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Report of the Ad Hoc Working Group on the Durban Platform for Enhanced Action

Synthesis report on the aggregate effect of the intended nationally determined contributions

Note by the secretariat

Summary

This document presents a synthesis report on the aggregate effect of the 119 intended nationally determined contributions (INDCs) communicated by 147 Parties by 1 October 2015. It provides estimates of the aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the implementation of those INDCs. Those levels are compared with the emission levels in 1990, 2000 and 2010 as well as with emission trajectories consistent with (1) action communicated by Parties for the pre-2020 period, and (2) holding the average global temperature rise below 2 °C above pre-industrial levels. This report identifies and discusses trends that indicate opportunities for enhanced action to address climate change in the longer term. In addition, it synthesizes information relating to the adaptation component of the INDCs communicated by 100 Parties.

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Contents

I. Summary

A. Mandate and approach

1. This document is a synthesis report on the aggregate effect of the intended nationally determined contributions (INDCs) communicated by Parties in response to the invitation made by the Conference of the Parties (COP) in decisions 1/CP.19 and 1/CP.20.

2. The COP, by decision 1/CP.20, paragraph 16(b), requested the secretariat to prepare by 1 November 2015 a synthesis report on the aggregate effect of the INDCs communicated by Parties by 1 October 2015. This report contains information compiled and synthesized from the 119 INDCs of 147 Parties communicated by this date. An online technical annex contains further detailed information on the methodology used for the quantitative assessment contained in this report.[1]

3. In response to the mandate given to the secretariat, this report provides an estimate of the aggregate greenhouse gas (GHG) emission levels in 2025 and 2030 resulting from the implementation of the INDCs. The estimates have been calculated both in annual and cumulative terms. It also synthesizes information relating to the adaptation component of the INDCs communicated by Parties.

4. Given that not all Parties had communicated an INDC by 1 October 2015, and that not all of the INDCs cover all gases and sectors, the estimated aggregate level of emissions covered by the INDCs is a subset of the total global emissions.[2] To arrive at a global estimate of emissions in a certain year, Intergovernmental Panel on Climate Change (IPCC) reference scenarios have been used to estimate the emissions not covered by the INDCs until 2030. The chosen reference scenarios capture action communicated by Parties for the pre-2020 period and keep climate policies constant thereafter (hereinafter referred to as the pre-INDC trajectories). Global emission levels in 2025 and 2030 based on the INDCs are thus arrived at by adding the aggregate emissions resulting from the INDCs and the remaining emissions derived from IPCC reference scenarios.[3] The estimates are presented as median values and associated ranges owing to the various assumptions and conditions specified by Parties in their submissions and uncertainties associated with gaps in information.

5. The estimated global emission levels in 2025 and 2030 are further discussed in relation to past and projected future emission trends, as follows:

(a) Global GHG emission levels in 1990, 2000 and 2010;

(b) Global GHG emission levels in 2025 and 2030 corresponding to pre-INDC trajectories consistent with action communicated by Parties for 2020 or earlier;

(c) Global GHG emission levels in 2025 and 2030 corresponding to least-cost scenarios consistent with holding the temperature rise below 2 °C above pre-industrial levels (hereinafter referred to as 2 °C scenarios).

[1] Available at <http://unfccc.int/focus/indc_portal/items/9240.php>.

[2] INDCs also do not include emissions from international aviation and maritime transport. This report assumes the post-2020 carbon-neutral growth target presented by the International Civil Aviation Organization (see <http://www.icao.int/Meetings/a38/Documents/WP/wp430_en.pdf>) and the range of carbon dioxide emission projection scenarios presented by the International Maritime Organization (IMO) in the *Third IMO GHG Study 2014* (see <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>).

[3] For further information on the approach, see chapter II.C.

6. Finally, with a view to providing information on the aggregate effect of INDCs beyond 2030, this report discusses a number of identified trends that indicate opportunities for enhanced action in the longer term. These trends, based on the information contained in the INDCs, are discussed with regard to participation, policies and institutions, cooperation, national circumstances and ambition.

7. In accordance with the mandate, this report does not present or analyse the INDC of any individual Party. Rather, it focuses on the aggregate effect of the INDCs of all Parties as a group. Furthermore, it is a single study of the INDCs rather than an overview or assessment of various studies conducted by third parties.

B. Overview of the communicated intended nationally determined contributions

8. As at 1 October 2015, **119 INDCs had been received, covering 147 Parties to the Convention**,[4] including one regional economic integration organization,[5] and **representing 75 per cent of Parties and 86 per cent of global emissions in 2010**. Given that some sectors and gases are not covered by the communicated INDCs, 80 per cent of the global emissions are covered by the communicated INDCs. All Parties included information on their mitigation contributions. A total of 100 Parties, accounting for 84 per cent of the INDCs, also included an adaptation component in their INDCs.

9. While the structure and content of the communicated INDCs vary, **most Parties**[6] **explicitly addressed the information elements listed in decision 1/CP.20, paragraph 14**. Many Parties provided additional information, such as on market-based mechanisms and on support needs for the implementation of their INDCs, including domestic and international finance, technology transfer and development, and capacity-building support.

10. A synthesis of the information provided by Parties in their INDCs, including on the reference point, time frames, scope and coverage, is contained in chapter I.C below. Chapter I.D provides an overview of the aggregate effect of INDCs, including opportunities for addressing climate change resulting from the INDCs in the medium and longer terms. Finally, chapter I.E synthesizes information on the adaptation component of the INDCs.

C. Synthesis of information in the communicated intended nationally determined contributions

11. **Most of the INDCs are national in scope; they address all major national GHG emissions or at least the most significant sources. Many contain quantified emission reduction targets, which take a variety of forms** (see figure 1):

(a) Some of the INDCs include economy-wide mitigation targets, with absolute emission reduction targets expressed as an emission reduction below the level in a specified base year and ranging from 9.8 to 90.0 per cent. A few of the INDCs contained absolute

[4] A complete list of the Parties that submitted an INDC by 1 October 2015 is provided in footnote 28.

[5] The INDC of the European Union and its member States is counted as one INDC representing 29 Parties (the European Union and its 28 member States).

[6] In this report, the following qualifiers are applied to denote the percentage of the submitted INDCs that mention the issue: “a few” for less than 10 per cent; “some” for 10–40 per cent; “several” for 40–70 per cent; “many” for 70–90 per cent; and “most” for 90 per cent and above. Chapter I.E below uses these qualifiers to indicate the percentage range of the INDCs submitted that elaborate on a certain adaptation issue.

targets that are not linked to a base year but establish an overall maximum absolute limit on emissions (e.g. carbon neutrality by a future date);

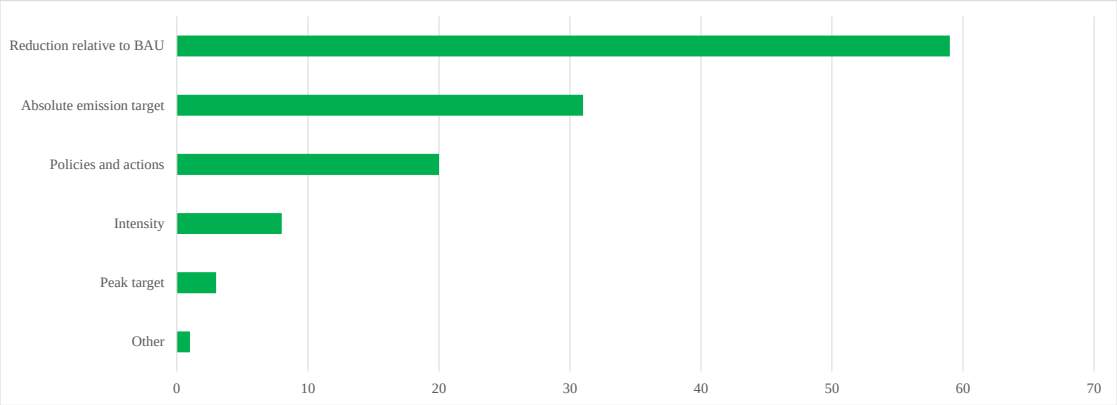
(b) Half of the INDCs include relative targets for reducing emissions below the 'business as usual' (BAU) level, either for the whole economy or for specific sectors, ranging from 1.5 to 89.0 per cent;

(c) A few of the INDCs contain intensity targets, with reductions in GHG emissions per unit of gross domestic product (GDP) or per capita ranging from 13 to 65 per cent relative to the level in a base year (e.g. 2005 or 2010) or to the absolute level of per capita emissions by 2025 or 2030;

(d) A few of the INDCs specify the year or time frame in which the respective Party's emissions are expected to peak (e.g. by 2030 or earlier);

(e) Some of the INDCs contain strategies, plans and actions for low GHG emission development reflecting the respective Parties' special circumstances, in accordance with decision 1/CP.20, paragraph 11.

Figure 1
Types of mitigation target communicated in the intended nationally determined contributions



Abbreviation: BAU = 'business as usual'.

12. **Some Parties included in their INDCs sectoral or subsectoral quantified targets.** A few Parties included targets for the energy and land use, land-use change and forestry (LULUCF) sectors together with their economy-wide targets. Some Parties identified targets for renewable energy as part of the information to facilitate the clarity, transparency and understanding of their INDCs. Renewable energy targets were expressed using different indicators, such as share in the energy matrix, installed capacity, generation and penetration, and ranged between 3.5 and 100.0 per cent for these indicators.

13. **Many Parties identified conditions for the full implementation of their INDCs,** such as: expectations concerning the results of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) process; the level of effort undertaken by other Parties; the availability of market-based mechanisms; and access to enhanced financial resources, technology transfer and technical cooperation as well as enhanced capacity-building support. Some Parties did not specify conditions for their INDCs.

14. **Some of the INDCs include an unconditional mitigation component alongside an enhanced conditional one.** Most of the conditional components relate to the provision of finance, technology or capacity-building support and translate into a percentage increase in the level of effort associated with the related unconditional component. The percentage increase is specific to the type of target selected by the Party (e.g. percentage reduction in

emissions against a base year, BAU or emission intensity) and ranges from 2 to around 53 per cent of additional emission reductions.

15. Furthermore, a few Parties stated in their INDCs the expectation that negotiations under the ADP will provide the clarity required for meeting some of the above-mentioned conditions. **A few Parties also indicated that they reserve the right to revise their INDCs in the light of the outcome of the ADP process.**

16. In addition to setting mitigation objectives for 2025 or 2030, **some Parties included a longer-term vision for low-emission development, which, in some cases, was specified as an aim to achieve zero emissions**. Related goals range from a 25 per cent GHG emission reduction by 2050 below BAU or base year level (e.g. 1990 or 2000) to lower per capita emission levels in the future or achieving carbon neutrality by 2050 or 2085.

17. As the reference point, some Parties chose 1990, a few chose 2005 and others referred in their contributions to 2000, 2010, 2013, 2014 or 2015. Some Parties specified their level of emissions for a base year or provided information on BAU reference scenarios for the mitigation objectives expressed relative to BAU. **Most Parties indicated either a 5- or 10-year implementation period for their INDCs.** Many of the INDCs refer to an implementation timeline up to 2030, while a few refer to an implementation timeline up to 2025. A few of the INDCs communicated targets for both 2025 and 2030, one of which is indicative or interim. A few Parties indicated a timeline of up to 2035, 2040 or 2050, mostly in conjunction with another target year. Furthermore, a few Parties communicated an implementation period starting before 2020.

18. Mitigation targets varied in their scope and coverage of the sectors and GHGs. **Many cover most or all of the IPCC sectors**, including energy, industrial processes and product use, agriculture, LULUCF and waste. A few Parties specifically highlighted transport and buildings, while others also mentioned shipping and aviation, oil industry flaring, solvents and electric power. In line with what is currently reported by Parties under the Convention, **most of the INDCs cover carbon dioxide (CO_2) and many cover methane (CH_4) and nitrous oxide (N_2O) emissions, while some also cover emissions of sulphur hexafluoride (SF_6)**, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and nitrogen trifluoride (NF_3). A few of the INDCs include additional gases or emissions, including short-lived climate forcers (SLCFs).

19. Most Parties communicated some information on the assumptions and methodological approaches used for estimating and accounting emissions and removals, with varying level of detail. Most Parties provided information on their use of IPCC guidelines. While the guidelines applied differ, **many Parties are shifting or intending to shift towards more recent guidelines. They are also widening the coverage of sectors and GHGs in their inventories.** Several Parties also provided information on the global warming potential (GWP) values used. Of those Parties, most indicated that they used values from the IPCC Second Assessment Report (SAR) and Fourth Assessment Report (AR4) (including those INDCs that refer to decision 24/CP.19), while a few used values from the IPCC Fifth Assessment Report (AR5). One Party reported the use of global temperature potentials.

20. **Most Parties included emissions and removals from LULUCF.** A few Parties indicated that a common framework for LULUCF accounting may be desirable, which could be based on existing guidance and experience under the Convention and its Kyoto Protocol. However many of the INDCs do not provide comprehensive information on the assumptions and methods applied in relation to LULUCF, which presents a major challenge for the quantitative evaluation of the aggregate effect of the INDCs.

21. As regards future GHG emission levels, a few Parties provided a baseline, BAU scenario or projections. Some Parties referred to assumptions regarding macroeconomic variables, such as GDP or population, or to growth rates of those two variables, or to sector-specific variables, in particular for the energy sector. Only a few Parties provided values and some referred to sources of data such as national statistics or international databases.

22. **Most Parties provided information relating to planning processes**, including specific aspects such as: the national process of the development and approval of the INDC; institutional arrangements; stakeholder engagement; policy and legislative issues; and priority areas for implementation. Most Parties have already taken a number of steps to develop a strong domestic basis for planning and implementing their INDCs and expect to build on those efforts in the future. Many INDCs are directly backed by already existing national legislation or policies. And several INDCs provide information on processes towards new legislation and policies, triggered by the preparation of the INDCs. While the level of ambition and the degree of advancement in national climate policies vary, all Parties mentioned that their INDCs are based on, among others, existing policies or ongoing national processes, as well as on experiences with implementing the Convention and its Kyoto Protocol.

23. Information provided in many INDCs indicates **concrete areas for undertaking action to address climate change, focusing on, inter alia, renewable energy and energy efficiency, sustainable transport, carbon capture and storage, and conservation and sustainable management of forests, as well as reducing non-CO_2 gases**. Among others, Parties mentioned specific measures such as grid modernization, renewable energy targets, financial schemes to promote clean investments, environmental taxes, subsidy reforms, fuel economy and energy conservation standards, programmes for low-emission agriculture and waste management, and measures to promote forest conservation and reduce deforestation.

24. Many Parties provided information emphasizing that their INDCs have undergone national stakeholder consultation processes with a view to raising awareness and securing buy-in with respect to their INDCs and related long-term development plans. **Parties highlighted that support from actors such as the private sector, academia and civil society, as well as from relevant sectoral ministries and regional and local governments, is critical for the identification of realistic targets.** Examples of processes to engage stakeholders included the establishment of expert task forces and working groups, parliamentary hearings, large-scale public consultations, including workshops, targeted meetings and an invitation for written submissions, as well as awareness-raising campaigns. A few Parties noted that they still plan to hold consultations on the overall national climate policy underlying their INDCs.

25. **Several of the INDCs highlight the link between the implied actions to address climate change and the development priorities, including social and economic development and poverty eradication.** Some Parties highlighted synergies between their development and climate action, while a few further noted specific co-benefits of action to address climate change, including improvements in air quality, human health, job creation and others, as well as synergies between adaptation and mitigation actions, in particular in agriculture and forestry.

26. **All Parties included a narrative on how they consider their INDC to be fair and ambitious, as well as how it contributes towards achieving the objective of the Convention**. Many Parties commented on the principles that should govern global action and on relevant national circumstances and outlined specific criteria for fairness and ambition. The **principles for action** included, inter alia: a shared global effort undertaken in a fair and equitable manner with the participation of all Parties; equity; common but differentiated responsibilities and respective capabilities; recognition of national circumstances; application of the same rules to all Parties and the use by all Parties of the

same legal form of commitment; and recognition of the fact that no single indicator can reflect fairness or a globally equitable distribution of efforts. A few Parties referred to the need to respect human rights and gender equality. With regard to **national circumstances** as a factor underlying ambition, Parties highlighted a combination of considerations related to the size of the country and its climatic conditions, natural resource endowment and energy balance, key economic and social trends and dependencies, and vulnerability to climate change impacts.

27. In this context, **specific criteria for evaluating fairness include responsibility, capability, mitigation potential and cost of mitigation, the degree of progression/stretching beyond the current level of effort, and the link to objectives and global goals**. Most Parties in their INDCs view responsibility directly or indirectly in the context of their past, current and future share in the global emissions and per capita emissions in comparison with global averages. Regarding the capacity to contribute, considerations include the level of development, GDP per capita, ability to invest in mitigation, and international support received. Some Parties listed the potential for cost-efficient mitigation and past efforts among the fairness criteria.

28. In explaining how their INDCs are ambitious, most Parties **elaborated on how their contributions represent a significant progression beyond their current undertakings**. In doing so, some Parties showed that their INDCs imply the acceleration of the rate of decarbonization of their economies, the decoupling of GHG emissions from economic growth, and the reduction of emissions below the BAU level. Falling per capita emissions, peaking years for emissions and the translation of previously aspirational objectives into domestically legally binding goals were also used by Parties to communicate ambition. A few Parties also highlighted their contribution to the provision of support, including for the development and diffusion of low-emission technologies, and referred to their past performance in reducing their emissions.

29. **In discussing how their INDCs contribute towards achieving the objective of the Convention,** several Parties indicated that their expected level of emissions in the future would fall within a global emission pathway that is consistent with the goal of keeping the global average temperature increase below 2 °C, while a few Parties referred to 1.5 °C. In this context, some referred to an 80–95 per cent emission reduction by 2050 compared with the 1990 level for developed countries, or to global emissions being at least halved by 2050 compared with the 1990 level, in accordance with the findings of the IPCC. Other Parties referred to global and national decarbonization efforts. A few Parties stated that their adaptation components contribute to achieving the objective of the Convention by reducing vulnerability both nationally and globally.

30. Over half of the communicated INDCs indicate that **Parties plan to use or are considering the use of market-based instruments** from international, regional or domestic schemes, including the clean development mechanism (CDM). Most of those Parties indicated that they would use market instruments to meet only part of their targets. Several Parties stressed that the use of market-based mechanisms is important for the cost efficiency of the mitigation effort and for enhancing the level of ambition. The assessment of the aggregate effect of the INDCs presented in this report assumes that no double counting of outcomes from actions to reduce emissions will occur.

31. **Support needs for the implementation of INDCs were highlighted by several Parties.** Those Parties identified in their INDCs needs for targeted investment and finance, capacity-building and technology, with some providing quantitative estimates of the support required for the implementation of their INDCs and for achieving the upper level of their mitigation contributions. Some Parties identified domestic measures to support the implementation of their INDCs, including the use of market-based mechanisms, increased budgetary support, public–private partnerships, green procurement programmes, reforms of

pricing and taxation regimes, the improvement of green credit mechanisms and the establishment of specialized national funds. A few Parties noted the importance of engaging the private sector in this context.

32. **Several Parties noted the importance of enhanced international support in the context of the new global agreement**, including its scaling-up, and the strengthening of the role of and linkages between the existing operating entities of the Financial Mechanism, including the Green Climate Fund (GCF) and the Global Environment Facility (GEF), and the Technology Mechanism under the Convention.

D. Aggregate effect of the communicated intended nationally determined contributions

1. Aggregate effect of the intended nationally determined contributions until 2030

33. The implementation of the communicated INDCs is estimated to result in **aggregate global emission levels**[7] **of 55.2 (52.0 to 56.9)**[8] **Gt CO_2 eq in 2025 and 56.7 (53.1 to 58.6) Gt CO_2 eq in 2030**. The global levels of emissions in 2025 and 2030 were calculated by adding the estimated aggregate emission levels resulting from the implementation of the communicated INDCs (41.7 (36.7 to 47.0) Gt CO_2 eq in 2025 and 42.9 (37.4 to 48.7) Gt CO_2 eq in 2030) to the levels of emissions not covered by the INDCs.[9] Aside from various uncertainties in the aggregation of the INDCs, these ranges capture both unconditional and conditional targets. Global cumulative CO_2 emissions after 2011[10] are expected to reach 541.7 (523.6– 555.8) Gt CO_2 in 2025 and 748.2 (722.8– 771.7) Gt CO_2 in 2030.

34. **Compared with global emissions in 1990, 2000 and 2010,**[11] **global aggregate emission levels resulting from the INDCs are expected to be higher** by 34–46 per cent in 2025 and 37–52 per cent in 2030 in relation to the global emission level in 1990; 29–40 per cent in 2025 and 32–45 per cent in 2030 in relation to the global emission level in 2000; and 8–18 per cent in 2025 and 11–22 per cent in 2030 in relation to the global emission level in 2010. While these figures show that global emissions considering INDCs are expected to continue to grow until 2025 and 2030, the growth is expected to slow down substantially, to 11–23 per cent in the 2010–2030 period compared with 24 per cent in the 1990–2010 period. **The relative rate of growth in emissions in the 2010–2030 period is expected to be 10–57 per cent lower than that over the period 1990–2010, reflecting the impact of the INDCs.**[12]

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[7] Reported emission levels in this report, unless otherwise indicated, include emissions from land-use change and use metric global warming potential values from the AR4 with a 100-year time-horizon.

[8] Unless otherwise stated, ranges indicate 20 to 80 per cent ranges and single values indicate medians.

[9] Estimates of emissions in 2025 and 2030 not covered by the INDCs were made by extracting from the IPCC AR5 scenarios (reflecting the 2020 pledges under the Cancun Agreements) the emission growth rates of relevant countries, regions, sectors and/or GHGs.

[10] The sum of all global fossil, industrial and land-use change emissions for the years 2012–2025 or 2012–2030, inclusive.

[11] Historical annual emission time series are derived from gas-by-gas data sources in order to allow for consistent treatment of metrics, like GWPs from the AR4. These gas-by-gas data sources are reported UNFCCC inventory data for Parties included in Annex I to the Convention, available national communication data or biannual update report data, complemented by authoritative global data sources as used by AR5 Working Group III to estimate historical emission data, including the International Energy Agency (IEA) and the Emission Database for Global Atmospheric Research (EDGAR).

[12] The absolute growth in global emissions over the period 2010–2030 compared with 1990–2010 is expected to be 10 per cent lower (median) with a range from 12 per cent higher to 46 per cent lower.

35. **Global average per capita emissions considering INDCs are expected to decline by 8 and 4 per cent by 2025 and by 9 and 5 per cent by 2030 compared with the levels in 1990 and 2010, respectively.** This is based on estimated global average per capita emissions, considering INDCs, of 6.8 (6.5–7.1) t CO_2 eq/capita in 2025 and 6.7 (6.4–7.2) t CO_2 eq/capita in 2030.[13] Emissions in 2000 were approximately equal to expected per capita emission levels in 2030 (range: –5 to +6 per cent) and 1 per cent above expected 2025 levels (range: –3 to +5 per cent).

36. **Implementation of the INDCs would lead to lower aggregate global emission levels than in pre-INDC trajectories.**[14] The level of global GHG emissions associated with the INDCs is expected to be lower than the emission level in pre-INDC trajectories, by 2.8 (0.2–5.5) Gt CO_2 eq in 2025 and 3.6 (0.0–7.5) Gt CO_2 eq in 2030.[15] Taking into account the conditional components of the INDCs would make the upper level of this range 1.0 and 1.9 Gt CO_2 eq lower than with unconditional components only.[16] These figures provide an estimate of the aggregate effect of the INDCs stemming from the action to reduce emissions and enhance sinks compared with emission scenarios that are consistent with action communicated by Parties for the pre-2020 period.

37. Compared with the emission levels consistent with the least-cost 2 °C scenarios,[17] aggregate GHG emission levels resulting from the INDCs are expected to be higher by 8.7 (4.7–13.0) Gt CO_2 eq (19 per cent, range 10–29 per cent) in 2025 and by 15.1 (11.1–21.7) Gt CO_2 eq (35 per cent, range 26–59 per cent) in 2030.

38. Figure 2 compares the global emission levels resulting from the INDCs in 2025 and 2030 with pre-INDC reference scenarios and 2 °C scenarios. GHG reference scenarios are derived from the contribution of Working Group III to the AR5 that are consistent with action communicated by Parties for the pre-2020 period (red). The aggregate emissions expected to result from the INDCs show a wide range owing to the various assumptions and conditions specified by Parties in their submissions and uncertainties associated with gaps in information (yellow bars). Mitigation scenarios for a least-cost trajectory to keep the global mean temperature rise below 2 °C are shown in blue, with an enhancement of global mitigation starting today (dark blue), by 2020 (medium blue) or with an assumed

[13] Assuming the United Nations 2015 low, high and median population scenarios in combination with the other uncertainties. In the median population scenario, population is expected to reach 8.04 billion in 2025 and 8.40 billion in 2030 (see the 2015 revision of the United Nations 2012 population projections, available at <http://esa.un.org/unpd/wpp/>).

[14] Those 22 trajectories are a subset of scenarios from the IPCC AR5 scenario database, specifically the 450 ppm scenarios and their high short-term target (HST) implementations with delayed 2030 onset of coordinated emission reductions as designed within the AMPERE project.

[15] In contrast to the given average reduction, the median reduction resulting from the INDCs below reference scenarios is 3.0 Gt CO_2 eq in 2025 and 3.0 Gt CO_2 eq in 2030.

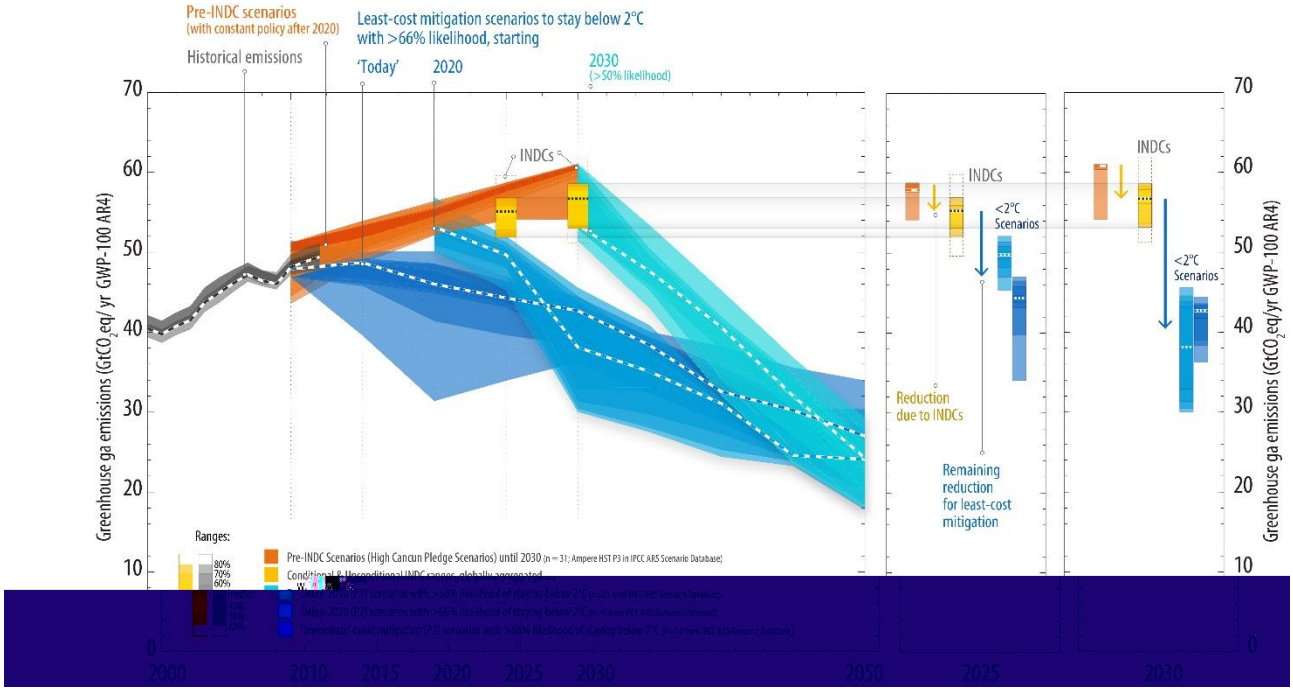
[16] This excludes an assessment of the conditions related to LULUCF and also an assessment in case where the extent of the conditional component of the INDC is uncertain.

[17] Scenarios consistent with limiting the global average temperature rise below 2 °C above pre-industrial levels were taken from the AR5 scenario database. Scenarios that follow a least-cost emission trajectory from 2010 onwards (so-called P1 scenarios) with a greater than 66 per cent likelihood of staying below 2 °C correspond to 44.3 (38.2–46.6) Gt CO_2 eq emissions in 2025 and 42.7 (38.3–43.6) Gt CO_2 eq emissions in 2030. Scenarios that follow an economically optimal emission trajectory from 2020 onwards (so-called P2 scenarios) with a greater than 66 per cent likelihood of staying below 2 °C correspond to 49.7 (46.2–51.6) Gt CO_2 eq emissions in 2025 and 38.1 (30.3–45.0) Gt CO_2 eq emissions in 2030. Given the similarity of emissions under P1 scenarios to emissions in 2015, and given the similarity of P1 and P2 scenarios by 2030, in this report the difference between INDC emission levels and the joint set of P1 and P2 scenarios is given. When comparing with P2 scenarios only, the difference is smaller in 2025, namely 4.8 (2.0–7.9) Gt CO_2 eq, and larger in 2030, namely 17.0 (10.6–26.0) Gt CO_2 eq.

delay only after 2030 (turquoise). In those scenarios, subsequent emission reduction rates over the period 2030–2050 are higher if there is a delayed enhancement of global mitigation.

Figure 2

Comparison of global emission levels resulting from the intended nationally determined contributions in 2025 and 2030 with other trajectories



Source: AR5 scenario database, IPCC historical emission database and INDC quantification.

Abbreviations: AR4 = Fourth Assessment Report of the IPCC, AR5 = Fifth Assessment Report of the IPCC, GHG = greenhouse gas, GWP = global warming potential, HST = high short-term target, INDCs = intended nationally determined contributions, IPCC = Intergovernmental Panel on Climate Change.

39. **The estimated aggregate annual global emission levels resulting from the implementation of the INDCs do not fall within least-cost 2 °C scenarios by 2025 and 2030.** The global temperature increase by the end of this century depends both on emissions up to 2030, which depends on the level of effort in the INDCs and any increase thereof, and emissions in the post-2030 period. By lowering emissions below pre-INDC trajectories, the INDCs contribute to lowering the expected temperature rise until and beyond 2100. **However, temperature levels by the end of the century strongly depend on assumptions on socioeconomic drivers, technology development and action undertaken by Parties beyond the time frames stated in their INDCs (e.g. beyond 2025 and 2030).** Making such assumptions is beyond the scope of this report.

40. If Parties were to not enhance mitigation action until 2030 beyond the action envisaged in the INDCs, the possibility of keeping the temperature increase below 2 °C still remains. However, the scenarios in the IPCC AR5 indicate that this could be achieved only at substantially higher annual emission reduction rates and cost compared with the least-cost scenarios that start today or in 2020. Therefore, much greater emission reductions effort than those associated with the INDCs will be required in the period after 2025 and 2030 to hold the temperature rise below 2 °C above pre-industrial levels.

41. The average annual emission reductions for the period between 2030 and 2050 for least-cost scenarios that start in 2030 from emission levels consistent with the INDCs and bring back emissions to 2 °C scenarios are estimated at 3.3 (2.7–3.9) per cent. This is around double the rate compared with the least-cost scenarios that assume enhanced mitigation action by 2010 or 2020, which require annual emission reductions of only 1.6 (0.7–2.0) per cent in the same period.

42. Given the fact that GHGs are long-lived in the atmosphere and therefore cumulative emissions determine the impact on the climate system, higher emissions in the early years (compared with least-cost trajectories) would necessitate greater and more costly emission reductions later on in order to keep the global mean temperature rise below the same level with the same likelihood. According to the AR5, the total global cumulative emissions since 2011 that are consistent with a global average temperature rise of less than 2 °C above pre-industrial levels at a likely (>66 per cent) probability is 1,000 Gt CO_2. Considering the aggregate effect of the INDCs, global cumulative CO_2 emissions are expected to equal 54 (52–56) per cent by 2025 and 75 (72–77) per cent by 2030 of that 1,000 Gt CO_2.[18]

2. Opportunities for the medium and longer terms emerging from the intended nationally determined contributions

43. The extent to which efforts to reduce emissions will be sufficient to limit the global average temperature rise to less than 2 °C above pre-industrial levels strongly depends on the long-term changes in the key economic drivers that will be induced by the implementation of the current INDCs, as well as the determination of Parties to increase levels of ambition before and after 2030. Paragraphs 44–54 below provide general information on trends emerging from the INDCs that could provide opportunities for increased ambition in the future.

Participation

44. **The INDCs indicate a significant increase in the number of countries taking climate action, which is often national in scope and covers a large number of sectors and GHGs.** Of particular importance is the increase in the number of Parties that have moved from project-, programme- or sector-based actions towards economy-wide policies and objectives. Whereas in the pre-2020 period a total of 61 Parties presented absolute, BAU, intensity or peaking year based quantified targets, in their INDCs 127 Parties communicated such targets.

45. Furthermore, all Parties provided information that facilitates the clarity, transparency and understanding of their INDCs. While the information provided reflects national circumstances and capabilities, in terms of data consistency, completeness and quality the information communicated in the INDCs represents a significant step forward compared with the information communicated in relation to action in the pre-2020 period.

46. **The increasing determination of Parties to take national action to combat climate change together with an increasing national capacity to do so is clearly manifested through the significant number of Parties submitting INDCs and their enhanced scope of action.** However, problems remain in relation to data gaps and quality of information submitted in the INDCs, showing that further efforts are needed to increase the capacity of many countries to plan, implement and monitor their climate-related actions.

[18] For a 50 per cent probability of staying below 2 °C, the AR5 (see table 2.2 of the Synthesis Report, available at <http://ar5-syr.ipcc.ch/ipcc/ipcc/resources/pdf/IPCC_SynthesisReport.pdf>) indicates cumulative CO_2 emissions of 1,300 Gt CO_2 after 2011. Considering the aggregate effect of the INDCs, global cumulative CO_2 emissions are expected to equal 42 (40–43) per cent by 2025 and 58 (56–59) per cent by 2030 of that 1,300 Gt CO_2.

Policies and institutions

47. **Information contained in the INDCs shows a clear and increasing trend towards introducing national policies and related instruments for low-emission and climate-resilient development.** Many INDCs are already backed by existing national legislation or policies and several have triggered national processes to establish relevant policy frameworks. Furthermore, many INDCs involved public consultation and the engagement of a wide range of stakeholders to demonstrate the developmental benefits of action to combat climate change and to secure the buy-in of such action.

48. Information provided by Parties highlights the trend towards an **increasing prominence of climate change on national political agendas**, driven in many cases by interministerial coordination arrangements as well as by an increasing trend towards the mainstreaming of climate change in national and sectoral development priorities. At the same time, many Parties have made efforts to ensure that the private sector, civil society and other non-governmental actors recognize the importance of, and provide support for, national action to combat climate change.

49. National political and institutional processes have been influenced by the invitation for Parties to communicate their INDCs and they could provide a foundation for enhanced action in the future. While INDCs may have served as a catalyst for the consolidation and enhancement of climate-related policies in a few countries, in many they have represented an incentive to initiate such policies. In general, it can be argued that the realities of policy development and of social acceptance related to the preparation of the INDCs provide a foundation for enhanced action in the future. However, the timing and scale of such enhanced action depends on the determination of governments. In this context, many Parties referred in their INDCs to the need for a robust 2015 agreement that would provide a common framework for action and the means to enhance the capacity of those countries that need it the most.

Cooperation and support

50. **The INDCs show an increasing interest of Parties in enhanced cooperation to achieve climate change goals collectively through a multilateral response and to raise ambition in the future.** In particular, Parties stressed the need for strengthening finance, technology transfer and capacity-building support for climate action in general as a means of creating an enabling environment and scaling up action. Some also mentioned opportunities in the development and implementation of policy, economic and market-based instruments.

51. The information contained in some of the INDCs points to the need for identifying, exploring and implementing further opportunities for cooperation on addressing climate change. In this context, Parties referred to the outcome of the current negotiations process under the ADP and the need for it to foster and promote cooperation, including through the strengthening of existing mechanisms and tools under the Convention or the establishment of new ones.

National circumstances and ambition

52. **All Parties have raised the ambition of their climate action included in their INDCs compared with efforts communicated for the pre-2020 period. There is strong recognition of the need for enhanced global action in the context of achieving the objective of the Convention and of the commitment to doing so multilaterally.** In this context, many Parties referred to the goal of limiting the temperature rise to below 2 °C above pre-industrial levels as a benchmark for guiding national and global ambition. Many countries expressed determination to achieve this goal and acknowledged that this would only be possible through collective efforts.

53. As noted in paragraph 36 above, while actions enshrined in the INDCs will deliver sizeable emission reductions compared with the pre-2020 period, global aggregate emission levels in 2025 and 2030 resulting from the INDCs do not fall within 2 °C scenarios. The INDCs signal, however, an increasing determination of Parties to take action to reduce emissions and increase the resilience of their economies, with a few Parties already indicating the aim to reduce their net emissions to zero in the longer term. National determination has enabled Parties to shape their efforts in line with their circumstances, with many already recognizing related sustainable development and socioeconomic co-benefits. Yet, the need remains to scale up and accelerate efforts before and after 2030.

54. Narratives provided by Parties in their INDCs convey the vision that each country implements its own strategy and reveal the need for a process to reconcile efforts made in the context of different national circumstances with the efforts needed to keep the global temperature rise below 2 °C. This issue should be addressed as Parties consider current and future efforts in relation to any agreed goal under the Convention.

E. Adaptation component of the intended nationally determined contributions

55. **One hundred Parties included an adaptation component in their INDCs.** The secretariat received adaptation components from 46 African States, 26 Asia-Pacific States, 19 Latin American and Caribbean States, 7 Eastern European States and 2 Western European and other States.

56. Parties highlighted their **common determination to strengthen national adaptation efforts in the context of the 2015 agreement**. Some stressed that adaptation is their main priority for addressing climate change, in particular as they see it to be strongly linked to national development, sustainability and security.

57. Although the INDCs are diverse and each has some unique features, the following elements of information featured in many adaptation components:

(a) National circumstances informing the adaptation component;

(b) Long-term goals and/or visions guiding the adaptation component;

(c) Impacts and vulnerability assessments;

(d) Legal and regulatory frameworks, strategies, programmes and plans, which provide the basis for, or have informed, adaptation actions;

(e) Measures or actions planned or under implementation in specific areas and/or sectors;

(f) Loss and damage;

(g) Means of implementation;

(h) Monitoring and evaluation of adaptation;

(i) Synergies between mitigation and adaptation.

58. This synthesis report provides an overview of the adaptation components by summarizing key information, identifying emerging trends and illustrating the various elements of the adaptation components by providing concrete examples. It was not possible at this point to evaluate the aggregate effect of the adaptation components given the methodological uncertainties associated with such an evaluation.

59. The diversity of the national circumstances of Parties is reflected in all INDCs with information pertaining to geographical characteristics, population dynamics and socioeconomic situation. Many Parties communicated that their adaptation components are guided by long-term development aspirations as well as by global climate objectives, including the goal of holding the increase in global average temperature below 2 °C or 1.5 °C above pre-industrial levels, which a few Parties used as a reference point for defining their adaptation components. In many cases, the time-horizon for Parties to implement national long-term goals and/or vision is 2030.

60. **All adaptation components of INDCs included information on key impacts and vulnerabilities.** Parties reported in particular on observed changes or projections of future changes, the most vulnerable sectors or geographical zones, high-risk impacts and incurred costs resulting from the impacts of extreme events. In terms of climate hazards, the main sources of concern identified by most Parties are flooding, sea level rise and drought/desertification.

61. The information provided clearly demonstrates that **Parties are moving to full-scale planning and implementation of adaptation and strengthening and scaling up existing efforts. Most Parties referred to developing nationwide adaptation plans and strategies;** several Parties indicated that they are conducting the process to formulate and implement national adaptation plans (NAPs) and most of them foresee having developed their NAP by 2020. Such national efforts are often accompanied by specific policies, measures and initiatives in practically all key economic sectors and areas, with water, agriculture, health, ecosystems, forestry and infrastructure being reported as the priority ones. A few Parties intend to undertake actions with regional or global impacts as they will address transboundary issues.

62. The recognition of the need to **involve relevant stakeholders in the planning and implementation of adaption**, including vulnerable communities, was high on the agenda of several Parties. In addition, many emphasized the need to consider gender issues when undertaking adaptation.

63. **Loss and damage associated with past and projected impacts of climate variability and change were reported by several Parties, some of which have quantified projected loss and damage,** for example in the form of absolute costs, annual loss of GDP, or percentage of land or agricultural production lost by a certain year or a particular threshold, for example a specific rise in sea level. A few Parties provided details on projected costs of climate change impacts and how intended adaptation measures are expected to reduce them while leaving some residual damage, clearly making an economic case for investing in adaptation and disaster risk reduction.

64. **Most Parties provided information on the means of implementation (e.g. finance, technology and capacity-building) needed to support the implementation of their planned adaptation actions,** including related to support needs and envisaged domestic and international support. Financial needs for adaptation were quantified by some Parties, with individual needs ranging from USD 100 million to over 200 billion for the whole INDC period to around USD 10 million to 3 billion per year. A few Parties provided projected adaptation costs for different mitigation scenarios, thus clearly indicating that the need for adaptation depends on mitigation ambition.

65. Some Parties emphasized that they are and will be undertaking adaptation with domestic support, giving a clear signal that **countries are already investing significant resources in adaptation**. Many underlined the need for receiving international support in the form of finance, technology transfer and capacity-building in line with the Convention, as such support will determine Parties' ability to safeguard developmental gains, to fulfil

their intended unconditional mitigation actions and to use their domestic resources for developmental purposes rather than adaptation.

66. In addition to national efforts and international support, a few adaptation components included new forms of cooperation, such as South–South and triangular cooperation, and Parties announced their readiness to support the adaptation efforts of other countries through such activities.

67. Noting that climate change actions require a holistic approach, **several Parties elaborated on the synergies between adaptation and mitigation as part of their overall low-emission, climate-resilient development strategies**. Synergies are being sought at project, sector or landscape level, in planning or institutional frameworks at the national, regional or local level and in urban and rural settings and by prioritizing those adaptation measures that offer significant mitigation co-benefits.

68. Given that the complex and long-term nature of climate change and its impacts requires that adaptation be designed as a continuous and flexible process and subject to periodic review, several Parties described how they will monitor and evaluate their intended adaptation actions and the support provided and received.

69. Regarding the monitoring and evaluation (M&E) of adaptation action, **some Parties highlighted that they have established or will establish quantitative and qualitative indicators for adaptation and vulnerability to measure progress**. In terms of the M&E of domestic and international support provided and received, in particular finance, a few Parties are putting in place climate finance systems for determining, disbursing and monitoring climate expenditure and for enhancing the visibility of adaptation measures within the allocation of national budgets.

70. Overall, **the adaptation components of the INDCs constitute a representative overview of how Parties, building on progress made so far, intend to address adaptation and loss and damage at the national level in the coming decades**. The wide range of initiatives to enhance adaptation that Parties communicated reflects the relevance of adaptation to all areas of social and economic activity and the strong interest of Parties in continuing to strengthen their efforts on adaptation together with their mitigation efforts.

II. Synthesis report on the aggregate effect of the intended nationally determined contributions

[English only]

A. Mandate and background

71. The COP, by decision 1/CP.17, launched a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties for adoption at COP 21 and to come into effect and be implemented from 2020. In accordance with that decision, the work under the process was to be undertaken by the ADP and be completed as early as possible, but no later than 2015.[19]

72. By decision 1/CP.19, the COP invited all Parties to initiate or intensify domestic preparations for their INDCs, without prejudice to the legal nature of the contributions, in the context of adopting a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties towards achieving the objective of the Convention as set out in its Article 2, and to communicate those INDCs to the secretariat well in advance of COP 21 (by the first quarter of 2015 by those Parties ready to do so) in a manner that facilitates the clarity, transparency and understanding of them.[20]

73. The COP, by decision 1/CP.20, reiterated its invitation to Parties to communicate their INDCs[21] and agreed that each Party's INDC towards achieving the objective of the Convention as set out in its Article 2 will represent a progression beyond the current undertaking of that Party.[22] It also agreed that the least developed countries (LDCs) and small island developing States may communicate information on strategies, plans and actions for low GHG emission development reflecting their special circumstances in the context of their INDCs.[23] Finally, all Parties were invited to consider communicating their undertakings in adaptation planning or to consider including an adaptation component in their INDCs.[24]

74. Also by decision 1/CP.20, the COP agreed that the information to be provided by Parties communicating their INDCs, in order to facilitate clarity, transparency and understanding, may include, as appropriate, inter alia, quantifiable information on the **reference point** (including, as appropriate, a base year), **time frames** and/or **periods for implementation**, **scope and coverage**, **planning processes**, **assumptions and methodological approaches**, including those for estimating and accounting for **anthropogenic GHG emissions and, as appropriate, removals**, as well as information on how the Party considers that its INDC 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.[25]

[19] Decision 1/CP.17, paragraphs 2–4.
[20] Decision 1/CP.19, paragraph 2(b).
[21] Decision 1/CP.20, paragraph 9.
[22] Decision 1/CP.20, paragraph 10.
[23] Decision 1/CP.20, paragraph 11.
[24] Decision 1/CP.20, paragraph 12.
[25] Decision 1/CP.20, paragraph 14.

75. By that same decision, the COP requested the secretariat to prepare, by 1 November 2015, a synthesis report on the aggregate effect of the INDCs communicated by Parties by 1 October 2015.[26]

76. This document was prepared in response to that request and presents a synthesis of the aggregate effect of the 119 INDCs covering 147 Parties received by 1 October 2015. Chapter II.B provides an overview of the communicated INDCs, including their coverage and key components. Chapter II.C presents the approach and methods used for assessing the aggregate effect of the INDCs, as well as key challenges and assumptions adopted; chapter II.D provides a synthesis of the information contained in the INDCs; and chapter II.E presents the aggregate effect of the INDCs, with the exception of information relating to the adaptation component of the INDCs. Chapter II.F focuses on the adaptation component of the INDCs. An online technical annex contains further detailed information on the methodology used for the quantitative assessment contained in this report.[27]

B. Overview of the intended nationally determined contributions

77. As at 1 October 2015, 119 INDCs had been communicated to the secretariat, covering 147 Parties to the Convention,[28] including one regional economic integration organization,[29] representing 75 per cent of Parties and covering 86 per cent of global emissions in 2010.[30]

78. The communicated INDCs vary in their form, structure and content, reflecting different national circumstances. All Parties included information on their plans to reduce GHG emissions or enhance sinks, either in the form of mitigation targets or in the form of strategies, plans and actions for low GHG emission development. A synthesis of that information is presented in chapter II.D below. 100 Parties, accounting for 84 per cent of the INDCs, also included an adaptation component in their INDCs, an overview of which is presented in chapter II.F below.

[26] Decision 1/CP.20, paragraph 16(b).

[27] Available at <http://unfccc.int/focus/indc_portal/items/9240.php>.

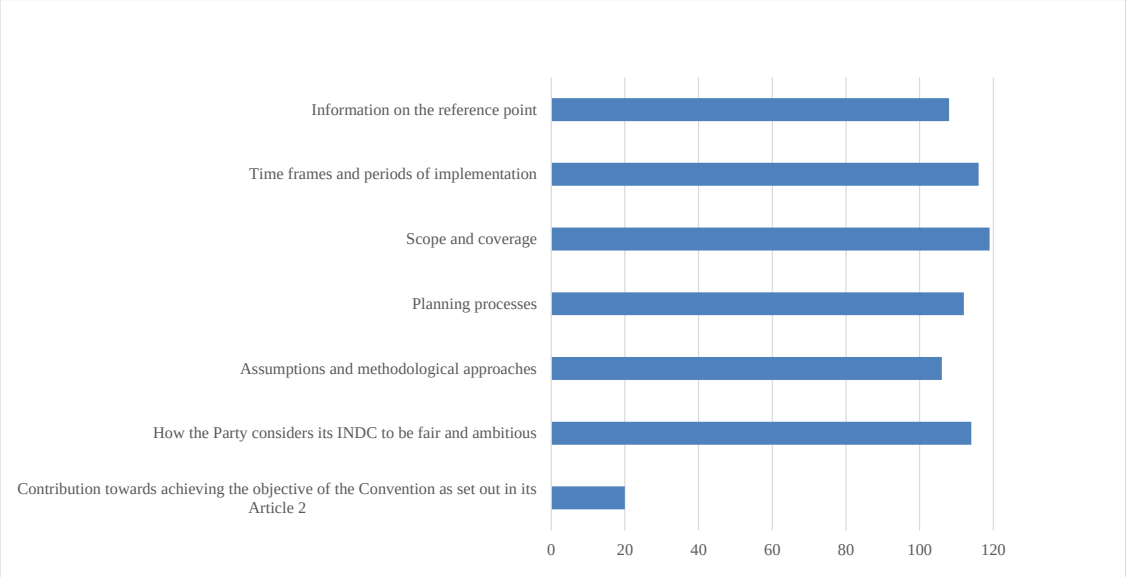
[28] Albania, Algeria, Andorra, Argentina, Armenia, Australia, Azerbaijan, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Botswana, Brazil, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Cote d'Ivoire, Democratic Republic of the Congo, Djibouti, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Israel, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kyrgyzstan, Lao People's Democratic Republic, Latvia and the European Commission on behalf of the European Union and its member States (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland) acting jointly, Lebanon, Lesotho, Liberia, Liechtenstein, Madagascar, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Mauritius, Mexico, Monaco, Mongolia, Montenegro, Mozambique, Myanmar, Namibia, New Zealand, Niger, Norway, Papua New Guinea, Paraguay, Peru, Philippines, Republic of Korea, Republic of Moldova, Russian Federation, Rwanda, Samoa, San Marino, Sao Tome and Principe, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Solomon Islands, South Africa, Swaziland, Switzerland, Tajikistan, Thailand, the former Yugoslav Republic of Macedonia, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, United Republic of Tanzania, United Stated of America, Uruguay, Vanuatu, Viet Nam, Zambia and Zimbabwe.

[29] The INDC of the European Union and its member States is counted as one INDC representing 29 Parties (the European Union and its 28 member States).

[30] Source: database developed for the preparation of this synthesis report.

79. Most Parties[31] explicitly addressed the information elements listed in decision 1/CP.20, paragraph 14. Some Parties provided information on all of those elements, while other Parties addressed some. Figure 3 presents a summary of Parties' provision of information in their INDCs, which is further elaborated in chapter II.D below.

Figure 3
Information provided by Parties communicating their intended nationally determined contributions in accordance with decision 1/CP.20, paragraph 14



Note: Most Parties communicated in their INDCs information on how they consider that their respective INDC is fair and ambitious in the light of their national circumstances together with information on how their INDC contributes towards achieving the objective of the Convention as set out in its Article 2. Some INDCs addressed these issues separately.

Abbreviation: INDC = intended nationally determined contribution.

80. In addition to providing the information outlined in decision 1/CP.20, several INDCs contain information relating to the use of market mechanisms and many contain information on means of implementation necessary for the implementation of their INDCs, including domestic and international finance, technology transfer and development, and capacity-building (see paras. 179–186 below).

C. Approach and methods

81. This chapter provides a brief overview of the approach, methods, challenges and assumptions in relation to the preparation of this report, with the exception of those related to the adaptation component of the INDCs, which are discussed in chapter II.F below. Further information and details on methodology and related assumptions have been compiled in the web-based technical annex.

[31] In this report, the following qualifiers are applied depending on the percentage of the submitted INDCs that mention the issue: "a few" for less than 10 per cent; "some" for 10–40 per cent; "several" for 40–70 per cent; "many" for 70–90 per cent; and "most" for 90 per cent and above. Chapter II.F below uses these qualifiers to indicate the percentage range of the submitted INDCs that elaborate on a certain adaptation issue.

1. Approach

82. In responding to the mandate referred to in paragraph 75 above, this report provides a synthesis of the information submitted by Parties in their INDCs, which has been structured following the information elements identified in paragraph 14 of decision 1/CP.20, as outlined in paragraph 74 above.

83. With a view to evaluating the aggregate effect of the communicated INDCs, this report provides estimates of the aggregate emission levels in 2025 and 2030 for the sectors and gases covered by the INDCs resulting from the achievement of the contributions. The emission levels were calculated both in annual and cumulative terms (i.e. cumulative emissions from 2011 to 2025 and from 2011 to 2030). The estimates are presented as median values and associated ranges owing to the various assumptions and conditions specified by Parties in their submissions and uncertainties associated with gaps in information.

84. It should be noted that the estimates of aggregate effect depend on, among other things, the share of emissions that is covered by the INDCs. As noted in chapter II.B above, the INDCs communicated to date do not cover all Parties and not all Parties that have communicated an INDC have included all gases and sectors. Therefore, the aggregate emission levels of the Parties, gases and sectors covered by the INDCs cover approximately 80 per cent of global emissions.[32]

85. The estimates of the global level of emissions in 2025 and 2030 resulting from the implementation of the communicated INDCs were calculated using IPCC scenarios. Those scenarios were also used to obtain estimates of emissions in 2025 and 2030 not covered by the INDCs by extracting from them the emission growth rates of relevant countries, regions, sectors and gases. The global levels of emissions in 2025 and 2030 were estimated by adding the estimated aggregate emission levels of the sectors and gases covered by the INDCs that result from the implementation of the communicated INDCs in 2025 and 2030 to the levels of emissions not covered by the INDCs from IPCC scenarios for the same years. The method used to estimate the global levels of emissions in 2025 and 2030 resulting from the implementation of the communicated INDCs is further explained in paragraphs 90–98 below.

86. The estimated global levels of emissions in 2025 and 2030 associated with the INDCs are further discussed in relation to:

(a) The global levels of emissions in 1990, 2000 and 2010;

(b) The global emission levels in 2025 and 2030 corresponding to pre-INDC trajectories consistent with action communicated by Parties for 2020 or earlier;

(c) The global emission levels in 2025 and 2030 corresponding to least-cost scenarios consistent with holding the global average temperature rise below 2 °C above pre-industrial levels (hereinafter referred to as 2 °C scenarios).

87. Finally, with a view to providing information on the aggregate effect of the INDCs beyond 2030, this report discusses identified trends that could provide opportunities for enhanced action in the longer term. Using the information contained in the INDCs, such trends are discussed with regard to participation, policies and institutions, cooperation, national circumstances and ambition.

[32] Eighty per cent refers to the share of global emissions in 2010 related to the sectors and gases covered by the communicated INDCs.

88. In accordance with the mandate for its preparation, this report does not present or analyse any individual INDC. It focuses on the effect of the INDCs in aggregate. Furthermore, it represents a single study of the INDCs rather than an overview of the outcomes of multiple studies by other institutions. For the purpose of this report, the following ground rules have been applied:

(a) The report is based on information communicated by Parties in their INDCs. The use of additional information is described in paragraph 94 below;

(b) The analysis is focused on the sectors and gases covered by the INDCs. GHG emissions that do not fall within the scope of the INDCs were only assessed at the aggregate global level using scenarios from the IPCC scenario database, as explained in paragraphs 95 and 96 below;

(c) Likewise, the report does not include in its analysis the effect of any other policy or target not communicated by Parties as part of their INDCs;

(d) Information is aggregated and not presented at any national or regional level;

(e) No assumptions have been made on the likelihood of the INDCs being fully implemented or exceeded. In preparing the report, the secretariat assumed that Parties will achieve in full the level of emissions implied in their INDCs.

2. Methods

89. As noted in paragraph 85 above, the estimates of global emissions in 2025 and 2030 associated with the communicated INDCs were derived by adding the estimated aggregate emissions resulting from the implementation of those INDCs to the estimated global aggregate emissions not covered by the INDCs. In the context of this report, methods were used to:

(a) Estimate the aggregate levels of emissions resulting from the implementation of the communicated INDCs in 2025 and 2030;

(b) Estimate the levels of the emissions not covered by the INDCs in 2025 and 2030 using IPCC reference scenarios.[33]

90. The aggregate levels of emissions in 2025 and 2030 resulting from the implementation of the communicated INDCs were estimated by adding up the expected levels of emissions in the same year communicated in each individual INDC. The resulting emission level is expressed as a median value with an associated range (20^{th} to 80^{th} percentile) owing to the uncertainties underlying the aggregation of the INDCs as well as the conditions expressed by Parties in their submissions.

91. Whenever a Party included in its INDC the expected level of emissions in 2025 or 2030, that figure was used in the calculation of the aggregate level. In the absence of such a figure, the method used for quantifying that level differed depending on the type of INDC, as follows:

[33] This estimate is based on global emission figures for 2025 and 2030 for the countries, sectors and gases not covered by the communicated INDCs derived from scenarios in the IPCC AR5 scenario database that reflect the 2020 pledges under the Cancun Agreements. The specific scenarios used for the sector-, gas-, country- and region-specific growth rates of emissions until 2025 and 2030 are those from the so-called P3 set of scenarios, specifically the AMPERE 'HST' subset (n=22) that investigated climate policies to meet the 2020 pledges under the Cancun Agreements and kept climate policies constant thereafter until 2030.

(a) For absolute economy-wide emission reduction targets relative to a base year, the estimated level of emissions in the target year (2025 or 2030) was calculated directly by subtracting from the level of emissions in the base year the percentage specified by the Party for that target year;

(b) For emission reductions below BAU level, the estimated level of emissions in the target year was calculated by subtracting from the expected level of emissions in the target year the percentage reduction specified by the Party for that year;

(c) For intensity targets (e.g. targets expressed as a percentage reduction in the relationship between emissions and GDP), the estimated level of emissions in the target year was calculated by, firstly, subtracting from the intensity in the reference year the percentage specified by the Party for that target year and, secondly, by multiplying the resulting intensity by the expected level of GDP in the target year, as communicated by the Party, if available;

(d) For emission peaking targets, historical emission growth rates were projected linearly towards zero in the year of peaking to obtain an estimate of maximum emissions;[34]

(e) For Parties that used a combination of any of the above and for which sectors and gases may overlap, expected levels of emissions in 2025 and 2030 were estimated individually. The target that resulted in the lowest emission levels was used in the calculation of the aggregate emissions;

(f) For other types of INDCs, including policies and measures, this report does not contain a quantification of their effect unless official estimates for emissions in 2025 and 2030 were provided by the Party in question.

92. Most Parties indicated a time frame of up to either 2025 or 2030 in their INDCs. For Parties that used a time frame of up to 2030, the level of emissions in 2025 was estimated using linear interpolation between the latest available emission level and the estimated level of emissions in 2030 resulting from the implementation of their INDC. If the Party in question had previously communicated a target with a time frame of up to 2020 (e.g. action communicated in the context of the pre-2020 period), the level of expected emissions in 2020 pursuant to that target was used in the interpolation alongside the current level of emissions. In that case, both emission levels for 2025 were aggregated to achieve the global emission level in order to reflect the inherent uncertainty in the quantification.

93. For Parties that used a time frame ending in 2025, their estimated level of emissions in 2030 resulting from the implementation of their INDC was calculated as follows:

(a) If the Party provided a long-term trajectory or target, that information was used to interpolate emissions from the expected emission levels in 2025 resulting from the implementation of its INDC to the level specified by the long-term trajectory or target;

(b) If the Party did not provide a long-term trajectory, linear extrapolation from the estimated emission level in 2025 was used to estimate the emission level in 2030 using an average change in emissions until 2025, on the basis of available historical data and, if available, of actions communicated for 2020 or earlier period.

94. In applying the methods specified above, the targets communicated by each Party as part of its INDC took precedence. That information was complemented, as necessary, by data contained in the latest official inventories, national communications, biennial update

[34] Whenever necessary, multiple initial growth rates were used. The secretariat ensured that the estimates were consistent with national expert assessments.

reports and biennial reports. Any remaining data gaps were addressed by using a set of scientific global data sets.[35]

95. As noted in paragraph 84 above, the estimated level of emissions communicated in each INDC for the target years (2025 and 2030) includes only those sectors and gases specified by each Party in its INDC. As a result, the aggregate level of emissions resulting from the implementation of the communicated INDCs is a partial estimate that excludes Parties that did not communicate an INDC as well as the sectors and gases that each Party chose not to include in its INDC. In order to discuss that partial estimate in the global context, total global emissions in 2025 and 2030 were estimated in accordance with paragraph 85 above.

96. To derive the level of the emissions not covered by the communicated INDCs, global emission scenarios[36] were adjusted to remove the reference emissions strictly associated with the INDCs by extracting any relevant gas-, sector-, country- or region-specific growth rate. Additional details are available in the technical web-based annex.

97. Cumulative CO_2 emissions were calculated by assuming the same growth rates in CO_2 and non-CO_2 emissions as the IPCC reference scenarios projected, starting from the last available year of historical emission data in the underlying emission database. The resulting share of CO_2 emissions was then applied to the linearly estimated trajectory of GHG emissions between the last historical data point and estimated emission levels for 2020, 2025 and 2030. Consistent with the report of IPCC Working Group I,[37] future carbon emissions were then summed for the cumulative emission estimate, starting after 2011.

98. The results presented in chapter II.E correspond to a 60 per cent range from the 20th percentile to the 80th percentile across the set of a total of 304 emission estimates for 2025 and 2030, with 152 being different implementations of the ‘high’ and 152 being different implementations of the ‘low’ emission estimates. Those estimates are taken from the respective ends of any communicated INDC target ranges. The ‘high’ end aggregates all unconditional central INDC targets (where a Party communicated only a single target) and any upper end of ranges that were provided by a Party. The ‘low’ end similarly aggregates all central INDC targets as well as the lower ends of the target ranges, if applicable. The ‘low’ variant was calculated by including any conditional targets, if available.

3. Key challenges and assumptions

99. The approach and methods described above include a number of uncertainties linked to data availability and quality.

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[35] For a consistent aggregation of emissions, a gas-by-gas data basis was necessary, in order to allow the conversion from different metrics, such as GWP SAR or GWP AR5 metrics into GWP AR4, which was used consistently for the aggregation in this report. This is part of the reason why, in some cases, complementary data sets were necessary in order to arrive at an estimate for the aggregate effect of the INDCs. The primary complementary source of gas-by-gas data on the emissions of Parties not included in Annex I to the Convention was the IPCC AR5 historical emission database (as shown in figure SPM.1 of the contribution of Working Group II to the AR5), which is a composite database including sources such as IEA, EDGAR and Houghton et al. (Houghton RA, van der Werf GR, DeFries RS, Hansen MC, House JI, Le Quéré C, Pongratz J and Ramankutty N. 2012. Chapter G2 Carbon emissions from land use and land-cover change. *Biogeosciences*. 9: pp.5125–5142.), in combination with data from the Food and Agriculture Organization of the United Nations, the Carbon Dioxide Information Analysis Center and others.

[36] The scenarios were taken from the IPCC AR5 scenario database, available at <https://secure.iiasa.ac.at/web-apps/ene/AR5DB/dsd?Action=htmlpage&page=about>.

[37] *Climate Change 2013: The Physical Science Basis*. Available at <http://www.ipcc.ch/report/ar5/wg1/>.

100. One key challenge relates to the different ways in which Parties have chosen to express their INDCs, including time frames and reference years as well as the sectors and gases covered.

101. Further challenges relate to the methodologies used for estimating and projecting GHG emissions as well as to the quality, clarity and completeness of the data used (see chapter II.D below). The latter includes, for example: missing information on metrics, such as GWP values applied; lack of gas-by-gas emission data to be able to aggregate emissions with the same consistent metrics; missing or incomplete data on the BAU scenario and expected future values for GDP or population; lack of clarity on approaches to the accounting of the LULUCF sector; missing information on the application of conditions in the target year; and lack of information on the use of international market-based mechanisms and how double counting was avoided.

102. The above-listed challenges were addressed by applying a consistent approach, as follows:

(a) Uncertainties arising from the different ways in which Parties have chosen to express their INDCs were addressed by applying the method described in paragraph 91 above;

(b) As noted in chapter II.C.1 above, the analysis is based on data included by Parties in their INDCs. Challenges related to missing data were addressed as described in paragraph 94 above;

(c) Differences in the coverage of sectors and emissions were addressed by limiting the country-level analysis to the GHG emissions covered by the INDCs;

(d) Uncertainties linked to conditions specified by Parties in their INDCs were addressed by estimating unconditional and conditional emission reduction levels and expressing the result as a range.

103. A major area of uncertainty relates to the approaches used for estimating, projecting and accounting emissions and removals from the LULUCF sector. The results presented in this report are dependent upon the high sensitivity of the methods used to estimate global emissions to how emissions and removals from that sector were considered. For example, some Parties intend to follow specific accounting rules, while others take a full carbon accounting approach (i.e. include LULUCF net emissions or removals like any other sector).[38]

104. This report takes those divergent treatments of the LULUCF sector into account when estimating the global emission levels. For example, a relative target below a historical base year was applied to the total national emissions including LULUCF emissions, if the country stated its intention to account for the LULUCF sector as any other sector. To the extent quantifiable with the available data sources, exceptions were taken into account, for example reported wildfire-related (and approximate estimates for insect-related) emissions were subtracted in the base year, if emissions related to natural disturbances were intended not to be counted up to 2025 or 2030. In the absence of other methods to estimate LULUCF-related accounting for some countries, this report assumes, if applicable, a (discounted) continuation of credits/debits from the first commitment period under the Kyoto Protocol (see more details in the web-based technical annex). Where available, reported projections 'with existing measures' formed the basis for LULUCF-related emission and removal estimates in the future, unless the Party specified LULUCF

[38] Some Parties specify also how natural disturbances and harvested wood products are to be accounted for.

projections in its INDC. Alternatively, the last available historical data points were assumed constant.

105. There is a definitional difference between the UNFCCC guidance for estimating anthropogenic GHG emissions and removals from the LULUCF sector on the one side and the land-use change related emissions that are part of the global emission estimates of the IPCC[39] and scenarios within the IPCC AR5 scenario database on the other side. In order to be able to compare global emission levels to IPCC AR5 estimates and the IPCC AR5 scenarios, this report proceeds as follows: the underlying calculations take into account LULUCF emissions and removals as indicated by Parties with regard to their effect on the other sectors in the total national emissions by 2025 and 2030. In order to arrive at global total emission estimates in line with the IPCC global emissions, a range of global land-use change emission scenarios in line with the pledges under the Cancun Agreements is assumed for the timeline up to 2025 and 2030.[40] This enables the comparability of the aggregate emission estimates in this report with the emission levels provided by the IPCC.[41]

106. It should be noted that, in addition to the conditions stated by Parties in their INDCs, the uncertainty related to the accounting of LULUCF emissions and projections of LULUCF emissions and removals is a factor contributing to the need to express the estimated aggregate emissions in 2025 and 2030 as a range. The change in the aggregate LULUCF emissions and projections is within the range of the IPCC AR5 reference scenarios' change in land-use change emissions from current levels to 2025 and 2030. This qualitatively supports the chosen approach described above of how global emission estimates are made consistent with those from IPCC AR5 scenarios.

107. Emissions from international transport also have to be included in the global emission estimates in order to estimate global aggregate emissions that are comparable to emission scenarios from the IPCC AR5 scenario database. For this report, the International Civil Aviation Organization 2013 target of carbon-neutral growth from 2020 is used[42] (i.e. plateauing of international aviation CO_2 emissions from 2020). The assumed level of the plateau is 0.75 Gt CO_2, or 64 per cent above 2010 levels. For maritime transport emissions, this report used so-called "scenario 5" (1.19 Gt CO_2 emissions in 2030) from the International Maritime Organization (IMO) *Third IMO 2014 GHG study*,[43] which assumes a 2.9 per cent reduction below a high-growth baseline scenario. In order to span the range of mitigation scenarios presented by IMO, IMO "scenario 3" is used as a sensitivity case, which assumes a similar 2.9 per cent reduction, but below a low-growth baseline scenario. This sensitivity case lowers estimated global aggregate emission estimates by 0.1 Gt CO_2 for 2025 and 0.25 Gt CO_2 for 2030 compared with the default case.

[39] See, for example, figure SPM.1 contained in the contribution of Working Group III to the AR5.

[40] Specifically, global land-use change emissions in the past up to 2013 follow the Houghton et al. data set used in the contribution of Working Group III to the AR5 and are merged with the land-use change emissions that are part of the P3 AMPERE HST scenarios from the IPCC AR5 scenario database. The estimated change in LULUCF emissions between current levels and 2025 or 2030 (a change of –1.0 Gt CO_2 by 2025 compared with in 2005 and a change of –1.1 Gt CO_2 by 2030 compared with in 2005) pursuant to Parties' information in their INDCs, inventories and reference level projections is within the range spanned by the change of emissions in the applied land-use change emission scenarios, which supports the validity of this aggregation step in order to yield global emission estimates that are comparable to the IPCC AR5 scenarios.

[41] As footnote 40 above.

[42] See <http://www.icao.int/Meetings/a38/Documents/WP/wp430_en.pdf>.

[43] Available at <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>.

108. As regards the use of international market-based mechanisms, the present analysis assumes that any international offset will lead to additional emission reductions abroad. In other words, it is assumed that emission reductions in the context of the implementation of one INDC are not counted twice in the context of implementing another one.

D. Synthesis of the information in the intended nationally determined contributions

109. This chapter provides a synthesis of the information communicated by Parties in their INDCs, except for the information related to the adaptation component.[44] It is structured in accordance with the information elements identified in paragraph 14 of decision 1/CP.20, as described in paragraph 74 above, with a slightly changed order to allow for technical information relevant to the quantitative analysis to be presented together.

110. Information that facilitates the clarity, transparency and understanding of the INDCs enables the estimation of the resulting aggregate emissions in 2025 and 2030. A lack of completeness and consistency of information increase the uncertainty of the results and necessitate the use of assumptions. The approach to using that information is described in chapter II.C above.

1. Types and targets of intended nationally determined contributions

111. All of the INDCs contain information on mitigation targets or on strategies, plans and actions for low GHG emission development within a specified time frame or implementation period (see figure 4).

112. Most of the INDCs are national in scope; they address all major national GHG emissions or at least the most significant sources. Many contain quantified emission reduction targets, which take a variety of forms:

(a) Some of the INDCs include economy-wide mitigation targets, with absolute emission reduction targets expressed as an emission reduction below the level in a specified base year and ranging from a 9.8 to 90.0 per cent emission reduction below the respective base year level. A few of the INDCs contain absolute targets that are not linked to a base year but establish an overall maximum absolute limit on emissions (e.g. carbon neutrality by a future date or a specified amount of GHGs to be emitted over a period of time);

(b) Half of the INDCs include relative targets for reducing emissions below the BAU level, either for the whole economy or for specific sectors, ranging from 1.5 to 89.0 per cent;

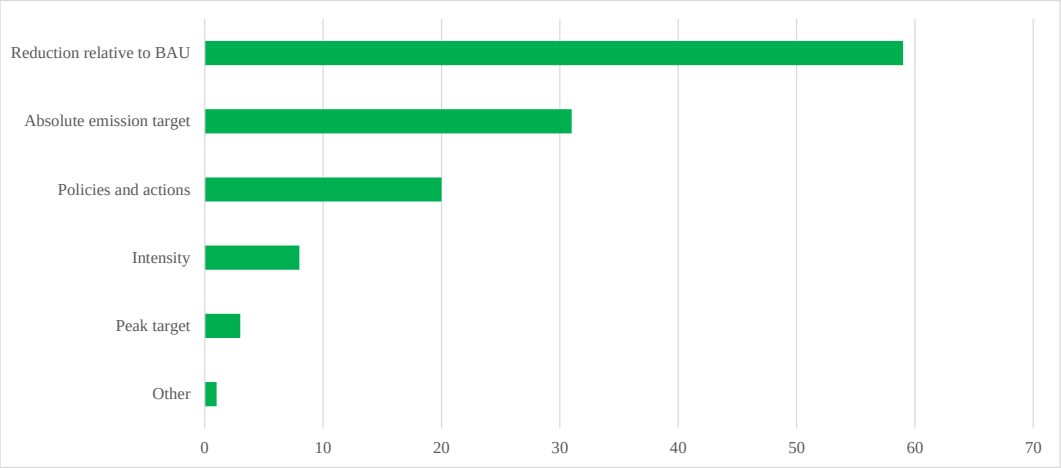
(c) A few of the INDCs contain intensity targets, with reductions in GHG emissions per unit of GDP or per capita ranging from 13 to 65 per cent relative to the level in a base year (e.g. 2005 or 2010) or to the absolute level of per capita emissions by 2025 or 2030;

(d) A few of the INDCs specify mitigation contributions through to the year or time frame in which their emissions are expected to peak (e.g. by 2030 or earlier);

(e) Some of the INDCs contain strategies, plans and actions for low GHG emission development reflecting Parties' special circumstances, in accordance with decision 1/CP.20, paragraph 11.

[44] A synthesis of the information communicated by Parties in their adaptation components is contained in chapter II.F below.

Figure 4
Types of mitigation target communicated in the intended nationally determined contributions



Abbreviation: BAU = 'business as usual'.

113. Some of the INDCs communicated specific mitigation targets for individual sectors or subsectors to support and/or underpin the overall mitigation target. A few Parties communicated a quantified target for renewable energy expressed as a percentage of different indicators, such as share in the energy matrix, installed capacity, penetration, generation and others. Some Parties included such targets as part of the information to facilitate the clarity, transparency and understanding of their INDCs. The targets ranged between 3.5 to 100.0 per cent of these indicators. Furthermore, a few Parties communicated quantified targets for LULUCF expressed either as hectares, cubic meters of biomass or tonnes of carbon.

114. Many Parties identified conditions for the full implementation of their INDCs, such as: expectations concerning the results of the ADP process; the level of effort undertaken by other Parties; the availability of market-based mechanisms; and access to enhanced financial resources, technology transfer and technical cooperation as well as enhanced capacity-building support. Some Parties did not specify conditions for their INDCs.

115. A few Parties provided information on specific conditions, such as: the establishment of an effective set of accounting rules and guidelines for estimating GHG emissions and removals, including from the LULUCF sector; the availability of economic instruments, including international, regional and bilateral market-based instruments; the costs of technology; and the absorbing capacity of forests.

116. Some of the INDCs include an unconditional mitigation component alongside an enhanced conditional one. Most of those conditional components relate to the provision of finance, technology or capacity-building support and translate into a percentage increase in the level of effort associated with the unconditional component. Such percentage increase is specific to the type of target selected by the Party (e.g. percentage reduction in emissions against a base year, BAU or emission intensity) and ranges from 2 to around 53 per cent of additional emission reductions.

117. Furthermore, a few Parties stated in their INDCs the expectation that negotiations under the ADP will provide the clarity required for meeting some of the above-mentioned conditions. A few Parties also indicated they reserve the right to revise their INDCs in the light of the outcome of the ADP process.

118. Together with uncertainties related to the estimation of emission reductions associated with the communicated mitigation targets and strategies, plans and actions for low GHG emission development, conditions attached to the INDCs result in aggregate global emissions for 2025 and 2030 being expressed as ranges (see para. 83 above).

119. In addition to communicating information on mitigation targets or strategies, plans and actions for the near to medium terms, some Parties included information on long-term mitigation strategies for the period up to and beyond 2050, indicating a transition towards low-emission development and climate resilience. In many of those INDCs, the near- to medium-term mitigation contribution is embedded in the long-term development strategy, aiming at greater ambition over time. The long-term goals communicated in the INDCs range from a 25 per cent GHG emission reduction by 2050 below BAU, through emission reductions or per capita emission reductions by 2050 below a specific base year level (e.g. 1990 or 2000), to achieving carbon neutrality or the transition to a low-emission society by 2050 or 2085, respectively.

2. Information on the reference point (including, as appropriate, a base year)

120. Information on the reference point generally constitutes an indication of a specific year (base year) or time frame when the emission levels or emission intensity levels serve as reference to set a mitigation target for the future. Information on the base year rather applies to absolute emission reductions or intensity-based mitigation objectives rather than to the objectives expressed as reductions below BAU or as a peaking year.

121. All Parties provided information on the reference point. Some Parties chose 1990 as a base year, a few chose 2005 and others referred in their INDCs to 2000, 2010, 2013, 2014 or 2015. Some Parties further specified the level of their emissions for the reference point and/or the specific source of the emission data for the reference point, such as a respective national inventory or other reports submitted to the UNFCCC, such as biennial update reports. Some Parties that expressed their mitigation objectives as a reduction below BAU level provided information on the reference emission scenarios.

3. Time frames and/or periods of implementation

122. Time frames and/or periods of implementation refer to a time period into the future during which the INDCs are to be implemented and/or achieved. Depending on their national circumstances, Parties communicated a single year or a period.

123. Most Parties communicated information on time frame and/or period of implementation in their INDCs. Most Parties communicated either a 5- or 10-year time frame for the implementation of their INDC. Many of the communicated INDCs refer to periods of implementation up to 2030, while a few INDCs specify a period up to 2025. A few of the INDCs communicated targets for both 2025 and 2030, one of which is indicative or interim. A few Parties indicated a timeline ending in 2035, 2040 or 2050, mostly in conjunction with another target year. Furthermore, a few Parties communicated an implementation period starting before 2020.

4. Scope and coverage

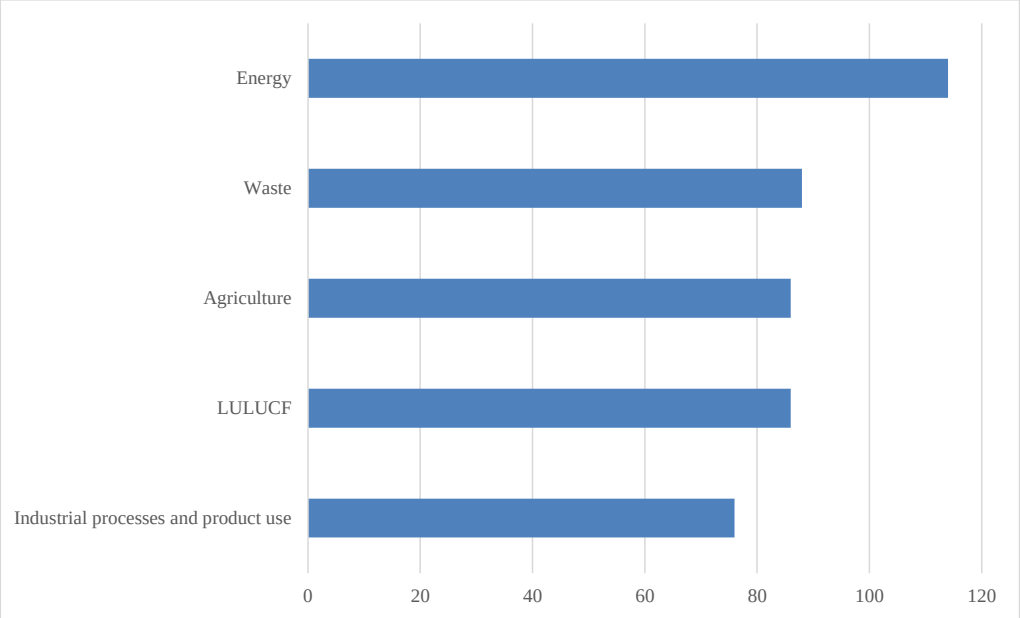
124. Information on the scope and coverage of the INDCs generally refers to the sectors and gases that are included in the mitigation targets or strategies, plans and actions for low GHG emission development and therefore provides the basis for determining whether the INDCs are covering total GHG emissions or a subset thereof. The mitigation targets or strategies, plans and actions for low GHG emission development communicated in the INDCs vary in their scope and coverage of the sectors and GHGs.

125. Many of the communicated INDCs cover most or all sectors in line with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) and hence are 'economy wide'. Those INDCs generally include the energy, industrial processes and product use, agriculture, LULUCF and waste sectors (see figure 5).

126. A few Parties provided information on the coverage of specific sectors that are of national importance and often form a subset of one or several of the IPCC sectors, such as the transport and/or building sector, while others also mentioned shipping and aviation, oil industry flaring, solvents and electric power.

127. Some Parties highlighted their mitigation actions in the forest sector, in particular through implementation of the activities referred to in decision 1/CP.16, paragraph 70 (hereinafter referred to as REDD-plus activities).[45] A few of those Parties further elaborated that their mitigation efforts in the forest sector will be coordinated through their existing REDD-plus initiatives.

Figure 5
Sectors covered by the communicated intended nationally determined contributions

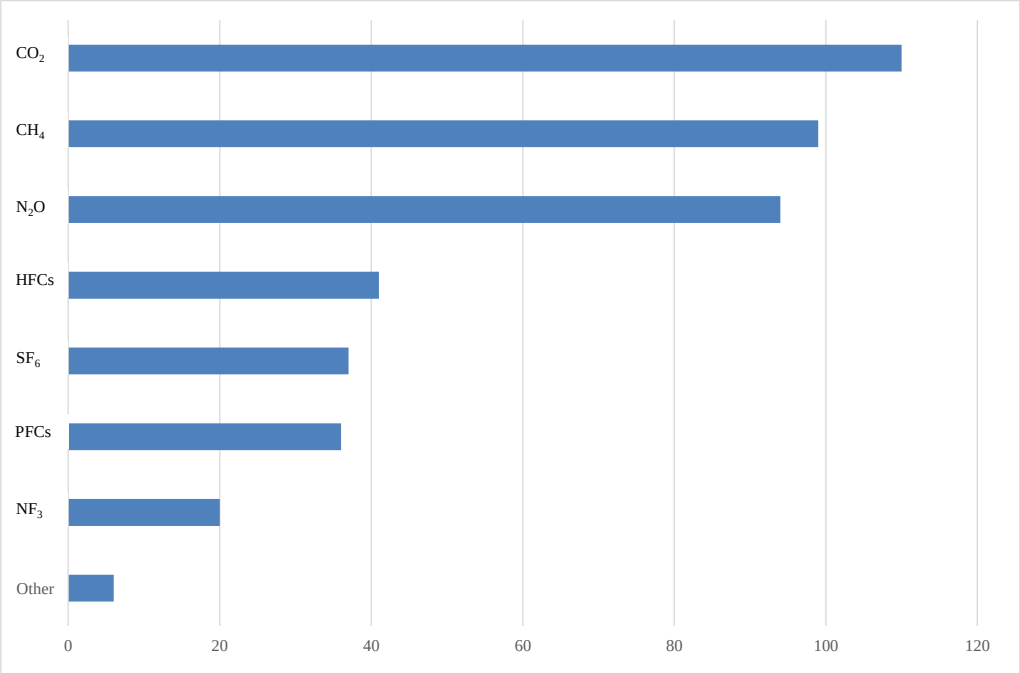


Abbreviation: LULUCF = land use, land-use change and forestry.

128. The coverage of GHGs in the INDCs is influenced by national circumstances. In line with the reporting activities of Parties under the Convention, most of the communicated INDCs cover CO_2 and many cover CH_4 and N_2O emissions, while some also cover emissions of SF_6, HFCs, PFCs and NF_3. A few of the INDCs include additional gases or emissions, including SLCFs (see figure 6).

[45] In decision 1/CP.16, paragraph 70, the COP encouraged developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

Figure 6
Gases covered by the intended nationally determined contributions



129. Diversity in the coverage of sectors and gases across the communicated INDCs poses a key challenge to assessing the aggregate effect of the INDCs in terms of global GHG emissions, as the aggregate level of emissions resulting from the INDCs in 2025 and 2030 is only a partial estimate of global emissions, excluding emissions from sectors and gases not covered by the communicated INDCs.

130. Differences in the coverage of gases across the INDCs do not have consequences for the evaluation of their aggregate effect itself, as long as such coverage is transparently presented ex ante, but it could affect the estimated total emission reductions and the calculation of the overall impact on increasing the total level and concentration of GHG emissions in the atmosphere.

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

131. Most Parties communicated some information on the assumptions and methodological approaches used for estimating and accounting emissions and removals, with varying level of detail. Most of those assumptions and methodologies relate to the estimation and projection of GHG emissions and removals. The quality and quantity of the information varied greatly, depending primarily on the communicated mitigation target and national capacity. Some Parties also provided information on the source of their data, including references to national studies, their GHG inventory and national communications.

Reporting guidelines

132. To respond to the requirements to prepare and communicate national inventories of GHGs, Parties use guidelines prepared by the IPCC, including: the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*; the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance); the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF); and the 2006 IPCC Guidelines.

133. While the guidelines applied differ, many Parties are shifting or intending to shift towards more recent guidelines. They are also widening the coverage of sectors and GHGs in their inventories.

134. Many Parties referred to the standard methods and procedures contained in the different IPCC guidelines. Some Parties mentioned the use of the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol, as well as the IPCC good practice guidance, the IPCC good practice guidance for LULUCF and the *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*.

Global warming potentials and other metrics

135. GWPs are used for aggregating emissions of the different GHGs into a single national total. Several of the INDCs communicated by Parties contain information on GWPs. Most of these INDCs considered GWPs on a 100-year timescale in accordance with either the IPCC Second Assessment Report (including those INDCs that refer to decision 17/CP.8) or the AR4 (including the INDCs that refer to decision 24/CP.19). A few Parties used GWP values published in the AR5, and one Party used GWP values and also global temperature potentials to describe its mitigation targets.[46]

Land use, land-use change and forestry

136. Many Parties included emissions and removals from LULUCF or specific mitigation actions targeting them in their INDCs. Several Parties mentioned actions in the LULUCF sector among the priority areas in the implementation of their INDCs.

137. Some of the INDCs contain information specific to LULUCF accounting. Many of them, however, do not include comprehensive information on the assumptions and methods to be used in the accounting of emissions and removals from LULUCF. This presents a major challenge in the assessment of the aggregate effect as it represents a major area of uncertainty.

138. A few Parties stated their intention to account for LULUCF, covering all emissions and removals from all pools and gases, using a net-net approach. Others listed a number of activities, namely afforestation, reforestation, revegetation, wetland restoration, reducing emissions from deforestation and forest degradation.

139. A few Parties indicated that they are switching to a comprehensive land-based approach but that the actual approach for quantifying LULUCF is still to be defined. A few Parties explained that the decision on whether LULUCF would be included, and any related methods, would be made at a later stage once better information on mitigation potential is available.

140. A few Parties stated that they will also make use of specific provisions for LULUCF in order to address specific issues in the contribution, such as how to address the inclusion of harvested wood products, the exclusion of emissions from natural disturbances, permanence, land-use flexibility, legacy and non-anthropogenic effects.

141. Some Parties indicated that a common framework for accounting may be desirable, which could be based on existing guidance and experiences under the Convention and its Kyoto Protocol. Most of these Parties are of the view that such a framework should be comprehensive and should ensure transparency and environmental integrity. Finally, one

[46] One Party used GWPs for black carbon as described in Bond et al. 2013. Bounding the role of black carbon in the climate system: A scientific assessment. *J. Geophys. Res. Atmos*. 118(11): pp.5380–5552.

Party indicated that reference scenarios or levels used in the accounting of LULUCF should, when based on a projection, be subject to a technical assessment process.

Future greenhouse gas emission levels

142. For mitigation targets other that economy-wide absolute emission reductions, information on expected GHG emissions in the future is required to assess the aggregate effect of the INDCs. Only a few Parties provided a quantitative baseline, BAU scenario or projections of emissions for 2025 and/or 2030. A few Parties indicated that they will provide related information once it becomes available.

143. Some Parties provided information on the assumptions used to develop a BAU scenario or to project GHG emissions. Most of these Parties referred to macroeconomic variables such as GDP or population, or to growth rates of these two variables. Other Parties mentioned the use of sector-specific variables, in particular for the energy sector, such as future demand for energy or electricity, electrification rates, efficiency and grid loss, as well as activity data for other sectors. A few only provided values for these variables and some referred to sources of data such as national statistics or international databases.

144. A few Parties mentioned the use of models to estimate future emissions, such as the Long-range Energy Alternative Planning system or the Greenhouse Gas Costing Model (GACMO). A few also indicated the development of scenarios to estimate future emissions under BAU and different levels of mitigation effort and based on the implementation of a series of mitigation measures.

6. Planning processes

145. Most of the INDCs communicated by Parties contain information on planning processes related to their INDCs, in both the national and international contexts. In this context, Parties communicated information on existing and future institutional arrangements related to the implementation of their INDCs, including references to existing related legislation, strategies, policies and measures aimed at addressing climate change, enhancing ambition, and/or concrete measures in the key sectors that lead to reducing GHG emissions or enhancing sinks. Some of the INDCs also contain information on stakeholder engagement processes as well as on concrete areas identified as priorities for future action. Some Parties provided information on how existing policies or legislation would be enhanced in order to implement their INDCs or on further processes necessary for the domestic approval and implementation of their INDCs.

Institutional arrangements

146. Institutional arrangements, including institutional structures and processes, were indicated by Parties to be a key element of the overall national climate change planning process. Many of the INDCs highlight mechanisms for coordination and cooperation, including for: intersectoral/inter-agency dialogue; raising awareness, facilitation of consultation and establishing relationships among various stakeholders; and establishing effective systems for collecting, processing, reporting and archiving required data and information.

147. Many Parties in their INDCs communicated that, as a result of the implementation of their current climate policies, they have already established institutions and instruments to address climate change, which they will draw upon in the agency cooperation and coordination on climate change at the national level, and in some cases at the regional and local levels. In this context, some Parties highlighted that they are preparing existing institutions for the challenges of implementing their INDCs and the transition towards low-emission development by broadening their scope and equipping them with additional

some Parties referred to, inter alia, renewable energy targets, fuel economy and energy efficiency standards, grid modernization, financial schemes to promote clean investments, environmental taxes, subsidy reforms, programmes for low-emission agriculture and waste management, and measures to promote forest conservation and reduce deforestation.

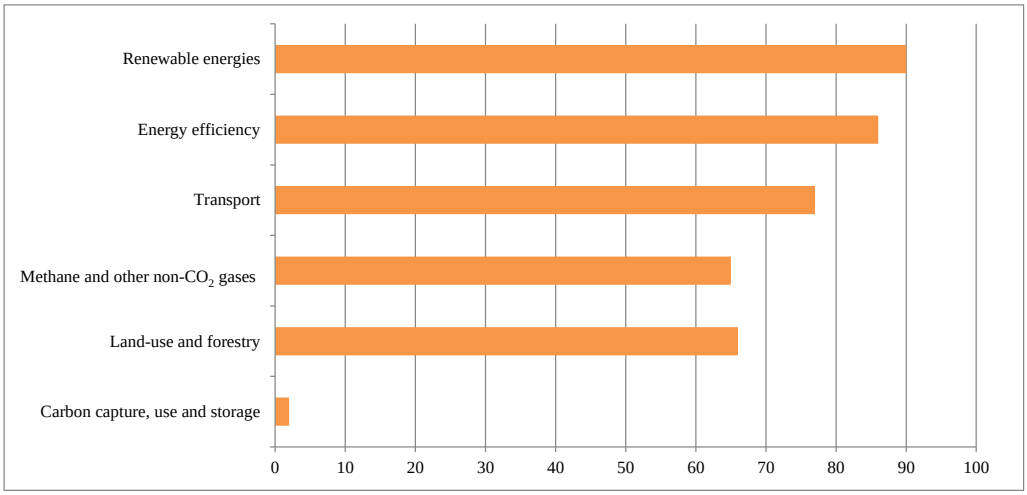
154. Renewable energy was highlighted in many INDCs. Related actions aim at increasing the share of and improving access to clean energy, such as feed-in tariffs, investment programmes for renewable energy generation, and improvement of the grid infrastructure. A few Parties communicated quantified renewable energy targets, with some aiming at achieving 100 per cent renewable energy supply for the electricity sector.

155. Actions on energy efficiency, also highlighted in many INDCs, include the modernization of energy generation and transmission infrastructure, the promotion of smart grids, efficiency improvements in industrial processes, and energy conservation standards. Sustainable transport is highlighted in several INDCs through measures such as improving public transport, limiting the import of inefficient vehicles and using fuel efficiency standards. A few Parties also communicated quantitative energy efficiency targets.

156. In several INDCs Parties provided information on plans to implement policies and measures to reduce CH_4 and other non-CO_2 gases by improving crop and livestock production, promoting low-carbon agriculture and establishing waste management and recycling programmes as well as waste-to-energy facilities. Furthermore, several INDCs highlight measures to promote the conservation and sustainable management of forests. Some Parties particularly highlighted the importance of REDD-plus activities in this context. A few Parties communicated targets for increasing forest cover.

Figure 7

Priority areas for implementation highlighted in the intended nationally determined contributions



157. In providing information on their priority areas for implementation, several Parties highlighted the link between the actions to address climate change implied by their INDCs and their development priorities, including social and economic development as well as poverty eradication. In this context, some Parties highlighted co-benefits of action to address climate change, including reduction in local air pollution and resulting benefits for health, improved access to energy, and synergies between adaptation and mitigation actions, in particular in agriculture and forestry.

158. With regard to next steps, some Parties communicated improving statistical and accounting systems for emissions as well as analytical capabilities among their priorities.

Examples of planned measures include: improving statistical indicator systems; personnel training; improving the quality of data; and establishing reporting mechanisms at the national, subnational and entity levels. Several of the INDCs indicate the intention to improve the existing or to put in place a new system for monitoring, measuring and reporting emissions.

Stakeholder engagement

159. Many Parties referred in their INDCs to the importance of extensive national consultation and interdisciplinary coordination to ensure strong alignment with development objectives and buy-in from all relevant stakeholders.

160. Several Parties specifically highlighted that all levels of government share responsibility for action and the existence of inter-agency coordinating mechanisms on climate change in the countries. A few of the INDCs have been approved at the highest political level, for example by the national Parliament, the Cabinet of Ministers or by the President. Furthermore, the importance of national, subnational and regional cooperative action both by government and non-State actors was noted by several Parties. A few of the INDCs specifically note that initiatives undertaken by cities and subnational governments will be an important driver for their implementation.

161. Many Parties provided information emphasizing that their INDCs have undergone national stakeholder consultation processes with a view to raising awareness and securing buy-in with respect to their INDCs and related long-term development plans. Parties highlighted that support from actors such as the private sector, academia and civil society, as well as from relevant sectoral ministries and regional and local governments, is critical for identifying realistic targets. A few Parties still plan to hold consultations on the overall national climate policy underlying their INDCs and on the specific measures that allow emission reductions, with some already having specified the target time frame for them to take place.

162. INDCs have led to the establishment of new institutional arrangements and consultation processes, in some cases involving not only sectoral ministries, businesses, environmental non-governmental organizations, academia and local governments, but also the general public. Some Parties have put in place new processes to engage relevant public and private actors, such as sectoral dialogues, cross-cutting working groups, expert teams and technical peer review, or inviting written submissions as part of the national consultation process on their INDCs. Other examples of processes to engage stakeholders included the establishment of expert task forces and working groups, parliamentary hearings, large-scale public consultations, including workshops, targeted meetings and an invitation for written submissions, as well as awareness-raising campaigns. In one country such consultations reportedly involved more than 500 participants.

7. Fairness, ambition and contribution to the objective of the Convention

163. Most Parties communicated in their INDCs information on how they consider that their respective INDC is fair and ambitious in the light of their national circumstances, as well as on how their INDC contributes towards achieving the objective of the Convention as set out in its Article 2 together; hence that information is addressed together in this report.

Fairness

164. Most Parties provided information on how they consider that their INDC is fair and ambitious in the light of their national circumstances.

165. In setting the context for the discussion on fairness and ambition, Parties highlighted a number of principles underlying their INDCs and related action. They included inter alia,

the importance of a shared global effort undertaken in a fair and equitable manner; the principles of equity and common but differentiated responsibilities and respective capabilities; the need for taking into account Parties' national circumstances; the recognition that all countries need to act to address climate change; the application of the same legal form and rules to all Parties; and the recognition that fairness considerations include various aspects and national circumstances, as no single indicator can accurately reflect fairness or a globally equitable distribution of Parties' efforts.

166. Most of the INDCs refer to specific national circumstances when outlining why they are fair and ambitious. National circumstances relevant to determining the fairness and ambition of the INDCs communicated by Parties include, inter alia, considerations related to: the size and geography of the country; its population and urban density; its climatic conditions; its natural resource endowment; its energy mix (abundance/lack of natural and renewable energy resources, dependence on fossil fuels, already having a low-carbon energy system, and limits on the use of nuclear energy due to public concerns); and its vulnerability to climate change impacts.

167. Several Parties highlighted the link between the actions to address climate change implied by their INDCs and their development priorities, including social and economic development as well as poverty eradication. Some Parties highlighted synergies between their development and climate priorities and a few further noted specific co-benefits of action to address climate change, including improvements in air quality, human health, job creation and others, as well as synergies between adaptation and mitigation actions, in particular in agriculture and forestry.

168. Many Parties linked the discussion on the fairness and ambition of their INDCs to national circumstances, in particular to economic and social trends, such as: high economic growth; high population growth; being in the process of rapid industrialization and urbanization; facing challenges of economic development; aspirations for growth and poverty eradication; the need for the improvement of living standards; dependence on the global supply chain for food and energy security; sensitivity to the volatility of regional and global developments; high dependency on climate-sensitive sectors such as agriculture, tourism, water and health; as well as the specifics of the respective industrial structure (e.g. large share of manufacturing and high energy efficiency of major industries, and large share of emissions originating from agriculture).

169. In providing information on how they consider their INDCs to be fair and ambitious, many Parties further provided information on specific criteria for evaluating fairness and ambition, including criteria relating to the Party's responsibility and capability, mitigation potential, cost of mitigation actions, the degree of progression/stretching beyond the current level of effort, and the link to objectives and global goals. Most of those Parties in their INDCs viewed responsibility directly or indirectly in the context of their past, current and future share in the global emissions and per capita emissions in comparison with global averages, as well as the trends in one or several of those indicators.

170. Regarding the capacity to contribute, considerations include level of development, GDP per capita, ability to invest in mitigation, and international support received. Some Parties listed the potential for cost-efficient mitigation and past efforts among the fairness criteria.

Ambition

171. For many Parties, ambition corresponds to the size of their efforts to address climate change in relation to their national circumstances, capacity and responsibility. The interpretation of ambition varies from country to country and is manifested in narratives that explain Parties' level of efforts. For example, many Parties referred in their INDCs to progression beyond current undertakings, either in terms of the size of the effort or its type,

comparison to the efforts of other Parties in similar circumstance and linkages to global objectives. Most Parties placed ambition in the context of their national circumstances and the fairness considerations noted above.

172. In explaining how their INDCs are ambitious, most Parties elaborated on how their contributions represent a significant progression beyond their current undertakings. In doing so, some Parties communicated that their mitigation targets or strategies, plans and actions for low GHG emission development imply an acceleration in the national rate of decarbonization of their economies and that a decoupling of GHG emissions from economic growth will be achieved. Other Parties provided information on ambition and progression by highlighting emission reductions below BAU scenarios and/or substantial acceleration in the annual pace of emission reduction, declining per capita emissions, peaking years for emissions and the translation of previously aspirational objectives into domestically legally binding goals. Some noted that their mitigation targets or strategies, plans and actions for low GHG emission development go beyond the reduction requirements stated by the IPCC and/or relevant COP decisions for the global emission level or for specific groups of Parties.

173. Some of the INDCs highlighted past performance and already undertaken actions to reduce emissions as indicators for explaining their fairness and ambition. For example, a few Parties referred to the overall outcomes of policies that they have put in place to implement the Kyoto Protocol and the emission reductions achieved in this context.

174. Some Parties provided information on ambition by linking their INDC to the objectives of the global transition towards a low-carbon economy, with a few INDCs specifically referring to the overall low-carbon transformation of the economy, the decarbonization of energy supply, increasing carbon sinks, and the modernization and diversification of the economy. A few Parties also highlighted their contribution to the provision of support, including for the development and diffusion of low-emission technologies, and referred to their past performance in reducing their emissions.

Contribution towards achieving the objective of the Convention

175. As previously noted, most Parties communicated information on the contribution towards achieving the objective of the Convention together with the above-discussed information on fairness and ambition.

176. Several Parties indicated that their expected level of emissions in the future would fall within a global emission pathway that is consistent with the goal of keeping the global average temperature increase below 2 °C, while a few Parties referred to 1.5 °C. In this context, some referred to an 80–95 per cent emission reduction by 2050 compared with the 1990 level for developed countries, or to global emissions being at least halved by 2050 compared with the 1990 level, in accordance with the findings of the IPCC. Other Parties referred to global and national decarbonization efforts. Other Parties stated the direct link between their INDC and the general objective of the Convention as stated in its Article 2.

177. A few Parties stated that their adaptation components contribute to the objective of the Convention by reducing vulnerability both nationally and globally.

178. Regarding the Party's capacity to contribute to global mitigation actions towards achieving the objective of the Convention, considerations include the overall level of development, GDP per capita, vulnerability to climate change, ability to invest in long-term mitigation measures, such as carbon-efficient technologies, and the support received from the international community that is framing the national capacity to prepare and implement the INDC. A few Parties considered the carbon intensity of their economy, the potential for cost-efficient mitigation and overall abatement costs, as well as past efforts (ensuring that first movers are recognized for past mitigation actions) among the relevant fairness criteria.

8. Additional information

179. Some of the INDCs contain information in addition to the elements specified in decision 1/CP.20, paragraph 14, including on the use of market-based mechanisms and the provision of support for the implementation of the INDCs.

Market-based mechanisms

180. Nearly half of the Parties that communicated an INDC indicated their intention to use market-based mechanisms, with some Parties identifying those instruments as a condition for the implementation of their INDCs. These Parties explicitly noted plans to use carbon credits from international, regional or domestic schemes, including some Parties that expressed an interest in using the CDM. Moreover, some Parties stated either a general interest in market-based mechanisms or an intention to further explore their use.

181. Some of these Parties highlighted the role of market-based mechanisms in enhancing the cost-efficiency of mitigation efforts, thus creating opportunities to raise overall ambition. While almost no quantitative information was provided on the expected degree of use, some Parties indicated that they would use market-based mechanisms to meet only part of their mitigation targets.

182. Finally, some Parties stressed the need for principles and/or rules for governing the use of such mechanisms. Such rules would aim at preventing double counting of emissions, ensuring the environmental integrity of the credits generated and promoting sustainable development benefits.

Support for implementing intended nationally determined contributions

183. Information on support for implementing INDCs communicated by Parties includes: needs for targeted investment and finance, technology and capacity-building; domestic matters such as planned measures to enhance support for implementation; and general expectations of the agreement to be reached at the Paris Conference in relation to finance, technology cooperation and capacity-building.

184. Information on support needs was communicated in many of the INDCs. The majority include information on the need for enhanced international support for the implementation of the INDCs and for enhancing ambition over time in the form of finance, technology transfer and capacity-building. Some Parties included quantitative estimates of the investment and financial support required for the full implementation of their communicated INDCs or for achieving the upper level of their conditional targets. Parties communicating conditional and unconditional components identified financial support as a key factor for moving towards the highest range.

185. Some Parties communicated INDCs including information on domestic measures related to the support and finance necessary for their implementation. Among others, such measures include: the use of market instruments; increased budgetary support for climate action; the development of public–private partnerships; green procurement programmes; reformation of pricing and taxation regimes; improvement of green credit mechanisms; establishment of national funds to channel and stimulate financial flows from different public and private sources; and the development or strengthening of cooperation arrangements with financial institutions, such as the GCF.

186. With regard to international support, several Parties noted the need: for enhancing existing institutional arrangements under the Convention for delivering international financial, technology and capacity-building support under the agreement to be reached at the Paris Conference; for increasing the scale of financial support for climate change action; for strengthening support mechanisms under the Convention, such as the GCF, the GEF

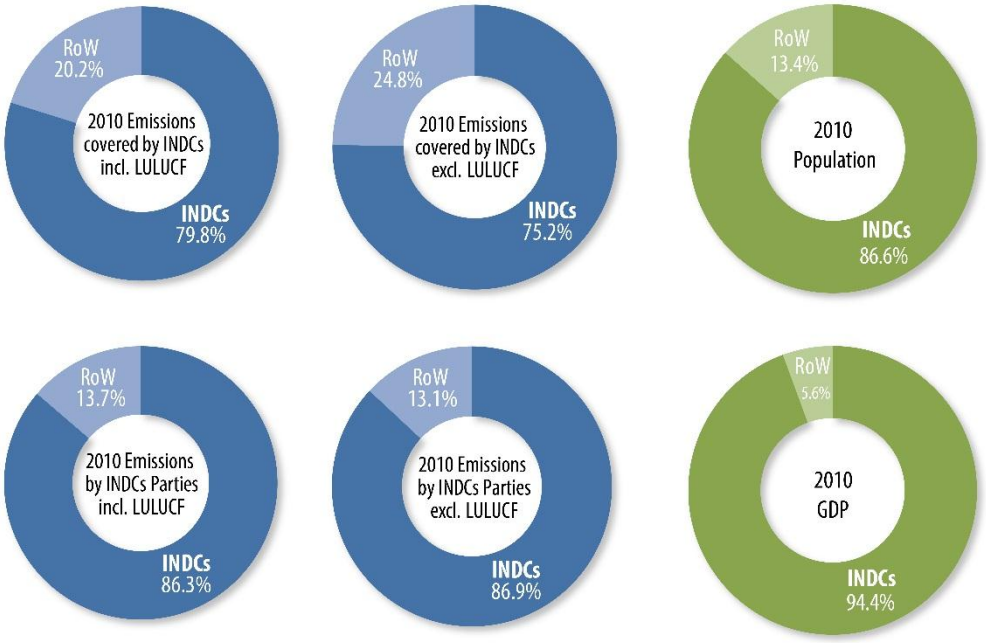
and/or the Technology Mechanism; and for establishing an international mechanism on capacity-building.

E. Aggregate effect of the intended nationally determined contributions

1. Coverage by the intended nationally determined contributions of current emissions

187. The INDCs presented up to 1 October 2015 cover 80 per cent of global emissions in 2010. Excluding LULUCF, they cover sectors and gases from which 75 per cent of global emissions in 2010 originated. The level of total national emissions of the Parties that put forward INDCs is slightly higher, given that there are some sectors and gases not covered by the INDCs. Those emissions cover 86 per cent of global emissions in 2010 and 87 per cent excluding LULUCF. The Parties that put forward an INDC represent 87 per cent of the world's population and 94 per cent of GDP in 2010 (see figure 8).[47]

Figure 8
Coverage of the communicated intended nationally determined contributions as at 1 October 2015



Source: Aggregation of greenhouse gas emissions reported in the INDCs; population data: 2015 revision of the United Nations World Population Prospects, available at <http://esa.un.org/unpd/wpp/>; GDP data: International Monetary Fund World Economic Outlook data, with GDP expressed in current USD, available at <https://www.imf.org/external/pubs/ft/weo/2015/01/weodata/index.aspx>.

Abbreviations: GDP = gross domestic product, INDCs = intended nationally determined contributions, LULUCF = land use, land-use change and forestry, RoW = rest of the world.

[47] GDP in current USD according to the International Monetary Fund *World Economic Outlook 2015*. When using GDP adjusted for purchasing power parity in current USD, according to the International Monetary Fund *World Economic Outlook 2015*, the share of Parties that communicated an INDC represents 90 per cent of the world's GDP in 2010.

2. Expected aggregate emissions in 2025 and 2030

188. The estimated aggregate emission level for only the sectors and gases covered by INDCs and that results from the implementation of the communicated INDCs, applying the methods described in chapter II.C above, is expected to equal 41.7 (36.7 to 47.0)[48] Gt CO_2 eq in 2025 and 42.9 (37.4 to 48.7) Gt CO_2 eq in 2030.

189. The global levels of emissions in 2025 and 2030 were estimated by adding the estimated aggregate emission levels resulting from the implementation of the communicated INDCs to the levels of emissions not covered by the INDCs, in accordance with the IPCC reference scenarios. Thus, the global emission level resulting from the INDCs[49] is expected to amount to **55.2 (52.0 to 56.9) Gt CO_2 eq in 2025 and 56.7 (53.1 to 58.6) Gt CO_2 eq in 2030**.[50] Many of the targets in the INDCs were stated as ranges, or alternatively the quantification underlying this report used in some cases a low and high scenario, if the quantification was not unambiguous. If only the higher end of each unconditional INDC is aggregated, global total emissions are projected to be 55.3 to 58.8 Gt CO_2 eq in 2025 and 57.8 to 61.2 Gt CO_2 eq in 2030. Similarly, when aggregating all of the lower ends of the ranges, including any conditional INDCs, the estimated level of global emissions is equal to 51.4 to 55.0 Gt CO_2 eq in 2025 and 52.6 to 56.1 Gt CO_2 eq in 2030.

190. Global cumulative CO_2 emissions resulting from the implementation of the communicated INDCs after 2011 are expected to reach 541.7 (523.6 to 555.8) Gt CO_2 in 2025 and 748.2 (722.8 to 771.7) Gt CO_2 in 2030.

3. Expected aggregate emissions in relation to emission levels in 1990, 2000 and 2010

191. The level of global total emissions is estimated as 38.8 Gt CO_2 eq in 1990; 40.5 Gt CO_2 eq in 2000; and 48.1 Gt CO_2 eq in 2010.[51]

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[48] Unless otherwise stated, ranges indicate 20–80 per cent ranges and single values indicate medians.

[49] Reported emission levels in this report, unless otherwise indicated, include land-use change emissions and use GWP AR4 metric values with a 100-year time-horizon.

[50] These estimates are based on adding the assessed aggregate level of emissions covered by the INDCs and global emission figures for 2025 and 2030 for the countries, sectors and gases not covered by the INDCs derived from scenarios in the IPCC AR5 scenario database that reflect 2020 pledges under the Cancun Agreements. The quantification of the INDCs has been done separately for the lower and higher ends of any provided ranges, distinguishing as well into conditional and unconditional targets. In each of those cases, uncertainties related to estimating and accounting methodologies, data gaps and interpolation of 2025 values in the case of INDCs communicating targets for 2030 etc. were taken into account as previously discussed. If a Party provided only a single value of emission reduction (without a range), that single value is reflected in both distributions, possibly with a respective low and high quantification, if there was ambiguity around the appropriate estimated 2025 or 2030 emission level.

[51] The contribution of Working Group III to the AR5 estimated emissions in 1990 at 38 Gt CO_2 eq, emissions in 2000 at 40 Gt CO_2 eq and emissions in 2010 at 49 Gt CO_2 eq (with uncertainty ranges) using GWPs from the IPCC Second Assessment Report for aggregation (see figure SPM.1 in the contribution of Working Group III to the AR5). For this report, 100-year GWPs from the AR4 were used, but global numbers are comparable and within the uncertainty range of the contribution of Working Group III. In order to estimate historical emissions that are consistent and comparable with the provided future INDC emission estimates, the historical emission estimates were derived on the basis of IPCC AR5 scenario estimates. The set of IPCC AR5 scenario estimates is not harmonized and exhibits slight variations in recent historical emissions between the scenarios. Specifically, historical emission estimates are derived by backwards extending IPCC AR5 scenarios on the basis of UNFCCC inventory data for Parties included in Annex I to the Convention, IPCC historical data for Parties not included in Annex I to the Convention, the Houghton et al. emissions used by the IPCC for

192. The global aggregate level of emissions resulting from the implementation of the communicated INDCs is thus expected to increase as follows:

(a) In relation to 1990: by 41 (34–46) per cent by 2025 and by 45 (37–52) per cent by 2030;

(b) In relation to 2000: by 35 (29–40) per cent by 2025 and by 39 (32–45) per cent by 2030;

(c) In relation to 2010: by 13 (8–18) per cent by 2025 and by 17 (11–22) per cent by 2030.

193. If the ambition level of the announced INDC targets is kept, targets not enhanced and those stated targets exactly met, rather than overachieved, global emissions are likely to increase until 2030. The rate of emission increase over the past two decades is however very unlikely to be repeated, with an expected increase of 11–22 per cent in the period 2010–2030 compared with 24 per cent in the period 1990–2010. From 2010 to 2030, the relative emission increase in line with the INDCs is expected to be 10–57 per cent lower than the relative global emission increase over the prior two decades from 1990 to 2010, thus reflecting the impact of the implementation of the INDCs.

194. Global average per capita emissions are expected to be 6.8 (6.5 to 7.1) t CO_2 eq/capita in 2025 and 6.7 (6.4 to 7.2) t CO_2 eq/capita in 2030.[52]

195. Per capita emissions were equal to 7.4 t CO_2 eq/capita in 1990; 6.7 t CO_2 eq/capita in 2000; and 7.0 t CO_2 eq/capita in 2010. Thus, future global average per capita emissions show a slight decline of 8 and 4 per cent by 2025 and of 9 and 5 per cent by 2030 compared with their historical levels in 1990 and 2010, respectively.[53] Emission levels in 2000 were approximately equal (+/–0 per cent) to expected per capita emission levels in 2030 (range: –5 to +6 per cent) and 1 per cent above expected 2025 levels (range: –3 to +5 per cent). After a decade of decreasing global average per capita emissions from 1990 to 2000 and the recent increase from 2000 to 2010, the implementation of the communicated INDCs hence represents a turning point, namely the restart of lowering per capita emissions.

4. Expected aggregate emissions resulting from the implementation of the communicated intended nationally determined contributions in relation to trajectories consistent with actions communicated by Parties for 2020 or earlier

196. In this report, global emission levels resulting from the implementation of the communicated INDCs are compared with reference case scenarios similar to other ‘with existing measures’ scenarios. More precisely, the used reference scenarios could be called ‘with existing pledges’, as they capture the 2020 Cancun pledges, but are not necessarily ‘with current policies’ scenarios (hereinafter referred to as pre-INDC trajectories).

land-use change emissions and any remainder emission differences in 2010. Those remainder emission differences between the bottom-up emission estimates and the IPCC scenarios in 2010 vary from scenario to scenario (–0.1 (–0.2 to 0.8) Gt CO_2 eq), but are small when compared with global emissions (–0.3 (–0.4 to 1.5) per cent). To capture the uncertainty, those remainder differences were backcasted by a range of four different methods: (1) keeping the remainder emissions constant, or making them proportional to the other emissions at a (2) global, (3) regional or, where IPCC scenario information was available, (4) country level.

[52] The projections of per capita emissions assume three different population growth projections, namely the low, median and high ones according to the 2015 revision of the United Nations 2012 population projections (median: 8.04 billion by 2025 and 8.40 billion by 2030).

[53] The declines in per capita emissions are stated here as averages of the median values for the low and high cases, which represent the two ends of any ranges within the INDCs. The 60 per cent uncertainty range is approximately +/–3 per cent around those median values.

Reference case scenarios from the IPCC AR5 scenario database[54] that are used in this chapter correspond to those that take into account actions communicated by Parties for 2020 or earlier and project emissions further until 2030 without additional climate policies for the 2020–2030 period.

197. Reflecting the assumptions underlying the pre-INDC trajectories, aggregate global emissions according to these scenarios are projected to reach 57.7 (57.7 to 58.5) Gt CO_2 eq in 2025 and 60.8 (60.7 to 60.8) Gt CO_2 eq in 2030.

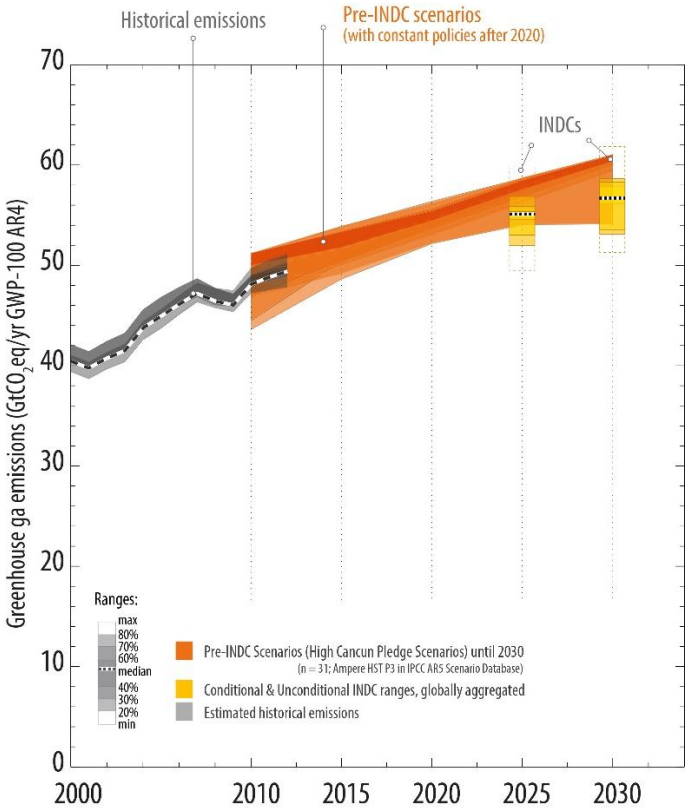
198. A discussion on the expected global level of aggregate emissions resulting from the implementation of the communicated INDCs in relation to trajectories consistent with the pre-INDC trajectories provides information on progress on action to reduce emissions and enhance sinks. In particular, it illustrates the aggregate effect of the implementation of the INDCs in addition to actions communicated for 2020 or earlier.

199. Figure 9 compares global emission levels resulting from the implementation of the communicated INDCs by 2025 and 2030 (yellow bars) with pre-INDC trajectories (red).

[54] Specifically, this report uses 22 reference scenarios that are categorized as P3 scenarios in the IPCC AR5 scenario database and belong to the group of 'high short-term' scenarios designed within the AMPERE project (see <https://secure.iiasa.ac.at/web-apps/ene/AMPEREDB/static/download/WP2_study_protocol.pdf>). This subset's emissions are only used until 2030, after which they assume the onset of global implementation. Before 2030, these scenarios assume the implementation of the higher-emission end of the 2020 Cancun pledges and keep climate policies constant until 2030.

Figure 9

Global emission levels resulting from the implementation of the communicated intended nationally determined contributions by 2025 and 2030 in comparison with trajectories consistent with action communicated by Parties for 2020 or earlier



Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.

Abbreviations: AR4 = Fourth Assessment Report of the Intergovernmental Panel on Climate Change, GWP = global warming potential, INDCs = intended nationally determined contributions.

200. As illustrated in figure 10, global GHG emissions resulting from the implementation of the communicated INDCs are generally expected to be lower than the emission levels according to pre-INDC trajectories by 2.8 (0.2–5.5) Gt CO_2 eq in 2025 and 3.6 (0.0–7.5) Gt CO_2 eq in 2030.[55, 56] Taking into account the conditional components of the INDCs would make the upper level of the range 1.0 and 1.9 Gt CO_2 eq higher than with unconditional components only.[57]

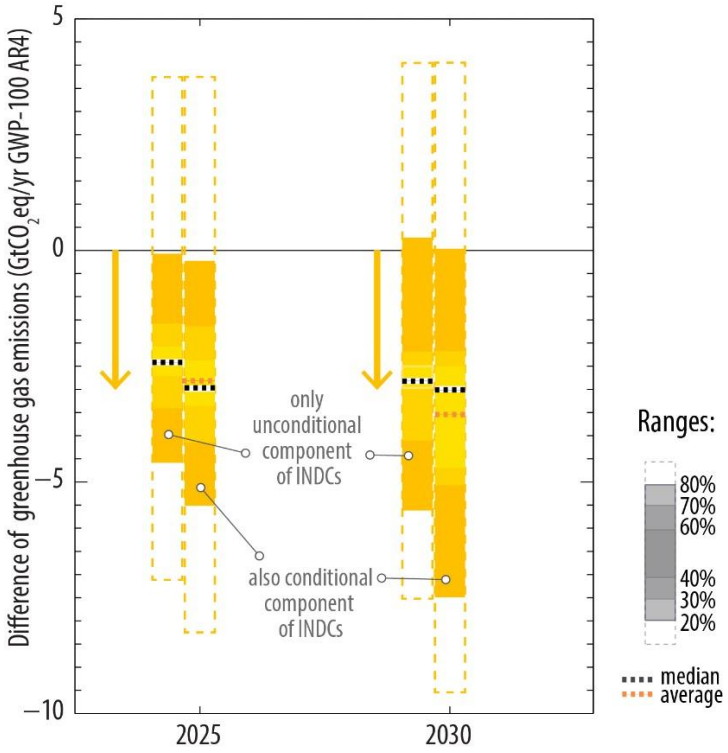
[55] In some instances, the estimated global emissions at the higher end of the INDC target range would theoretically result in higher global emissions than in the considered IPCC reference scenario. This can occur if communicated INDC target growth rates are above the IPCC reference scenario growth rates for the same sectors and gases.

[56] In contrast to the given average reduction, the median reduction resulting from the INDCs below reference scenarios is 3.0 Gt CO_2 eq in 2025 and 3.0 Gt CO_2 eq in 2030.

[57] This excludes an assessment of the conditions related to LULUCF and cases where the extent of the conditional component of the INDC is uncertain.

Figure 10

Difference between global emission levels resulting from the intended nationally determined contributions and pre-INDC trajectories



Note: Both bars indicate the percentiles over 304 individual scenarios, which sample across multiple choices, like lower or higher ends of communicated intended nationally determined contributions, different interpolation methods and different reference scenarios from the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Abbreviations: AR4 = Fourth Assessment Report of the Intergovernmental Panel on Climate Change, GWP = global warming potential, INDCs = intended nationally determined contributions.

201. Any emission reduction below the considered reference scenarios is a step towards achieving 2 °C scenarios. Thus, the percentage achievement of the full path can be measured as the percentage by which the global emission levels resulting from the implementation of the communicated INDCs are lower than the reference scenarios in comparison with the full difference between the reference and 2 °C scenarios. In this comparison, the INDCs are estimated to reduce the difference between the pre-INDC trajectories and 2 °C scenarios by 27 (1 to 58) per cent by 2025 and 22 (–1 to 47) per cent by 2030.[58]

[58] The provided reductions below reference scenarios, expressed as percentages of the full difference between reference scenarios and least-cost mitigation scenarios, take both the 2 °C mitigation scenarios into account that enhance mitigation in 2010 (P1 scenarios) and those that enhance mitigation in 2020 (P2 scenarios), as shown in figure 11. When taking into account only the 2 °C mitigation scenarios with an enhancement of global mitigation action by 2020 (P2), the respective percentages are 37 (3 to 73) per cent by 2025 and 18 (0 to 42) per cent by 2030.

5. Expected aggregate emissions resulting from the implementation of the communicated intended nationally determined contributions in relation to least-cost 2 °C scenarios

202. Least-cost 2 °C scenarios were taken from the IPCC AR5 scenario database.[59] The scenarios that follow a least-cost emission trajectory from 2010 onwards exhibit on average a slight emission increase until 2015 (see figure 11) and many scenarios of this set could be considered as approximating a world in which mitigation action is being enhanced 'today'. A second set of scenarios implies an enhancement of least-cost global mitigation action by 2020, reaching on average even lower emissions by 2030 compared with the first set of scenarios. Taking both groups of 2 °C scenarios together, emissions in 2025 tend to be between the 2000 and 2010 emission levels, namely at 45.4 (43.0 to 48.9) Gt CO_2 eq. By 2030, the emissions of this joint set are at 42.5 (36.3 to 43.6) Gt CO_2 eq, close to 2000 emission levels. In comparison, considering only scenarios with an enhancement of global mitigation action by 2020 implies 2030 emissions levels of 38.1 (30.3 to 45.0) Gt CO_2 eq, which is similar to 1990 emissions.

203. According to the AR5, global cumulative CO_2 emissions after 2011, for a likely chance of keeping global average temperature rise below 2 °C, should be limited to less than 1,000 Gt CO_2.[60]

204. In general terms, aggregate emissions resulting from the implementation of the communicated INDCs do not fall within the range of least-cost 2 °C scenarios, as illustrated in figure 11.

205. The global temperature at the end of this century depends on both emissions up to 2030 and emissions in the post-2030 period. By lowering emissions below pre-INDC trajectories, the INDCs contribute to lowering the expected temperature rise until and beyond 2100. However, temperature levels by the end of the century strongly depend on assumptions on socioeconomic drivers, technology development and action undertaken by Parties beyond the time frames stated in their INDCs (e.g. beyond 2025 and 2030).

206. If Parties were not to enhance mitigation action until 2030, but assumed mitigation action after 2030 that still aimed at staying below a 2 °C temperature increase, scenarios from the IPCC AR5 scenario database indicate that this is possible, but only at substantially higher annual reduction rates compared with the least-cost 2 °C scenarios. Thus, it can be concluded that greater reductions in the aggregate global emissions than those presented in the INDCs will be required for the period after 2025 and 2030 to hold the temperature rise below 2 °C above pre-industrial levels.

207. Reductions in GHG emissions compared with 2010 emission levels are on average 3.3 (2.7–3.9) per cent per annum for the 2030–2050 period in mitigation scenarios that approximately start from INDC global emission levels by 2030. In comparison, least-cost

[59] Scenarios consistent with limiting the temperature rise below 2 °C above pre-industrial levels were taken from the AR5 scenario database. Scenarios that follow a least-cost emission trajectory from 2010 onwards (so-called P1 scenarios) with a greater than 66 per cent likelihood of temperature rise staying below 2 °C correspond to a range of 44.3 (38.2–46.6) Gt CO_2 eq emissions in 2025 and 42.7 (38.3–43.6) Gt CO_2 eq emissions in 2030. Scenarios that follow a least-cost emission trajectory from 2020 onwards (so-called P2 scenarios) with a greater than 66 per cent likelihood of temperature rise staying below 2 °C correspond to a range of 49.7 (46.6–51.6) Gt CO_2 eq emissions in 2025 and 38.1 (30.3–45.0) Gt CO_2 eq emissions in 2030. Given the similar emissions of P1 scenarios to current emissions in 2015 (see figure 11), and given the similarity between P1 and P2 scenarios by 2030, this report analyses the joint set of P1 and P2 mitigation scenarios in addition to separate considerations of P1 or P2 only.

[60] This figure relates to a 'likely chance'. For a 50 per cent probability of staying below 2 °C, the AR5 indicates 1,300 Gt CO_2 as the amount of cumulative CO_2 emissions after 2011.

mitigation scenarios that enhance mitigation action by 2010 or 2020 will suffice with annual reductions of only 1.6 (0.7–2.0) per cent in comparison with 2010 emission levels for the 2030–2050 period.

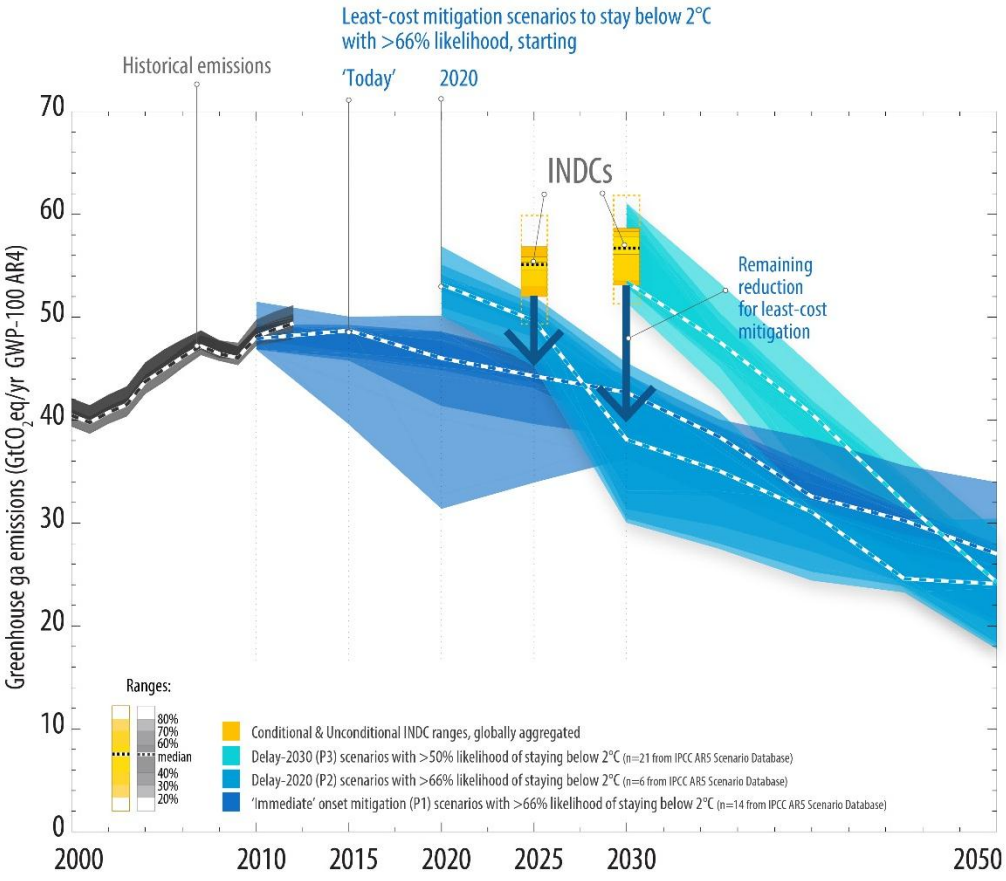
208. The assessment of end-of-century temperatures is possible under 'what-if' cases for the level of emissions beyond 2030. While this report draws a comparison between emission levels expected to result from the INDCs in 2025 and 2030 and various IPCC scenarios, the use of climate models to estimate end-of-century temperatures resulting from specific post-2030 assumptions (like constant or linear extensions of emissions or assumed constant climate policies) is considered to be out of its scope.

209. The following discussion is therefore limited to a comparison of the level of global emissions resulting from the implementation of the communicated INDCs in 2025 and 2030 and GHG emission levels for the same years implied under the 2 °C scenarios.

210. The discussion provides only a snapshot comparison of the level of emissions in the individual years. Whether or not current efforts are enough to achieve a limit on temperature rise can only be evaluated on the basis of information on action within and beyond the time frame covered by the INDCs, including all countries, gases and sectors as well as efforts to reduce emissions from 2030 onwards.

Figure 11

Estimated global emissions following the implementation of the communicated intended nationally determined contributions by 2025 and 2030 and 2 °C scenarios



Abbreviations: INDCs = intended nationally determined contributions, IPCC AR5 = Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

211. Aggregate GHG emissions resulting from the implementation of the communicated INDCs are expected to be 8.7 (4.7–13.0) Gt CO_2 eq (19 per cent, range 10–29 per cent) and 15.1 (11.1–21.7) Gt CO_2 eq (35 per cent, range 26–59 per cent) above the level of emissions under the joint set[61] of 2 °C scenarios in 2025 and 2030, respectively (see figure 12).

212. The emission differences towards least-cost trajectories can be read in at least three ways:

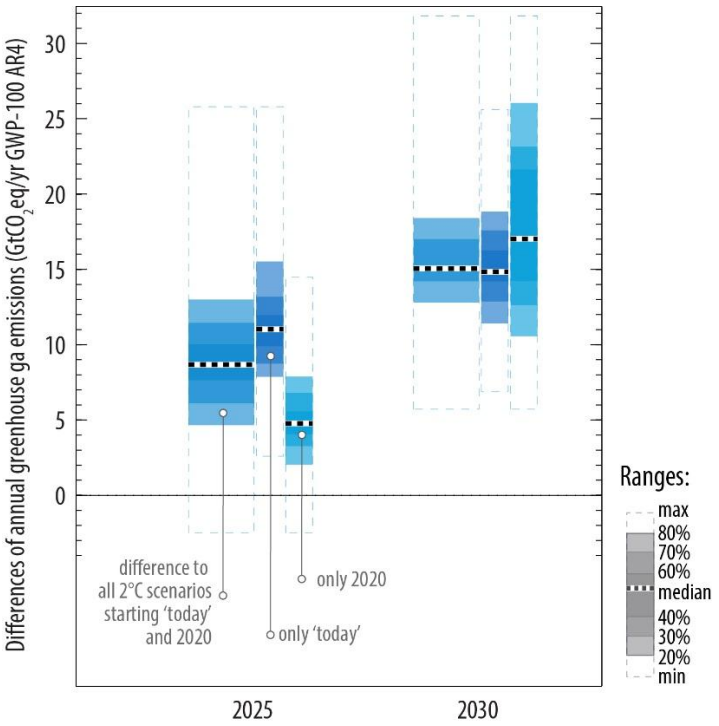
(a) They illustrate a difference that could be filled by either enhanced INDCs or additional mitigation effort on top of that currently indicated in the INDCs;

(b) They indicate the additional effort that would have to be mastered after 2025 and 2030, as higher emissions in the near term would have to be offset by lower emissions in the long term in order to achieve the same climate targets with the same likelihood;

(c) They are an illustration of the higher costs that the world might face in the long term, given that least-cost emission trajectories indicate the cost-optimality of increased near-term mitigation action.

Figure 12

Aggregate global emissions due to the implementation of the communicated intended nationally determined contributions and least-cost 2 °C scenarios



Note: The figure is based on a collective set of 7,296 differences resulting from all combinations between 48 considered Intergovernmental Panel on Climate Change 2 °C least-cost mitigation scenarios and 152 estimates of the global aggregate emission levels in accordance with the intended nationally determined contributions and any related uncertainties or ranges.

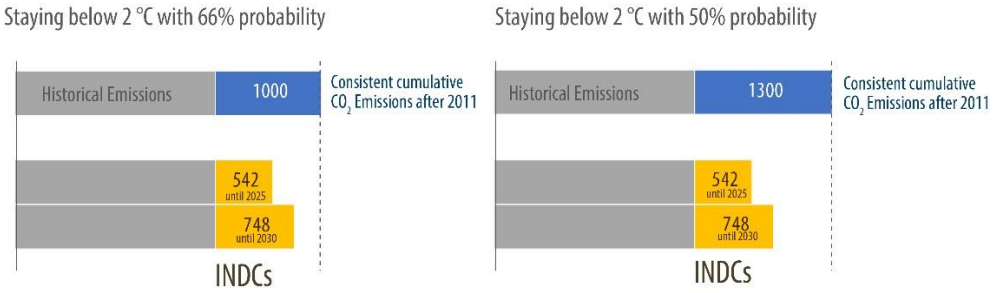
[61] Considering both scenario groups with enhancement of mitigation action in 2010 (so-called P1 scenarios) and 2020 (so-called P2 scenarios), which keep the global mean temperature rise below 2 °C with at least a 66 per cent likelihood, as shown in figure 11.

Abbreviations: AR4 = Fourth Assessment Report of the Intergovernmental Panel on Climate Change. GWP = global warming potential, INDCs = intended nationally determined contributions.

213. Given the fact that GHGs are long lived in the atmosphere and cumulative emissions therefore determine the impact on the climate system, higher emissions in the early years (compared with least-cost trajectories) would necessitate lower and overall likely more costly reductions later on in order to keep global mean temperature below the same level with the same likelihood. Global cumulative CO_2 emissions resulting from the implementation of the communicated INDCs (see para. 190 above) are expected to reach 54 (52–56) per cent by 2025 and 75 (72–77) per cent by 2030 of the global total cumulative CO_2 emissions consistent with 2 °C scenarios (see para. 203 above).

214. Figure 13 compares cumulative CO_2 emissions expected under the INDCs (medians) and cumulative CO_2 emissions in line with keeping the global average temperature rise relative to pre-industrial levels below certain levels. Shown are comparisons for keeping temperatures below 2 °C with 66 per cent (middle panel) or 50 per cent likelihood (right panel). Historical (grey, 1,890 Gt CO_2) and consistent future cumulative CO_2 emissions (blue) are taken from the contribution of Working Group I to the AR5.[62] Numbers shown relate to Gt CO_2 emissions after 2011.

Figure 13
Cumulative CO_2 emissions



Abbreviation: INDC = intended nationally determined contribution.

6. Opportunities for the medium and longer terms emerging from the intended nationally determined contributions

215. As already noted, the time frame for action indicated by Parties in their INDCs is up to either 2025 or 2030, with a few Parties providing longer-term targets towards a transition to low-emission development and enhanced ambition until and beyond 2050. The following is a discussion in general terms of the effect of the INDCs beyond 2030. It does not intend to draw conclusions regarding future action or possible temperature scenarios, but rather reflects trends emerging from the aggregation of the communicated INDCs that could provide opportunities for increased ambition in the future.

216. The extent to which efforts to reduce emissions will be sufficient to limit the global average temperature rise to less than 2 °C above pre-industrial levels strongly depends on the long-term changes in the key economic drivers that will be modified by the implementation of the current INDCs, as well as the determination of Parties to increase levels of ambition before and after 2030, including through the multilateral process.

[62] See a comparison with other cumulative CO_2 emission amounts in table 2.2 of the Synthesis Report of the AR5.

Participation

217. **The INDCs indicate a significant increase in the number of countries taking climate action, which is often of national character and covers a large number of sectors and GHGs.** Parties responded actively to the invitation made by the COP for them to communicate their INDCs, despite the short time frame established by decision 1/CP.20. At the time of the adoption of the Cancun Agreements (decision 1/CP.16), 96 Parties had submitted their quantified economy-wide emission reduction targets and nationally appropriate mitigation actions. In comparison, by 1 October 2015, 148 Parties overall had submitted their INDCs. It is expected that several of the Parties that did not communicate their contributions by October 2015 will do so in the run-up to the Paris Conference or shortly thereafter.

218. A large number of Parties communicated INDCs that are national in scope, using a variety of ways to express them. Of particular importance is the increase in the number of Parties that have moved from project-, programme-, or sector-based actions towards economy-wide policies and objectives. Whereas in the pre-2020 period a total of 61 Parties presented absolute, BAU, intensity or peaking year based quantified targets, in their INDCs 127 Parties communicated such targets.

219. Parties have also been active in providing information to facilitate the clarity, transparency and understanding of their INDCs, with many following guidance provided in decision 1/CP.20, paragraph 14. This has enabled many Parties to be explicit on the technical aspects of their contributions, such as scope, coverage, assumptions and methodologies, and has allowed for enhanced clarity, transparency and understanding. While there are gaps and issues of consistency and data quality, this information has provided a basis for the evaluation contained in this report of the aggregate effect of the INDCs in terms of GHG emissions. This constitutes a significant improvement compared with the information provided on the pre-2020 period, which was shared in many cases informally through the work programmes under the subsidiary bodies.

220. The high level of response of Parties as well as the presence of information communicated as part of the INDCs point towards an increase in national capacities to plan, develop and communicate mitigation actions in the form of targets, strategies and plans. The identified areas where data quality, transparency and completeness could be further improved indicate, however, that further efforts are needed to increase the capacity of many countries to plan, implement and monitor their climate-related actions, including through enhanced cooperation, support and/or an enabling institutional environment.

Policies and institutions

221. **The INDCs show an increasing trend towards introducing national policies and related instruments for low-emission and climate-resilient development.** Many INDCs are already backed by national law and many have triggered national processes to establish relevant policy frameworks. Furthermore, many INDCs have gone through public consultation and engagement of a wide range of stakeholders to socialize the development benefits of action to combat climate change and secure the buy-in of such action.

222. One key driver for understanding the aggregate effect of the INDCs in the longer term is the induced institutional, legislative and policy change at the national and international levels. All Parties that have communicated INDCs have already taken a number of steps to develop a strong basis at the domestic level for the implementation of their INDC and are planning on building on those efforts going forward.

223. The information communicated by Parties related to planning processes (see chapter II.D.6 above) shows that a large number of the INDCs have been prepared by Parties on the basis of existing institutions, policies and legislative frameworks, with some being already

backed up by national law. Although the level of advancement in the national climate policies varies across Parties, depending on national circumstances and capacities, all Parties developed their INDCs building on existing processes and experiences.

224. The information communicated in the INDCs points towards the strengthening and further developing of national institutional arrangements, legislation and policies and measures for addressing climate change in the future, suggesting credible and realistic political commitments with an implementation plan and a longer-term vision.

225. In their INDCs, many Parties communicated that the preparation and finalization of their INDCs was underpinned by a number of national consultation and interdisciplinary coordination processes, many of which have been established solely for the INDC preparation process. Such stakeholder engagement processes generally aim at fostering the understanding of the INDC on a political and societal level in order to ensure alignment with development objectives and enhance broad support across relevant stakeholder groups.

226. Information provided by Parties highlights the trend towards an increasing prominence of climate change on national political agendas, driven in many cases by interministerial coordination as well as by an increasing trend towards the mainstreaming of climate change into national and sectoral development priorities. At the same time, many Parties have made efforts to ensure that the private sector, civil society and other non-governmental actors recognize the importance of, and provide support for, national action to combat climate change.

227. National political and institutional processes have been partly influenced by the invitation for Parties to communicate their INDCs. While INDCs may have served as a catalyst for the consolidation and enhancement of climate-related policies in a few countries, in many it has represented an incentive to initiate them. In general, it can be argued that the realities of policy development and of social acceptance related to the preparation of the INDCs provide the grounds for increased action in the future. However, the timing and scale of such enhanced action depends on the determination of governments and the long-term effectiveness of the 2015 agreement.

228. Existing and enhanced national capacities with regard to the formulation and implementation of climate policies, together with a better understanding and enhanced general acceptance and support of climate policies as part of national development strategies, could increase the potential for enabling stronger implementation and further policy change in the longer term and transitioning to low-emission development.

229. However, the timing and scale of such enhanced action depends on the determination of governments. In this context, many Parties referred in their INDCs to their expectations and the need for a robust outcome of the current negotiations process towards a new agreement in order to provide an enabling environment for action as well as the means to enhance the capacity of those countries that need it the most.

Cooperation and support

230. **The INDCs show the increasing interest of Parties in cooperation to achieve climate change goals and raise ambition in the future.** In their INDCs, many Parties referred to the enhanced cooperation required for the implementation of their INDCs, as well as it being an important driver of future ambition. They also referred to the need for enhanced cooperation to enable Parties to enhance domestic actions related to climate change and to address related challenges collectively in the future.

231. Some Parties indicated the general role of cooperation related to financial, technology transfer and capacity-building support for implementing their INDCs, while other Parties communicated opportunities for cooperation in the areas of technology and the

development and implementation of policy and economic instruments, including market-based mechanisms, or through cooperative initiatives.

232. The information communicated by Parties in their INDCs indicated a trend towards enhanced international cooperation in order to drive the implementation of the INDCs as well as to raise the ambition of future action in response to climate change. Cooperation is increasingly taking place among various stakeholders, including national, subnational and regional cooperative action both by governmental bodies and non-State actors, mobilizing action in response to climate change.

233. Some of the INDCs refer to international and regional cooperation and partnerships in specific areas, including: sustainable energy; low-carbon agriculture; biofuels; forest monitoring systems; restoration and reforestation activities; international exchanges on best practices; as well as partnerships with research centres, the private sector, technology funds and financing institutions in the context of global decarbonization. A few of the INDCs highlighted the importance of North–South and South–South cooperation.

234. Through their INDCs, Parties indicated a general interest in global action in the context of a multilateral response to climate change under the UNFCCC, with some Parties suggesting enhanced institutional arrangements for international finance, technology transfer and capacity-building support as part of the agreement to be reached at the Paris Conference as central elements to create an enabling environment in this regard. The UNFCCC, through its Technology Mechanism and Financial Mechanism, including the Technology Executive Committee, the Climate Technology Centre and Network, the GEF and the GCF, provides the framework and tools for enhancing targeted cooperation and delivering the necessary support to Parties for implementing their INDCs and could enhance its catalytic role in this regard. In this context, some Parties referred to the importance of reaching agreement by the end of this year on a protocol, another legal instrument or an agreed outcome with legal force and to improve the linkages to and between existing mechanisms under the Convention.

235. The information contained in some of the INDCs points to the need for identifying, exploring and implementing further opportunities for cooperation on addressing climate change. In this context, Parties referred to the outcome of the current negotiation process under the ADP and the need for it to foster and promote cooperation, including through the strengthening of existing mechanisms and tools under the Convention or the establishment of new ones.

National circumstances and ambition

236. All Parties have raised the ambition of their climate action in relation to efforts communicated for the pre-2020 period. There is strong recognition of the need for enhanced global action in the context of achieving the objective of the Convention and of the commitment to doing so through a multilateral response. In this context, many Parties referred to the goal of limiting global average temperature rise below 2 °C or 1.5 °C above pre-industrial levels as a benchmark for national and aggregate ambition. They also stressed the clarity provided by this goal to guide national and international efforts. Many Parties expressed their determination to achieve this goal and acknowledged that this would only be possible through collective efforts, including enhanced cooperation.

237. As previously noted, while significant progress has been made with regard to the pre-2020 period, global aggregate emission levels in 2025 and 2030 resulting from the INDCs do not fall within 2 °C scenarios. It has also already been stressed that the extent to which efforts to reduce emissions linked to the INDCs are sufficient to meet the temperature goal strongly depends on the long-term changes in the key economic drivers that will be induced by the implementation of the current INDCs as well as the determination of Parties to increase their levels of ambition before and after 2030. The

INDCs could potentially affect such action, either by inducing changes today that could be replicated or scaled up in the future, or by locking in factors such as policies or infrastructure.

238. National narratives on ambition and fairness indicate the serious consideration that Parties have given to the size of national efforts to combat climate change. An increasing number of countries are considering longer-term horizons towards low-emission and climate-resilient development. With a view to delivering their INDCs, several countries may have to overcome a range of economic, technological and capacity-related barriers.

239. While a discussion of the efforts beyond 2025 and 2030 as well as the changes and factors mentioned above is beyond the scope of this report, the INDCs signal an increasing determination of Parties to take action to reduce emissions and increase the resilience of their economies, with a few Parties already indicating an aim to reduce their net emissions to zero. National determination has enabled Parties to shape their efforts in line with their circumstances, with many already recognizing and realizing related socioeconomic co-benefits. Yet the need for sustained and longer-term action would require not only maintaining those trends after 2025 or 2030 but also some degree of acceleration and scaling up.

240. As noted in paragraph 163 above, most Parties provided information on how they consider their INDCs to be fair and ambitious and how they contribute towards achieving the objective of the Convention. The information contained in the communicated INDCs suggests that there is strong recognition among Parties of the need for enhanced global action in the context of the objective of the Convention to address climate change and the commitment to doing so through a multilateral response with all countries contributing their fair share. The understanding of what is considered fair and ambitious, however, varies depending on the particular national circumstances (see chapter II.D.7 above).

241. Related narratives convey the vision that each country has of its own efforts. Such information could potentially lead to a higher degree of understanding of how national circumstances and other factors determine the efforts of each country. At the same time, the narratives reveal the need to balance a wide variety of national circumstances with the information provided by science on the efforts required to keep global average temperature rise below any given level. This question should be addressed as Parties prepare further efforts beyond current time frames and consider them in relation to any goal agreed under the UNFCCC.

F. Adaptation component of the intended nationally determined contributions

1. Background information

242. By 1 October 2015, 100 Parties, including 38 LDC Parties, had included an adaptation component in their INDCs. The secretariat received adaptation components from 46 African States, 26 Asia-Pacific States, 19 Latin American and Caribbean States, 7 Eastern European States and 2 Western European and other States. Some of them indicated that adaptation is their main priority in addressing climate change.

243. This chapter provides a concise overview of the adaptation components of the INDCs communicated by Parties in accordance with paragraph 12 of decision 1/CP.20. The chapter focuses on the elements of the adaptation components that featured in most INDCs:

(a) National circumstances informing the adaptation component;

(b) Long-term goals and/or vision guiding the adaptation component;

(c) Impact and vulnerability assessments;

(d) Legal and regulatory frameworks, strategies, programmes and plans, which provide the basis for, or have informed, adaptation actions;

(e) Measures or actions planned or under implementation for different time frames, in particular for the shorter (2015–2020) and longer terms (2020–2030);

(f) Loss and damage;

(g) Means of implementation;

(h) Monitoring and evaluation;

(i) Synergies between adaptation and mitigation.

244. The secretariat has synthesized the information submitted by Parties for each element with a focus on areas communicated by a critical mass of Parties. Additional examples and specific aspects of the adaptation components are highlighted throughout the sections. For each element, a number of emerging trends have been identified. It was not possible at this point to evaluate the aggregate effect of the adaptation components given the methodological uncertainties associated with such an evaluation.

2. Synthesis of the information communicated by Parties in the adaptation components of their intended nationally determined contributions

National circumstances informing the adaptation component

245. Most Parties provided information on their national circumstances, identifying, inter alia, aspects of their national circumstances that are particularly important for the adaptation component. This information relates in particular to their geography, population and economic indicators. A few Parties stated that their INDC is subject to revision, taking into account future changes in national circumstances.

246. Several Parties described their overall geographical characteristics. Such information generally includes a description of the overall location and geography of the country. Parties also referred to key climatic zones of the country, length of coastline, mountain chains and level of forest coverage and biodiversity. Descriptions of the overall climate of the country were included in some INDCs, with references to indicators such as mean temperature, mean precipitation, arid- or semi-arid character and level of climate variability of the country. Some Parties provided more specific parameters, such as the amount of cultivated land, estimated amount of available groundwater and deforestation rate. Specific environmental developments were also highlighted, including the disappearance of major water bodies, a high deforestation rate and the rapid spread of desertification in past decades.

247. Some Parties described their population dynamics and considered how they relate to climate change and adaptation, referring to, for example, high population density, growth, high proportion of youth in the population and the need to adapt under the assumption that the population is likely to be significantly higher in 2030. Others highlighted the challenges associated with concentrations of population in vulnerable areas. Some referred to their placement in the Human Development Index as an indicator of their overall development status.

248. Overall economic situation and associated development challenges were also described. Parties highlighted key economic indicators such as GDP, GDP growth and Gini coefficient. They described the main economic activities and the number of people engaged in those activities, dependencies on climate-sensitive sectors such as agriculture, water resources, tourism and health, as well as economic weaknesses due to, for example, the narrow focus of the economy. Some drew attention to the multiple challenges of pursuing

economic development and undertaking climate action under the limitations posed by their economic situation.

249. In addition, Parties drew attention to various specific development indicators, including the proportion of people employed in vulnerable sectors, the proportion of people with access to electricity, sanitation, drinking water and basic services and health care, the number of people living in poverty or with lack of food security, and the proportion of infants suffering malnutrition.

250. Political stability was highlighted by some Parties. While a few Parties emphasized that they have recently stabilized a political crisis and are now focusing on development, others highlighted the priority of ensuring national security and territorial integrity in view of regional conflicts and the additional pressures brought on by absorbing large numbers of refugees.

251. Finally, Parties highlighted some key development setbacks, such as the Ebola outbreak in Western Africa and major hurricanes in the Caribbean, illustrating that development gains can be fragile in the light of climate change impacts.

Long-term goals and/or vision guiding the adaptation component

252. Most Parties defined a long-term goal or vision to guide the adaptation component of their INDC. Their long-term goals or visions are aspirational, qualitative, quantitative or a combination of the three. Some goals and visions are enshrined in the constitution of a Party, while others are contained in national laws, strategies and plans.

253. Several goals and visions are climate specific, but all of them are closely intertwined with development objectives such as poverty eradication, economic development or improvement of living standards, security and human rights. A few Parties referred to the United Nations Millennium Development Goals and subsequent Sustainable Development Goals in defining their national goals.

254. Some Parties articulated their vision in climate- or adaptation-specific terms, for example as the objective of mainstreaming adaptation into development. In sharing their long-term goals or visions, Parties also emphasized specific elements such as the need to reduce losses, the participation of all segments of the population and the consideration of related issues, such as the welfare of women, children, the elderly, people with disabilities and environmental refugees.

255. Others expressed their vision in broader and non-climate or adaptation-specific terms, such as a commitment to safeguarding security, territory and population, human rights and advancing development goals in the light of projected climate impacts. Several Parties, in particular the LDCs, mentioned that they aspire to become an emerging country with a middle-income economy by 2030. Another example of a broader approach was the aim to create, by 2050, a prosperous, strong, democratic, culturally developed and harmonious modern socialist society.

256. A few Parties aligned their vision for adaptation with the goal of holding the increase in global average temperature below 2 °C or 1.5 °C above pre-industrial levels. One Party mentioned that its goal is to focus on initiatives necessary to ensure the achievement of mitigation targets. Another Party is seeking, among other things, to enhance collaboration at the national, regional and global levels.

257. References to Mother Earth, adaptation as a matter of survival and a nation suffering from the adverse impacts of climate change were also included in the national visions and goals.

258. Most of the adaptation components indicated a time frame for the national long-term goals and/or vision, while others provided the year by which they/it will be achieved. In many cases, it is by 2030.

Impact and vulnerability assessments

259. Most Parties reflected on key impacts and vulnerabilities in their adaptation components. Depending on their national circumstances, Parties did this through different types of information, mainly on (1) observed and projected changes and impacts, including high-risk impacts; and (2) the most vulnerable sectors and geographical and population segments of the country. In describing their vulnerabilities, Parties drew attention to their ongoing vulnerability studies, provided estimates of past socioeconomic losses due to extreme weather events and referred to links and interconnections between climate risks and non-climatic factors, such as food insecurity and rapid urbanization. Table 1 presents the main elements of impact and vulnerability assessments communicated by Parties, accompanied by some examples.

Table 1
Main elements of impact and vulnerability assessments

Main element	*Examples*
General description of non-climatic vulnerabilities	– Post-conflict fragility of the State – Poverty and low-skilled human resources – High prevalence of HIV/AIDs in adult population – Host country to displaced persons
Observations, predictions and risks	– Observed rate of warming of 0.26 °C per decade in the period 1951–2012 – Projected sea level rise of 0.81 m by 2100
Vulnerable sectors and zones	– Water – Agriculture and forestry – Ecosystems and biodiversity, including wildlife – Health – Energy, tourism, infrastructure and human settlements – Areas liable to drought and desertification, low-lying coastal areas and small islands – Land-locked countries and mountains
Vulnerable populations	– Rural populations – Poorest segments of society – Women, youth, the elderly and the disabled
Economic costs of impacts	– Annual cost of extreme events in the period 2000–2012 estimated at USD 1.4 billion – Loss of gross domestic product (GDP) due to drought and floods estimated at 3 per cent – Consequence of one extreme event: loss of 20 years of investment in road and water infrastructure, USD 3.8 billion (equivalent of 70 per cent of GDP per year) and the collapse of the productive apparatus of the country
Ongoing assessments	– Launch of a vulnerability study for the period 2012–2100 – Process to develop tools for assessing vulnerability and risk – Process to estimate the cost of adaptation as well as support needs

260. In terms of observed changes, many Parties reported that they have observed various levels of temperature increase in their territories, ranging from 0.5 to approximately 1.5 °C in the past 50 years. Some Parties referred to observed sea level rise, including to a global increase of 1.7 mm per annum in the period 1901–2010. Other observed changes highlighted by many Parties include increased extreme weather, in particular floods and drought, changes in rainfall patterns and increased water scarcity. For instance, one Party reported that water availability per capita is now three times lower than in 1960, while another Party highlighted that annual maximum rainfall intensity in one hour increased from 80 mm in 1980 to 107 mm in 2012.

261. Future projections were made for similar indicators. Parties drew on a variety of models and scenarios to estimate changes. Estimates of temperature increase include 1–2 °C by 2050 and 1–4.5 °C by 2100, depending on scenarios and regional differences. Estimates of sea level rise include a range of 60–70 cm under a +2 °C scenario, as well as 0.81 m by 2100. Other projections include lower or more extreme seasonal precipitation.

262. Most of the adaptation components contain a description of the key climate hazards faced by countries. The three main sources of concern identified by Parties are flooding, sea level rise and drought/desertification. One Party reported that some of the islands in its territory have disappeared under water. Many Parties highlighted stronger winds and rains, typhoons, hurricanes, heat waves, sea surges, ocean acidification and changes in circulation patterns. The high risk of glacial lake outburst floods, in particular in the Himalayan region, was also mentioned.

263. The vulnerable sectors most referred to by Parties are: water, agriculture, biodiversity and health. Forestry, energy, tourism, infrastructure and human settlements were also identified as vulnerable by a number of Parties, and wildlife was also mentioned by at least three. In terms of geographical zones, arid or semi-arid lands, coastal areas, watersheds, atolls and other low-lying territories, isolated territories and mountain ranges were identified in the adaptation components, and some Parties identified specific regions of their countries that are most vulnerable. Vulnerable communities were identified as being mostly composed of: rural populations, in particular smallholders, women, youth and the elderly. Several Parties provided quantitative estimates of vulnerable people or communities, sometimes using specific indicators. For instance, one Party identified 319 municipalities as highly vulnerable, while another one stated that 42 million people might be affected by sea level rise due to its long coastline.

264. In addition to climate impacts, Parties referred to the social, economic and political consequences of those climate change impacts. Many referred to the risk of fluctuations in food prices as well as to other food and water security concerns, while some highlighted that agricultural calendars are at risk of being disrupted due to changes in precipitation and the growing season. In this context, a few Parties also referred to elements of social justice, highlighting that high-risk areas are often populated by the poorest and most marginalized segments of the population. A few are transitioning to a post-conflict situation and climate change poses an additional burden on their fragile state.

265. In describing their high vulnerability, a few Parties referred to their rank in the Human Development Index or in climate change vulnerability indices.

266. Transboundary aspects were also mentioned, with Parties explaining how some national vulnerabilities have regional and even global effects. For instance, one Party explained that it is the home of four major rivers of West Africa, which are threatened by the impacts of climate change, and that its geographical situation could make it a shelter for neighbouring countries, in particular nomadic pastoralists, increasing the pressure on river basins already affected by drought and changing rainfall patterns. Two major food

exporters reported on their contribution to global food security and the global risk induced by the vulnerability of their agriculture and livestock sectors.

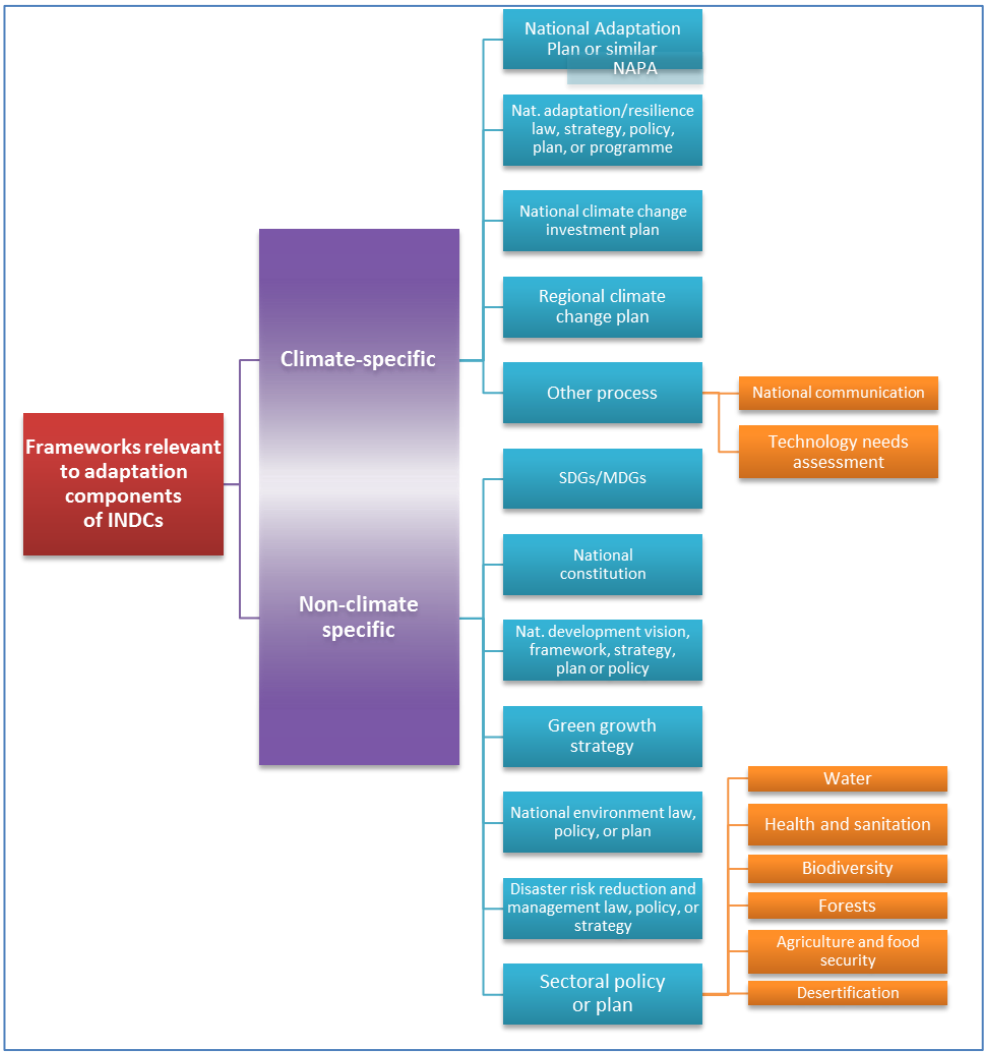
267. Some Parties drew attention to ongoing vulnerability assessments. Parties are engaging in various types of activity; for example, they are developing guidance and tools to support the assessment of vulnerability and risk at the national level for a comprehensive and quantitative analysis of impacts, mapping regional vulnerabilities, developing an adaptation information system, and identifying vulnerabilities in the period 2021–2100 in seven key sectors with the aim of defining an adaptation action plan. In addition, a few Parties shared their intentions to regularly update their climate vulnerability assessments on the basis of new climate information.

268. Some of the adaptation components provide assessments of the loss and damage incurred over a given period or for an extreme event that occurred at one point in time. These were expressed in financial terms. For example, one Party suffered losses of USD 48 million per annum in the period 1980–1999 and USD 1.4 billion per annum in the period 2000–2012, while another one referred to total losses of USD 6 billion due to extreme events in the period 2010–2011. A devastating hurricane in August 2015 was reported to have led to loss and damage amounting to USD 392.3 million for one Party. Past loss and damage is also expressed a few times as a percentage of Parties' GDP. For example, one Party stated that floods and drought cause economic losses worth an estimated 3 per cent of the country's GDP. It is also worth noting that one Party stated that 9 per cent of overall government investment already goes to adaptation, and that that proportion could increase to 15 per cent in the future. In addition, Parties expressed loss and damage in non-financial terms, including by providing information on the size of flooded areas, houses destroyed, decrease in crop yield, drop in industrial production, number of roads affected or number of casualties.

Legal and regulatory frameworks, strategies, programmes and plans that provide the basis for, or have informed, adaptation actions

269. In their INDCs, Parties demonstrated that they have or are establishing national adaptation planning and implementation processes to enhance the impacts of their adaptation actions (for an overview, see figure 14). Coordination mechanisms were highlighted, some of which have been established at the highest political level with a legal mandate.

Figure 14
Legal and regulatory frameworks, strategies and programmes



Abbreviations: INDC = intended nationally determined contribution, MDGs = United Nations Millennium Development Goals, NAPA = national adaptation programme of action, Nat. = national, SDGs = Sustainable Development Goals.

270. Most Parties have committed to further advancing the implementation of their existing frameworks, strategies, programmes and plans in the future and to developing new ones, when deemed necessary, and have described those that guide their current and future work on adaptation, including in the context of implementing the adaptation component of their INDC. Various strategies, programmes and plans were presented, some of which are specific to climate change, some are specific to sectors of the economy and others are economy wide. Despite the various frameworks and instruments used to enhance the enabling environment for addressing adaptation, the information communicated demonstrates Parties' efforts to address adaptation in a coherent and programmatic manner.

271. There are also references to instruments established under the Convention. For instance, many LDCs expressed their willingness to build upon the momentum created by the preparation and implementation of their national adaptation programmes of action (NAPAs) to continue enhancing their adaptation actions, in particular as they embark on the process to formulate and implement NAPs.

272. In fact, several Parties, the LDCs and developing countries that are not LDCs alike, indicated that they are conducting the process to formulate and implement NAPs and that they are developing a NAP to be ready by 2020. Thus far, progress in the process to formulate and implement NAPs includes the development of road maps for some and the formulation of the NAP itself for a few others. One Party that is currently formulating its NAP already plans for it to be updated in 2021.

273. In addition, some Parties have embarked on adaptation planning and implementation processes that encompass many features of the NAP process. Some Parties mentioned having developed national or sectoral plans or national programmes that define their adaptation priorities. In addition, many Parties have integrated climate change adaptation into either their national plans and policies or some of their sectoral plans. Other Parties are in the process of doing so. For instance, one Party described how planning processes are undertaken at the subnational level by mandating decision makers to identify vulnerabilities and to define adaptation plans for their regions. They also reported on the opportunity to align national adaptation strategies with regional adaptation strategies and action plans.

274. Other instruments that were reported as contributing to the strengthening of the enabling environment for adaptation action in the medium and long terms include a national climate change communication strategy and seeking synergies with other environmental agreements.

275. The consideration of gender issues is seen by many Parties as imperative in establishing an enabling environment for adaptation. For example, one Party has established a climate change gender action plan. Other Parties mentioned the need to address human rights. Linkages with mitigation aspects were also recognized, with one Party indicating that its climate change strategy focuses on adaptation and that it considers mitigation as a function of adaptation.

Measures and actions, planned or under implementation

276. The development and coordination of national frameworks, policies and programmes leads to the identification and prioritization of adaptation measures and actions to be implemented. In fact, the main element of the adaptation components communicated by Parties is their measures and actions, in particular the ones that they consider as priorities. The most common time-horizons defined for implementing the reported measures and actions are the periods of 2015–2020 and 2020–2030, but some Parties also provided information on their past and current initiatives. Most Parties derived the measures or actions presented in their adaptation components from those contained in existing strategies, plans or programmes, such as their NAPAs, which were cited by many LDCs, or other national action plans.

277. While all adaptation measures and actions identified contribute to the implementation of the national vision and goals, the decision to prioritize some of them was based on criteria such as: timing or urgency; efficacy; co-benefits, in particular poverty reduction, sustainable development or mitigation; social inclusiveness; technological feasibility; and cost, including economic costs and benefits.

278. According to the adaptation components received, a lot of work has already been undertaken in addressing adaptation and the implementation of measures or actions is already happening in many countries. As such, Parties expressed their willingness to strengthen or upscale existing efforts.

279. In addition, most of the adaptation components identify priority areas or sectors and a set of associated specific actions. Several Parties also reported measures of a cross-cutting nature. In addition, a few reported that they will take an integrated approach in implementing part or all of their adaptation measures and actions. For example, one Party

intends to address adaptation by looking at the nexus of water, agriculture, energy and human consumption. In a few cases, quantitative targets and goals were included as part of the description of the actions and measures.

280. Intended adaptation efforts were also expressed as overall policy objectives, such as: integration of adaptation into development planning and implementation, including 'climate proofing' key development sectors and the integration of adaptation into the national budget; strengthening institutional capacity; enforcing behavioural change; ensuring various types of resilience (economic, social and environmental); and preventing and solving conflict.

281. Approaches to implementing adaptation found in the adaptation components include:

(a) Community-based adaptation;

(b) Ecosystem-based adaptation;

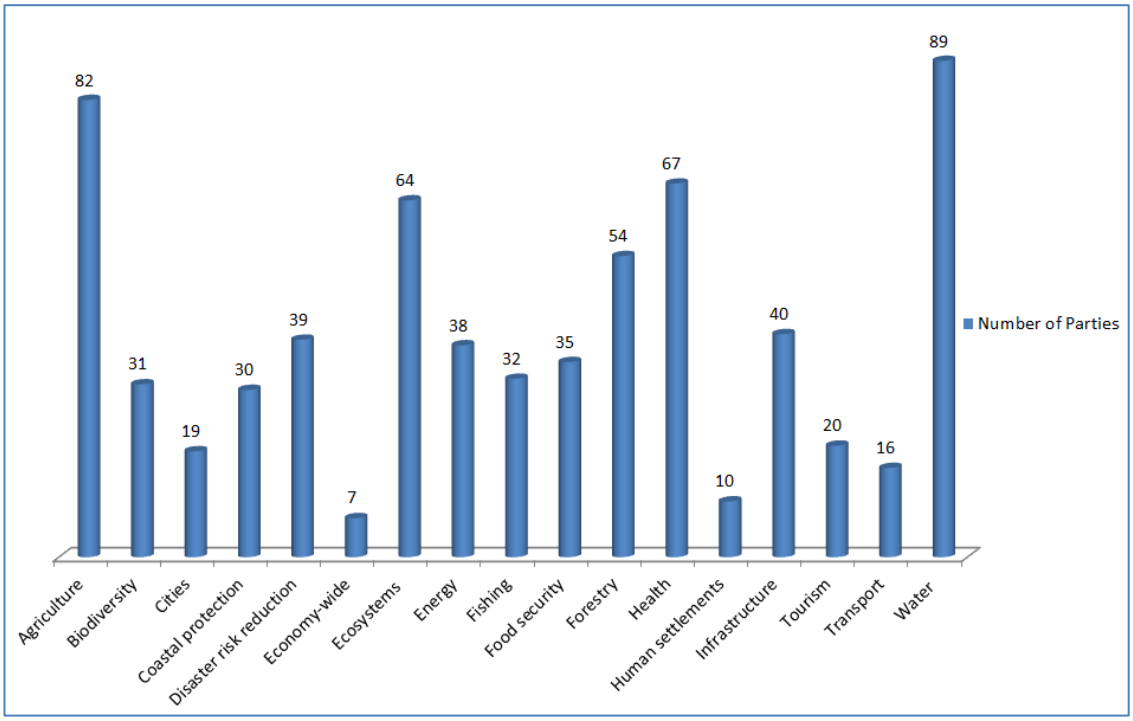
(c) Landscape approach to adaptation;

(d) Livelihood diversification;

(e) Exploring synergies between adaptation and mitigation (see paras. 311 and 312 below).

282. In their adaptation components, Parties referred to actions in virtually every sector and area of the economy, as indicated in figure 15. The first three priority areas were water, agriculture and health.

Figure 15
Priority areas and sectors for adaptation actions



283. Water security is clearly a key development priority for most Parties and therefore various types of action related to the protection of water resources have been included in the adaptation components. These generally aim at saving water, ensuring security of supply, enhancing the allocation of water and broadening the resource base. The actions

range from specific water-saving measures, such as the desalination of 285 million m^3 water for drinking water supply, or the construction of water conservation facilities for farmlands, to broader considerations, such as mainstreaming climate change adaptation in the water sector, implementing a national water master plan, building a man-made lake, constructing reservoirs for glacier melt water harvesting, or building a water-saving society. A few Parties are putting in place integrated water management systems. Some Parties seek to develop water-saving irrigation systems, while others referred to their consideration of climate criteria in their water management efforts. Some Parties outlined more specific techniques, such as digging wells, rainwater harvesting or the substitution of water withdrawal from aquifers with surface water.

284. Many Parties referred to actions in the agriculture sector and introduced their programmes and policies, such as promoting sustainable agriculture and land management, implementing integrated adaptation programmes for agriculture, developing climate criteria for agricultural programmes and adopting agricultural calendars. Others described specific methods that can be applied to combat specific climate-related problems in the agriculture sector. For example, Parties described methods for pest management, including integrated pest management, introduction of heat-, drought- and disease-resistant crop and fodder types and the distribution of medicine. Many referred to the importance of resilient crops and are planning to build on native maize species or other improved crop varieties. Parties also referred to agricultural improvements that can reduce erosion, including measures such as improving livestock production to reduce erosion. Some Parties defined quantitative parameters, for instance the objective of converting 1 million ha grain to fruit plantations to protect against erosion.

285. Human health was also commonly cited as a priority sector. A number of Parties are aiming at an overall integration of climate impacts and/or the identification of priority actions in the health sector and would like to enhance management systems or contingency plans for public health to enhance the adaptive capacity of public medical services. In terms of more specific measures to combat vector-borne diseases, one Party aims to protect pregnant women and children under five against vector-borne diseases, while another one referred to suppressing mosquito populations. Other measures include early warning systems with epidemiological information, as well as health surveillance programmes and contingency plans for heat waves.

286. Another priority area identified by many Parties is ecosystems, including in the context of biodiversity conservation. Many defined enhancing the resilience of or rehabilitating ecosystems as one of their objectives. In terms of biodiversity, Parties identified some specific objectives and actions, including tracking, monitoring and assessing impacts on biodiversity, establishing biodiversity corridors, protecting moorlands and other ecosystems, and increasing the conservation of species and the recovery of forest, coastal and marine ecosystems. One Party is preparing a biodiversity index and atlas, while others are striving to protect wildlife species.

287. Disaster risk reduction has been addressed concomitantly to adaptation by several Parties and they reported on their current and future efforts relating to disaster reduction, the strengthening of early warning systems and contingency plans. Some mentioned the development of insurance schemes as one of their measures, in particular to protect the most vulnerable communities. A few Parties intend to resettle part of their population highly exposed to climate risk in safer areas. In this context, one Party announced that it is preparing its people for emigration owing to the country's high vulnerability to sea level rise.

288. In line with emerging trends seen in national frameworks and policies as reported by Parties, some of the actions and measures seek to address transboundary issues. Among those, most relate to the regional level and are associated with the management of shared

river basins, but one Party also mentioned its intention to contribute to the integration of climate change into regional transhumance plans. Transboundary issues with a global scope were reported by a few Parties that have sectors of their economies, for example food production, that contribute to ensuring global security.

289. There is recognition that progress has already been made by many Parties in addressing adaptation. For example, one Party indicated that it has made great strides in reducing vulnerability in the tourism, agriculture and ecosystem management sectors, among others; it has also enhanced its research and data management. In addition, a few Parties mentioned that the methodologies and tools that they have developed for their national adaptation work have been recognized by the international community as good practices.

290. In addition, several Parties indicated that they are encouraging the active participation of relevant stakeholders as a means of strengthening the implementation of their adaptation actions. Among these, some Parties specifically mentioned the need to enhance the participation of vulnerable communities, including women, with a view to empowering them.

291. A few Parties provided objectives and targets for their adaptation measures or actions. For example, one Party defined quantitative targets for planning, including that 100 per cent of the national territory and all sectors should be covered by climate change plans by 2030.

Loss and damage

292. Loss and damage associated with past[63] and projected impacts of climate variability and change were reported by several Parties. Loss and damage are projected to be incurred because of extreme hydrometeorological events such as drought, floods or tropical storms but also because of sea level rise and associated coastal erosion, increases in vector- and water-borne diseases or fires.

293. Projected loss and damage have been quantified by some Parties, for example in the form of absolute costs, annual loss of GDP (ranging from 1 to 2 per cent by 2030 to 1.8 to 8.6 per cent by 2050 to 9.4 per cent by 2100), or percentage of land or agricultural production lost or percentage of population affected by a certain year or a particular threshold, for example a specific rise in sea level. A few Parties provided details on projected costs of climate change impacts and how intended adaptation measures are expected to reduce the projected costs of impacts, leaving some residual damage, thus clearly making an economic case for investing in adaptation and disaster risk reduction.

294. Measures highlighted to reduce projected loss and damage include first and foremost: aligning development, adaptation, disaster risk reduction and adaptation; enhancing risk sharing and transfer, including setting up insurance schemes; strengthening institutional arrangements and legislative frameworks; strengthening early warning systems; enhancing building codes and land-use planning; and promoting social protection.

Means of implementation for adaptation actions

295. Most Parties provided information on the means needed, including finance, technology and capacity-building, to support the implementation of their envisaged adaptation actions. The information reported relates to:

[63] Information on loss and damage due to past climate impacts is included in the section on impact and vulnerability assessments above.

(a) Support needs, including needs for finance, technology and capacity-building;

(b) Domestic support, including institutional arrangements;

(c) International support;

(d) South–South cooperation.

296. Specific support needs identified by Parties include the need for:

(a) Favourable enabling environments with appropriate institutional arrangements and legislation, including for strengthening the engagement of the private sector;

(b) Sufficient financial resources to assess, plan, implement, monitor and evaluate adaptation actions;

(c) Technologies for adaptation,[64] including in the areas of climate observation and monitoring, early warning systems, water resources, including irrigation and waste water management, coastal zones, resilient transportation, sustainable agriculture, forestry and land management;

(d) Training and building of institutional and human capacities and technical expertise, including in the area of vulnerability and adaptation assessments;

(e) Research, data and information, including in the area of climate forecasting and modelling;

(f) Education, raising awareness and outreach on climate change impacts and adaptation.

297. While several Parties quantified their financial needs, others are in the process or are planning to do so. Needs for finance were expressed either as total quantified financial needs to implement mitigation and adaptation actions identified in the INDCs or as specific adaptation finance needs. Parties that reported specific financial needs for adaptation did so for either the whole INDC period (with individual needs ranging from USD 100 million to over USD 200 billion) or on an annual basis (with individual needs ranging from around USD 10 million to USD 3 billion per year). A few Parties provided additional information on their finance needs by sector or plan/strategy and two Parties provided projected adaptation costs for different mitigation scenarios.

298. Several Parties reported on how they are addressing the identified support needs through the provision of domestic support, in particular finance. Those financial resources are reported to come from a variety of sources, including: the national budget; insurance; contingent credit and catastrophe bonds; income credits of the domestic market; allocations from valued added tax as well as environmental fees, taxes and levies; soft and low-interest loans; and the domestic private sector.

299. Investment strategies/plans and national climate change/adaptation funds are being set up by some Parties to assist in allocating resources in national budgets, to mobilize additional resources, to assist in engaging the private sector, including through establishing public–private partnerships, and to ensure adequate uptake of finance.

300. In addition, several Parties noted their ongoing capacity-building, training and research efforts, including related to research cooperation, innovation clusters and cooperation with regional and local governments as well as the financial sector.

[64] Some Parties referred to their technology needs assessments.

301. While developing country Parties are providing significant domestic support for adaptation, many underlined the need to receive international support in the form of finance, technology transfer and capacity-building in line with the Convention. While one Party noted that all adaptation costs should be borne by developed country Parties, several Parties stressed that a substantial amount should be provided by developed countries to allow for the implementation of additional adaptation activities. International support for adaptation is further sought as it will determine Parties' ability to safeguard development gains, fulfil their intended unconditional mitigation actions and use their domestic resources for development purposes rather than for adaptation.

302. International finance is to come from the GCF, the Adaptation Fund, the GEF, including the Least Developed Countries Fund and the Special Climate Change Fund, other bilateral and multilateral funds, including United Nations programmes and organizations, as well as foreign direct investments and soft loans.

303. In addition to finance, Parties called for international support in the areas of:

(a) Clean technology transfer on concessional and preferential terms;

(b) Capacity-building.

304. South–South cooperation on the basis of solidarity and common sustainable development priorities was highlighted by a few developing country Parties as a further means to support and strengthen adaptation, including at the regional level. For example, one Party communicated its intention to establish a fund for South–South cooperation on climate change.

Monitoring and evaluation

305. Given that the complex and long-term nature of climate change and its impacts require that adaptation be designed as a continuous and flexible process and subject to periodic review, several Parties described how they will monitor and evaluate their intended measures.

306. While some Parties have developed or are in the process of developing an integrated system for monitoring, reporting and verifying their mitigation and adaptation components, others have developed or are in the process of developing adaptation-specific M&E systems and institutional set-ups. A few Parties intend to integrate the review of adaptation into existing M&E systems and processes for national development, for example into annual sector-based progress reports or results-based management systems, to ensure that adaptation achievements are captured and reported in regular development reports.

307. Parties seek to monitor and evaluate adaptation actions as well as support provided and received, with a view to:

(a) Tracking progress in implementation to inform the adaptation process by sharing lessons learned and to update adaptation plans;

(b) Determining the degree to which the adaptive capacity of individuals, communities and systems has been raised and vulnerability has decreased;

(c) Improving transparency, performance evaluation and accountability;

(d) Ensuring that resources are well utilized to increase resilience and produce real benefits;

(e) Tracking climate finance as well as technology transfer and capacity-building.

308. Regarding the M&E of adaptation action, some Parties highlighted that they have established or will establish adaptation and vulnerability indicators to measure progress.

Indicators reported include quantitative (e.g. number of people benefiting from adaptation activities, number of hectares with drought-resistant crops under cultivation, and forest coverage increases to 45 per cent) and qualitative (e.g. degree of integration of adaptation into sectoral policies and plans, and level of awareness) ones.

309. The focus on short-term monitoring of activities, processes and outputs rather than on longer-term outcomes was stressed by one Party. A few Parties have initially tested the M&E of adaptation for specific regions, sectors or projects and, on the basis of those experiences and lessons learned, are now planning to scale up M&E to the national level. Connecting project-level with national-level M&E of adaptation is the goal of a three-tier M&E approach[65] highlighted by one Party.

310. In terms of the M&E of domestic and international support provided and received, in particular finance, a few Parties are putting in place climate finance systems for determining, disbursing and monitoring climate expenditure and for enhancing the visibility of adaptation measures within the allocation of their national budgets.

Synergies between adaptation and mitigation

311. Noting that climate change actions require a holistic approach, several Parties elaborated on the synergies between adaptation and mitigation as part of their overall low-emission, climate-resilient development strategies. Synergies are being sought at project, sector or landscape level, in planning or institutional frameworks at national, regional or local level and in urban and rural settings. Table 2 provides an overview of the frequently highlighted sectors offering adaptation and mitigation synergies along with example measures.

Table 2
Sectors and sample measures reported by Parties offering synergies between adaptation and mitigation

Sector	*Examples of adaptation measures with mitigation co-benefits*
Agriculture, forestry and other land-use, including livestock	– New crop varieties that allow for a decrease in the use of pesticides and are able to withstand water stress – Sustainable land management practices – Improved livestock production practices – Protection and restoration of forests – Afforestation, including of mangroves and drought-tolerant species
Human settlements and infrastructure	– Climate-smart and resilient urban centres – Waste and storm water management, including treatment
Water	– Integrated water resources management, including watershed protection
Energy	– Renewable energy – Energy efficiency

[65] The first tier, macro-level monitoring, would allow for tracking the evolution of the national adaptation planning process as a whole. The second tier, meso-level monitoring, would allow for tracking progress and results at a disaggregated level, either sectoral or geographical; and finally the third tier, a micro-level structure of reporting, would apply to specific adaptation actions. Reporting is envisaged to be undertaken annually. Every four years (i.e. at the end of a planning cycle), an aggregated NAP impact study would elaborate on results achieved and make recommendations for the next cycle.

Sector	*Examples of adaptation measures with mitigation co-benefits*
Tourism	– Ecotourism

312. Reported ways of maximizing synergies between adaptation and mitigation include:

(a) Taking an ecosystem-based or a community-based approach;

(b) Prioritizing those adaptation measures that offer significant mitigation co-benefits;

(c) Minimizing the carbon footprint of adaptation measures.