appropriate, removals; and how the Party considers that its NDC is fair and ambitious in the light of its national circumstances, and how it contributes towards achieving the objective of the Convention as set out in its Article 2.[32]

54. CMA 1 adopted further guidance on the information necessary for clarity, transparency and understanding of NDCs. In communicating their second and subsequent NDCs, Parties shall provide the information necessary for clarity, transparency and understanding contained in annex I to decision 4/CMA.1 as applicable to their NDCs. In addition, CMA 1 strongly encouraged Parties to provide this information in relation to their first NDC, including when communicating or updating it by 2020.[33]

55. The guidance on the information necessary for clarity, transparency and understanding is without prejudice to the inclusion of components other than information on mitigation in an NDC.[34]

C. Approach

56. The guidance on the information necessary for clarity, transparency and understanding of NDCs was used as a framework for synthesizing the relevant information contained in the communicated NDCs,[35] which was supplemented by the synthesis of other information included in the NDCs but not covered by the guidance, such as on adaptation, means of implementation necessary for NDC implementation, domestic mitigation measures, and economic diversification plans and response measures.

57. The synthesis covers only the information communicated by Parties in their NDCs and the synthesized information is presented for all those Parties taken together.

58. The approach to and methods for estimating projected emission levels resulting from NDC implementation are consistent with those set out in document FCCC/PA/CMA/2021/8/Add.3.

Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Cuba, Democratic People's Republic of Korea, Democratic Republic of the Congo, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Ethiopia, European Union (and its 27 member States), Fiji, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Iceland, India, Indonesia, Iraq, Israel, Jamaica, Japan, Jordan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Malawi, Malaysia, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Mexico, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Qatar, Republic of Korea, Republic of Moldova, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, South Africa, South Sudan, Sri Lanka, State of Palestine, Sudan, Suriname, Switzerland, Tajikistan, Thailand, Togo, Tonga, Tunisia, Uganda, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Zambia and Zimbabwe.

[31] Article 4, para. 8, of the Paris Agreement.

[32] Decisions 1/CP.21, para. 27; and 4/CMA.1, para. 9.

[33] Decision 4/CMA.1, paras. 6–10 and annex I.

[34] Decision 4/CMA.1, para. 8.

[35] As per decision 1/CP.21, para. 25.

59. For this report, projected emission levels resulting from implementation of the NDCs were compared with emission scenarios assessed by the IPCC, specifically categories of scenarios from the contribution of Working Group III to the AR6 (table SPM.2). Different categories cover scenarios of limiting warming to different levels. For example, there are 204 scenarios assessed by the IPCC of limiting warming likely below 2 °C (with over 67 per cent chance) with concerted mitigation action having started by 2020 (category "C3a"); and there are 50 scenarios assessed by the IPCC of keeping warming at around 1.5 °C with no or limited overshoot and achieving net zero emissions in the latter half of this century in line with Article 4, paragraph 1, of the Paris Agreement (category "C1a").

IV. Synthesis of information contained in nationally determined contributions

A. Overview

60. This report considers the 166 latest available NDCs, representing 193 Parties to the Paris Agreement, covering 94.9 per cent of total global emissions in 2019, which are estimated at 52.6 Gt CO_2 eq[36] without LULUCF (and around 56.4 Gt CO_2 eq with LULUCF[37]).

61. Almost all Parties (95 per cent) provided the information necessary for clarity, transparency and understanding of their NDCs in accordance with Article 4, paragraph 8, of the Paris Agreement and decision 1/CP.21, paragraph 27. Of the Parties that submitted new or updated NDCs, almost all (94 per cent) provided such elements of information, already applying the CMA guidance referred to in paragraph 54 above.

62. Most Parties (80 per cent) provided information on adaptation, with some (13 per cent) identifying the adaptation component of their NDC as their adaptation communication, and a few (2 per cent) provided information organized around the elements identified in the annex to decision 9/CMA.1.

63. In addition, almost all Parties provided other information, such as on the means of implementation necessary for NDC implementation; domestic mitigation measures; and/or economic diversification plans and response measures.

B. Scope and coverage

64. All Parties provided information on mitigation targets or mitigation co-benefits resulting from adaptation actions and/or economic diversification plans in their NDCs (see figure 1), which range from economy-wide absolute emission reduction targets to strategies, policies, plans and actions for low-emission development, to be implemented within a specified time frame or implementation period:

(a) Some Parties (37 per cent) included absolute emission reduction targets expressed as an emission reduction from the level in a specified base year, ranging from 7.2 to 88.0 per cent. A few other Parties (4 per cent) specified a year or time frame in which their emissions are expected to peak or reach a maximum level of absolute emissions (e.g. by

[36] Including emissions from countries that are not Parties to the Paris Agreement, a harmonization factor to ensure comparability with SSP scenarios assessed by the IPCC, and emissions from international aviation and maritime transport, which accounted for approximately 1.2 and 1.5 per cent, respectively, of total global emissions in 2019.

[37] In line with anthropogenic land-use emissions and removals in the scenarios assessed by the IPCC, although aggregate global net emissions estimated on the basis of national GHG inventories would be lower. The difference mainly reflects whether forest sinks in areas of managed land are defined as anthropogenic. Note that land-use emissions are generally subject to relatively large uncertainties. The chosen harmonized emission level facilitates comparability between aggregate emissions according to NDCs, emissions in IPCC-assessed scenarios and IPCC-reported emission milestones (see table SPM.2 in the contribution of Working Group III to the AR6) or timing of achievement of net zero emissions.

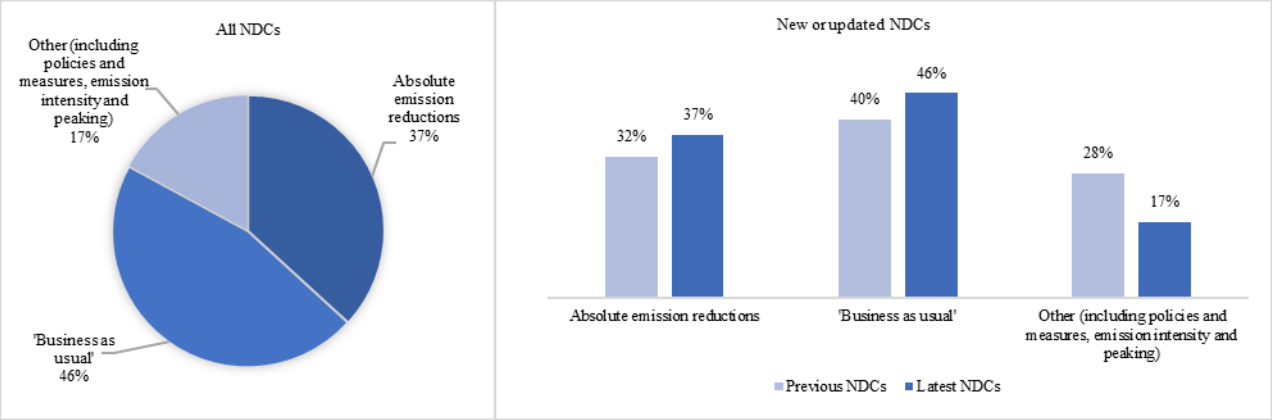
2030). In addition, a few of those Parties (2 per cent) expressed their target as a carbon budget in addition to the absolute target, establishing an overall limit on GHGs to be emitted over a specified period of time (e.g. between 2021 and 2030);

(b) Many Parties (46 per cent) included relative targets for reducing emissions below the 'business as usual' level by a specified target year, either for the whole economy or for specific sectors, ranging from 5 to 103.5 per cent and thus achieving carbon neutrality; or emission intensity targets for reducing specific GHG emissions per unit of gross domestic product relative to a base-year (e.g. 1990) level;

(c) Many Parties (51 per cent) included strategies, plans and actions for low-emission development reflecting their particular national circumstances;

(d) Many Parties (50 per cent) provided information on mitigation co-benefits resulting from their adaptation actions and/or economic diversification plans, mostly in combination with other targets.

Figure 1
Types of mitigation target and share of Parties that communicated them in nationally determined contributions



65. Total global GHG emissions (without LULUCF) taking into account implementation of the latest NDCs are estimated to be around 53.4 (51.8–55.0) Gt CO_2 eq in 2025 and 52.4 (49.1–55.7) Gt CO_2 eq in 2030 (see figure 2).

66. In comparison, the total GHG emission levels resulting from implementation of the NDCs presented in the previous version of this report were estimated to be around 54.7 (52.7–56.7) Gt CO_2 eq in 2025 and 54.9 (51.5–58.3) Gt CO_2 eq in 2030, which are about 2.4 (1.8–3.0) and 4.7 (4.8–4.7) per cent higher for 2025 and 2030 respectively than the estimated emission levels presented in this version of the report.

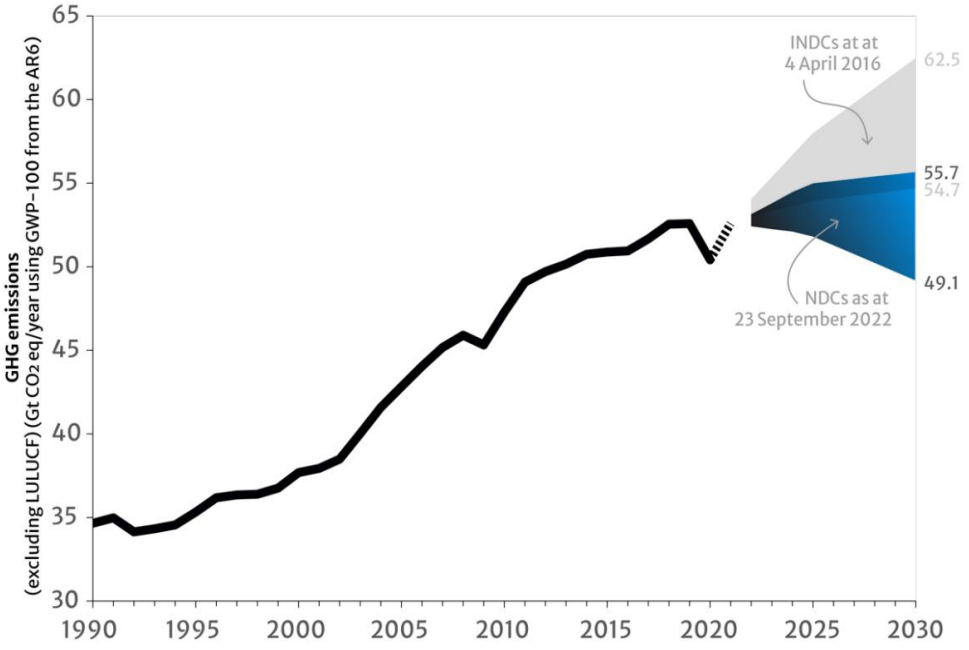
67. The NDCs of most Parties (82 per cent) are unconditional, at least in part, with many including more ambitious conditional elements. The implementation of most conditional elements depends on access to enhanced financial resources, technology transfer and technical cooperation, and capacity-building support; availability of market-based mechanisms; and absorptive capacity of forests and other ecosystems. Total GHG emission levels resulting from implementation of the unconditional elements of the NDCs are estimated to be 54.2 (53.5–55.0) Gt CO_2 eq in 2025 and 54.2 (52.7–55.7) Gt CO_2 eq in 2030 (see figure 2). On the other hand, assuming full implementation of all NDCs, including explicitly conditional elements, emission levels are estimated to be lower in 2025, at 52.6 (51.8–53.5) Gt CO_2 eq, and in 2030, at 50.7 (49.1–52.2) Gt CO_2 eq.

68. When considering only the new or updated NDCs, the total GHG emissions of the relevant Parties are estimated to be around 46.4 (44.9–47.8) Gt CO_2 eq in 2025 and 45.6 (42.7–48.6) Gt CO_2 eq in 2030, similar to the 2019 emission level (45.6 Gt CO_2 eq) of those Parties.

69. Of the Parties that submitted new or updated NDCs, most (83 per cent) included unconditional components and many included additional conditional elements, mainly conditional upon finance. Compared with their previous NDCs, some 15 per cent more Parties included unconditional elements in their new or updated NDCs.

Figure 2

Projected range and progression of emission levels according to nationally determined contributions



Note: The projected ranges cover the higher-emission end for unconditional elements of NDCs to the lower-emission end when also taking conditional elements of NDCs into account. Emissions from international aviation included are assumed constant by 2030 at the 2019 level (~619 Mt CO_2); emissions from international maritime transport of 755 Mt CO_2 eq in 2018 are assumed to be on a linear trajectory by 2030 towards the international maritime sector's target of halving emissions by 2050 compared with the 2008 level. The comparison of total emissions resulting from implementation of the INDCs and the latest NDCs includes the difference in assumed bunker emissions (approximately 407 and 707 Mt CO_2 eq lower emissions in 2025 and 2030 respectively).

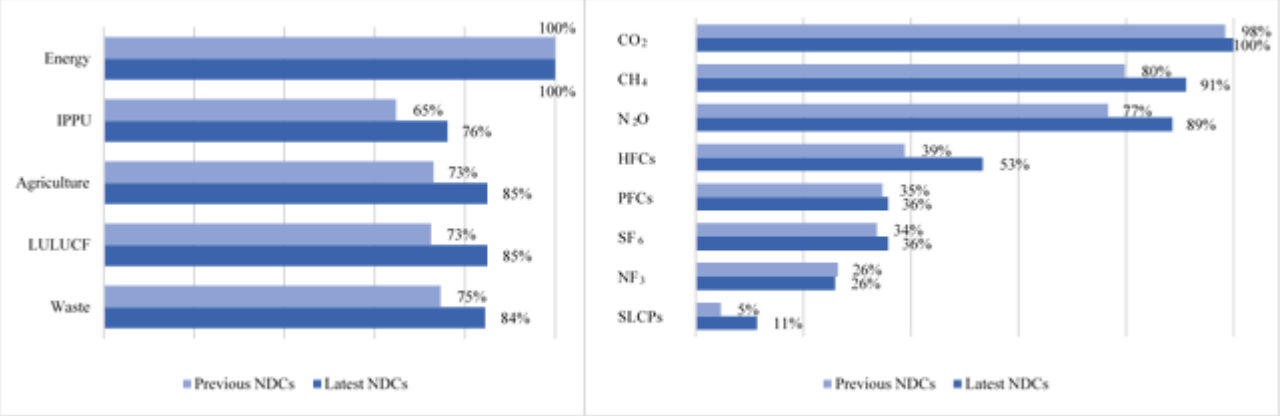
70. All Parties provided information on the scope and coverage of their NDCs, including sectors and gases covered. The coverage of sectors and gases has increased in the new or updated NDCs compared with the Parties' previous NDCs (see figure 3).

71. Most Parties (80 per cent) have economy-wide NDCs, with many (66 per cent) covering all sectors defined in the 2006 IPCC Guidelines. All NDCs cover the energy sector, more than 80 per cent cover agriculture, LULUCF and waste and 76 per cent IPPU.

72. Some Parties (26 per cent) provided information on coverage of specific sectors of national importance, which are often a subset of one or more IPCC sectors, such as shipping and aviation, cooling, food production, transport, mining or buildings, while others mentioned specific carbon pools, oceans or blue carbon.

73. All NDCs cover CO_2 emissions, almost all (91 per cent) cover CH_4 and most (89 per cent) cover N_2O emissions, many (53 per cent) cover HFC emissions and some cover PFC and SF_6 (36 per cent) and NF_3 (26 per cent) emissions. Some Parties (11 per cent) included additional gases or emissions, including short-lived climate pollutants, such as black carbon, sulfur dioxide and non-methane volatile organic compounds.

Figure 3
Sectors and greenhouse gases covered by Parties that communicated them in nationally determined contributions



74. Most Parties (81 per cent) provided information on how they are striving to include all categories of anthropogenic emissions and removals in their NDCs over time, as well as explanations for the exclusion of any categories. Many Parties (45 per cent) stated that they already have economy-wide NDCs including all sectors and GHGs. Some other Parties (43 per cent) explained why certain sectors and/or gases had been excluded, such as owing to categories being negligible or insignificant, data unavailability or inaccuracy, or lack of technical capacity.

75. In addition to communicating information on mitigation targets or plans for the near to medium term, many Parties (44 per cent) provided information on long-term mitigation visions, strategies or targets for up to and beyond 2050 that either have already been formulated or are under preparation in the LT-LEDS.[38]

C. Time frames and/or periods of implementation

76. All Parties communicated in their NDCs the time frame and/or period of implementation, which refers to a time in the future by or in which an objective is to be achieved.

77. Almost all Parties (92 per cent) communicated a time frame and/or period of implementation of until 2030, while a few (8 per cent) specified periods of until 2025, 2035, 2040 or 2050. Many Parties (55 per cent) indicated 1 January 2021 as their starting date for NDC implementation; some (31 per cent) started implementing their NDC in or before 2020; and a few Parties (3 per cent) mentioned starting implementation in 2022.

78. All Parties communicated a target year, expressing a single-year target, a multi-year target (i.e. for a period of consecutive years) or multiple target years (i.e. several non-consecutive target years) depending on the target. Most Parties (86 per cent) communicated a single-year target for 2030, while a few (4 per cent) indicated a single-year target for 2025, 2035 or 2040. A few Parties (8 per cent) communicated multiple target years, including when target years were associated with the implementation of different policies and measures. A few other Parties (8 per cent) indicated having a multi-year target for NDC implementation.

[38] As at 23 September 2022, 52 LT-LEDS had been communicated, representing 62 Parties, 32 of which had communicated a new or updated NDC. In addition, 22 Parties communicated long-term mitigation visions, strategies or targets in their NDCs. For a list of communicated LT-LEDS, see https://unfccc.int/process/the-paris-agreement/long-term-strategies. For more details on LT-LEDS, see document FCCC/PA/CMA/2022/8.

D. Quantifiable information on the reference point (including, as appropriate, a base year)

79. Most Parties (90 per cent) provided quantified mitigation targets, expressed as clear numerical targets, while the rest (10 per cent) included strategies, policies, plans and actions as referred to in Article 4, paragraph 6, of the Paris Agreement or policies and measures for which there is no quantifiable information as components of their NDCs (see para. 64 above).

80. Almost all Parties (91 per cent) also provided information on the reference year, base year, reference period or other starting point for measuring progress towards the target, with some (23 per cent) selecting 1990 and others (61 per cent) selecting a year between 2000 and 2020. Of the Parties that provided information on the starting point for measuring progress, most (77 per cent) are measuring achievement of their targets against a base-year level; some (16 per cent) have chosen to measure progress in terms of a deviation from a level in the target year, with most selecting 2030; and a few (7 per cent) provided a reference period.

81. Almost all Parties (90 per cent) further provided information on the reference indicator used to express their target. Most of those Parties (76 per cent) chose absolute GHG emissions as the reference indicator, some (13 per cent) chose the 'business as usual' GHG emission level and a few (5 per cent) chose a GHG emission budget or emission intensity per unit of gross domestic product or sectoral 'business as usual' levels. Most Parties (72 per cent) provided a quantified value for their reference indicator for either the base year, the target year or both, as appropriate.

82. Of the Parties that submitted new or updated NDCs, most (84 per cent) updated the basis for defining their targets, including reference points and 'business as usual' scenarios. Although such updates lead to higher-quality NDCs, for some Parties they lead to significant changes in the estimated emission levels for 2025 and 2030, for reasons other than changes to target levels.

83. Most Parties that included strategies, plans and actions as referred to in Article 4, paragraph 6, of the Paris Agreement provided other information for clarification, including on expected levels of emission reduction or prevention, increased forest coverage, reduction of deforestation, energy efficiency targets, renewable energy share or other non-GHG policy targets.

84. Most Parties (83 per cent) provided information on the sources of the emission data used for quantifying the reference point, including national inventory reports, biennial reports, biennial update reports and/or national communications. Other sources of information identified were national documents and statistics, such as sector activity reports; national development plans and/or strategies; sustainable development plans, economic development projections; national climate change plans; energy master plans; national statistics on economy, energy and/or trade; waste management strategies; national resource plans; energy road maps; national forest reports; and socioeconomic forecasts.

85. Most Parties (73 per cent) presented information on the reasons they might update the values of their reference indicators, such as owing to significant changes in specific financial, economic, technological and/or political conditions, impacts of extreme natural disasters or economics impacts of the pandemic; the scale of access to support and other means of implementation, expected improvements or modifications to activity data, variables or methodologies used in estimating national emissions, baselines or projections, or the results of the ongoing negotiations on common metrics; or to reflect the actual situation during the implementation period.

E. Assumptions and methodological approaches, including for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals

1. Intergovernmental Panel on Climate Change methodologies and metrics

86. Most Parties (83 per cent) communicated information on the IPCC methodologies they used for estimating emissions and removals. Of those Parties, most (71 per cent) referred to the 2006 IPCC Guidelines and a few (8 per cent) to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, while a few others (4 per cent) mentioned that they used both sets of guidelines to cover different sectors.

87. Many Parties (65 per cent) provided information on the metrics they used for estimating emissions and removals. All of those Parties used GWP values over a 100-year time-horizon, with 47 per cent using such values from the AR5, some (25 per cent) using such values from the AR2 and some (26 per cent) from the AR4. Other Parties used GWP values as well as global temperature potential values from the AR5 for estimating their mitigation targets.

88. Most Parties (83 per cent) communicated information on the assumptions and methodological approaches to be used for accounting anthropogenic GHG emissions and, as appropriate, removals, corresponding to their NDCs. Of those Parties, most (87 per cent) referred to the 2006 IPCC Guidelines, while some others (11 per cent) referred to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Some also mentioned the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and/or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*.

89. In addition, some Parties (15 per cent) referred to the standard methods and procedures contained in the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*.

2. Assumptions and methodological approaches

90. Many Parties (46 per cent) expressed mitigation targets as a deviation from a 'business as usual' level, with most (84 per cent) of those Parties presenting quantitative baselines and mitigation scenarios such as baselines and projections based on historical data and trends in emissions and economic parameters. Most of those Parties referred to key parameters and variables such as gross domestic product and population and growth thereof, and cost-benefit analysis. They provided sector-specific parameters, covering energy consumption, energy demand and production, electricity grid capacity, fossil fuel combustion, demographic and migratory forecasts, urbanization rate, transportation network changes and vehicle numbers, sectoral growth rate, forest growth rate, livestock trends, per capita waste generation, and energy and waste statistics per tourist.

91. A few Parties (7 per cent) communicated additional information on other approaches used for estimating sector- or activity-specific emissions or baselines, including using regional data sources for downscaling data or generating data at the national level, and calculation tools or approaches for estimating short-lived climate pollutants or precursor emissions. Some Parties (28 per cent) mentioned using specific modelling tools for estimating their emissions or baselines, such as The Integrated Market Allocation-Energy Flow Optimization Model System, the Greenhouse Gas Abatement Cost Model, Green Economy Modelling, the Low Emissions Analysis Platform, the PROSPECTS+ emissions scenario tool and the Ex-Ante Carbon-balance Tool.

92. Of the Parties that submitted new or updated NDCs, most (84 per cent) provided more detailed information than previously on the assumptions, methodological approaches and procedures used for developing their baselines or mitigation scenarios.

3. Land use, land-use change and forestry

93. Many Parties (50 per cent) clarified how they intend to address emissions and subsequent removals due to natural disturbances on managed land if such events occur. A few of them mentioned that they may use a statistical approach to identifying natural disturbances following relevant IPCC guidance.

94. Some Parties (32 per cent) stated that emissions and removals from harvested wood products will be accounted for as part of their NDCs, with only a few of them (5 per cent) mentioning the use of an approach other than the production approach.

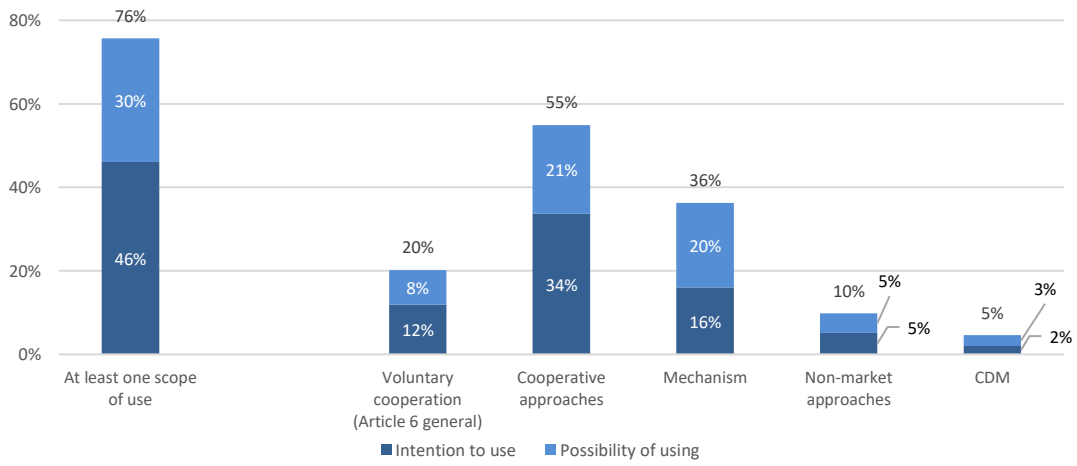
95. Some Parties (24 per cent) mentioned that the effects of age-class structure in forests will be taken into account when estimating the mitigation contribution of forests by using a projected forward-looking forest reference level (taking into account current management practices).

4. Voluntary cooperation under Article 6 of the Paris Agreement

96. Most Parties (81 per cent) provided information relating to voluntary cooperation. Almost all of them (76 per cent) communicated that they plan to or will possibly use at least one of the scopes of voluntary cooperation in implementing their NDCs (see figure 4) by directly or indirectly referring to the scopes in their NDCs: general use of voluntary cooperation under Article 6; use of cooperative approaches under Article 6, paragraph 2; use of the mechanism under Article 6, paragraph 4; use of non-market approaches under Article 6, paragraph 8; and use of the clean development mechanism.[39] The share of Parties that indicated that they plan to or will possibly use at least one of the scopes of voluntary cooperation increased to 82 per cent in the new or updated NDCs compared with 49 per cent in their previous NDCs.

97. Planned or possible use of cooperative approaches was the scope of voluntary cooperation most frequently communicated by Parties (55 per cent), followed by planned or possible use of the mechanism under Article 6, paragraph 4 (36 per cent).

Figure 4
Share of Parties indicating in nationally determined contributions the intention to use or possibility of using specific scopes of voluntary cooperation



98. Some Parties (11 per cent) communicated the use of voluntary cooperation as a condition for achieving their mitigation targets, including use of cooperative approaches to complement domestic mitigation measures for achieving the mitigation target.

99. However, some Parties (34 per cent) have set limits on their use of voluntary cooperation: a few (3 per cent) stated that they will use voluntary cooperation only as a means

[39] Only direct references to use of the clean development mechanism were considered; references to, for example, “international market-based mechanisms” were not considered direct references.

of achieving conditional elements of their mitigation targets; a few (5 per cent) have set quantitative limits on their use of voluntary cooperation for achieving their mitigation targets, such as achieving targets primarily through domestic efforts but partially through voluntary cooperation; and some (30 per cent) have set qualitative limits on their use of voluntary cooperation for achieving their mitigation targets, such as using units that adhere to standards and guidelines to ensure additionality, permanence or avoidance of double counting of emission reductions. The share of Parties that have set qualitative limits on their use of voluntary cooperation increased from 19 per cent for the previous NDCs to 32 per cent for the new or updated NDCs.

F. Planning and implementation processes

100. Almost all Parties (97 per cent) provided information on their NDC planning processes and most also referred to their implementation plans, communicating information on their institutional arrangements, stakeholder engagement processes and policy instruments, including legislation, strategies, plans and policies.

1. Domestic institutional arrangements

101. Most Parties (87 per cent) indicated that domestic institutional arrangements are a key element of coordinating, planning and implementing climate change policy and action at the national and international level and fostering public participation. Most of them referred to specific arrangements in place for NDC preparation, such as inter-institutional commissions, councils and committees, led by a designated entity with a coordination role and including members from public entities, the private sector, non-governmental organizations and/or academia. A few other Parties (1 per cent) communicated that such arrangements are under development.

102. Most Parties (79 per cent) referred to formal arrangements in place for consulting stakeholders, including the general public, local communities, indigenous peoples, private entities, business and trade associations, civil society organizations, youth associations, women's associations, regional development partners, academia and research communities. Almost all of those Parties (93 per cent) indicated that they conducted such consultation and engagement processes in an inclusive and participatory manner. Many of those Parties (60 per cent) specifically referenced gender-sensitive consultations, referring to specific guidelines for ensuring gender sensitivity, such as during public consultations, and highlighting the inclusion of national gender machineries, gender and women's groups, or non-governmental organizations in the process.

103. A few Parties (1 per cent) mentioned the Marrakech Partnership for Global Climate Action,[40] which, under the leadership of the high-level champions, supports implementation of the Paris Agreement by strengthening collaboration between national Governments and cities, subnational regions, businesses, investors and civil society to accelerate action on climate change. In this context, a few Parties (5 per cent) highlighted the voluntary commitments announced or pledged in collaboration with non-Party stakeholders.[41]

104. Many Parties (56 per cent) mentioned specific policy instruments in place to facilitate NDC implementation in addition to institutional arrangements, and some others (25 per cent) mentioned instruments being under development. Such policy instruments include energy and/or climate strategies, low-emission development strategies, NDC implementation road maps, NDC action plans, laws and regulations on climate change, sectoral national mitigation and adaptation plans, and NDC investment plans.

105. Some Parties (13 per cent) included information on their domestic measurement, reporting and verification systems, while many others (53 per cent) indicated that such

[40] See https://unfccc.int/climate-action/marrakech-partnership-for-global-climate-action.

[41] Voluntary commitments by Parties and non-Party stakeholders are reported and tracked in order to capture the extent of climate action taken globally on the global climate action portal (https://climateaction.unfccc.int/) and in the Yearbook of Global Climate Action (see, e.g., https://unfccc.int/sites/default/files/resource/Yearbook_GCA_2021.pdf).

systems are under development. Those Parties acknowledged the important role of such systems in continuously monitoring and tracking the status and progress of their NDCs and mitigation efforts, and highlighted that the results will be reflected in national inventory reports and/or biennial transparency reports, ensuring national and international transparency. About 3 per cent of Parties noted that the feedback from such systems will be used to guide the preparation of their subsequent NDCs.

2. Gender

106. Most Parties (75 per cent) provided information related to gender in their NDCs and some (39 per cent) affirmed that they will take gender into account in implementing them.

107. Many Parties (52 per cent) referred to relevant policies and legislation, and some (28 per cent) affirmed a general commitment to gender equality, while some (38 per cent) included information on how gender had been or was planned to be mainstreamed in NDC implementation, and many (46 per cent) on specific tools and methods, such as gender analyses or assessments, gender indicators, gender-disaggregated data, and gender-responsive budgeting, and a few (6 per cent) included gender as a criterion for prioritizing activities.

108. Many Parties (44 per cent) that referred to gender in their NDCs treated it as a cross-cutting issue to be addressed across adaptation and mitigation, with some (13 per cent) focusing on adaptation. Some Parties (11 per cent) considered gender exclusively in the context of adaptation. Some Parties (24 per cent) mentioned taking gender into account in formulating and implementing their NAPs.

109. Some Parties (38 per cent) referred to their planned gender-responsive and some (21 per cent) to gender-sensitive climate action or generally elaborated on gender aspects in the context of specific sectors, including agriculture, energy, disaster risk reduction, water, health, LULUCF, fisheries, waste and education.

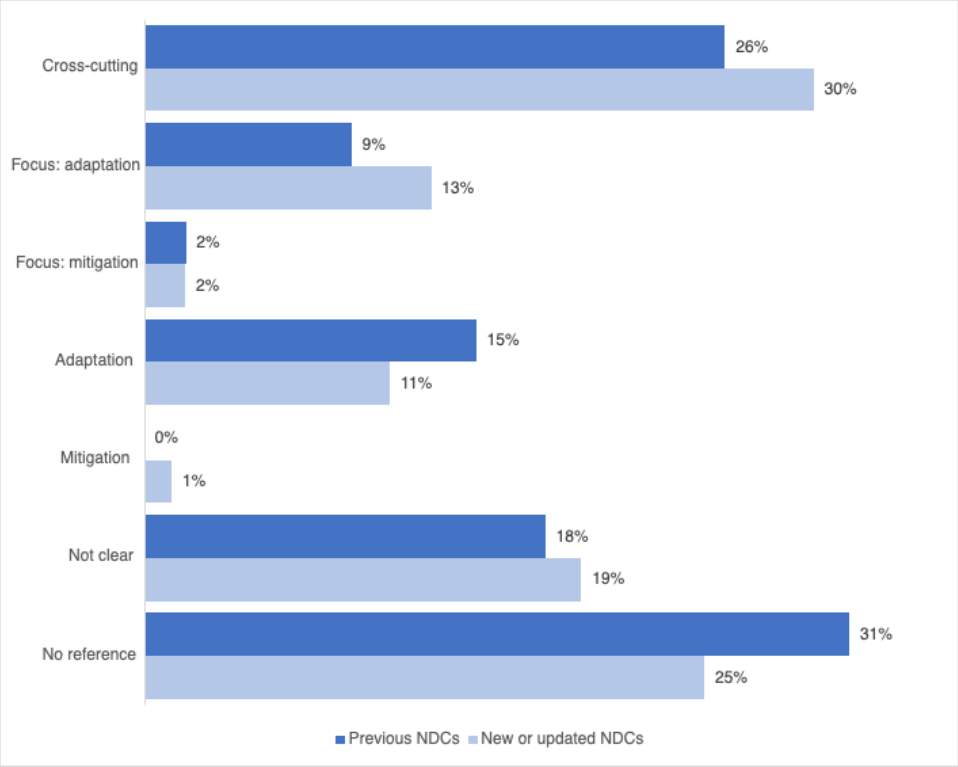
110. Some Parties (38 per cent) highlighted the importance of providing capacity-building, finance and technology for gender-specific action and of these means of implementation being gender-responsive.

111. Some Parties (11 per cent) implicitly or explicitly considered gender as it intersects with other social factors. A few Parties (5 per cent) explicitly considered specific genders in the context of their differentiated needs and perspectives and the gender-differentiated impacts of and contributions to climate change and climate action. Some of them (32 per cent) framed women as being vulnerable and some (27 per cent) framed women as stakeholders or agents of change. A few Parties (4 per cent) explicitly considered other genders.

112. Parties are increasingly considering gender in their NDCs and recognizing gender integration as a means of increasing the ambition and effectiveness of their climate action. The share of Parties referring to gender in the new or updated NDCs compared with their previous NDCs has increased and the share of Parties considering gender as a cross-cutting issue has also risen (see figure 5).

113. Some Parties (26 per cent) referenced gender in their first NDCs, while some (20 per cent) elaborated more on gender than in their previous NDCs. Some Parties (12 per cent) considered gender to a similar or decreased extent.

Figure 5
Reference to gender in nationally determined contributions



3. Indigenous peoples and local communities

114. Some Parties (29 per cent) that provided an adaptation component described the role of indigenous peoples and local communities in the context of their NDCs, including the situation and consideration of the rights of indigenous peoples at the national level, such as legal and consultative arrangements for protecting their rights. They emphasized the vulnerabilities of indigenous peoples relating to their intrinsic relationship with forests and ecosystems and conditions of poverty. The benefits of drawing on indigenous knowledge and expertise, in particular for adaptation, were highlighted, as was the importance of combining traditional and modern practices and of ensuring the participation and leadership of indigenous peoples in climate efforts. Parties outlined how indigenous peoples were engaged in NDC preparation, including through consultations on sectoral proposals, risk assessment and analysis of indigenous knowledge.

115. In addition, some of those Parties elaborated on how actions identified in the NDC aim to benefit indigenous peoples by, for example, enhancing access to finance and technology; building capacity for reducing vulnerabilities and for leadership, negotiations and indigenous-led climate action; generating payments for ecosystems services; providing development opportunities; enhancing market access to indigenous products; and diversifying livelihoods. Some Parties (18 per cent) specifically elaborated on the role of local communities in climate action, highlighting the importance of empowering such communities, building their capacity to adapt and ensuring their participation in related activities, such as through community-based adaptation plans, decentralization strategies and livelihood improvements, as well as through adaptation measures, such as mangrove restoration, that enhance the resilience of local communities to climate change.

4. Action for Climate Empowerment[42]

116. Almost all Parties (97 per cent) provided information on using one or more ACE elements to promote implementation of mitigation and adaptation activities. Some Parties (26 per cent) indicated their intention, and the support needed, to systematically address ACE

[42] As footnote 22 above.

by developing national ACE strategies, incorporating ACE and its elements into general climate policies and plans, upholding ACE as a guiding principle and cross-cutting priority for climate action, and setting specific ACE-related targets.

117. Many Parties (45 per cent) elaborated on climate education measures such as updating formal, informal and non-formal education curricula and programmes, establishing laws and policies to ensure provision of climate education, mainstreaming climate change in national education strategies and plans, and providing training and resources for teachers and educators. Many Parties (50 per cent) included information on training measures, including integrating climate change into training programmes for civil servants and other stakeholders.[43] The need for training was also highlighted in the context of achieving just transition and accessing green jobs.

118. Many Parties (63 per cent) provided information on measures for raising public awareness, such as developing communication strategies, disseminating knowledge through traditional and new media, and implementing awareness-raising campaigns for specific sectors, such as health, biodiversity and energy efficiency. Almost all Parties (92 per cent) mentioned public participation, including information on institutional arrangements (see paras. 100–102 above). Some Parties (35 per cent) included information on public access to information, providing details on developing regulations and systems to guarantee and facilitate access to climate information and data.

119. In the new or updated NDCs, Parties generally communicated more clearly, and in more detail, than previously on general principles, past achievements, future commitments, and needs and gaps in relation to ACE. More Parties are explicitly referring to ACE as a necessary means of mobilizing and empowering society to deliver the mitigation and adaptation objectives outlined in their NDCs.

5. Best practices and other contextual matters

120. Many Parties (63 per cent) communicated best practices for NDC preparation, such as institutionalizing climate policy development within joint planning frameworks; strengthening stakeholder capacity to participate more substantively in NDC preparation and implementation; designing planning and reporting systems for transparency and public scrutiny; incorporating experience and lessons learned from INDC preparation and implementation efforts; conducting extensive stakeholder consultation and peer review to enhance their understanding of the NDC; conducting a preliminary assessment of pre-2020 efforts to identify gaps and needs and develop an NDC road map; mainstreaming NDC goals in existing strategies, plans and policies to obtain political support and benefit from existing arrangements; partnering with regional and international organizations to develop a robust NDC; and establishing a scientific and quantitative system for analysing and assessing progress of implementation.

121. On the basis of their national circumstances and development pathways, many Parties (57 per cent) highlighted other contextual aspirations and priority areas, such as maximizing synergies between short- and long-term climate commitments and the SDGs; adaptation and climate-resilient development; collaboration and provision of adequate support by developed country Parties and international organizations; deploying low-emission technologies to drive emission reduction, safeguarding food security and eradicating poverty; involving youth, local governments and communities and/or indigenous groups in a gender-responsive manner; just transition of the workforce; social and climate justice; circular economy; integrated resource management; oceans or blue carbon; disaster risk reduction; human health; producing energy from renewable sources and/or energy efficiency; and reducing risks caused by loss and damage.

122. Of the Parties that submitted new or updated NDCs, some Parties (25 per cent) provided information on how their NDC preparation was informed by activities or events relevant to the collective assessment of progress in addressing climate change, such as the United Nations Secretary-General's calls to strengthen climate action and ambition during

[43] See paras. 210–213 below for more information on training measures in the context of capacity-building.

the 2018 high-level event on climate change, the recommendations from the Talanoa Call for Action and/or the best available science, such as the SR1.5.

G. Mitigation co-benefits resulting from adaptation action and/or economic diversification plans

123. Many Parties (43 per cent) considered mitigation co-benefits resulting from their adaptation action and/or economic diversification plans and a few (3 per cent) mentioned that such co-benefits have been taken into account in their mitigation efforts. Many of those Parties (45 per cent) considered social and economic consequences of response measures and included an economic diversification plan and/or a just transition or social pillar for designing climate policies that foster a just and equitable transition, and managing changes arising in relevant sectors due to the implementation of climate policies. Some other Parties (24 per cent) considered positive and/or negative economic and social consequences of response measures without linking them to the mitigation co-benefits of their adaptation action and/or economic diversification plans. Some Parties presented their sectoral mitigation and adaptation plans in the agriculture, energy, forestry, tourism, transport and manufacturing sectors as transition or diversification plans.

124. Parties highlighted unequal impacts on different groups of society or the workforce as consequences of response measures, with impacts on the workforce[44] being the most frequently mentioned. Some (28 per cent) plan to address such impacts by including the concept of just transition in their overall NDC implementation, such as a just transition mechanism and just transition funds; laws and strategies for protecting workers; a social mechanism for job creation, skills development and employment policies; and a consultation process for social protection. A few Parties (3 per cent) paid special attention to addressing impacts of response measures on vulnerable groups and communities in relation to poverty, job opportunities and inequality during transition.

125. Some Parties (23 per cent) referenced economic diversification as part of their national development plans and climate policies to boost the country's resilience to climate change and response measures. Some of them (21 per cent) linked such plans to an existing poorly diversified economy and the impact of response measures on sectors of high economic importance, such as extraction of fossil fuels. Those Parties specifically mentioned economic diversification plans or actions focused on high-emitting sectors and sectors of economic importance. Such plans include enhancing education; increasing the share of energy generation using renewable sources; improving energy efficiency through regulatory measures, pricing signals and technology deployment in the fisheries, industry and buildings sectors; carbon dioxide capture and storage in the oil and gas industry; implementing fuel switch and fuel price reforms in the transport sector; moving to circular economy for better waste management; adopting sustainable tourism practices to build the tourism sector; fostering financial services to increase investment; promoting investment in forestry for sustainable logging and wood processing; and product diversification in the agriculture sector.

126. Some Parties described how their adaptation action contributes to emission reduction, including their intention to consider mitigation co-benefits in NAP formulation. In terms of sectors, some described the potential co-benefits of various agricultural adaptation measures, including climate-smart agriculture, reducing food waste and vertical farming. Adaptation of coastal ecosystems was highlighted as another source of co-benefits, in particular planting mangroves and seagrass beds. Other sectors with potential co-benefits mentioned were forestry, natural resources and the environment, energy and waste.

127. Most Parties identified agriculture as a high priority for adaptation, either explicitly or as part of cross-sectoral adaptation efforts, and most are aiming to use mitigation opportunities in the sector. Many Parties highlighted the need to focus on activities that have positive effects on mitigation and adaptation while ensuring food security.

[44] Such as low-income groups, women, young people, indigenous peoples and people with disabilities.

H. Fairness and ambition in the light of national circumstances

128. Almost all Parties (99 per cent) explained, using different metrics, how they consider their NDCs to be fair and ambitious in the light of their national circumstances.[45]

129. Those Parties included qualitative and/or quantitative information on how their NDCs represent progression[46] and highest possible ambition, such as through increased estimated level of emission reductions; earlier projected peaking of emissions; enhancing mitigation efforts; prioritizing adaptation actions with mitigations co-benefits over mitigation; increasing unconditional elements; including long-term targets; introducing and/or enhancing policies; elaborating on adaptation action; integrating climate goals into national policy instruments; enhancing linkages with the SDGs; using more accurate data and moving to higher-tier estimation; establishing arrangements for monitoring and/or tracking progress of implementation; enhancing the stakeholder consultation process; developing sector-based action plans for implementation; and presenting additional information to facilitate clarity, transparency and understanding.

130. Many Parties (56 per cent) framed fairness consideration within their past, current and future share in global and/or per capita emissions compared with global averages, or in relation to the trends in one or several of the metrics referred to in paragraph 129 above, with 15 per cent indicating that, despite the pandemic and its impacts on their economies, they are committed to implementing their NDCs to address climate change.

131. Many Parties (60 per cent) provided information on ambition by linking their NDCs to their commitment to transition to a sustainable and/or low-carbon and resilient economy; some (32 per cent) expressed that they have incorporated their NDC goals and policies into national legislative, regulatory and planning processes as a means of ensuring implementation; and some (11 per cent) addressed ambition in the context of the inclusive design of their NDCs, considering various cross-cutting aspects, such as investment plans, gender-responsiveness, education and just transition.

132. Many Parties (53 per cent) stated that their NDCs are in line with the long-term goals of the Paris Agreement or with the mitigation pathways for limiting global warming to well below 2 or 1.5 °C above pre-industrial levels. Of the Parties that submitted new or updated NDCs, most (71 per cent) highlighted that they have enhanced their mitigation and/or adaptation contributions.

133. Compared with the projected emissions according to the INDCs as at 4 April 2016, according to the latest NDCs total global GHG emissions are estimated to be on average around 2.6 Gt CO_2 eq, or 4.6 per cent, lower by 2025, and 6.2 Gt CO_2 eq, or 10.5 per cent, lower by 2030.

134. When considering only the emissions of Parties with new or updated NDCs, emissions are estimated according to the latest NDCs to be 4.8 (4.3–5.2) Gt CO_2 eq, or 9.5 (9.2–9.7) per cent, lower by 2030 than projected according to the INDCs as at 4 April 2016.

[45] Metrics include capabilities; historic and current responsibility; climate justice; share in global emissions; level of per capita emissions; vulnerability to the adverse impacts of climate change; development and/or technological capacity; mitigation potential; cost of mitigation actions; degree of progression or progression beyond the current level of effort; and link to objectives of the Paris Agreement and its long-term global goals.

[46] In this report, the term "progression" is used to refer to the difference between the estimated emission levels associated with implementation of Parties' INDCs communicated to the secretariat as at 4 April 2016 and those according to the NDCs available in the NDC registry as at 23 September 2022. In the figures in this report the progression is shown from INDCs as at 4 April 2016 (grey shading), covered in document FCCC/CP/2016/2, to NDCs as at 23 September 2022 (blue shading), aggregated in this report.

I. Contribution towards achieving the objective of the Convention as set out in its Article 2, and towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement[47]

135. The information necessary to facilitate clarity, transparency and understanding of NDCs, which almost all Parties communicated, includes information on how the NDC contributes towards:[48]

(a) Achieving the objective of the Convention as set out in its Article 2;

(b) Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement.

136. Many Parties (55 per cent) indicated that their level of emissions in the future is expected to fall within the scope of a global emission pathway that is consistent with the goal of keeping the global average temperature increase below 2 or 1.5 °C.

137. In that context, Parties highlighted their national mitigation and/or adaptation efforts, NDC targets, LT-LEDS, development pathways for decoupling emissions from economic growth, and mobilization of domestic and international support.

138. The projected total global GHG emission level for 2025 in line with the latest NDCs is:

(a) 53.7 (49.0–58.4) per cent higher than in 1990 (34.7 Gt CO_2 eq);

(b) 41.3 (37.0–45.7) per cent higher than in 2000 (37.8 Gt CO_2 eq);

(c) 24.4 (20.6–28.2) per cent higher than in 2005 (42.9 Gt CO_2 eq);

(d) 12.6 (9.2–16.1) per cent higher than in 2010 (47.4 Gt CO_2 eq);

(e) 5.0 (1.7–8.2) per cent higher than in 2015 (50.9 Gt CO_2 eq);

(f) 1.6 per cent higher (with a range from 1.6 per cent lower to 4.7 per cent higher) than in 2019 (52.6 Gt CO_2 eq).

139. For 2030, the projected total global GHG emission level in line with the latest NDCs is:

(a) 50.8 (41.4–60.3) per cent higher than in 1990;

(b) 38.7 (30.0–47.4) per cent higher than in 2000;

(c) 22.1 (14.4–29.8) per cent higher than in 2005;

(d) 10.6 (3.6–17.5) per cent higher than in 2010;

(e) 3.0 per cent higher than in 2015 (ranging from 3.5 per cent lower to 9.5 per cent higher);

(f) 0.3 per cent lower than 2019 (ranging from 6.6 per cent lower to 6.0 per cent higher);

(g) 1.9 per cent lower than the projected emissions for 2025 (ranging from 5.1 per cent lower to 1.2 per cent higher).

140. In comparison, the estimated total GHG emission level for 2030 associated with implementation of Parties' INDCs implied a stronger emission increase above historical levels: 68.6 (57.4–79.8) per cent above the 1990 level, 23.6 (15.4–31.8) per cent above the 2010 level and 11.4 (4.0–18.8) per cent above the 2019 level (see figure 6).

141. For Parties that communicated new or updated NDCs, their total GHG emissions are estimated at 45.6 Gt CO_2 eq in 2019, and the total GHG emission level resulting from implementation of their NDCs is estimated to also be around 46.4 (44.9–47.8) Gt CO_2 eq by 2025 and a bit lower at 45.6 (42.7–48.6) Gt CO_2 eq by 2030. Compared with their 2010

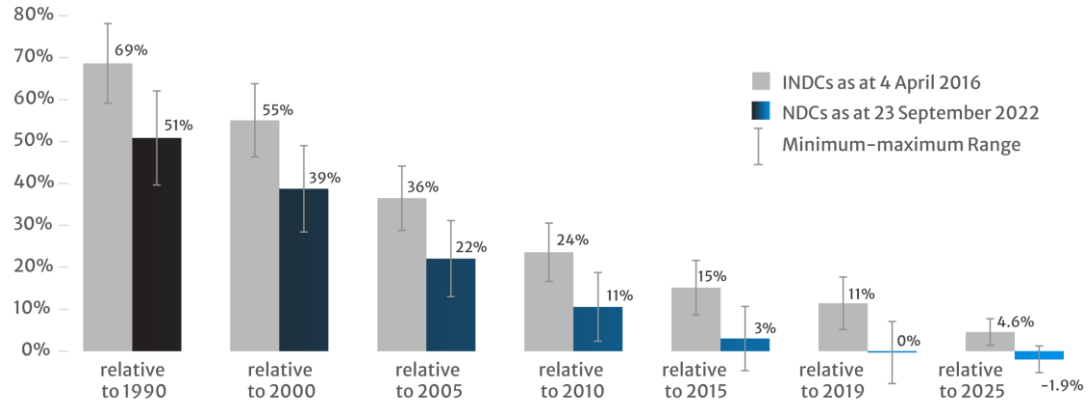
[47] See document FCCC/PA/CMA/2021/8/Add.3 for additional information, including on estimation methods and assumptions used.

[48] See decision 4/CMA.1, annex I, para. 7.

emission level, the emission level of the Parties that communicated new or updated NDCs is projected to be about 12.3 (8.8–15.9) per cent higher by 2025 and 10.5 (3.4–17.6) per cent higher by 2030. Compared with their 2019 emission level, the Parties' emission level is estimated to be 1.6 per cent higher by 2025 (with a range from 1.6 per cent lower to 4.8 per cent higher) and very similar by 2030 (with a range from 6.5 per cent lower to 6.4 per cent higher). This indicates the possibility of peaking of emissions for that group of Parties before 2030, if the lower end of the estimated emission level resulting from implementation of the NDCs, including conditional elements, is achieved.

Figure 6

Projected total emission level in 2030 according to nationally determined contributions compared with historical levels and estimated 2025 level



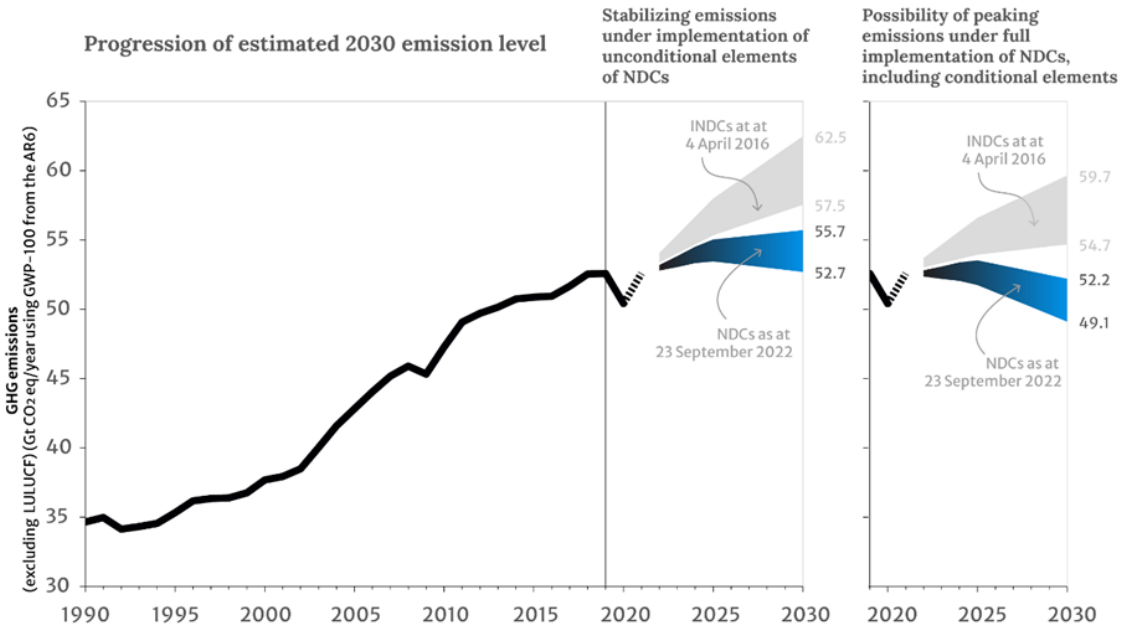
142. The total GHG emission level resulting from implementation of the unconditional elements of the NDCs is projected to be 3.1 (0.2–6.0) per cent higher in 2030 than in 2019; whereas the total GHG emission level resulting from implementation of the NDCs including conditional elements is projected to be 3.6 (0.7–6.6) per cent lower in 2030 than in 2019. This indicates that if all NDCs (including all conditional elements) are fully implemented, there is an even stronger possibility of a peaking of global emissions before 2030 than indicated in the previous version of this report (see figure 7). However, in order to achieve that peaking, the conditional elements of the NDCs need to be implemented, which depends mostly on access to enhanced financial resources, technology transfer and technical cooperation, and capacity-building support; availability of market-based mechanisms; and absorptive capacity of forests and other ecosystems.

143. In comparison, assuming full implementation of INDCs (including all conditional elements), a continuously increasing trend in emissions up until 2030 was estimated, resulting in a global emission level of approximately 8.8 (4.0–13.5) per cent above the 2019 level.[49] Implementation of only the unconditional elements of the INDCs was estimated to result in a global emission level by 2030 of approximately 14.1 (9.4–18.8) per cent above the 2019 level (see figure 7).

[49] This estimate of the aggregate effect of INDCs as at 4 April 2016 was made using the same updated inventory data and methodology as the estimate of the aggregate effect of all NDCs as at 23 September 2022.

Figure 7

Historical and projected total global emissions according to nationally determined contributions



Note: For comparison, global emissions with LULUCF in 2030, when taking into account implementation of the new or updated NDCs (blue areas), are estimated to be 56.4 (54.9–57.9) Gt CO_2 eq considering unconditional elements and 52.8 (51.3–54.4) Gt CO_2 eq assuming full implementation.

144. According to the latest NDCs, the Parties' per capita emissions will equal 6.6 (6.4–6.8) t CO_2 eq in 2025 and, slightly lower, 6.2 (5.8–6.6) t CO_2 eq in 2030, which is, on average, 3.8 (0.8–6.7) per cent lower in 2025 and 9.5 (3.8–15.2) per cent lower in 2030 than in 2019.

145. Many Parties (44 per cent) provided quantifiable information on their long-term mitigation visions, strategies and targets for up until and beyond 2050, many of which communicated LT-LEDS in line with Article 4, paragraph 19, of the Paris Agreement. The total GHG emissions of those Parties are estimated to be 36.6 (34.9–38.4) Gt CO_2 eq in 2030, which is 2 per cent above (with a range from 3 per cent below to 7 per cent above) their emissions in 2010 and 6 (2–11) per cent below their emissions in 2019.

146. On the basis of the information provided on long-term mitigation visions, strategies and targets in the NDCs and LT-LEDS, the total emissions in 2050 of the Parties with long-term targets are estimated at 14.2 (12.3–16.1) Gt CO_2 eq. Mindful of the inherent uncertainty of such long-term estimates, the information indicates that these Parties' total GHG emission level could be 64 (59–69) per cent lower in 2050 than in 2019 and their annual per capita emissions would be 2.4 (2.1–2.7) t CO_2 eq by 2050. Under scenarios of limiting warming to likely below 2 °C (with over 67 per cent likelihood), annual per capita emissions are 2.2 (1.4–2.9) t CO_2 eq; hence the estimated long-term per capita emissions of these Parties are at a level consistent with 2 °C scenarios. However, for scenarios of limiting warming to 1.5 °C (with 50 per cent likelihood by 2100) and achieving net zero emissions this century, annual per capita emissions by 2050 are required to be two to three times lower, at 0.9 (0.0–1.6) t CO_2 eq.

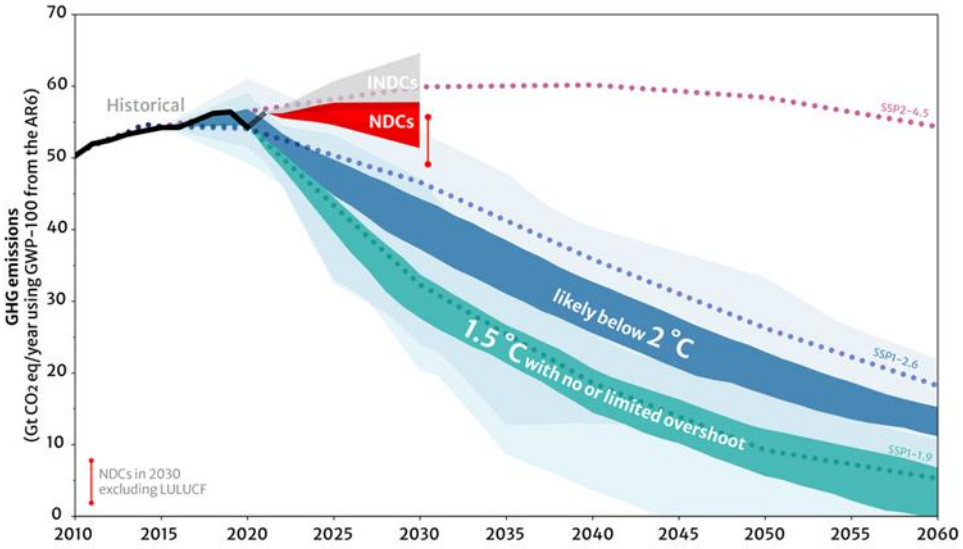
Comparison with scenarios considered by the Intergovernmental Panel on Climate Change

147. The contribution of Working Group III to the AR6 concludes that, in scenarios of limiting warming to 1.5 °C (with over 50 per cent likelihood) with no or limited overshoot, GHG emissions are reduced by 43 (34–60) per cent by 2030 relative to the 2019 level. For the subgroup of scenarios in which net zero emissions are also achieved in line with Article 4, paragraph 1, of the Paris Agreement, the emission reductions are slightly less, at 41 (31–59) per cent by 2030, and for those in which net zero emissions are not achieved this century, the near-term emission reductions until 2030 tend to be slightly stronger, at 48 (35–61) per cent, relative to the 2019 level. In scenarios of keeping warming to likely below 2 °C (with

over 67 per cent likelihood) with mitigation action starting in 2020, emissions in 2030 are 27 (13–45) per cent below the 2019 level (see figure 8).

Figure 8

Comparison of scenarios assessed in the Intergovernmental Panel on Climate Change Sixth Assessment Report with projected total and per capita global emissions according to nationally determined contributions



Note: The assessed global emissions (including LULUCF) for the scenarios assessed in the AR6 are provided for the medium (SSP2-4.5), low (SSP1-2.6) and very low (SSP1-1.9) scenarios of IPCC Working Group I (dotted lines). The IPCC scenario categories are shown with interquartile ranges (dark shading) and 5–95 per cent range (light shading). The two categories were assessed by the IPCC Working Group III to be consistent with a likely chance of staying below 2 °C (over 67 per cent chance) (category C3a; blue shading) and 1.5 °C warming (over 50 per cent chance by 2100) with net zero emissions this century (category C1a; teal shading). The illustrative SSP scenarios were assessed by IPCC to feature end-of-century warming of 2.7 (2.1–3.5) °C for SSP2-4.5 (purple dots), 1.8 (1.3–2.4) °C for SSP1-2.6 (blue dots) and 1.4 (1.0–1.8) °C for SSP1-1.9 (teal dots) (see table SPM.1 in the contribution of Working Group I to the AR6). The level of GHG emissions by 2030 estimated to be in line with the NDCs is 52.4 (49.1–55.7) Gt CO_2 eq excluding LULUCF (red vertical bar) and 54.6 (51.3–57.9) Gt CO_2 eq when – in line with shown IPCC scenarios – including LULUCF.

148. The total global GHG emission level in 2030 taking into account implementation of the latest NDCs is expected to be 10.6 (3.6–17.5) per cent above the 2010 level and 0.3 per cent below the 2019 level (with a range from 6.6 per cent below to 6.0 per cent above). This is lower than the expected level presented in the previous version of this report (15.9 per cent above the 2010 level and 4.7 above the 2019 level).

149. Taken together with the information in figure 8 and paragraphs 142, 147 and 148 above, this implies an urgent need for either a significant increase in the level of ambition of NDCs between now and 2030 or a significant overachievement of the latest NDCs, or a combination of both, in order to attain the cost-effective emission levels suggested in many of the scenarios considered by the IPCC. If emissions are not reduced by 2030, they will need to be substantially reduced thereafter to compensate for the slow start on the path to net zero emissions. The latest IPCC scenario data set does not contain scenarios of still reaching the goal of 1.5 °C with low or limited overshoot after 2030 if emission levels are kept in line with those based on implementation of the current NDCs up until 2030. The AR6 scenario database includes some scenarios of having a likely chance of staying below 2 °C warming without enhancement of NDC ambition before 2030. Those scenarios assume a strongly enhanced annual emission reduction rate of 2.3 (1.5–3.3) Gt CO_2 eq from 2030 to 2040. In scenarios that assume immediate mitigation action before 2030, warming is kept below 2 °C, with lower annual emission reduction rates of around 1.5 (0.7–2.5) Gt CO_2 eq from 2020 to 2030 and 1.1 (0.6–1.7) Gt CO_2 eq from 2030 to 2040 (see figure 8).

150. Comparing the level of emissions suggested in the IPCC scenarios that are categorized to be in line with immediate mitigation action from 2020 and limiting warming to likely

below 2 °C (with an over 67 per cent chance) or below 1.5 °C (with an over 50 per cent chance)[50] with the total emission level by 2030 projected according to the NDCs, there is a large difference. The difference in the case of 2 °C scenarios is 14.2 (10.3–18.0) Gt CO_2 eq in 2030. Assuming all conditional elements of NDCs are implemented, the difference is reduced to 12.5 (8.5–15.9) Gt CO_2 eq. Without any implementation of conditional elements of NDCs, the gap is wider, at 16.0 (12.0–19.4) Gt CO_2 eq. The gap in the case of 1.5 °C scenarios that feature net zero emissions this century is wider still, at 22.6 (19.9–26.9) Gt CO_2 eq. Assuming all conditional elements of NDCs are implemented, the difference in relation to these 1.5 °C scenarios is somewhat narrowed to 20.3 (18.7–25.3) Gt CO_2 eq. Without implementation of any conditional elements, the difference amounts to 23.9 (22.2–28.8) Gt CO_2 eq (see figure 8).

151. Taking into account implementation of NDCs up until 2030, projected global mean temperatures are subject to significant uncertainty owing to the range of emission levels estimated for 2030 resulting from implementation of NDCs (including whether conditional elements are implemented or not), the range of illustrative emission extensions beyond 2030 and inherent climate system uncertainties.[51] The best estimate of peak temperature in the twenty-first century (projected mostly for 2100 when temperature continues to rise) is in the range of 2.1–2.9 °C depending on the underlying assumptions.[52] Without implementation of any conditional elements of NDCs, the best estimate of temperature change is 2.5–2.9 °C warming. Assuming full implementation of NDCs, including all conditional elements, the best estimate for peak global mean temperature is 2.1–2.4 °C.

152. On the basis of the latest NDCs, cumulative CO_2 emissions in 2020–2030 are estimated to be around 430 (420–440) Gt CO_2. Compared with the carbon budget consistent with 50 per cent likelihood of limiting warming to 1.5 °C (500 Gt CO_2), cumulative CO_2 emissions in 2020–2030 based on the latest NDCs would likely use up 86 per cent of the remaining carbon budget. That would leave a post-2030 carbon budget of around 70 (60–80) Gt CO_2, which is equivalent to approximately two years of projected global total CO_2 emissions by 2030. Similarly, in the context of the carbon budget consistent with a likely (67 per cent) chance of keeping warming below 2 °C (estimated by the IPCC to be 1,150 Gt CO_2 from 2020 onward), cumulative CO_2 emissions in 2020–2030 based on the latest NDCs would likely use up 37 per cent of the remaining carbon budget (see figure 9). By comparison,

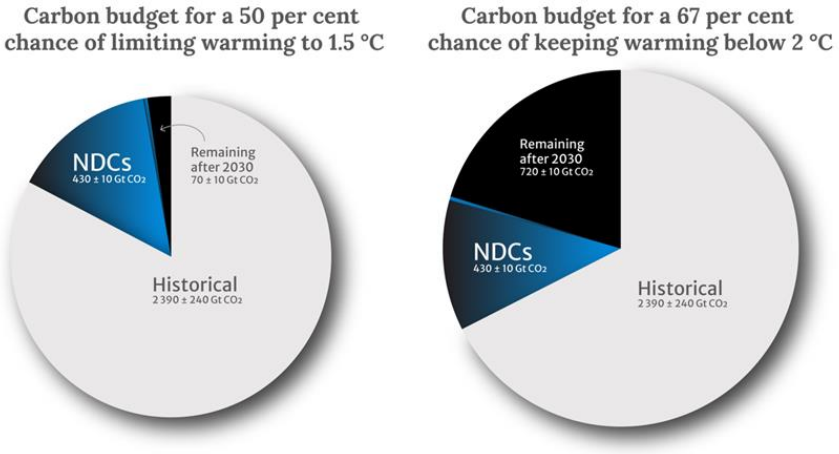
[50] The IPCC scenario categories are “C3a” for likely below 2 °C scenarios and “C1a” for 1.5 °C with no or limited overshoot scenarios with net zero emissions this century (see table SPM.2 in the contribution of Working Group III to the AR6). The differences are calculated as a Monte Carlo sampling with 100,000 members, sampling the minimum–maximum range, assumed as uniform distribution, of the quantifications for 2030 according to the NDCs and randomly the 2030 GHG emission levels of the scenarios within the harmonized and infilled “C1a” or “C3a” IPCC scenario categories. Reported ranges are medians and interquartile ranges.

[51] Temperature projections in this report build on a climate system uncertainty representation calibrated to findings in cross-chapter box 7.1 of the contribution of Working Group I to the AR6, namely the calibrated MAGICC7.3 climate emulator. For the emission time series, infilling and harmonization has been applied as for the scenarios in the contribution of Working Group III to the AR6. Illustrative post-2030 emission extensions project pre-2030 emission trends to up until 2050 and track thereafter the evolution of scenarios of similar to 2030 level emissions in the SR1.5 database using an adapted ‘equal quantile walk’ approach in line with approaches in existing scientific literature. When long-term visions, strategies and targets are taken into consideration for the post-2030 emission extension, the 2030–2050 global emissions are better constrained as 79 per cent of the 2019 global emissions are subject to long-term targets. These more constrained emissions also allow for more constrained (and lower) temperature projections. None of the temperature projections consider a possible overachievement of stated target levels. The stated warming ranges indicate best estimate (50 percentile) or 5 and 95 percentiles of peak temperature across NDC implementation (unconditional elements and full implementation).

[52] The stated emission ranges are ranges across best-estimate (median) emission projections for the range of considered emission scenarios in line with the NDCs. When including the climate uncertainty, the 5–95 percentile uncertainty range covers 1.5–4.3 °C. For the full implementation of NDCs (including all conditional elements), the 5–95 percentile uncertainty range (that includes both emission and climate uncertainties) covers 1.5–3.5 °C. For the scenarios assuming implementation of only unconditional elements of NDCs, the 5–95 percentile uncertainty range covers 1.8–4.3 °C.

total global historical CO_2 emissions up until 2020 are estimated by the IPCC to have amounted to 2,390 (2,150–2,630) Gt CO_2.

Figure 9
Carbon budgets



Note: The contribution of Working Group I to the AR6 provides an estimate of CO_2 emissions from 1850 to 2020 of 2,390 ± 240 Gt CO_2. For staying below 1.5 °C warming relative to the 1850–1900 level, an estimated 500 Gt CO_2 can be emitted from 2020 onward. Under implementation of the NDCs as at 23 September 2022, CO_2 emissions from 2020 to 2030 would amount to 430 ± 10 Gt CO_2, leaving the equivalent of approximately two years of emissions (70 ± 10 Gt CO_2) for thereafter. In the case of having a likely (67 per cent) chance of keeping warming to below 2 °C, the remaining carbon budget is 1,150 Gt CO_2 and approximately 720 ± 10 Gt CO_2 would remain for thereafter.

J. Adaptation

153. Adaptation involves responding to climate change by assessing impacts, vulnerability and risk; planning and implementing adaptation; making contingency arrangements for when impacts occur; addressing losses; and monitoring and evaluating adaptation efforts. Arrangements have been developed under the Convention to facilitate adaptation, in particular NAPs, institutions such as the Adaptation Committee and the Least Developed Countries Expert Group, partnership structures for closing knowledge gaps, and provisions to facilitate support for, and transparency of, adaptation. Under the Paris Agreement, Parties may include an adaptation component in their NDCs.

1. Scope

154. Most Parties (80 per cent) included an adaptation component in their NDCs, some (13 per cent) of which were designated as adaptation communications. In particular, they provided information on vulnerability and national circumstances; efforts to enhance adaptation-related research; adaptation measures, in particular NAPs and sectoral actions; contingency measures; synergies between adaptation and mitigation as well as with other global frameworks; and monitoring and evaluation of adaptation.

155. The information provided illustrates how Parties have advanced adaptation since their previous NDCs. For example:

(a) An increasing number of Parties are providing information on adaptation, indicating the importance attached to adaptation by Parties from all regions and groups;

(b) Many Parties (68 per cent) described the status of their process to formulate and implement NAPs, demonstrating how the NAP has been established as the main national instrument for adaptation and a key source of information for the NDCs.

156. Compared with their previous NDCs, Parties that communicated new or updated NDCs provided more detailed information on, in particular:

(a) Their national frameworks, thereby describing more integrated frameworks, in contrast to the multiple frameworks and individual projects described previously;

(b) Quantified time-bound targets (32 per cent),[53] in contrast to the qualitative and open-ended adaptation objectives provided previously, with some (15 per cent) highlighting the indicator frameworks that they intend to use for monitoring progress;

(c) Mitigation and sustainable development co-benefits of adaptation, as well as on other synergies between mitigation and adaptation.

157. Some Parties (13 per cent) identified the adaptation component as their adaptation communication, a few (2 per cent) provided information organized around the elements identified in the annex to decision 9/CMA.1 and some (10 per cent) announced their intention to prepare an adaptation communication.

2. Impacts, risk and vulnerability

158. Almost all (91 per cent) of the adaptation components described key climatic changes, referring in particular to temperature increase, extreme temperatures, precipitation changes and sea level rise. These were identified as triggering various climate impacts, in particular extreme events (including rainfall events, storms and cyclones), flooding, drought, heatwaves, saltwater intrusion, ocean acidification, coral bleaching, erosion, landslides, fires and thawing ice and permafrost. Parties described how impacts affect vulnerable areas. Of particular concern are agriculture and other aspects of food security, water, biodiversity and ecosystems, health systems, infrastructure (in particular energy, transportation and tourism) and loss of territory, livelihoods and habitats. Parties highlighted groups and areas that are particularly vulnerable. As factors of vulnerability, they highlighted, for example, dependence on climate-sensitive sectors, status as a small island developing State, having complex and vulnerable ecosystems, location of population and infrastructure on coasts, and economic factors, in particular poverty and lack of other institutional, financial and technical capacities. Vulnerability has also increased as a result of the pandemic.

3. Enhancing adaptation-related research for policymaking

159. Almost all Parties (95 per cent) that included an adaptation component considered how to enhance adaptation-relevant research, data, information and monitoring, and ensure that adaptation efforts are informed by science. The adaptation components described efforts to enhance research through, for example, data collection programmes, a national census on impacts, monitoring systems, observation networks, research centres, strengthened weather services, climate and risk modelling, risk maps with climate data and scenarios, and international cooperation. Research efforts focus in particular on oceans, coastal areas, land use and ecosystems. Research related to specific impacts includes developing flood or multi-hazard monitoring systems, sea level research programmes and remote sensing monitoring of hydrometeorological extremes. To ensure that adaptation is guided by robust science and projections, Parties are aiming to develop, for example, integrated climate information systems, open-source data, data pooling and sharing platforms for accessing information, and forecasting tools and scenarios.

4. Pre-emptive adaptation

160. Many Parties (68 per cent) that provided an adaptation component described the process for formulating and implementing their NAP and its status. Some (23 per cent) indicated that they have developed a NAP, while others (45 per cent) identified their intention to do so, including a timeline for completion or update and/or implementation. Some Parties (20 per cent) outlined links between their NAP and NDC, including how the NAP provided the basis for the adaptation component, how both build on the same vulnerability assessment, and how the NAP and NDC can be aligned. Some Parties (32 per cent) described in their adaptation components the scope of their NAP, including in relation to enabling risk and vulnerability analysis; integrating adaptation into development planning; enhancing climate information; strengthening adaptive, institutional, policy and technical capacities; outlining

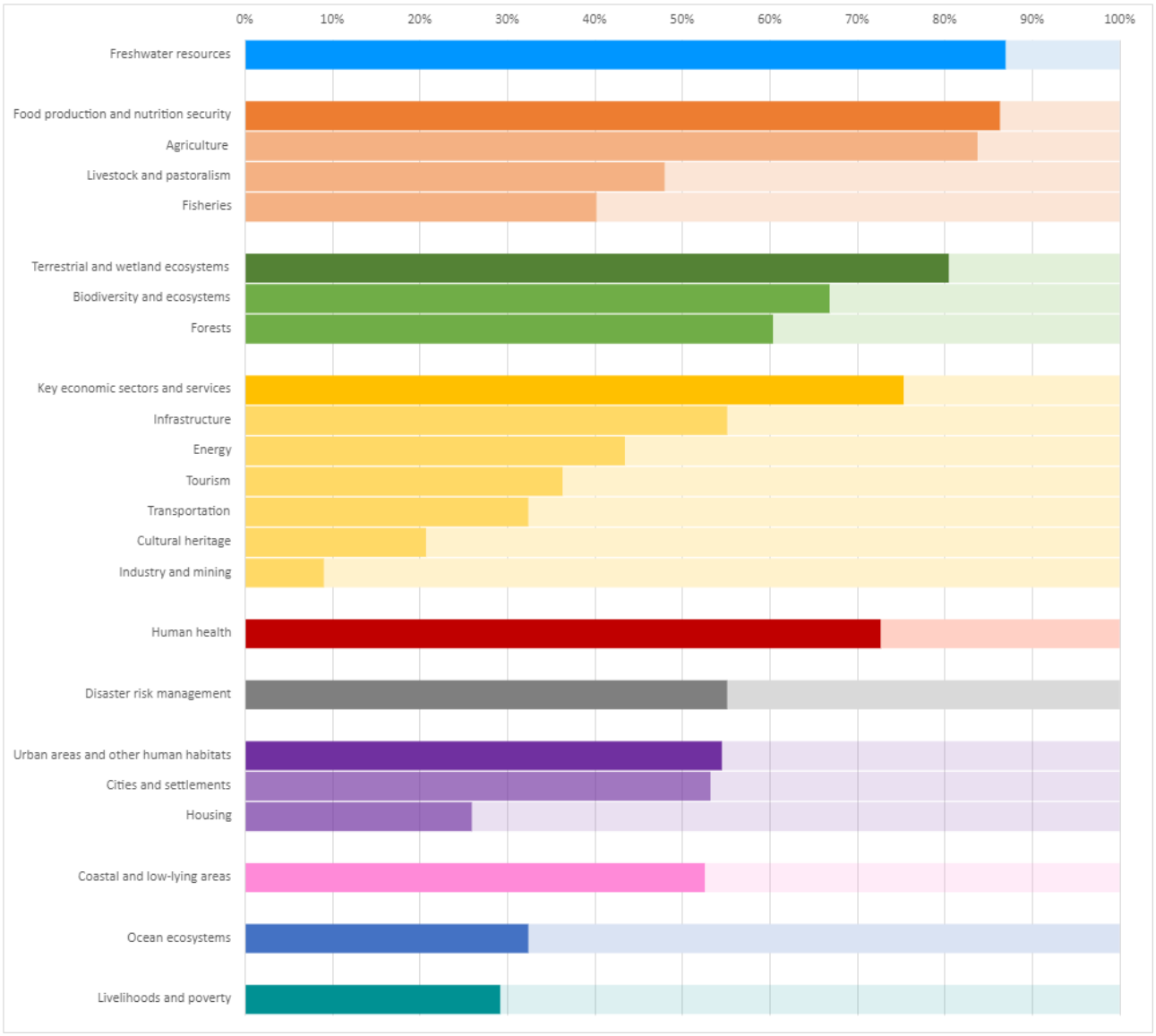
[53] See document FCCC/PA/CMA/2021/8/Add.1 for more details on quantified targets.

and prioritizing adaptation needs, objectives, milestones and actions as well as costs of adaptation; providing a framework for planning, implementation and coordination; integrating adaptation across frameworks and sectors; enhancing financing, engagement and gender-responsiveness; strengthening monitoring and evaluation (including by defining quantifiable goals and indicators for priority sectors); and enabling consideration of co-benefits between mitigation and adaptation.

161. Almost all Parties (94 per cent) with an adaptation component also described other policy frameworks relevant to adaptation, including information on how such frameworks provide a basis for adaptation efforts and how adaptation is integrated into and strengthened under other frameworks, such as adaptation-specific frameworks, national climate plans, local government or community-level plans, sectoral plans relevant to adaptation priorities, disaster risk reduction policies, national and regional development frameworks and UNFCCC frameworks (e.g. national adaptation programmes of action, technology needs assessments and the economic diversification initiative). A few Parties (5 per cent) highlighted the inclusion of adaptation considerations in their national constitution. In addition, a few Parties (2 per cent) declared a climate emergency in their country.

Figure 10

Share of adaptation components of nationally determined contributions referring to specific adaptation priority areas and sectors



162. Parties provided a wide range of information on adaptation in various priority areas (see figure 10). The key efforts in those priority areas are described below.[54]

163. Water scarcity and populations affected by major river floods are projected to increase, and climate change is expected to reduce raw water quality and pose risks to drinking water quality.[55] In most (87 per cent) adaptation components, freshwater resources were identified as a priority area and measures for enhancing availability, efficiency and quality of water supplies were presented, including enhancing or building water infrastructure and water resource plans, strategies and systems. Parties are aiming to strengthen watershed management, efficiency of water use and irrigation. Integrated water resources management, protecting and restoring water-related ecosystems such as forests, wetlands and rivers, and diversifying water supply were highlighted measures. Efforts to promote transboundary water management and cooperation were also mentioned.

164. Climate impacts pose multiple risks to food security, including reduced production of major crops (wheat, rice and maize) and redistribution of marine fisheries.[56] In most (86 per cent) adaptation components, measures for adapting food production systems and ensuring food security were prioritized, encompassing adaptation efforts in the areas of agriculture, livestock and fisheries. In agriculture (84 per cent), adaptation is being pursued via sectoral vulnerability analysis, research, planning, diversification, financial mechanisms and insurance, systems for agroclimatic information and improvements to post-harvest processing. As technical solutions, Parties are focusing on, for example, temperature-, pest-, disease-, flood- and/or drought-resistant crops, seed banks, enhanced pest and disease control, enhanced irrigation and water use, and sustainable, climate-smart and integrated land-use and cultivation methods. Many (48 per cent) adaptation components highlighted measures for enhancing resilience, sustainability and productivity of livestock and pastoralism, including research, disease control, rangeland management, more resilient breeds and feeds, insurance and diversification. The measures for enhancing sustainability of fisheries (40 per cent) involve research, diversification, capacity-building, sustainable management, habitat protection and financial instruments (e.g. insurance).

165. According to current climate change projections, a large proportion of terrestrial species face an increased risk of extinction, with many regions projected to experience increased tree mortality and forest dieback owing to increased temperatures and drought.[57] Most (81 per cent) adaptation components described adaptation efforts to protect terrestrial ecosystems and forests, with Parties aiming in particular to increase protected areas and connectivity, enhance urban biodiversity and forest areas, conserve vulnerable or threatened species, restore degraded lands and ecosystems, and implement sustainable forest management and reforestation.

166. Climate change is expected to have impacts in key economic sectors. For instance, patterns of energy demand will change, particularly in terms of heating and cooling needs, and supply will be affected depending on sources, technologies and regions.[58] Most (75 per cent) of the adaptation components described efforts to adapt key economic sectors and services, in particular infrastructure (55 per cent), energy (44 per cent), tourism (36 per cent), transportation (32 per cent), cultural heritage (21 per cent) and industry and mining (9 per cent). Parties are aiming to increase the resilience of infrastructure through risk assessment for critical infrastructure, building codes and resilience standards, elevating infrastructure, associated education and nature-based solutions. Efforts in the energy sector include analysing and planning for impacts, protecting hydropower resources and installations, diversification (e.g. by expanding clean energy), increasing energy efficiency, and conserving (as a result of standards, labelling and awareness-raising) and storing energy. In tourism, adaptation measures covered mainstreaming climate risk in sectoral policies; using

[54] See document FCCC/PA/CMA/2021/8/Add.1 for additional information on specific measures.

[55] See pp.555–557 of IPCC. 2022. *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. H Pörtner, D Roberts, M Tignor, et al. (eds.). Cambridge: Cambridge University Press. Available at https://www.ipcc.ch/report/ar6/wg2/.

[56] As footnote 55 above, pp.717–719.

[57] As footnote 55 above, pp.200–204.

[58] As footnote 55 above, pp.930–934.

financial instruments and insurance; diversifying towards, for example, green tourism; and protecting key locations (e.g. winter and coastal resorts). Adaptation measures in transportation include enhancing risk evaluation, such as by using geographic information systems, and developing green road infrastructure. Efforts to adapt cultural heritage focus on developing climate risk assessments, designing site-specific adaptation measures, promoting private investment in cultural heritage projects that incorporate adaptation criteria, providing training for heritage professionals to plan for climate change, and promoting integrated management of natural and cultural heritage sites. Adaptation measures in the mining and industrial sectors cover climate-proofing industrial facilities and deploying climate-compatible mining.

167. Climate change is expected to have negative impacts on human health, including increased likelihood of undernutrition as a result of diminished food production; injury, disease and death resulting from more intense heatwaves and fires; and higher risk of food-, water- and vector-borne diseases.[59] Health was identified as an adaptation priority in most (73 per cent) of the adaptation components, with relevant policy frameworks and plans described. The importance of building the capacity of health institutions to address climate change related health impacts and enhancing relevant information-sharing and awareness-raising was highlighted. Enhancing the climate resilience of public health systems was a recurring theme, with Parties aiming to build or improve related infrastructure. Parties are focusing on enhancing prevention, surveillance and monitoring of climate-sensitive diseases, providing training and education to healthcare professionals and communities, and performing vulnerability assessment and mapping. Measures tend to focus on improving sanitation and hygiene practices as well as on responding to climate-sensitive vector- or water-borne diseases, and cardiovascular and respiratory-related diseases.

168. Many (55 per cent) adaptation components described measures for enhancing disaster risk management and early warning systems. Policy and institutional measures include enhancing risk assessment and monitoring, integrating disaster risk management into adaptation efforts, and establishing early warning systems, including a national multi-hazard early warning system, community-based systems, or systems specific to particular areas or sectors (e.g. coasts and rivers, forestry and ecosystems, water, agriculture, transportation, infrastructure, health and tourism) or hazards (e.g. sea level rise, extreme events, disease outbreaks, drought and floods).

169. Many key climate risks will affect urban areas, and major impacts are projected in rural areas on water supply, food security and agricultural income.[60] Human habitats and settlements, including urban areas, were identified as priority areas in many (55 per cent) adaptation components. Efforts in this area are aimed at adapting and enhancing the resilience of both rural and urban settlements, responding to human mobility needs and addressing forced displacement. Measures include conducting research to understand the links between climate and migration; improving housing and other infrastructure; establishing temporary resettlement and shelter programmes to support displaced people; and creating migration opportunities and arrangements for relocation, while ensuring the right to remain. Some efforts are focused on adaptation of cities and urban areas, including through planning, vulnerability and risk assessment, upgrading informal settlements, urban greening and nature-based solutions.

170. Coastal and low-lying areas are increasingly exposed to risks associated with sea level rise as a result of increasing warming, which include saltwater intrusion, flooding and infrastructure damage.[61] Many (53 per cent) adaptation components included measures for protecting coastal and low-lying areas, including river deltas, and addressing sea level rise, erosion and saltwater intrusion. A few identified preventing loss of land as a main adaptation objective, with efforts including assessing and monitoring impacts on and vulnerability of coasts and national plans for coastal protection and management, implementing nature-based solutions for coastal restoration and protection, and defining standards, regulations and

[59] As footnote 55 above, pp.1,044–1,047.
[60] As footnote 55 above, pp.909–915.
[61] As footnote 55 above, pp.382–384.

guidelines for flood control structures. Parties also described efforts to adopt integrated coastal zone management approaches.

171. Ocean ecosystems are being affected by ocean warming, sea level rise, oxygen loss, acidification, intensified marine heatwaves and salinity intrusion. Sea level rise is having an impact on coastal ecosystems through habitat contraction, geographical shift in species, and loss of ecosystem functionality and biodiversity.[62] Some (32 per cent) adaptation components outlined efforts to adapt ocean ecosystems to promote sustainable development while safeguarding oceans. Measures are focused on investing in ocean-related measures and the blue economy and protecting marine and coastal ecosystems, with a focus on coral reefs, and seagrass and mangrove restoration and conservation. To support these measures, Parties identified steps to establish or strengthen related monitoring, surveillance and assessment systems and programmes.

172. Climate change is projected to slow economic growth and make reducing poverty more difficult.[63] Some (29 per cent) adaptation components identified livelihoods as an adaptation priority area. Innovative livelihood strategies, social safeguards and financial assistance for vulnerable groups and economic diversification were identified as being helpful in responding to loss of livelihoods.

5. Contingency measures

173. Contingency measures for dealing with emergencies and impacts that occur regardless of adaptation efforts were highlighted in some (27 per cent) adaptation components, such as strengthening resilience to impacts beyond the limits of adaptation through NAPs; search and rescue, contingency or emergency plans and systems; emergency shelters; humanitarian assistance civil defence; evacuation procedures; emergency or contingency funding; food reserves; disaster insurance schemes; livelihood protection policies; and support for displaced persons. For the agriculture and livestock sectors, Parties referred to insurance and risk management mechanisms as well as post-disaster relief. In the fisheries sector, measures include using financial instruments such as insurance against extreme events and establishing a minimum income for fishers. Measures were also suggested for health, infrastructure, coasts and tourism.

6. Monitoring and evaluation, and understanding progress

174. Many Parties (64 per cent) described in their adaptation components their efforts to enhance monitoring and evaluation of adaptation, such as by focusing on tracking progress, reducing vulnerability, improving efficiency and effectiveness of actions, and NAP implementation and support. Approaches included using systems for integrating climate and adaptation information, sectoral monitoring tools (e.g. for agriculture and tourism) and a platform for integrating tools for monitoring climate risk and low-emission development. Some of those Parties (32 per cent) identified and described their intention to apply global, national or sectoral quantified indicators for monitoring the development of specific climate parameters and impacts, and monitoring progress of specific measures and/or sectoral performance, including towards targets linked to a specific baseline. Quantified targets were identified for all priority sectors.[64]

7. Synergies with mitigation and sustainable development

175. Some Parties (22 per cent) identified in their adaptation components synergies between adaptation and mitigation (mitigation co-benefits of adaptation action are covered in chap. IV.G above). Some Parties (12 per cent) identified in their adaptation components how their mitigation action can generate adaptation co-benefits. For example, in the energy sector, using renewable energy (including offshore) can also enhance energy security and access to water and reduce pollution. Other mitigation measures, such as fuel switching, increasing energy efficiency and forest preservation, afforestation and reforestation, were

[62] As footnote 55 above, pp.381–382.

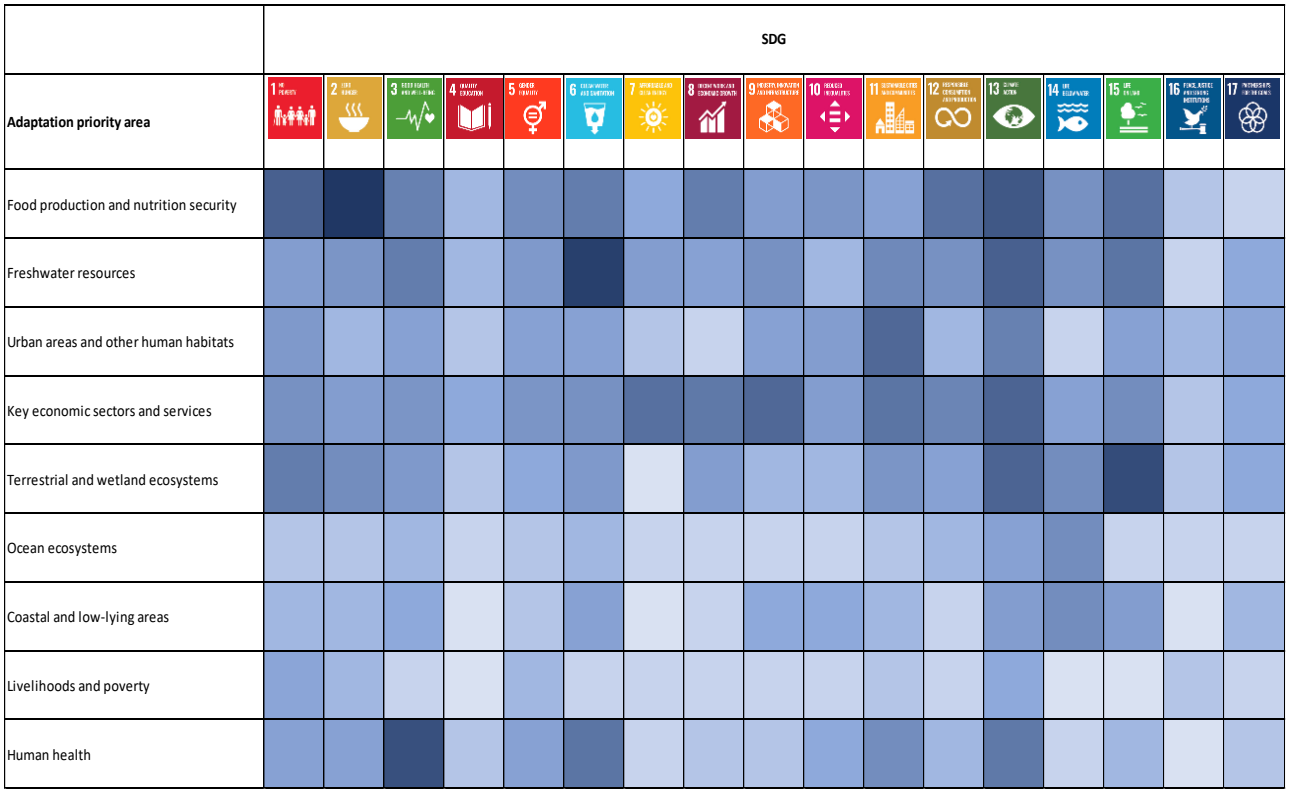
[63] As footnote 55 above, pp.1,174–1,175.

[64] See document FCCC/PA/CMA/2021/8/Add.2 for an overview of more specific targets defined for key adaptation areas.

described as having adaptation co-benefits (e.g. mangrove forests protect coastlines). The health co-benefits of emission reductions were also highlighted.

176. Some Parties (36 per cent) Parties described in their adaptation components how their adaptation actions relate to sustainable development frameworks, describing the overall linkages and synergies between their adaptation efforts and efforts towards the SDGs; identifying the essential role of adaptation in achieving the SDGs, as well as the role of sustainable development in successful adaptation; and emphasizing the importance and benefits of integrating implementation of climate- and SDG-related efforts. Further, some Parties (25 per cent) specified how adaptation in specific priority areas contributes to achieving individual SDGs. Figure 11 provides an overview of the specific synergies identified between adaptation efforts and efforts towards the SDGs.

Figure 11
Synergies between efforts in adaptation priority areas and efforts towards the Sustainable Development Goals identified in nationally determined contributions



Note: The shading reflects how frequently linkages were identified by Parties: the darker the shading, the more frequently linkages were identified.

K. Domestic mitigation measures

1. Priority areas and quantitative mitigation targets

177. In 2019, according to the contribution of Working Group III to the AR6, approximately 34 per cent (20 Gt CO_2 eq) of global GHG emissions came from energy supply, 24 per cent (14 Gt CO_2 eq) from industry, 22 per cent (13 Gt CO_2 eq) from agriculture and LULUCF, 15 per cent (8.7 Gt CO_2 eq) from transport and 5.6 per cent (3.3 Gt CO_2 eq) from buildings.[65] GHG emissions continuously increased in all sectors in 2010–2019, but most rapidly in transport and industry with average annual emission growth rates of about 2.0 and 1.4 per cent respectively.

[65] The contribution of Working Group III to the AR6 also includes estimates of GHG emissions from waste and cross-cutting or other under these sectors.

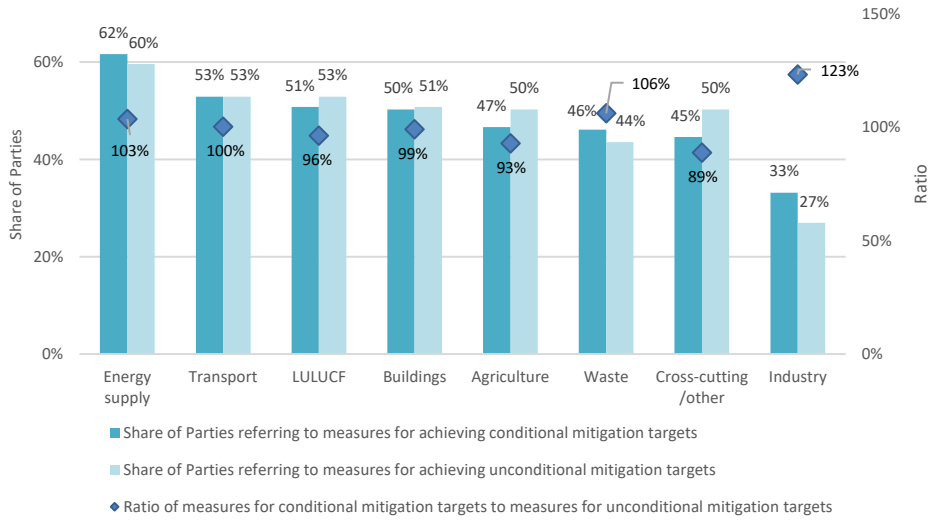
178. Under Article 4, paragraph 2, of the Paris Agreement, Parties shall pursue domestic mitigation measures with the aim of achieving the objectives of their NDCs.

179. Almost all Parties (97 per cent) outlined in their NDCs domestic mitigation measures as key instruments for achieving mitigation targets for their NDCs and/or specific priority areas of national importance, which are often a subset of one or more IPCC sectors, including energy supply, transport, buildings, industry,[66] agriculture, LULUCF and waste. Almost all Parties (92 per cent) communicated measures in the priority area of energy supply (see figure 13). However, a lot fewer (47 per cent) indicated measures in industry, the second largest source of GHG emissions with the second highest annual emission growth rate among the priority areas, although most Parties (75 per cent) included IPPU as a sector in the NDCs.

180. Most Parties (74 per cent) communicated one or more quantitative mitigation targets specific to priority areas or sub-areas, which support and underpin their overall mitigation targets. Such quantitative mitigation targets were provided most frequently for energy supply (57 per cent), followed by LULUCF (43 per cent) and cross-cutting or other (42 per cent), while they were much less frequently indicated in the other priority areas (5–19 per cent). Renewable energy generation targets were the most frequently communicated quantitative mitigation targets specific to sub-areas (54 per cent). As non-CO_2 emission targets for cross-cutting or other, some Parties (16 per cent) specified fluorinated gas emission targets and a few Parties (3 per cent) CH_4 emission targets.

181. Many Parties (67 per cent) communicated domestic mitigation measures for achieving unconditional mitigation targets in their NDCs,[67] many (65 per cent) included measures for achieving conditional mitigation targets and some (23 per cent) reported measures for achieving both unconditional and conditional mitigation targets. Measures for achieving conditional mitigation targets were most frequently identified by Parties in energy supply, followed by transport and LULUCF (see figure 12). Parties reported measures for achieving conditional mitigation targets 23 per cent more frequently than measures for achieving unconditional mitigation targets in relation to industry.

Figure 12
Share of Parties referring to measures for achieving conditional and unconditional mitigation targets in priority areas in nationally determined contributions



Note: If a Party communicated more than one measure for a specific priority area, it was counted as one Party communicating measures for that area.

[66] Covers measures targeting emissions from fuel use in industry, industrial process emissions and emissions from product use. For the scopes of the other priority areas, including cross-cutting or other, see document FCCC/PA/CMA/2021/8/Add.2.

[67] Such measures refer to those for achieving unconditional mitigation targets and those for achieving both unconditional and conditional mitigation targets. The same approach applies to measures for achieving conditional mitigation targets.

2. Mitigation options under priority areas

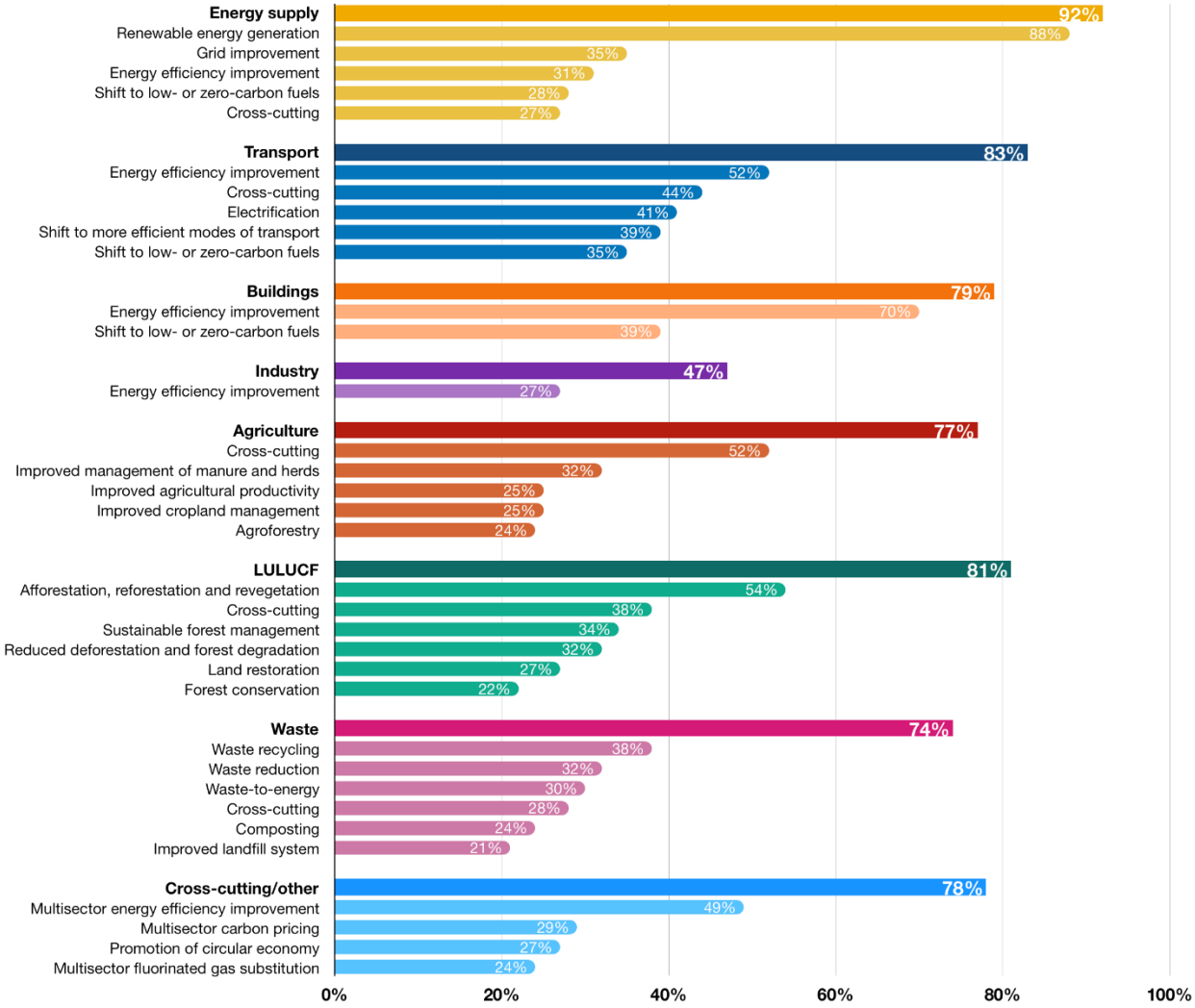
182. Renewable energy generation was the most frequently indicated mitigation option, followed by improving energy efficiency of buildings; afforestation, reforestation and revegetation; improving energy efficiency of transport; and cross-cutting measures in agriculture (see figure 13). Some Parties (21 per cent) communicated quantitative targets for the share of renewables in electricity generation by 2030 (ranging from 15 to 100 per cent); and many of them (13 per cent), accounting for 1.8 per cent of total global electricity generation in 2020[68] and 1.9 per cent of global GHG emissions in 2019, communicated target shares falling within or above the interquartile range in the SR1.5 of 47–65 (median 54) per cent for the global share of renewables in electricity generation by 2030 consistent with 1.5 ºC pathways with no or limited overshoot.

183. For the Parties that communicated new or updated NDCs, as in the previous NDCs, renewable energy generation was the most frequently indicated mitigation option and focus of quantitative mitigation targets, with the share of Parties indicating this option and targets sharply increasing from 59 to 91 per cent and from 37 to 56 per cent, respectively, since the previous NDCs.

[68] Estimated on the basis of data from IEA. 2022. *World Energy Balances*. Paris: IEA. All rights reserved; as modified by the secretariat. IEA data used in this report are subject to IEA terms and conditions, available at www.iea.org/terms.

Figure 13

Share of Parties referring to the specific priority areas and frequently indicated mitigation options in national determined contributions



Note: If a Party communicated more than one measure for a specific priority area or one of the frequently indicated mitigation options, it was counted as one Party communicating measures for that area or option respectively.

184. In the priority areas related to supply and end use of energy (such as energy supply, transport, buildings and industry), renewable energy generation, grid improvement and shifting to low- or zero-carbon fuels including biofuels and hydrogen were frequently or widely indicated as key mitigation options relevant to reducing the carbon intensity of electricity and fuels (see figure 13);[69] electrification was mentioned in relation to increasing the share of electricity in final energy supplied and switching fuel use from fossil fuels to electricity in end-use sectors such as transport and buildings, with the sectors benefiting from electricity with reduced carbon intensity for further decarbonization; and improving energy efficiency, grid improvement and shifting to more efficient modes of transport were often referenced in relation to reducing energy demand.

185. More broadly across all priority areas, Parties frequently indicated waste reduction, waste-to-energy, improved management of manure and herds, and fluorinated gas substitution as key mitigation options relevant to reducing non-CO_2 emissions, including CH_4 (see figure 13). In addition, Parties often communicated mitigation options related to circular

[69] The contribution of Working Group III to the AR6 states that, although global carbon intensity of energy supply decreased by 0.3 per cent annually between 2010 and 2019, the annual rate of reduction of carbon intensity required for 1.5 °C pathways with no or limited overshoot and 2 °C pathways is about 7.7 and 3.5 per cent respectively.

economy, including reducing and recycling waste, and waste-to-energy. Measures related to multisector carbon pricing were frequently identified as efficient ways of incentivizing low-carbon behaviours and technologies by putting a price on GHG emissions.

186. In terms of mitigation options relevant to enhancing carbon sequestration in soils or vegetation,[70] Parties most frequently indicated afforestation, reforestation and revegetation; sustainable forest management; and reduced deforestation and forest degradation (see figure 13). Some developing country Parties (31 per cent) referred to reducing deforestation, including through efforts to implement REDD+ activities. Parties highlighted the importance of socioeconomic and environmental non-carbon benefits resulting from these mitigation options, including for adaptation.

187. Parties identified measures for achieving conditional mitigation targets in their NDCs more frequently than measures for achieving unconditional mitigation targets by 133 per cent in relation to waste-to-energy, 116 per cent for composting, 100 per cent for cross-cutting under waste, 88 per cent for improved landfill system and 70 per cent for agroforestry.

188. According to the contribution of Working Group III to the AR6, mitigation options costing USD 100/t CO_2 eq or less (with estimated net emission reduction potential of 31–44 Gt CO_2 eq/year) could reduce global GHG emissions by at least half of the 2019 level by 2030, and options costing less than USD 20/t CO_2 eq account for over 50 per cent of the net emission reduction potential.[71] Parties reported such cost-effective mitigation options in their NDCs (see figure 14). Mitigation options costing less than USD 20/t CO_2 eq with the highest estimated net emission reduction potential (in parentheses) include:

(a) Solar energy[72] (3.3 Gt CO_2 eq/year), with many Parties (49 per cent), accounting for 52 per cent of total global electricity generation from fossil fuels in 2020[73] and 51 per cent of global GHG emissions in 2019, communicating corresponding measures, such as developing several large-scale photovoltaic power plants;

(b) Wind energy (3.08 Gt CO_2 eq/year), with some Parties (35 per cent), accounting for 51 per cent of total global electricity generation from fossil fuels in 2020[74] and 50 per cent of global GHG emissions in 2019, indicating corresponding measures, including increasing installed wind power capacity;

(c) Reduced conversion of forests and other ecosystems (2.28 Gt CO_2 eq/year), with some Parties (36 per cent), accounting for 37 per cent of total global forest cover in 2020[75] and 12 per cent of total global wetland area,[76] reporting corresponding measures, such

[70] In the contribution of Working Group III to the AR6, carbon dioxide removal, such as through afforestation and reforestation, and bioenergy with carbon dioxide capture and storage, is considered essential on 1.5 °C pathways with no or limited overshoot and 2 °C pathways to compensate for hard-to-abate residual emissions after substantial direct emission reductions in all sectors and to achieve net negative CO_2 emissions in the long term.

[71] The contribution of Working Group III to the AR6 presents mitigation potential as net emission reduction potential compared with the current-policy scenarios for 2015–2019. It refers to the costs as net lifetime costs of avoided GHG emissions relative to a reference technology. Costs of some mitigation options in figure 14, such as efficient lighting, appliances and equipment and fuel-efficient light-duty vehicles, are estimated to be less than zero.

[72] According to the contribution of Working Group III to the AR6, despite a sharp decline in their unit costs since 2010, solar and wind energy accounted for only 8 per cent of total global electricity generation in 2019, despite 1.5 °C pathways with no or limited overshoot requiring 100 per cent low- or zero-carbon electricity generation by 2050.

[73] As footnote 68 above.

[74] As footnote 68 above.

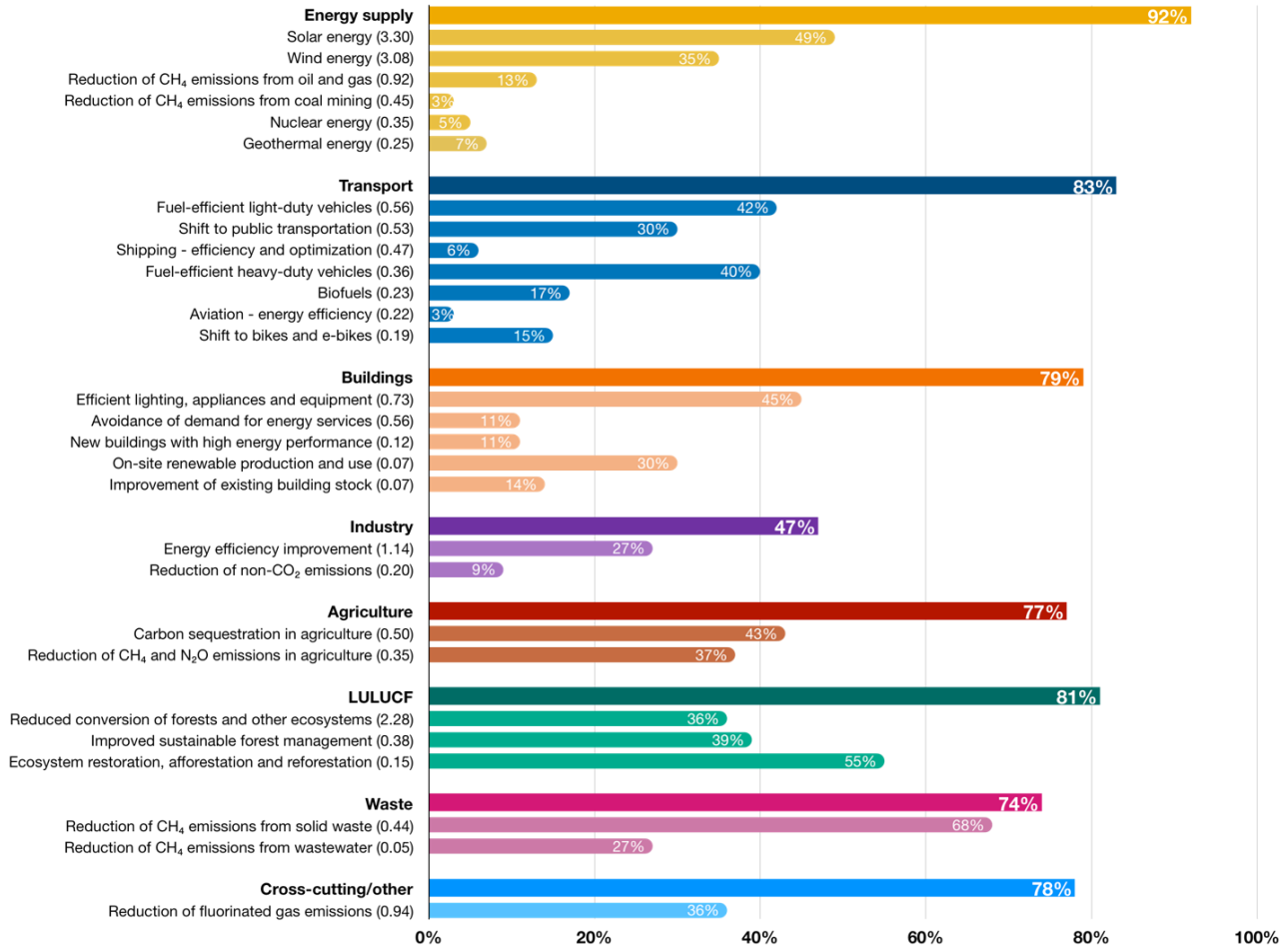
[75] Estimated on the basis of data from the Food and Agriculture Organization of the United Nations. 2020. *Global Forest Resources Assessment 2020*. Rome: Food and Agriculture Organization of the United Nations. Available at www.fao.org/documents/card/en/c/ca9825en; as modified by the secretariat.

[76] Estimated on the basis of data from the Center for International Forestry Research global wetlands map, available at https://www2.cifor.org/global-wetlands/ (accessed 27 July 2022); and Jiren Xu et. al. 2018. PEATMAP: Refining estimates of global peatland distribution based on a meta-analysis, *CATENA*: 160. pp.134–140. Available at https://core.ac.uk/download/pdf/227455185.pdf; as modified by the secretariat.

as drafting and implementing zero-deforestation agreements with landowners and stakeholders, and protecting coastal wetlands reported in the national wetlands inventory;

(d) Energy efficiency improvement in industry (1.14 Gt CO_2 eq/year), with some Parties (27 per cent), accounting for 58 per cent of total global final energy consumption in industry in 2020[77] and 49 per cent of global GHG emissions in 2019, identifying corresponding measures, including introducing grant schemes to cover the high upfront cost of investing in improving energy efficiency.

Figure 14
Share of Parties referring to mitigation options with high mitigation potential costing below USD 20/t CO_2 eq in 2030 in nationally determined contributions



Note: If a Party communicated more than one measure for a mitigation option, it was counted as one Party communicating measures for that option. The estimated net emission reduction potential (in Gt CO_2 eq/year) of each mitigation option costing below USD 20/t CO_2 eq in 2030 is presented in parentheses, estimated on the basis of data from the contribution of Working Group III to the AR6, which states that mitigation potentials and costs of individual technologies in a specific context or region may differ greatly from the provided estimates and are associated with uncertainties.

189. For the mitigation options with high mitigation potential costing USD 20/t CO_2 eq or less (see figure 14), Parties communicated measures for achieving conditional mitigation targets in their NDCs more frequently than measures for achieving unconditional mitigation targets by 91 per cent in relation to reducing CH_4 emissions from wastewater, 80 per cent for avoidance of demand for energy services, 71 per cent for biofuels, 69 per cent for wind energy, 67 per cent for geothermal energy, 65 per cent for efficient lighting, appliances and equipment, and 64 per cent for solar energy.

190. Parties identified in their NDCs mitigation options relevant to those referred to in paragraphs 36–38 of the Glasgow Climate Pact, including:

[77] As footnote 68 above.

(a) Phasing down unabated coal power generation. Coal-fired power generation was the single largest source of energy-related CO_2 emissions globally in 2018, accounting for 10 Gt CO_2 or 29 per cent.[78] A few Parties (9 per cent), accounting for 58 per cent of total global electricity generation from coal in 2020[79] and 35 per cent of global GHG emissions in 2019, indicated corresponding measures, such as replacing coal-fired power plants with combined-cycle gas power plants. A few of those Parties (3 per cent) mentioned the need and/or measures for a just transition for communities and workers dependent on coal. Moreover, a few of those Parties (3 per cent), accounting for 0.7 per cent of total global electricity generation from coal in 2020[80] and 2.6 per cent of global GHG emissions in 2019, communicated targets for the phase-down that fall within or above the range in the contribution of Working Group III to the AR6 of 67–82 per cent below the 2020 level by 2030 consistent with 1.5 °C pathways,[81] such as phasing out use of unabated coal to produce electricity by 2025;

(b) Phasing out inefficient fossil fuel subsidies and reforming fossil fuel subsidies.[82] A few Parties (4 per cent), accounting for 3.2 per cent of total global fossil fuel subsidies in 2020[83] and 2.8 per cent of global GHG emissions in 2019, identified corresponding measures, including gradually phasing out subsidies on electricity and fuels in tandem with social protection measures for low-income households;

(c) Reducing CH_4 emissions[84] from fossil fuel exploration, production and distribution, which has estimated net emission reduction potential of 0.92 Gt CO_2 eq/year for oil and gas and 0.45 Gt CO_2 eq/year for coal mining at costs below USD 20/t CO_2 eq in 2030 (see figure 14). Some Parties (14 per cent), accounting for 56 per cent of total global CH_4 emissions from energy in 2021[85] and 44 per cent of total global CH_4 emissions in 2019, communicated corresponding measures, such as achieving zero routine flaring by 2030, with a long-term goal to reduce flaring to the absolute minimum;

(d) Reducing CH_4 and N_2O emissions in agriculture, which has estimated net emission reduction potential of 0.35 Gt CO_2 eq/year at costs below USD 20/t CO_2 eq in 2030 (see figure 14). Some Parties (37 per cent), accounting for 36 per cent of total global CH_4 emissions from agriculture in 2019,[86] 45 per cent of total global CH_4 emissions in 2019 and 53 per cent of total global N_2O emissions in 2019, communicated corresponding measures, such as providing training on better ruminant livestock feeding for key stakeholders to

[78] See IEA global energy-related CO_2 emissions by sector, available at https://www.iea.org/reports/the-role-of-ccus-in-low-carbon-power-systems/the-co2-emissions-challenge, all rights reserved (accessed 11 July 2022).

[79] As footnote 68 above.

[80] As footnote 68 above.

[81] In the contribution of Working Group III to the AR6, coal consumption without deployment of carbon dioxide, capture and storage or carbon dioxide, capture, use and storage is projected to fall by 67–82 per cent below the 2020 level by 2030 on 1.5 °C pathways with no or limited overshoot.

[82] Removing fossil fuel subsidies is projected in the contribution of Working Group III to the AR6 to reduce global GHG emissions by up to 10 per cent by 2030 as well as yielding other environmental and financial benefits.

[83] Estimated on the basis of data from the IEA fossil fuel subsidies database, available at www.iea.org/data-and-statistics/data-product/fossil-fuel-subsidies-database, all rights reserved (accessed 28 July 2022), and the Organisation for Economic Co-operation and Development fossil fuel support data and country notes, available at www.oecd.org/fossil-fuels/countrydata/ (accessed 28 July 2022); as modified by the secretariat. "Total global fossil fuel subsidies" refers to those of 81 economies, representing 94 per cent of total global energy supply from fossil fuels and 92 per cent of global total final consumption of fossil fuels in 2020 (as footnote 68 above).

[84] According to the contribution of Working Group III to the AR6, for 1.5 °C pathways with no or limited overshoot, global CH_4 emissions need to be reduced by 34 per cent below the 2019 level by 2030, including to lower peak warming.

[85] Estimated on the basis of data from IEA Methane Tracker Data Explorer, available at https://www.iea.org/articles/methane-tracker-data-explorer, all rights reserved (accessed 17 July 2022); as modified by the secretariat. Energy supply is estimated to be the second largest source of anthropogenic CH_4 emissions globally, responsible for 38 per cent, after agriculture (40 per cent).

[86] As footnote 85 above.

increase uptake of leguminous fodder shrubs, and constructing biodigesters in rural farms to replace fuelwood consumption with biogas from anaerobic digestion of manure;

(e) Ecosystem restoration, afforestation and reforestation, which has estimated net emission reduction potential of 0.15 Gt CO_2 eq/year at costs below USD 20/t CO_2 eq in 2030 (see figure 14) and 2.18 Gt CO_2 eq/year at costs below USD 100/t CO_2 eq in 2030. Many Parties (55 per cent), accounting for 61 per cent of total global forest cover in 2020[87] and 30 per cent of total global wetlands,[88] communicated corresponding measures, such as reforesting about 12,000 ha annually through community and school programmes and mobilizing private investment in peat restoration through a package of reforms to the national peatland code.

191. Of the Parties that communicated new or updated NDCs after the adoption of the Glasgow Climate Pact, the shares that indicated the mitigation options referred to in paragraph 190(a–e) above were 29, 13, 25, 42 and 75 per cent, respectively, which are 14–225 per cent higher than the corresponding shares of the 193 Parties in the latest available NDCs. In particular, the shares of those Parties that indicated phasing down unabated coal power generation and phasing out inefficient fossil fuel subsidies and reforming fossil fuel subsidies are more than triple the corresponding shares of the 193 Parties.

192. Parties reported measures for achieving conditional mitigation targets in their NDCs more frequently than measures for achieving unconditional mitigation targets by 49 per cent in relation to reducing CH_4 and N_2O emissions in agriculture, 32 per cent for ecosystem restoration, afforestation and reforestation, and 13 per cent for reducing CH_4 emissions from fossil fuel exploration, production and distribution.

3. Coherence and synergies with development priorities

193. Many Parties (64 per cent) highlighted policy coherence and synergies between their mitigation measures and development priorities. The share of Parties highlighting policy coherence and synergies has increased from 54 to 72 per cent in the new or updated NDCs compared with the previous NDCs.

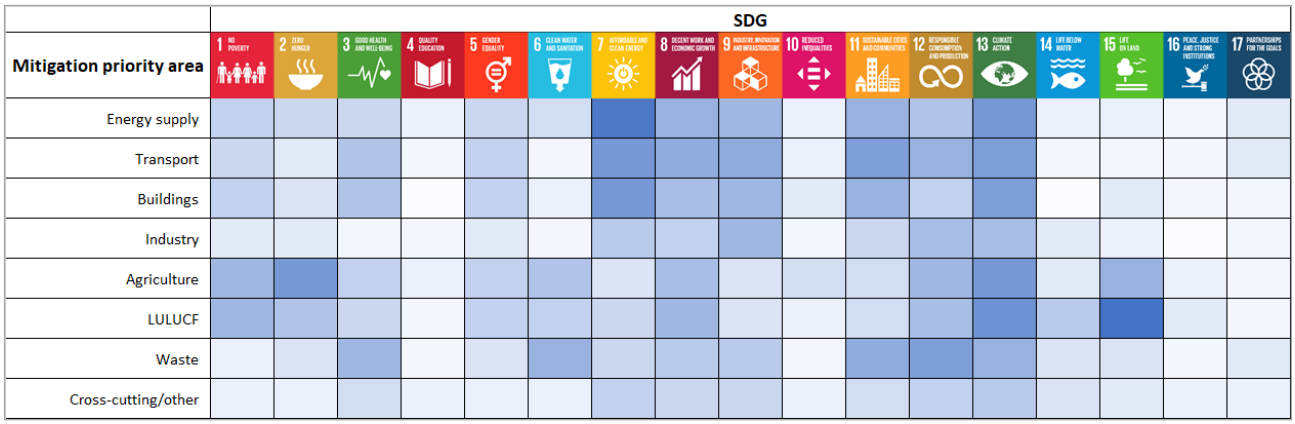
194. Half of those Parties, or 34 per cent of Parties, identified domestic mitigation measures in the context of the longer-term measures and targets set out in their LT-LEDS and/or other relevant national long-term low-emission development strategies or laws, including by identifying domestic mitigation measures for the NDC on the basis of programmes of action or mitigation options set out in the LT-LEDS; by requiring the Government to report, review and calibrate measures in the NDC at least once every five years to ensure progress towards 2050 or net zero targets; and by establishing an independent statutory body that advises the Government on setting mitigation targets and measures for the NDC in the context of the legally binding net zero target.

195. In addition, some Parties (22 per cent) clarified the alignment between their mitigation measures and efforts towards the SDGs, highlighting the multiple co-benefits of their measures for sustainable development and the cost-effectiveness of their measures in relation to sustainable development under fiscal constraints, including those due to the pandemic. For example, some Parties (15 per cent) communicated one or several specific SDGs in relation to which there are synergies with their priority areas or mitigation measures (see figure 15), with energy supply measures contributing to achieving SDG 7 (affordable and clean energy) (11 per cent) and LULUCF measures contributing to achieving SDG 15 (life on land) (11 per cent) most frequently indicated. On the other hand, a few Parties (1 per cent) clarified trade-offs between their priority areas or mitigation measures and specific SDGs, such as potential forest degradation related to SDG 15 from renewable energy development, to institute necessary safeguard mechanisms for implementing the mitigation measures.

[87] As footnote 75 above.
[88] As footnote 76 above.

Figure 15

Synergies between efforts in mitigation priority areas and efforts towards the Sustainable Development Goals identified in nationally determined contributions



Note: The shading reflects how frequently linkages were identified by Parties: the darker the shading, the more frequently linkages were identified.

196. Further, some Parties (22 per cent) highlighted synergies between their mitigation measures and green recovery from the impacts of the pandemic, such as implementing an economic sustainability plan that includes some of the mitigation measures in the NDC that create green jobs, including scaling up solar power generation in non-electrified regions.

L. Means of implementation

197. Almost all Parties (92 per cent) provided information on some or all means of implementation in their NDCs, although the structure and depth of that information varied significantly. While some Parties included a dedicated section on means of implementation or separate sections on finance, technology and/or capacity-building, many mentioned or referred to aspects of means of implementation in other sections of their NDCs.

198. Some Parties provided information on specific climate finance, technology and capacity-building projects, including, for some, detailed information on financial and technical requirements, implementing entities and time frames.

199. Some Parties highlighted South–South, triangular or regional cooperation as support mechanisms for NDC implementation, including for specific aspects of financial assistance, capacity-building and technology development and transfer.

1. Finance

200. Almost all Parties (92 per cent) provided information on finance as a means of NDC implementation, with most (69 per cent) characterizing finance in terms of international support needed and some (22 per cent) mentioning finance in relation to domestic implementation only. A few (6 per cent) mentioned finance in the context of providing financial support for other countries' NDC implementation. Many Parties (47 per cent) provided qualitative information on how finance will be used as a means of implementation either in general or through specific actions for financing mitigation or adaptation, such as earmarking public expenditure, establishing climate funds or supporting financial systems. Many Parties (47 per cent) included quantitative information on financial investment or expenditure to support their NDCs, such as on financing specific technology development funds, economy-wide budgetary programmes or specific projects and needs for financial support.

201. Many Parties (44 per cent) provided quantitative estimates of financial support needs, which were often expressed as total amounts over the time frame of the NDC. Some (34 per cent) of them provided updated quantitative estimates of financial support needs and some others provided estimates for the first time in their new or updated NDCs. Most of those

Parties differentiated quantitative estimates for conditional actions reliant on international support from those for unconditional actions that may be financed from domestic sources.

202. Some Parties (38 per cent) provided information on financial support needs across mitigation and adaptation themes or sectors. Mitigation finance is needed across renewable energy, energy efficiency, transport and forestry, while adaptation finance is needed for activities related to water, agriculture, coastal protection and resilience.

2. Technology development and transfer

203. With regard to information on technology development and transfer for NDC implementation, most Parties (78 per cent) covered qualitative aspects and some (33 per cent) provided information on both qualitative and quantitative aspects.

204. Many Parties (64 per cent) referred to technology development and transfer in the context of actions that inherently address both adaptation and mitigation, and about the same number (63 per cent) included information with a focus on mitigation. Many Parties (52 per cent) made reference to climate technology for adaptation. Almost all Parties (99 per cent) reported technology-related elements that are directly related to adaptation or address both mitigation and adaptation.

205. In terms of specific technologies that Parties intend to use for achieving their adaptation and mitigation targets, the most frequently identified were related to the energy sector (e.g. enhancing use of renewable energy and clean hydrogen, and decarbonizing power systems and boosting their storage capacity), followed by agricultural technologies (e.g. climate-smart agriculture and smart irrigation technologies) and technologies related to water and waste management (e.g. waste-to-energy technologies and circular economy practices). There is a growing focus on digital technologies for improving monitoring and data and information systems, including for forecasting and early warning systems, and on ecosystem-based technologies and practices, in particular across the agrifood system.

206. Technology needs mentioned by Parties were mainly (42 per cent) of a cross-cutting nature, addressing both adaptation and mitigation, followed by those focused on mitigation (33 per cent) or adaptation (25 per cent). In most cases (41 per cent) the technology needs were associated with multiple sectors (e.g. promoting cross-sectoral efficiency in use of energy and materials) or were stated in general terms. A few Parties (3 per cent) cited technology needs related to upgrading and maintaining critical infrastructure, including related to human health, particularly in the context of the pandemic and disaster recovery. Some Parties (13 per cent) referenced technology needs assessments and technology action plans for identifying priority technology needs for adaptation and mitigation.

207. Actions concerning policy, regulatory and legal aspects commonly referred to by Parties include developing or updating policies and strategies to promote technology innovation, including by establishing funds for this purpose, promoting use of renewable energy, and accelerating adoption and transfer of low-emission and climate-resilient technologies (e.g. zero-emission mobility). Increasingly, Parties are referring to policy and regulatory measures for promoting low-carbon and climate-resilient technologies towards implementing net zero strategies and decarbonization pathways at the national and sectoral level.

208. Some Parties (30 per cent) included information related to technology innovation, research and development, for instance with regard to promoting collaboration between countries and promoting institutions, mechanisms, tools and business models that foster progress in this area. In most cases, identified measures were multisectoral (37 per cent), followed by agriculture (15 per cent) as the most cited area of focus for technology innovation, research and development.

209. Some Parties (10 per cent) included specific information on their ongoing or intended provision of support to developing country Parties, including through South–South cooperation. In most cases the support targeted multiple sectors or was referred to in broad terms as relating to reducing GHG emissions and/or enhancing climate resilience.

3. Capacity-building

210. Most Parties (74 per cent) identified capacity-building as a prerequisite for NDC implementation. Many Parties (46 per cent) provided a specific section containing information on capacity-building needs and gaps. Capacity-building needs were identified for formulating policies, integrating mitigation and adaptation into sectoral planning processes, accessing finance, and providing the necessary information for clarity, transparency and understanding of NDCs.

211. With regard to the thematic areas of their capacity-building needs, many Parties (54 per cent) provided information on cross-cutting needs, many (42 per cent) expressed needs for adaptation and some others (34 per cent) needs for mitigation. Also, a few Parties (3 per cent) indicated capacity-building needs for addressing loss and damage as an independent pillar. In addition, a few Parties (3 per cent) indicated the importance of capacity-building in the context of risk and vulnerability assessment. Many Parties (62 per cent) identified capacity-building needs that were multisectoral or intersectoral, followed by some others that identified needs relating to specific sectors, including but not limited to agriculture, buildings and infrastructure, disaster prevention and preparedness, ecosystems, energy, health, transport and water.

212. With regard to the type of capacity-building needed, many Parties (66 per cent) referred to cross-cutting capacity-building needs, mainly for facilitating training, education, skills development, awareness-raising, research, innovation and development, as well as just transition of the workforce. Some Parties (27 per cent) emphasized the importance of institutional capacity-building to ensure the sustainability and retention of capacities at the national level.

213. In the new or updated NDCs, compared with in the previous NDCs, a significantly increased share of Parties (37 per cent) referred to capacity-building in specific sections. Moreover, the share of Parties (70 per cent) indicating that capacity-building needs were mostly of a multisectoral nature has risen significantly. The share of Parties (40 per cent) expressing capacity-building needs for adaptation has also increased, this being the thematic area in which most capacity-building needs were expressed. Further, the number of Parties expressing capacity-building needs for women, youth and vulnerable groups to expand their participation in decision-making processes has increased.