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Reporting from and review of Parties included in Annex I to the Convention
Compilations and syntheses of biennial reports from Parties included in Annex I to the Convention

Compilation and synthesis of fourth biennial reports of Parties included in Annex I to the Convention

Revised report by the secretariat

Addendum

Summary

This report compiles and synthesizes information from the fourth biennial reports submitted to the secretariat by Parties included in Annex I to the Convention relating to implementation of the Convention, such as information on quantified economy-wide emission reduction targets and progress towards those targets, including information on mitigation actions and their effects and estimates of emission reductions and removals and the use of units from market-based mechanisms and land use, land-use change and forestry activities; greenhouse gas emission trends and projections; and the provision of financial, technological and capacity-building support to developing country Parties.

Contents

Abbreviations and acronyms

AFOLU	agriculture, forestry and other land use
Annex I Party	Party included in Annex I to the Convention
Annex I Party not included in Annex II	Party included in Annex I to the Convention that is not included in Annex II to the Convention
Annex II Party	Party included in Annex II to the Convention
AR	Assessment Report of the Intergovernmental Panel on Climate Change
AUD*	Australian dollar
BR	biennial report
CCS	carbon dioxide capture and storage
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COP	Conference of the Parties
CTCN	Climate Technology Centre and Network
CTF	common tabular format
DKK	Danish krone
EIT Party	Party with economy in transition
ESD	European Union effort-sharing decision
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
GBP	pound sterling
GCF	Green Climate Fund
GDP	gross domestic product
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
IPPU*	industrial processes and product use
LT-LEDS	long-term low-emission development strategy(ies)
LULUCF	land use, land-use change and forestry
N_2O	nitrous oxide
NA*	not applicable
NDC	nationally determined contribution
NE	not estimated
NF_3	nitrogen trifluoride
non-Annex I Party	Party not included in Annex I to the Convention
non-EIT Party	Party that does not have an economy in transition
non-ETS sector	sector not covered by the European Union Emissions Trading System
ODA*	official development assistance
OECD	Organisation for Economic Co-operation and Development
OECD DAC	Organisation for Economic Co-operation and Development Development Assistance Committee
OOF*	other official flows
PaMs	policies and measures
PFC	perfluorocarbon

ppp*	purchasing power parity
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
SDG	Sustainable Development Goal
SF_6	sulfur hexafluoride
TPES	total primary energy supply
UNFCCC reporting guidelines on BRs	"UNFCCC biennial reporting guidelines for developed country Parties"
WAM	'with additional measures'
WEM	'with measures'
WOM	'without measures'

* Used exclusively in tables, boxes and figures.

I. Introduction

A. Mandate

1. COP 17 decided that developed country Parties should submit their BRs two years after the due date of a full national communication. It also decided that developed country Parties should use the UNFCCC reporting guidelines on BRs and the CTF for those guidelines for preparing their BRs. In addition, it requested the secretariat to prepare compilation and synthesis reports on the information reported by developed country Parties in their BRs.[1]

B. Scope of the report

2. This report compiles and synthesizes information from the BR4s submitted by 43 Annex I Parties, including the EU, and by Kazakhstan.[2] It does not include information from the BR4 of Ukraine, whose BR4 had not been received by the time of its preparation (BR4s were due for submission by 1 January 2020). However, in order to provide a comprehensive and balanced analysis, various approaches have been used to address the issue of missing data. This report updates the previous version[3] by including the information from the BR3 of the United States of America and the BR4s of Iceland and the United States, which were submitted after the publication of the previous version. It also includes information from the BR4s resubmitted during reviews conducted after the publication of the previous report; updated information contained in technical review reports; the latest available data on GHG emissions reported in the 2021 GHG inventory submissions of developed country Parties; and the latest NDCs and LT-LEDS submitted under the Paris Agreement.

3. The report highlights the efforts of Annex I Parties in fulfilling their commitments under the Convention. Annex I Parties have been progressing towards their 2020 emission reduction targets, albeit to varying extents, by putting in place a range of PaMs, and their GHG emissions have decreased significantly since 1990, although there has been some increase in emissions in recent years. Parties are increasingly focusing on targets for beyond 2020, and there has been a steady increase in their provision of climate finance, technology and capacity-building support, reflecting a continued commitment to supporting the global transition to a low-emission and climate-resilient future.

4. In addition to fulfilling the mandate from COP 17, this report could serve as useful input to the assessment of collective progress towards achieving the purpose and long-term goals of the Paris Agreement as part of the global stocktake in accordance with Article 14 of the Paris Agreement.

5. This report is structured following the main areas of reporting set out in the UNFCCC reporting guidelines on BRs, namely quantified economy-wide emission reduction targets (chap. II), GHG emissions and trends (chap. III), PaMs (chap. IV), GHG emission projections (chap. V), progress towards the 2020 targets by 2017 and outlook for achieving midterm and long-term emission reduction goals (chap. VI), and provision of financial, technological and capacity-building support to developing country Parties (chap. VII). The supplementary data used in the analysis is contained in the annex.

[1] Decision 2/CP.17, paras. 13 and 21.

[2] Kazakhstan submitted a quantified economy-wide emission reduction target to the secretariat although it is a non-Annex I Party. Hence, unless otherwise specified, information on Kazakhstan, considered an Annex I EIT Party for the purpose of the analysis in this report, has been included in the compilation and synthesis of data presented herein.

[3] FCCC/SBI/2020/INF.10 and Corr.1 and Add.1 and Add.1/Corr.1.

C. Changes compared with the compilation and synthesis of third biennial reports

6. For the compilation and synthesis of BR4s, the process of refining the analytical approaches continued with the aim of presenting an accurate and balanced picture of key trends in Parties' climate actions and their underlying drivers. The main changes compared with the compilation and synthesis of BR3s[4] include:

(a) An increased focus on how Parties' climate actions and provision of support relate to their post-2020 targets and strategies, including a more comprehensive description of Parties' midterm and long-term targets and strategies (chap. II) and implemented PaMs (chap. IV), as well as the outlook for achieving those targets (chap. VI);

(b) More information on the drivers of GHG emission trends (chap. III) and projections (chap. V), with a particular focus on the Parties with the highest shares of the total emissions reported across the BR4s. In an attempt to further nuance the analyses of the GHG emission trends and projections of EIT and non-EIT Parties, the increasing convergence in trends between the two sets of Parties has been addressed;

(c) Some revision of the presentation of the financial data (chap. VII) stemming from Parties improving their reporting approaches (e.g. the sectoral allocation of climate finance) or data-collection processes (e.g. reporting on private finance leveraged as a result of public climate finance). The section on technology transfer has been more closely aligned with the reporting elements from the UNFCCC reporting guidelines on BRs. The information presented on capacity-building projects supported has also been improved, including information on how the capacity-building support provided responds to the emerging needs of developing countries and on the integration of gender considerations into capacity-building.

II. Quantified economy-wide emission reduction targets

A. Overview

7. Annex I Parties report in their BRs[5] information on their quantified economy-wide emission reduction targets, including any conditions or assumptions relevant to attaining them, as communicated to the secretariat and contained in document FCCC/SB/2011/INF.1/Rev.1 or any update to that document.[6] Parties are also to report in their BRs on progress towards their targets.

8. All Annex I Parties except Turkey pledged targets for 2020 as part of the Cancun Agreements. Kazakhstan submitted its target on a voluntary basis. Each target is expressed as a percentage reduction in absolute GHG emissions from a base-year level to be achieved by 2020. Most Parties have taken on multiple targets: one that is unconditional (independent of future circumstances) and one or more that are conditional (contingent on certain conditions, such as treaty provisions or pledges made by other Parties).

9. Provisions tied to the conditional targets include achieving a comprehensive global agreement with the participation of all major economies; all Parties contributing their fair share to a cost-effective global emission reduction pathway; and having an effective set of rules for accounting for the contribution of LULUCF and use of units from market-based mechanisms. Table 1 shows Annex I Parties' emission reduction targets for 2020, their base years, the conditionality status of their 2020 targets and their post-2020 targets.

[4] Contained in document FCCC/SBI/2018/INF.8/Add.1.

[5] Available at https://unfccc.int/BRs.

[6] The latest update is contained in document FCCC/SBSTA/2014/INF.6.

10. The 2020 targets reported in the BR4s are the same as those reported in document FCCC/SBSTA/2014/INF.6, except those of Belarus[7] and Japan.[8] The 28 EU member States[9] committed to contributing to achieving a joint EU economy-wide emission reduction target of 20 per cent below the 1990 level by 2020 (see box 1). Additionally, some EU member States have domestic 2020 targets that are more ambitious than the target for the EU as a whole. Table I.1 presents additional details of Parties' 2020 targets.

Box 1
The European Union's joint economy-wide emission reduction targets

Under the Convention, the EU committed to contributing to achieving a joint economy-wide emission reduction target of 20 per cent below the 1990 level by 2020. Details on the implementation of the joint target are provided in the 2020 EU climate and energy package, adopted in 2009. The package stipulates that the target will be met by the EU and its member States through a 21 per cent reduction below the 2015 level in GHG emissions from installations under the EU ETS and a 10 per cent reduction below the 2005 level in emissions from sectors not under the EU ETS (primarily transport, agriculture, waste and some sources in the industrial processes and product use sector). For emissions under the EU ETS, the common EU-wide target applies to all EU member States as a group. For other emissions, the ESD provides targets for each member State individually to reduce or limit growth in its GHG emissions in the range of 20 per cent below to 20 per cent above the 2005 level by 2020. The target levels were set on the basis of the relative GDP per capita of the EU member States. Up to a certain limitation, the ESD allows EU member States flexibility in meeting their annual targets by carrying over overachievements to subsequent years within each member State, transferring annual emission allocations between member States and using international credits (i.e. credits from joint implementation and the clean development mechanism). Emissions and removals from the LULUCF sector are not included in the EU quantified economy-wide emission reduction target.

A further target has been pledged as part of the EU NDC under the Paris Agreement to reduce emissions by at least 40 per cent below the 1990 level by 2030. The 2030 target was set in the EU 2030 climate and energy framework and is operationalized by the revised EU ETS directive (directive 2018/410), the EU effort-sharing regulation (regulation 2018/842) and the EU LULUCF regulation (regulation 2018/841). The EU effort-sharing regulation, successor to the ESD, was adopted in 2018. It sets national emission reduction targets for 2030 ranging from 0 to 40 per cent below the 2005 level, and trajectories with annual limits for 2021–2030, for all EU member States, and keeps many of the flexibilities of the ESD. For 2030, a reduction target of 43 per cent below the 2005 level has been set for emissions under the EU ETS. For the 2030 target, the LULUCF sector is included for the first time, with the LULUCF regulation stipulating that each EU member State must ensure that the LULUCF sector does not produce net debits once specific accounting rules are applied.

The EU committed in 2019 to becoming climate-neutral by 2050 and submitted in 2020 a long-term strategy that encompasses all sectors of the economy. The European Commission's European Green Deal, launched in 2019, calls for responsibly increasing the ambition of the 2030 emission reduction target to at least 50 per cent and towards 55 per cent compared with the 1990 level.

11. All Parties pledged post-2020 targets in their NDCs under the Paris Agreement[10] and reported them in their BR4s. The targets are for 2030 for all Parties. In most cases, the targets submitted in the NDCs are updates to the post-2020 targets submitted under the Cancun

[7] Belarus communicated to the secretariat a conditional target of a 5–10 per cent emission reduction compared with the 1990 level, which is reflected in document FCCC/SBSTA/2014/INF.6; but it has communicated an emission reduction target of 8 per cent in all its BRs.

[8] After publication of document FCCC/SBSTA/2014/INF.6, Japan formally resubmitted its 2020 emission reduction target as a minimum 3.8 per cent emission reduction by 2020 compared with the 2005 level; see http://unfccc.int/focus/mitigation/items/9736.php.

[9] For the purpose of the analysis in this report, the United Kingdom of Great Britain and Northern Ireland has been considered an EU member State.

[10] On 4 November 2019 the Government of the United States notified the United Nations of its decision to withdraw from the Paris Agreement, effective 4 November 2020.

Agreements. For completeness, all Parties' post-2020 targets are shown in table 1, whether or not they were reported in the BR4s.[11]

12. Since 2016, many Parties have also submitted under the Paris Agreement targets, objectives and strategies that set the long-term direction of their national climate policy.[12] Some Parties included them in their BR4s to outline their trajectories to achieving their 2020 targets under the Convention, NDC targets for 2030 and LT-LEDS until 2050. These long-term targets are also presented in table 1.

13. The emission reduction targets (unconditional or unspecified) for 2020[13] range from at least 3.8 per cent below the 2005 level (Japan) to 30 per cent below the 1990 level (Monaco and Norway). The conditional emission reduction targets for 2020, taken on by Australia, Belarus, Canada, the EU, Iceland, Liechtenstein, New Zealand, Norway, the Russian Federation, Switzerland and Ukraine, range from 5–10 per cent below the 1990 level (Belarus) to 30 per cent below the 1990 level (EU, Iceland, Liechtenstein and Switzerland) and 40 per cent below the 1990 level (Norway).

14. The majority of Parties have 1990 as the base year for their emission reduction targets, while Australia selected 2000, Canada and the United States both selected 2005 and Japan selected the fiscal year 2005.

15. Where Parties submitted unconditional and conditional targets, they were aiming to increase the ambition of their target under certain circumstances. However, no Party with a conditional target analysed in its BR4 whether any of the conditions for shifting towards that target had been met so far.

B. Description of targets

16. All Parties communicated their targets as percentage reductions relative to emissions of selected GHGs in the base year, and also reported in their BR4s additional descriptive information on the targets, including gases and sectors covered, GWP values used for calculating CO_2 eq emissions, and use of units from market-based mechanisms and contribution of LULUCF.

17. For Kazakhstan and Monaco, the base year for F-gases (HFCs, PFCs and SF_6) is different from that for the other gases (CO_2, CH_4 and N_2O).

18. All Parties included CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 in their base-year emissions and targets; and all but Belarus, the EU, Iceland, Kazakhstan and Liechtenstein also included NF_3 in their targets. Only Ukraine[14] has yet to determine its base year for NF_3 (see table I.1).

19. Most Parties used GWP values from the AR4 for calculating their GHG emissions, except for Ukraine, which used those from the AR2.[15]

20. With regard to the sectoral coverage of the targets, all Parties included in their targets emissions from energy, transport, industrial processes,[16] agriculture and waste; while the EU target also includes emissions from international aviation, which are covered by the EU ETS.

[11] Information on the post-2020 targets presented in NDCs is available at http://www4.unfccc.int/ndcregistry/Pages/All.aspx; information on the post-2020 targets presented in the intended nationally determined contributions of Parties that have not yet ratified the Paris Agreement is available at https://www4.unfccc.int/sites/submissions/INDC/Submission%20Pages/submissions.aspx.

[12] Information on LT-LEDS is available at https://unfccc.int/process/the-paris-agreement/long-term-strategies.

[13] In this report, references to 2020 targets concern the unconditional targets, unless otherwise specified.

[14] For Ukraine, data were taken from its BR1 since it had not submitted its BR4 by the time of the preparation of this report.

[15] According to Ukraine's BR1.

[16] Industrial processes refers to the industrial processes and solvent and other product use sectors.

Table 1
Annex I Parties' greenhouse gas emission reduction targets[a]

	Quantified economy-wide emission reduction target for 2020 (reduction from base-year emission level)[b]			*GHG emission reduction target for 2030 (reduction from base-year emission level)[c]*			*GHG emission reduction long-term target or objective (reduction from base-year emission level)[d]*	
Party	*Base year*	*Unconditional (%)*	*Conditional (%)*	*Base year*	*Unconditional (%)*	*Conditional (%)*	*Base year*	*Target/objective*
Australia	2000	5	15–25	2005	26–28	–	–	Net zero emissions by 2050
Belarus	1990	–	5–10[e]	1990	At least 35	At least 40	–	–
Canada	2005	–	17	2005	At least 40	–	–	Net zero GHG emissions by 2050
EU	1990	20	30	1990	At least 55	–	–	Climate-neutral by 2050
Iceland	1990	20[f]	30	1990	At least 55	–	–	Climate-neutral and net zero emissions no later than 2040 and fossil fuel free by 2050
Japan	Fiscal year 2005	At least 3.8[g]	–	Fiscal year 2013	46 and continue efforts towards 50	–	–	Net zero, that is, to realize carbon neutrality by 2050
Kazakhstan	1990	15	–	1990	15	25	–	–
Liechtenstein	1990	20	30	1990	40	–	–	–
Monaco	1990	30	–	1990	55	–	–	Carbon-neutral by 2050
New Zealand	1990	5	10–20	2005	50	–	–	Net zero GHG emissions by 2050 (other than biogenic CH_4, for which the target is to reduce emissions by 24–27% below the 2017 level)
Norway	1990	30[h]	40	1990	50–55	–	1990	Emission reduction of 80–95% by 2050 compared to 1990
Russian Federation	1990	–	15–25	1990	Limiting GHG emissions to 70 relative to 1990 level	–	–	–
Switzerland	1990	20[i]	30	1990	50	–	–	Net zero GHG emissions by 2050
Turkey	–	–	–	–	Up to 21 from 'business as usual'	–	–	–
Ukraine	1990	–	20	1990	65	–	–	Net zero GHG emissions by no later than 2060
United Kingdom	–	–	–	1990 for CO_2, CH_4 and N_2O 1995 for HFCs, PFCs, SF_6 and NF_3	68	–	–	Net zero emissions by 2050

Party	*Quantified economy-wide emission reduction target for 2020 (reduction from base-year emission level)*[b]			*GHG emission reduction target for 2030 (reduction from base-year emission level)*[c]			*GHG emission reduction long-term target or objective (reduction from base-year emission level)*[d]	
	Base year	*Unconditional (%)*	*Conditional (%)*	*Base year*	*Unconditional (%)*	*Conditional (%)*	*Base year*	*Target/objective*
United States	2005	In the range of 17% emission reduction by 2020 compared with 2005 levels	–	2005	50–52	–	–	Net zero GHG emissions by 2050

[a] To ensure the completeness and accuracy of information, developed country Parties' 2030 and long-term targets reported in their BR4s have been updated and supplemented with information from the most recent NDCs and LT-LEDS submitted under the Paris Agreement.

[b] As communicated to the secretariat and contained in document FCCC/SBSTA/2014/INF.6, unless otherwise specified.

[c] As reported in NDCs under the Paris Agreement, available at http://www4.unfccc.int/ndcregistry/Pages/All.aspx, unless otherwise specified.

[d] As reported in LT-LEDS or NDCs under the Paris Agreement. The LT-LEDS are available at https://unfccc.int/process/the-paris-agreement/long-term-strategies.

[e] Belarus communicated to the secretariat a conditional target of a 5–10 per cent emission reduction compared with the 1990 level, which is reflected in document FCCC/SBSTA/2014/INF.6; but it has communicated an emission reduction target of 8 per cent in all its BRs.

[f] Iceland will fulfil its target jointly with the EU and its 28 member States in accordance with Article 4 of the Kyoto Protocol. Under its bilateral effort-sharing agreement with the EU, Iceland's cumulative emission allocation for the non-ETS sectors for 2013–2020 is 15,327.22 kt CO_2 eq.

[g] Target modified after publication of document FCCC/SBSTA/2014/INF.6 and officially communicated to the secretariat by the Government of Japan.

[h] Norway reported in its BR4 that its unconditional target under the Convention for 2020 of a 30 per cent emission reduction relative to the 1990 level is consistent with its quantified emission limitation or reduction commitment of 84 per cent of the base-year emissions for 2013–2020 as defined in the Doha Amendment to the Kyoto Protocol. Therefore, compliance under the Kyoto Protocol should ensure that Norway also meets its 2020 emission reduction target under the Convention.

[i] Switzerland reported in its BR4 that it will assess the fulfilment of its quantified economy-wide emission reduction target under the Convention by accounting against its quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol of 84.2 per cent of the 1990 emission level.

21. Australia, Canada, Iceland, Japan, Liechtenstein, New Zealand, Norway, Switzerland and the United States included the LULUCF sector in their targets, but with different accounting approaches (see tables 1 and I.1). Iceland, Japan, New Zealand, Norway and Switzerland will use the Kyoto Protocol activity-based approach to LULUCF accounting, which defines activities such as afforestation, reforestation, deforestation and forest management. Other Parties, such as Canada, Liechtenstein and the United States, will use a comprehensive land-based approach. Outside the Kyoto Protocol, there are no agreed rules on accounting for the contribution of emissions and removals estimated using either a land- or activity-based approach to achieving targets. However, Parties have used country-specific rules (e.g. Australia uses a net-net approach to accounting for LULUCF emissions together with the Kyoto Protocol accounting framework). Some Parties have not yet provided information on the LULUCF accounting approach that they will use.

22. Parties reported on their potential and actual use of units from market-based mechanisms (i.e. acquired certified emission reductions, emission reduction units, assigned amount units, carry-over units under the Kyoto Protocol, units from other mechanisms under the Convention and units from other market-based mechanisms) in achieving their targets. The EU and its member States have retained the option to use units from market-based mechanisms in achieving their targets under the Convention, including under the ESD, which allocates individual targets to the EU member States for sectors not under the EU ETS (see table I.5). No EU member State reported using market-based mechanisms under the Convention towards its ESD target in 2013–2018.[17] Of the other Parties, Belarus, Kazakhstan, the Russian Federation and the United States indicated that they will not use market-based mechanisms, and Canada reported that this is still to be determined (see table I.1). The EU, Liechtenstein, Monaco, Norway and Switzerland were the only Parties that reported using units from market-based mechanisms in 2013–2017 (see table I.8). Some of the Parties that reported their potential use of market-based mechanisms towards meeting their targets but that have not used any to date, such as New Zealand, reported that they will decide thereon in the future. There are no agreed rules outside the Kyoto Protocol on accounting for the contribution of units from market-based mechanisms to achieving targets.

C. Midterm and long-term targets[18]

23. For the post-2020 period, all Parties indicated 2030 as the deadline for achieving their targets in their NDCs. All Parties except Kazakhstan and Liechtenstein have submitted new or updated NDCs. Most Parties continued to use 1990 as the base year, while Australia, Canada, New Zealand and the United States use 2005. Japan uses 2013 and described its target against the 2013 fiscal year.

24. The 2030 emission targets include a 15 per cent reduction below the 1990 level (Kazakhstan), a 26–28 per cent reduction below the 2005 level (Australia), a 40–45 per cent reduction below the 2005 level (Canada), a 46 per cent reduction below the 2013 level (Japan), a 55 per cent reduction below the 1990 level (EU), a 50–52 per cent reduction below the 2005 level (United States) and a 68 per cent reduction below the 1990 level (United Kingdom).

25. An increasing number of Parties are outlining longer-term targets for 2050. Most Parties have set long-term targets or objectives and strategies for the post-2020 time-horizon, typically for 2050 (Australia, Canada, EU, Japan, Monaco, New Zealand, Norway, Switzerland, United Kingdom and United States), as part of their NDCs or LT-LEDS under the Paris Agreement. While many Parties have set their long-term target year as 2050, Iceland's long-term target year is 2040 and Sweden's is 2045. Most Parties mentioned their

[17] In their CTF tables, the United Kingdom reported on units purchased to meet its obligations for the first commitment period of the Kyoto Protocol; Malta reported on its purchase of annual emission allocations from other EU member States to meet its ESD commitment; Hungary reported on units that were cancelled by their account owners; and Portugal reported on purchases of units from market-based mechanisms by EU ETS operators within the country.

[18] To ensure the completeness and accuracy of information, developed country Parties' 2030 and long-term targets reported in their BR4s have been updated and supplemented with information from the most recent NDCs and LT-LEDS submitted under the Paris Agreement.

long-term targets in their BR4s, consistent with their NDCs or LT-LEDS. Together with long-term target years, most Parties described their targets, which included "climate neutrality", "carbon neutrality", "GHG neutrality", "net zero GHG emissions", and a 95 per cent reduction in GHG emissions by 2050 compared with 1990. Although Belarus did not explicitly mention its long-term target in its BR4, it was noted in its BR4 that its LT-LEDS is under development.

26. Many EU member States outlined in their BR4s ambitious trajectories to meeting their individual long-term goals. Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Lithuania, Luxembourg, Romania, Spain and Sweden have committed to contributing to the long-term goal of the EU. Instead of a national target, Belgium presented targets by region, namely carbon neutrality by 2050 for the Walloon Region, an 85 per cent reduction in GHG emissions by 2050 compared with 2005 in non-ETS sectors as part of a drive for total climate neutrality in the Flemish Region, and efforts to neutralize its carbon footprint by the end of 2050 in the Brussels-Capital Region. Sweden has set a goal of net zero emissions by 2045 and negative emissions thereafter. Sweden also outlined an ambitious interim emission reduction target for its transport sector of at least 70 per cent by 2030 relative to the 2010 level. Such targets, objectives and strategies provide long-term direction to national climate policy and ensure that near-term and midterm targets are consistent with that direction.

D. Improvements and challenges in reporting

27. Several Parties had issues with reporting information related to their targets in the CTF tables. In general, Parties have improved the transparency of the reporting on their targets, particularly regarding gases covered and GWP values used. Key challenges included reporting information on base years, the contribution of LULUCF and the possible scale of the contribution of market-based mechanisms. More Parties are choosing to resubmit their CTF tables during the review process and in doing so often resolve such issues.

III. Greenhouse gas emissions and trends

A. Overview

28. In accordance with the UNFCCC reporting guidelines on BRs, Annex I Parties shall report in their BRs summary information on their national GHG inventories, prepared following the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories",[19] for 1990 to the latest year reported in the most recent inventory submission available. All 43 Annex I Parties that submitted BR4s provided information on GHG emissions and removals for 1990–2017.[20]

29. In order to present the most recent information, this chapter covers information on GHG emissions for all 43 Annex I Parties reported in the 2021 annual GHG inventory submissions received as at 28 February 2022.[21] Total aggregate GHG emissions; emissions by gas; emissions by sector; and emission data for individual Annex I Parties are presented for three periods: 1990–2019, 1990–2000 and 2000–2019.

30. Totals are also presented for EIT Parties and for non-EIT Parties separately as these totals reflect the different trends in historical emissions for these groups of Parties, particularly for prior to 2000.

[19] Decision 24/CP.19, annex I.

[20] A total of 43 Annex I Parties, including the EU, submitted their BR4s. Ukraine did not submit its BR4.

[21] GHG data from 43 individual Parties (i.e. excluding EU) were used for the analysis.

B. Emission trends

31. For all Annex I Parties taken together, total aggregate GHG emissions decreased in 1990–2019: without LULUCF by 14.8 per cent, from 19,599 to 16,698 Mt CO_2 eq; and with LULUCF by 18.6 per cent, from 18,329 to 14,920 Mt CO_2 eq. These trends are influenced by the differences in the trends in emissions of EIT Parties and non-EIT Parties, particularly in 1990–2000, which was marked by EIT Parties transitioning from planned to market-based economies, as well as by the differences in the trends in total aggregate GHG emissions in 1990–2000 and 2000–2019.

32. Figures 1–2 show total GHG emission levels and trends for 1990–2019 for all Annex I Parties taken together, as well as separately for EIT and non-EIT Parties.

Figure 1
Greenhouse gas emissions without land use, land-use change and forestry of Annex I Parties in 1990–2019

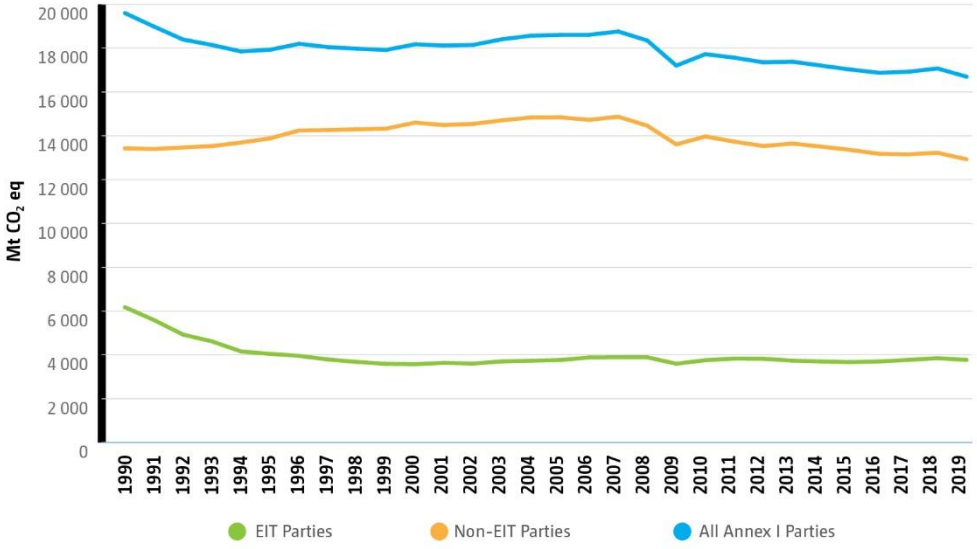
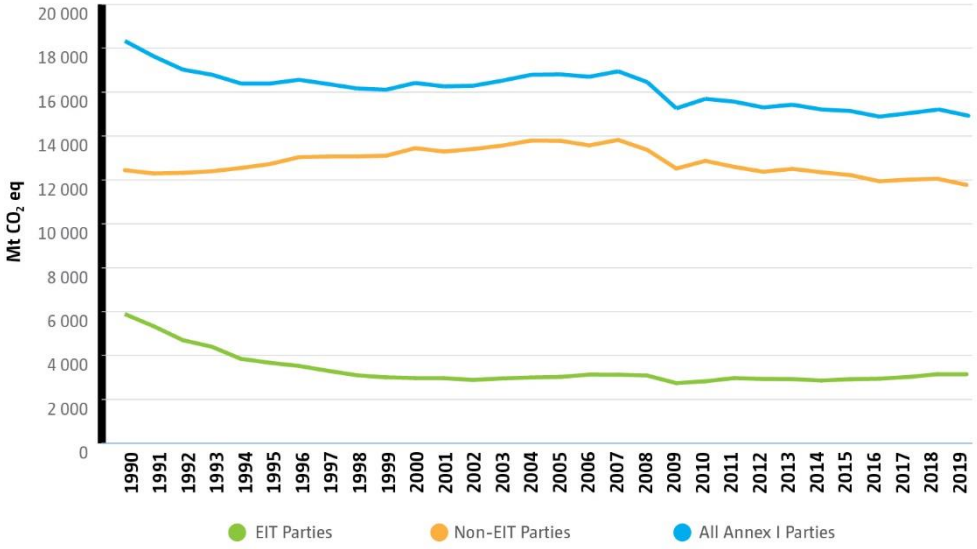


Figure 2
Greenhouse gas emissions with land use, land-use change and forestry of Annex I Parties in 1990–2019



33. For EIT Parties, GHG emissions decreased by 39.0 per cent without LULUCF and by 46.6 per cent with LULUCF in 1990–2019. Significant emission reductions occurred between 1990 and 2000 (by 42.1 per cent without LULUCF and by 49.5 per cent with

LULUCF) owing to a decline in economic output stemming from their transition to market-based economies (see box 2 for an example). After 2000, emissions increased steadily owing to economic recovery, but decreased by more than 7 per cent in 2009 as a result of the global financial crisis. In 2010, emissions increased by almost 5 per cent, but a downward trend followed until 2015. Emissions rose by 5.4 per cent without LULUCF and by 5.9 per cent with LULUCF between 2000 and 2019.

Box 2
Ukraine's greenhouse gas emissions

The trend in Ukraine's GHG emissions differs across time periods. Between 1990 and 2000, there was a stark decline in emissions (by about 55 per cent) due to economic conditions in the region. This was followed by fluctuations in the emission trend until 2007, owing primarily to structural changes in the economy. The global financial crisis resulted in a 9.3 per cent decrease in emissions in 2008–2013, despite increases in emissions in 2010 and 2011 (by 4.3 and 5.2 per cent, respectively). The downward trend in emissions continued in 2014 and 2015, owing mainly to the decline in industrial production and consequently in energy consumption. Since then, industrial production has recovered, which, together with an increase in the amount of fuel used in the energy sector, has led to 4.1 per cent growth in emissions.

34. For non-EIT Parties, GHG emissions in 2019 were lower than those in 1990 by 3.7 per cent without LULUCF and by 5.4 per cent with LULUCF, although the total GDP of those Parties rose by more than 75 per cent over that period. This indicates a possible decoupling of economic growth and GHG emissions. Emissions increased by 8.8 and 8.1 per cent in 1990–2000 without and with LULUCF, respectively. A significant decrease in emissions occurred between 2000 and 2019 (by 11.4 per cent without LULUCF and 12.4 per cent with LULUCF), reflecting the combined effects of the global financial and economic crisis in 2008 and the PaMs put in place by the Parties (see box 3 for an example).

Box 3
Germany's greenhouse gas emissions

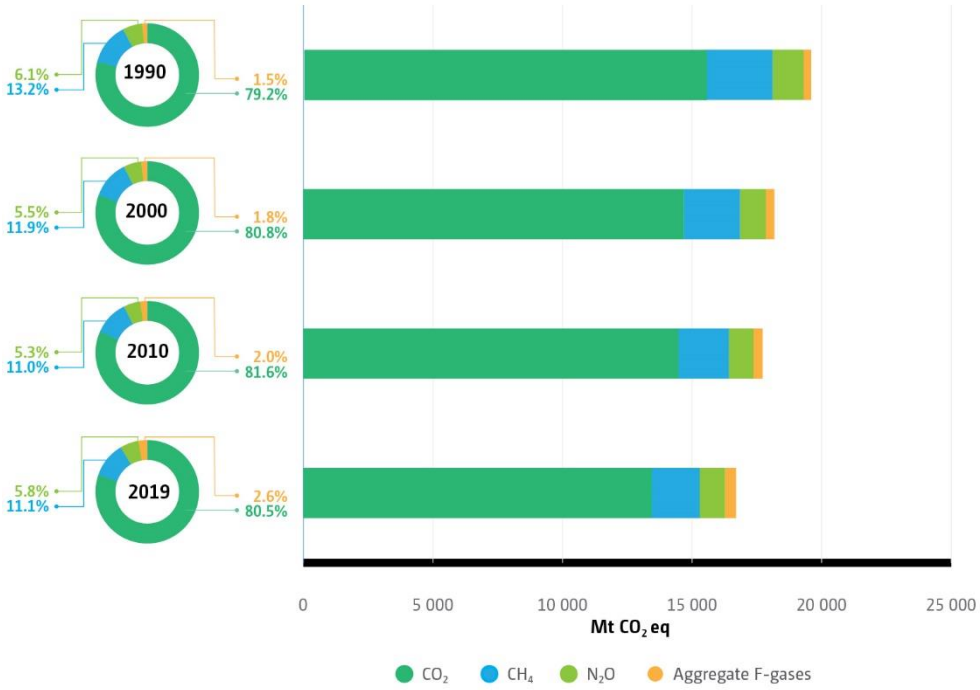
Germany's GHG emissions decreased by 35.1 per cent in 1990–2019. The decrease in emissions in the 1990s largely stemmed from economic restructuring in the former East Germany and the decrease in the 2000s was predominantly driven by a reduction in emissions from the energy sector, which largely resulted from the growing use of renewable energy, improvements in energy efficiency, and switching from solid to liquid and gaseous fuels. Moreover, changes in animal-housing methods, as well as legal regulations in the waste management sector, contributed to further emission reductions.

C. Emissions by gas

35. The shares of the different GHGs in total emissions remained the same in 1990–2019. For most Parties, the energy sector is the largest contributor to GHG emissions; hence CO_2 accounted for the largest share of emissions throughout the period. In 2019, CO_2 contributed 80.5 per cent of total emissions, while the contributions of CH_4 and N_2O were 11.1 and 5.8 per cent, respectively. In 1990, the share of CO_2 in the total emissions was slightly lower (79.2 per cent), while those of CH_4 and N_2O were higher (13.2 and 6.1 per cent, respectively). The share of F-gas emissions increased from 1.5 per cent in 1990 to 2.6 per cent in 2019.

36. Between 1990 and 2019, emissions of all direct GHGs, except F-gases, decreased. F-gas emissions increased by 48.2 per cent in 1990–2019 owing to the increased use of HFCs in refrigeration and air conditioning. Key contributors to the decrease in emissions include mitigation measures in electricity generation such as increased use of renewable energy and less GHG-intensive fuels, increased efficiency of power plants, modernization of industrial processes (e.g. in Canada), regulations in the waste management sector and of use of nitrogen fertilizers (e.g. part of measures implemented by EU member States) and improved CH_4 recovery systems. The shares of GHGs in the total emissions across 1990–2019 are displayed in figure 3.

Figure 3
Greenhouse gas emissions of Annex I Parties by gas in 1990–2019

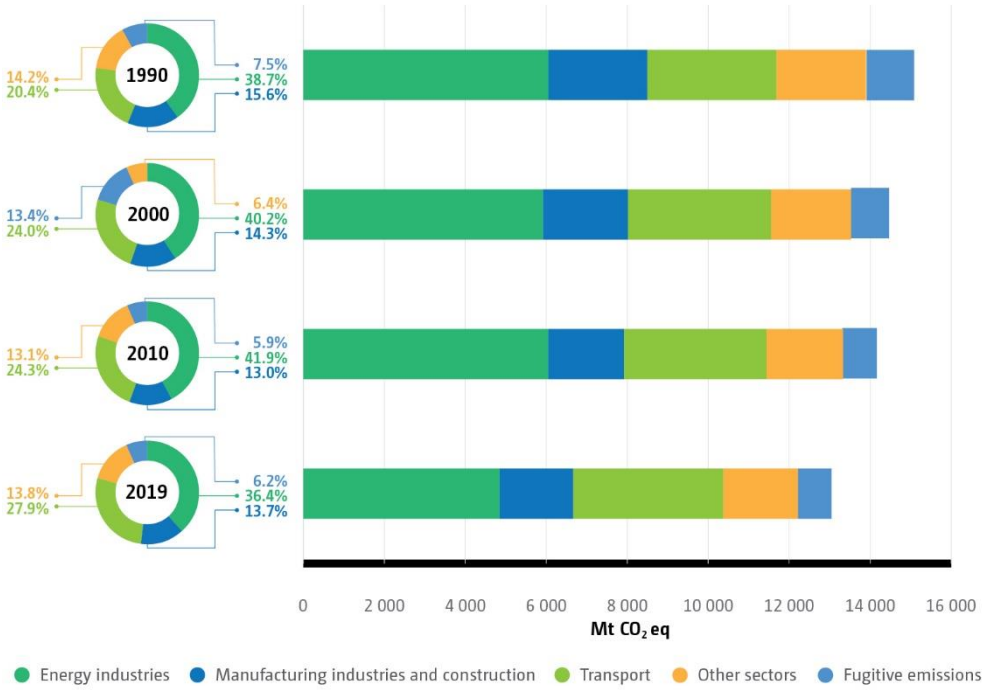


D. Emissions by sector

37. Throughout 1990–2019 the energy sector remained the dominant source of GHG emissions, contributing 13,311 Mt CO_2 eq in 2019 (amounting to 79.7 per cent). Although the energy sector accounted for the largest share of total emissions, mainly from heat and electricity generation and transportation, mitigation policies implemented have resulted in a 14.8 per cent decrease in energy sector emissions.

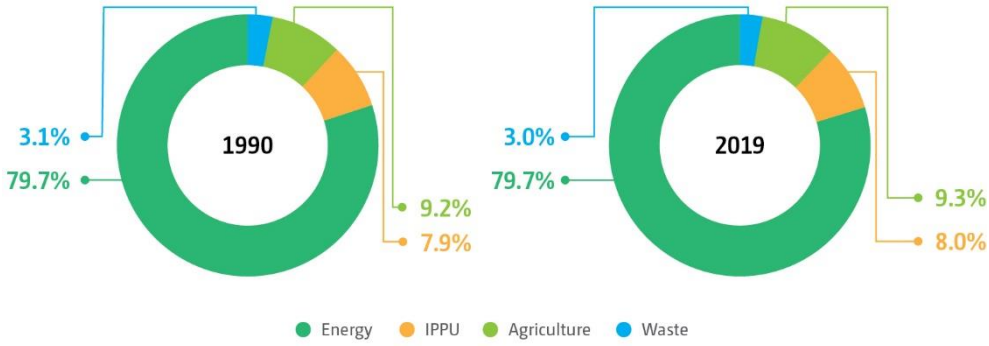
38. The energy sector emission trend between 1990 and 2019 results from emission changes in energy subsectors compensating for each other. While emissions from stationary combustion decreased, driven by an increase in the share of renewable sources in the electricity mix and improvements in energy efficiency, emissions from transport continued to increase, particularly from road transportation and domestic aviation. It is worth noting, however, that the rate of increase in emissions from transportation was significantly lower between 2000 and 2019 (4.9 per cent) than in 1990–2000 (10.9 per cent). In absolute terms, the largest emission reduction in 1990–2019 occurred in energy industries (–1,205.4 Mt CO_2 eq, or –19.9 per cent). Consistent with the overall downward trend, emissions from the energy sector decreased by 5.8 per cent in 1990–2000 and by 9.6 per cent in 2000–2019. GHG emissions from the energy sector in 1990–2019 are shown in figure 4.

Figure 4
Greenhouse gas emissions of Annex I Parties from the energy sector in 1990–2019



39. Emissions from agriculture accounted for the second-largest share in total emissions (about 9 per cent), followed by emissions from industrial processes and product use (about 8 per cent) and emissions from the waste sector (about 3 per cent). The shares of each sector in total emissions in 1990 and 2019 are shown in figure 5.

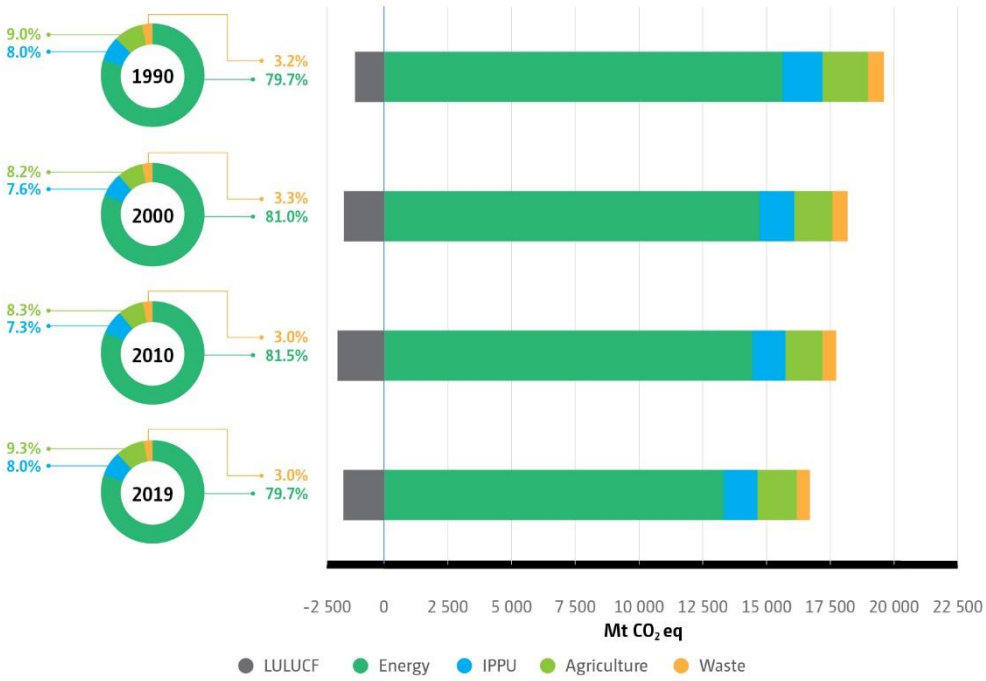
Figure 5
Shares of total greenhouse gas emissions by sector without land use, land-use change and forestry in 1990 and 2019



40. In 1990–2019, there was also an overall decline in emissions from other sectors. Emission reductions in the industrial processes and product use and agriculture sectors amounted to 240 Mt CO_2 eq (or 15.3 per cent) and 219 Mt CO_2 eq (or 12.3 per cent), respectively, while emissions in the waste sector decreased by the smallest amount (by 125 Mt CO_2 eq, or 19.9 per cent). The decreasing trend results from the growing use of renewable energy and improvements in plant and end-use efficiency, as well as from the modernization of industrial processes (e.g. in Canada), the installation of abatement technologies in nitric and adipic acid production (e.g. in the United Kingdom), a reduction in the use of nitrogen fertilizers (e.g. in Romania) and a reduction in livestock populations in most countries. Net GHG removals from LULUCF significantly increased, by 40.1 per cent, primarily owing to an increase in forest cover, a reduction in forest clearing for other land uses, and a decline in harvest rates.

41. Emissions from all sectors also decreased between 1990 and 2000. The largest emission reduction occurred in the energy sector, in particular in EIT Parties. The decreasing trend can be attributed mainly to the transition from centrally planned to market-based economies, which led to reduced economic activity and thus energy consumption. From 2000 to 2019, emissions from all sectors other than agriculture also decreased. Moreover, the increase in net GHG removals from LULUCF (by 1.2 per cent) was much lower than previously. Figure 6 shows the share in total emissions of each sector in 1990–2019.

Figure 6
Greenhouse gas emissions and removals of Annex I Parties by sector in 1990–2019

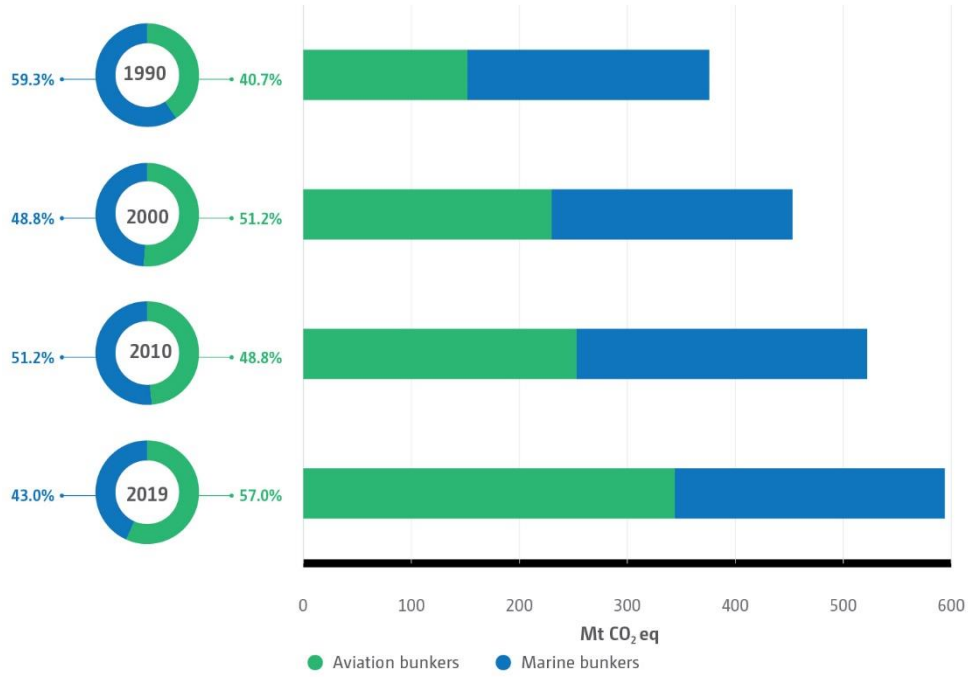


Note: The pie charts do not include the share of removals from the LULUCF sector.

42. In 2019, emissions from international bunkers amounted to 344 Mt CO_2 eq from aviation and 250 Mt CO_2 eq from navigation. From 1990 to 2019, these emissions increased: emissions from aviation more than doubled (by 126.6 per cent), while emissions from navigation rose by 11.6 per cent. In both 1990–2000 and 2000–2019, emissions from aviation also increased but at a lower rate (by 51.5 and 49.6 per cent, respectively). On the other hand, emissions from navigation slightly decreased in 1990–2000 (by 0.3 per cent) but increased by 11.9 per cent in 2000–2019 (see figure 7). In their latest reports to the UNFCCC, ICAO stated that in 2015 international aviation contributed 500 Mt of total global CO_2 emissions, while IMO estimated that in 2012 CO_2 emissions from international shipping contributed 2.2 per cent of total global emissions.[22]

[22] The submissions from ICAO and IMO are available at https://unfccc.int/topics/mitigation/workstreams/emissions-from-international-transport-bunker-fuels#eq-1.

Figure 7
Greenhouse gas emissions of Annex I Parties from international bunkers in 1990–2019



43. ICAO and IMO are making efforts to curb emissions from international aviation and shipping. The objective of IMO is to improve energy efficiency in international shipping and pave the way for decarbonization of the industry; for example, its initial strategy[23] calls for reducing emissions from international shipping by at least 50 per cent by 2050 compared with the 2008 level.

44. One environmental objective of ICAO is to limit and reduce aviation emissions that contribute to global climate change. ICAO has set aspirational goals in pursuit of this objective, including improving fuel efficiency by 2 per cent annually and maintaining the same level of CO_2 emissions from 2020 onward. To achieve these goals, ICAO has adopted measures such as improving aircraft technology and operations, using sustainable aviation fuels and establishing the Carbon Offsetting and Reduction Scheme for International Aviation.

E. Emission data for individual Annex I Parties

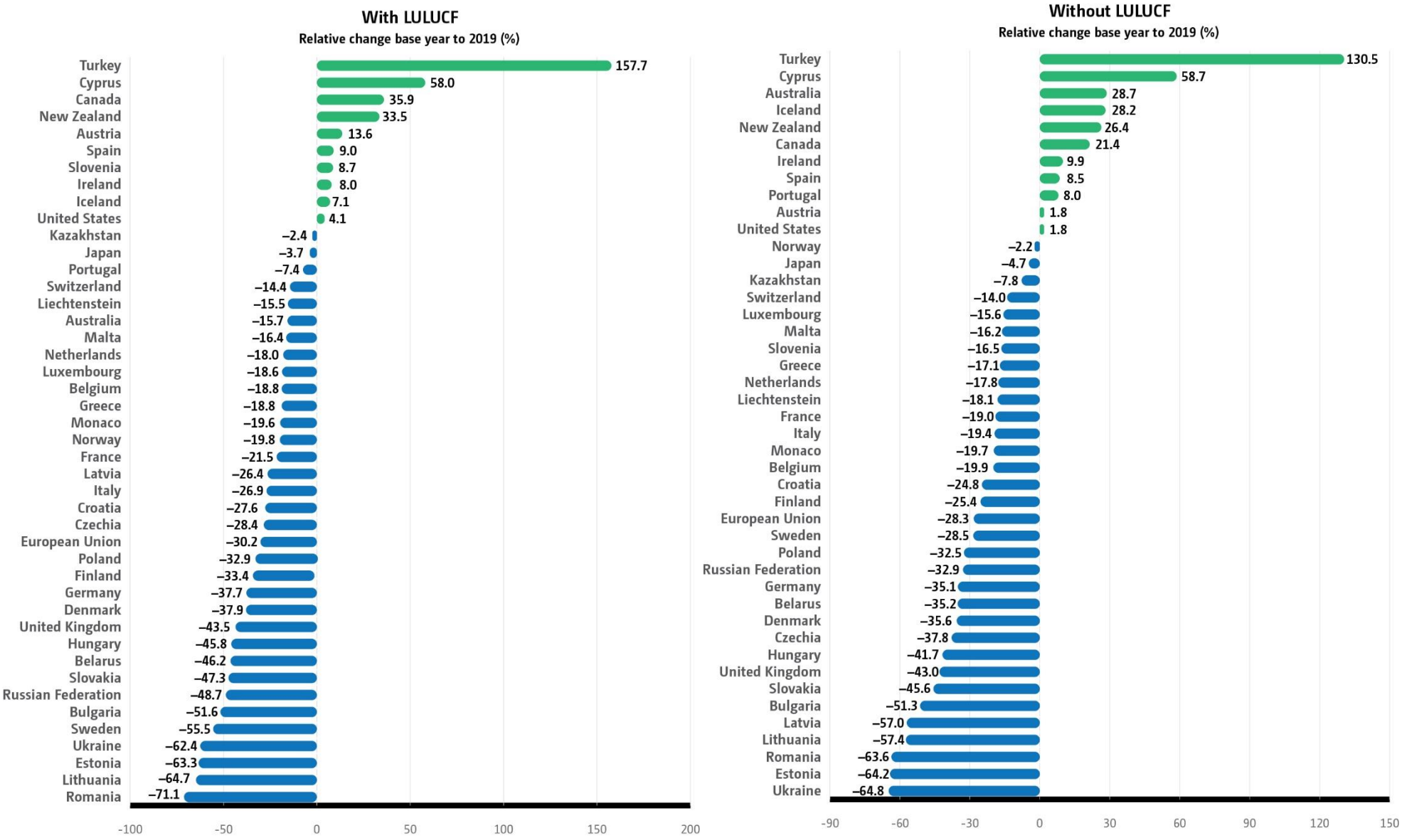
45. Total aggregate GHG emissions with and without emissions and removals from LULUCF for each Annex I Party are presented in tables I.3–I.4. Data are provided for 1990, 2000, 2010 and 2019. The percentage changes in emissions were calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the tables.

46. The changes in total aggregate GHG emissions in 1990–2019 varied considerably across Parties (see figure 8) owing to different economic development trends and distinct impacts of implemented climate change related PaMs. The GHG emission trends of EIT Parties and non-EIT Parties could thus be clearly distinguished.

[23] See https://www.imo.org/en/MediaCentre/HotTopics/Pages/Reducing-greenhouse-gas-emissions-from-ships.aspx.

Figure 8

Changes in total aggregate greenhouse gas emissions of individual Annex I Parties in 1990–2019



47. In 1990–2019, total aggregate GHG emissions with LULUCF increased in 10 Parties and decreased in 34 Parties and emissions without LULUCF increased in 11 Parties and decreased in 33 Parties. From 1990 to 2000, emissions without LULUCF decreased in 23 Parties and increased in 21 Parties and emissions with LULUCF decreased in 26 Parties and increased in 18 Parties. From 2000 to 2019, emissions without LULUCF decreased in 33 Parties and increased in 11 Parties and emissions with LULUCF decreased in 29 Parties and increased in 15 Parties.

48. In 1990–2019, Ukraine experienced the largest decrease in emissions without LULUCF (–64.8 per cent), followed by Estonia, Romania, Lithuania, Latvia and Bulgaria with emission reductions of more than 50 per cent. Most of the emission reductions occurred in EIT Parties, although emission growth could be observed in some of these Parties in 2000–2019 (for example due to increased economic activity and number of road vehicles). The steep decline in the emissions of EIT Parties in 1990–2000 resulted from a decline in economic output stemming from the transition to market-based economies and greatly outweighed any increase in emissions. Moreover, mitigation measures implemented in the majority of Parties, such as fuel switching, increased use of renewable energy sources, less use of synthetic fertilizers, and technological improvements leading to lower energy intensity (such as in most EU member States), led to deeper cuts in emissions.

49. The greatest increase in emissions without LULUCF occurred in Turkey (130.5 per cent), followed by Cyprus (58.7 per cent) and Australia and Iceland (28.7 and 28.2 per cent, respectively). This trend was influenced by population growth (e.g. in New Zealand), by energy-intensive industries (e.g. metal production in Iceland) and more generally by higher numbers of passenger vehicles, extreme weather conditions and higher demand for industrial products.

50. Taking into account net emissions and removals from LULUCF, the trend in emissions of some Parties is reversed. For example, when the LULUCF sector changed from being a source to a sink of GHG emissions (as for Australia) or the share of removals from LULUCF increased over the years (as for Norway), emissions with LULUCF decreased in 1990–2019 whereas emissions without LULUCF increased. On the other hand, where owing to changes in forest policy and natural disturbances the LULUCF sector became a net source (as for Slovenia), emissions with LULUCF increased even though emissions without LULUCF decreased significantly.

F. Improvements and challenges in reporting

51. Overall, the quantitative data on GHG emissions and trends reported by Parties in their BR4s are complete and transparent, although some are more detailed than others. The qualitative information could be improved, in particular the summary of emission trends and their drivers.

IV. Policies and measures

A. Overview

52. As per the UNFCCC reporting guidelines on BRs, Parties reported in their BR4s and CTF table 3 on their mitigation actions, including on PaMs implemented or planned since the previous national communication or BR to achieve their economy-wide emission reduction targets, including:

(a) Details of PaMs (name, objective and/or activity affected, brief description);

(b) Sectors affected by PaMs: energy, transport, industry or industrial processes, agriculture, forestry or LULUCF, waste, cross-cutting, other;

(c) Gases covered: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3;

(d) Types of instrument: regulatory, economic, fiscal, voluntary agreement, research, information and education;

(e) Status of implementation: planned, adopted, implemented or expired;

(f) Implementing entity or entities;

(g) Estimate of mitigation impact (not cumulative, in kt CO_2 eq).

53. A total of 42 Parties submitted a BR4 and included information on PaMs in CTF table 3, with 36 reporting impacts for some of their PaMs.

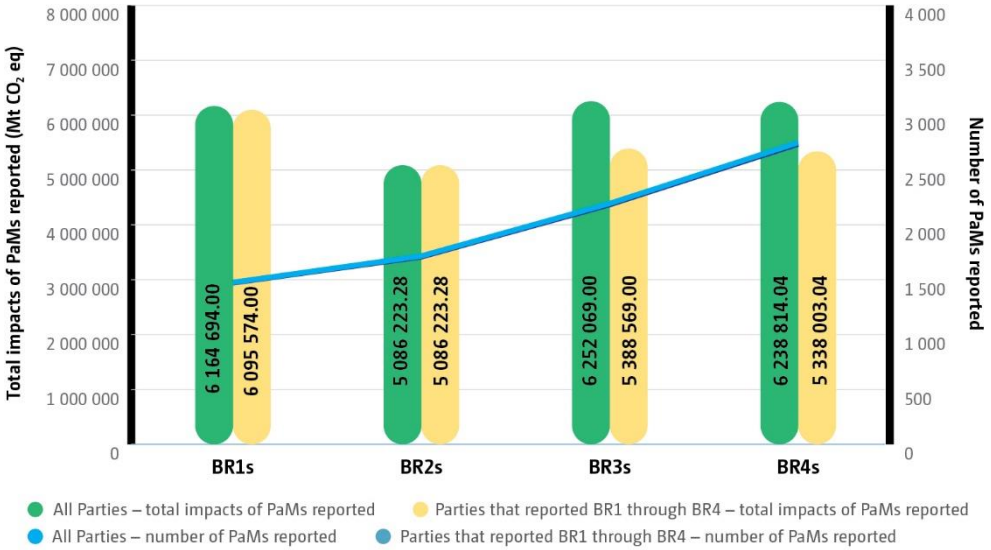
B. Profile of and trends in policies and measures reported in fourth biennial reports

54. In their BR4s, Parties reported a total of 2,749 PaMs, with estimated impacts reported for 30.0 per cent of them, totalling emission reductions of 6,238.81 Mt CO_2 eq. The number of Annex I Parties submitting BRs with information about their PaMs has remained stable over time, with 42 Parties submitting BRs in each of the four cycles. However, the total number of PaMs reported in each reporting cycle has steadily increased, from 1,475 in the BR1s to 2,749 in the BR4s. At the same time, the share of PaMs for which 2020 impacts were estimated fell from 49.7 per cent in the BR1s to 30.0 per cent in the BR4s. Total impacts quantified for all measures reported in each reporting cycle increased slightly from 6,164.69 Mt CO_2 eq in the BR1s to 6,238.81 Mt CO_2 eq in the BR4s. It is important to note that the impact quantified for individual PaMs can vary widely, as mitigation impacts of PaMs reported by Parties are related to their total emissions, as well as the scope of each policy or measure (i.e. the emission reductions targeted). As such, there is no correlation between the number of PaMs and the impacts quantified.

55. Not all Annex I Parties have submitted a BR in all four reporting cycles. In addition, of the Annex I Parties that submitted a BR in a specific reporting cycle, not all reported impacts of PaMs. Six Parties did not report estimated impacts for any PaMs in the BR4s. To provide some context, the Parties that have submitted a BR in all four reporting cycles account for 85.3 per cent of the total GHG emissions (without LULUCF) reported by all Annex I Parties for 2019. The number of PaMs reported by this group of Parties has increased from 1,472 in the BR1s to 2,737 in the BR4s. However, the total impact of PaMs reported by this group of Parties fell from 6,095.57 Mt CO_2 eq in the BR1s to 5,338.00 Mt CO_2 eq in the BR4s. Figure 9 shows the number of PaMs reported and the impacts estimated throughout the four reporting cycles, both for all Annex I Parties and for the Parties that have submitted BRs in all four reporting cycles.

Figure 9

Number of policies and measures reported and total impacts of policies and measures reported by Parties in their biennial reports



56. A small number of measures with a broad scope dominate the total impacts reported in the BR4s. When considering all measures reported by all Annex I Parties (not just those that reported in all four cycles), the 10 measures with the largest impacts reported in the BR4s together have an estimated impact of 3,512.81 Mt CO_2 eq, which amounts to 56.3 per cent of the total impacts estimated for the measures reported by all Parties in the BR4s. Five of these measures were reported by the United States and targeted multiple sectors in the form of the Significant New Alternatives Policy programme focusing on industrial gas emissions; standards for new and existing landfills; the voluntary Energy Star labelling programme; light-duty vehicle emission and efficiency standards; and appliance, equipment and lighting energy efficiency standards. Three of these measures are at the EU level, focusing on the energy and transport sectors, namely promoting energy use from renewable sources, improving the energy performance of buildings and developing energy action plans at the subnational level. The EU ETS is not among the top 10 measures in terms of impact because the EU has not reported an estimated impact for the measure. In line with the target for 2013–2020 to reduce sector-specific emissions under the EU ETS by 21 per cent in 2020 compared with the 2005 level, certificates allocated are annually reduced by an equivalent of 38.26 Mt CO_2 eq. The remaining two measures among the 10 largest were reported by the Russian Federation, both addressing the energy sector, in the form of the Russian Federation's Energy Action Plan and its State programme for the coal mining industry. All 10 measures were reported as implemented.

57. Throughout the BR reporting cycles, the same trend can be observed: a small number of measures are responsible for a significant portion of the total impacts reported, with the 10 measures with the largest impacts accounting for over 50 per cent of the total impacts estimated.

58. Table 2 shows the estimated emission reductions in 2020 due to PaMs reported with quantified effects across all BRs submitted.

Table 2
Quantified mitigation impacts in 2020 of policies and measures reported in biennial reports by individual Parties
(kt CO_2 eq)

Party	*BR1*	*BR2*	*BR3*	*BR4*
Australia	175 600.00	17 900.00	21 825.00	40 239.00
Belarus	25 010.00	1 250.00	3 050.00	No impacts reported
Canada	104 288.00	119 972.00	165 745.00	82 075.00
EU	2 846 150.00	1 692 450.00	1 724 923.00	1 627 393.00
EU member States	992 510.00	827 877.63	799 641.00	932 698.00
Iceland	328.00	215.00	No impacts reported	No impacts reported
Japan	48 960.00	67 474.00	183 673.00	180 345.00
Kazakhstan	314.00	247 365.00	25 421.00	4 060.00
Liechtenstein	12.00	63.00	10.00	12.00
Monaco	14.00	20.00	No impacts reported	12.00
Norway	1 120.00	120.00	16 633.00	24 776.00
New Zealand	11 732.00	5 329.00	6 647.00	6 652.00
Russian Federation	No BR submitted	No impacts reported	1 805 500.00	1 697 811.00
Switzerland	1 006.00	14 170.00	13 220.00	12 393.00
Ukraine	69 120.00	No BR submitted	No BR submitted	No BR submitted
United States	1 888 530.00	2 060 023.00	2 427 781.00	2 427 781.00

Note: The total impacts reported in this table do not add up to the totals mentioned in the text.

[a] The approach to calculating the total impacts has changed since the report on BR3s. In this report, impacts reported in both the BRs of the EU and the EU member States have been included in the totals. Previously, EU member States' reported impacts (excluding impacts related to the EU ETS) and the impacts of the EU ETS (but no other measures) reported by the EU were included in calculating the totals in order to avoid double counting. However, the reporting in the EU BRs focuses on EU-wide measures, while EU member States report domestic measures and some EU-wide measures. Despite this, there is generally good alignment with regard to reporting estimates of impacts of measures, so where EU member States report impacts of an EU-wide policy or measure, the EU does not report an estimate, and vice versa. This means that the approach used for the report on BR3s might have led to an underestimation of the total impacts reported.

1. Sectors

59. In their BR4s, Parties reported PaMs in the energy, transport, industry or industrial processes, agriculture, forestry or LULUCF, waste, cross-cutting and other sectors. The allocation of measures to sectors is not always fully comparable across Parties, particularly with regard to cross-cutting and other.[24] Parties reported measures as "cross-cutting" together with "other sectors" and "other". Parties also frequently reported several sectors for one measure, instead of reporting the measure as cross-cutting.

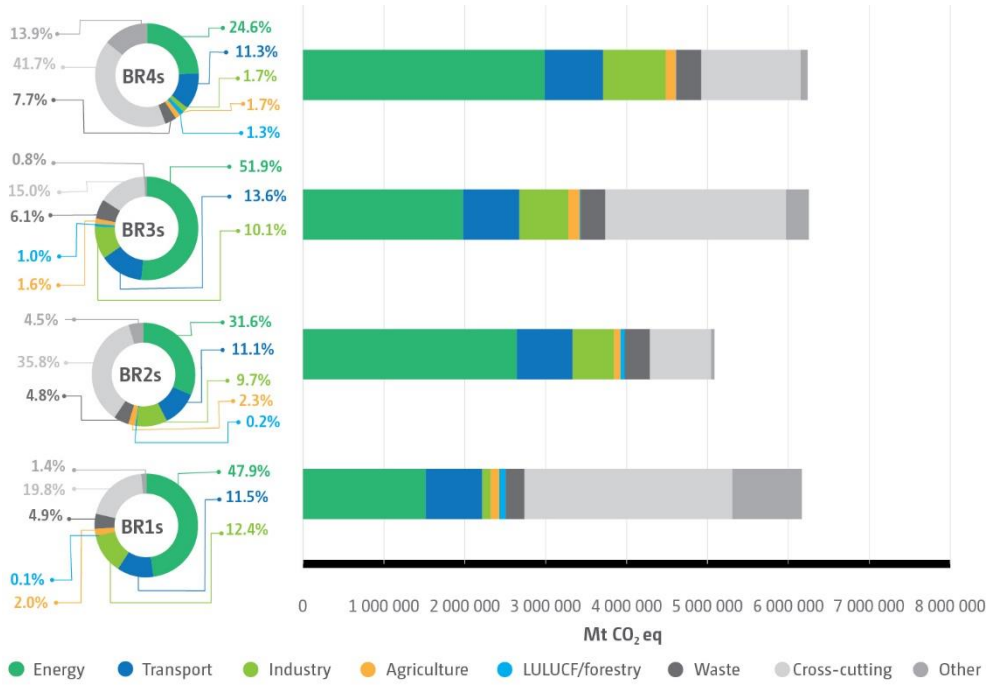
60. Energy including transport remains the focus of the PaMs reported in the BR4s. In the BR4s, most measures were reported under energy, transport and cross-cutting. More specifically, 30.8 per cent of measures were allocated to the energy sector, 19.9 per cent to cross-cutting, 18.7 per cent to transport, 8.4 per cent to other, 7.3 per cent to agriculture, 5.1 per cent to forestry/LULUCF, 5.1 per cent to waste and 4.7 per cent to industry or industrial processes. The picture is somewhat different regarding the mitigation impacts reported, where the energy sector and cross-cutting measures account for 47.9 and 19.8 per cent, respectively, of the impacts reported. The industry, transport, waste, agriculture and other sectors account for 12.4, 11.5, 4.9, 2.0 and 1.4 per cent, respectively, of the total impacts quantified, with LULUCF accounting for less than 0.1 per cent.

61. Over the four reporting cycles, the proportion of PaMs per sector compared with the total number of PaMs has remained mostly stable. Measures related to the energy, transport and cross-cutting sectors together account for over 60 per cent of measures reported over the cycles. The transport sector accounts for 18–21 per cent, energy for 19–31 per cent and cross-cutting for 20–27 per cent of the PaMs reported. The remaining sectors, with the exception of other, each account for well below 10 per cent. The picture is somewhat different for mitigation impacts estimated, where both sectoral shares and total impacts reported by sector vary significantly across the reporting cycles. Figure 10 presents the absolute and relative sectoral impacts of PaMs reported across the four reporting cycles.

62. In line with the trend of impacts being reported for a smaller fraction of measures indicated in paragraph 55 above, impacts have been quantified for smaller shares of measures in each sector over the four reporting cycles. The percentage of PaMs reported in the energy sector with quantified mitigation impacts was over 60 per cent for the BR1s, BR2s and BR3s, then dropped sharply from 60.9 to 43.9 per cent between the BR3s and BR4s; for the industry or industrial processes sector it decreased from 60.7 per cent in the BR1s to 41.9 per cent in the BR4s; and for agriculture and LULUCF the shares of PaMs reported with quantified impacts decreased from 42.6 and 37.5 per cent, respectively, in the BR1s to 30.5 and 27.1 per cent, respectively, in the BR4s.

[24] Where Parties reported measures as "other", they always specified the sector further by providing additional information in parentheses. Frequently, this is done to indicate that the measure relates to a subsector of the above-mentioned sectors, such as electricity, buildings or residential subsectors of energy. In some cases, the reason for allocating to "other" is not clear, as the specification made then points towards one of the above-mentioned sectors as a whole or even "cross-cutting". Where several sectors were reported, a number of sectoral combinations occurred more frequently, for example agriculture and forestry/LULUCF where measures concern agricultural and land-use practices, waste and energy where measures concern incineration of wastes or landfill gases for the purposes of power and heat generation, and energy and transport where measures relate to renewable energy and include elements related to electric vehicles or the use of biofuels.

Figure 10
Absolute and relative sectoral impacts of policies and measures reported in biennial reports



2. Instruments

63. In their BR4s, Parties reported the following types of instrument used for PaMs: regulatory, economic, fiscal, voluntary agreement, research, information and education.[25] For 64.1 per cent of PaMs only one instrument was reported in the BR4s. Hard instruments and combinations of hard and soft instruments were used for a greater number of PaMs than soft instruments. The majority of impacts were reported for regulatory and economic instruments. Of the PaMs for which only one instrument was reported, the type of instrument was reported as regulatory, economic, voluntary agreement or fiscal for 25.8, 22.2, 4.7 and 4.3 per cent, respectively. Information, education and research made up 4.0, 1.2 and 1.1 per cent, respectively, of the instruments reported. Combinations of regulatory, economic and fiscal instruments and voluntary agreements were reported to comprise 8.9 per cent of PaMs, while combinations of information, education and research accounted for 1.3 per cent. Combinations of hard and soft instruments accounted for 24.4 per cent of the PaMs. The majority of the total impact reported (69.1 per cent) stemmed from regulatory and economic instruments, possibly because such instruments have greater emission reduction potential and are considered more effective and their impacts are easier to quantify.

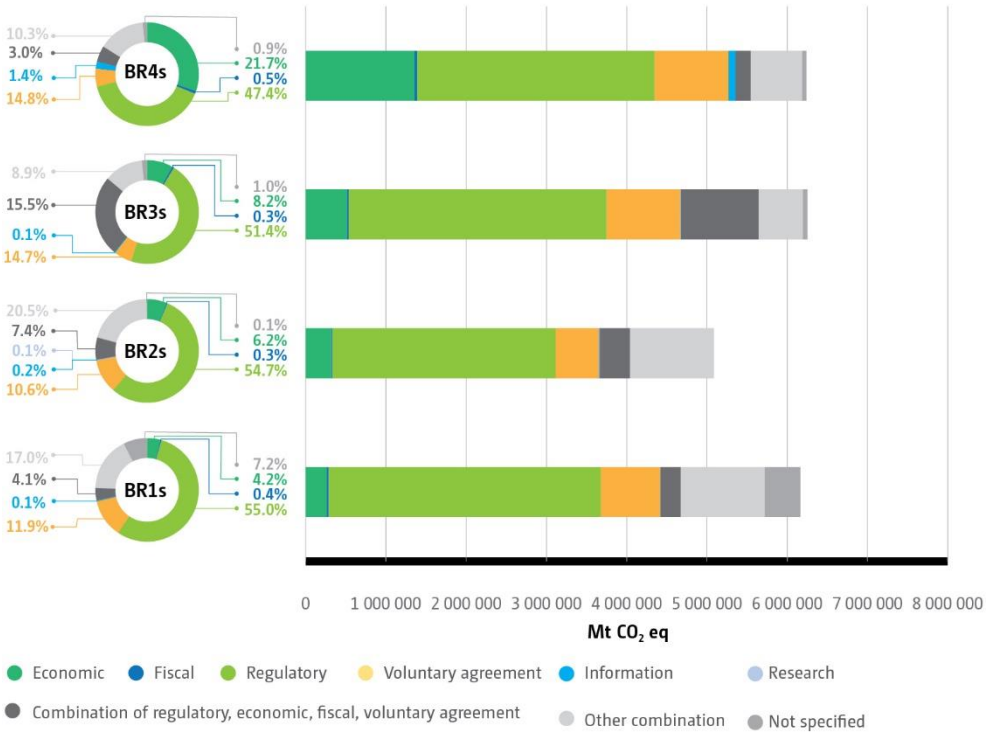
64. Over the four reporting cycles, looking at both the total number of PaMs and the number of PaMs with reported quantified impacts, a focus has clearly been laid on economic, fiscal and regulatory instruments, voluntary agreements or combinations thereof (see figure 11). Together, they account for over 62 per cent of the PaMs reported and between 76 and 90 per cent of the reported quantified impacts. Economic and regulatory instruments were dominant within hard instruments, accounting for 20–22 and 26–29 per cent of the PaMs reported, respectively. Parties have tended to focus on hard over soft instruments, with soft

[25] For the purpose of this assessment, regulatory, economic and fiscal instruments and voluntary agreements are referred to as 'hard' instruments, while research, information and education are referred to as 'soft' instruments. While voluntary agreements are not hard instruments with regard to enforcement, they are, particularly relating to voluntary agreements with industry, often laid down in writing, with clear targets and clear progress tracking measures and are thus, with regard to achieving mitigation impacts, more similar to regulatory, economic and fiscal measures than research, information and education.

instruments (not including combinations of soft and hard instruments) accounting for only 6–8 per cent of all PaMs reported and 0.1–1.4 per cent of reported impacts. Combinations of soft and hard instruments accounted for 22–32 per cent of the PaMs reported and 9–21 per cent of impacts reported.

65. The focus of impacts reported under the different instruments has clearly changed over time: total impacts reported for regulatory measures in the BR4s declined by 13 per cent as compared with the total impacts reported for such measures in the BR1s. On the other hand, total impacts reported for economic measures in the BR4s were more than five times higher than in the BR1s.

Figure 11
Absolute and relative mitigation impacts reported by instrument in biennial reports



3. Status

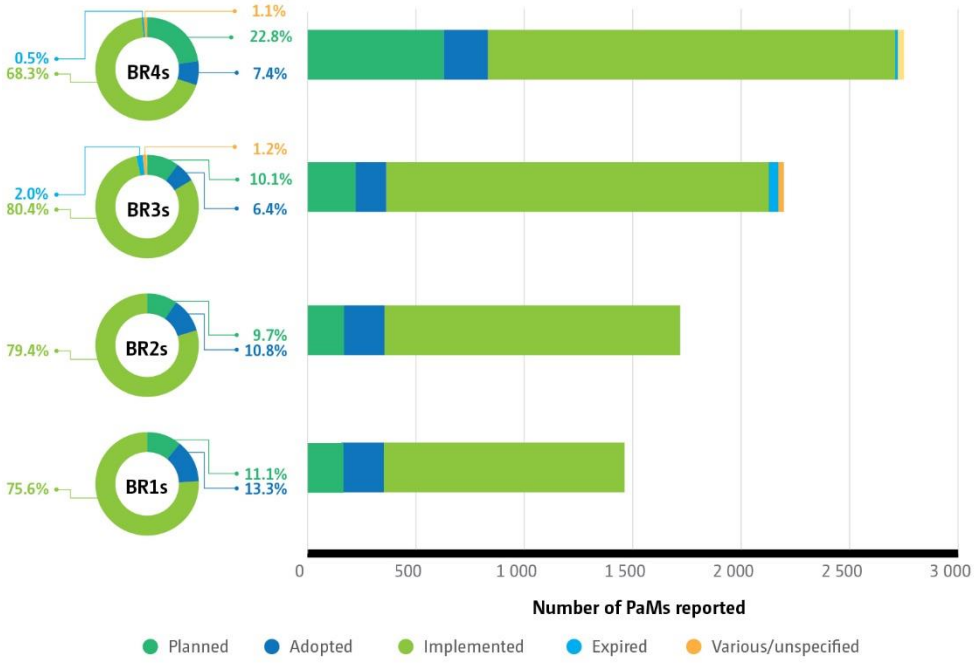
66. PaMs are reported as adopted, planned or implemented.[26] Of the measures reported in the BR4s, 68.3 per cent were reported as implemented, 22.8 per cent as planned and 7.4 per cent as adopted. In addition, Parties reported 0.5 per cent of PaMs as expired and for 1.1 per cent no information was provided or the information does not clearly fall into one of the above categories (see figure 12). Of the total impacts reported in the BR4s, 95.7 per cent stem from implemented measures, 0.4 from planned, 1.4 from adopted and 0.1 per cent from expired.

67. Looking at the sectoral distribution, planned or adopted PaMs account for only a small share of the total impacts reported per sector for most sectors: less than 2 per cent of the total impacts reported per sector were for planned measures and less than 1 per cent for adopted measures, except for adopted measures in the transport, agriculture and forestry/LULUCF sectors, accounting for 11.8, 2.5 and 13.1 per cent, respectively, of the impacts reported per sector. This could indicate that Parties have recently focused on those sectors or that policies in these sectors have a longer lag time between adoption and implementation. This is particularly likely for the transport sector, which is the only sector where GHG emissions have in recent years either continued growing or have not yet fallen as sharply as desired,

[26] In some cases, Parties reported as expired PaMs that are no longer in place but were previously reported as implemented.

indicating that a strong focus on the sector is required to achieve the more ambitious post-2020 targets.

Figure 12
Shares of policies and measures by status reported in biennial reports



68. There are clear trends in the status of PaMs over time. Over the reporting cycles a majority of PaMs have been reported as implemented, increasing from 75.6 to –80.4 per cent in the BR1s to BR3s and falling to 68.3 per cent in the BR4s. The corresponding downward trend in the share of PaMs reported as adopted, from 13.3 per cent in the BR1s to 6.4 per cent in the BR3s, potentially indicates that such PaMs moved into the implementation phase as Parties worked towards their 2020 targets. Furthermore, the number of PaMs reported as expired increased sharply between the BR1s and BR3s, potentially because many PaMs had completed their life cycle and/or were updated or replaced on the basis of experience. Such a life cycle seems to have restarted with regard to post-2020 targets, with the BR4s showing an increased share of PaMs reported as planned, up to 22.8 per cent from 10.1 per cent in the BR3s, and a decreased share of expired PaMs, down to 0.5 per cent in the BR4s.

69. Meanwhile, the picture for estimated impacts is similar. The share of the total estimated impacts stemming from implemented measures increased markedly between the BR1s and BR2s, from 78.5 to 92.4 per cent, and has remained at around 96 per cent since. At the same time, the share of the total estimated impact for adopted or planned measures fell from 21.5 to 7.6 per cent from the BR1s to the BR2s and has stayed at around 2 per cent since. The fact that the share of 2020 impacts reported for adopted PaMs does not follow the increasing trend in the number of PaMs reported as adopted from the BR3s to the BR4s might indicate that the impacts of newly adopted measures reported in the BR4s remain largely unquantified or that these PaMs have impacts which will only be realized in the midterm to long term.

4. Gases

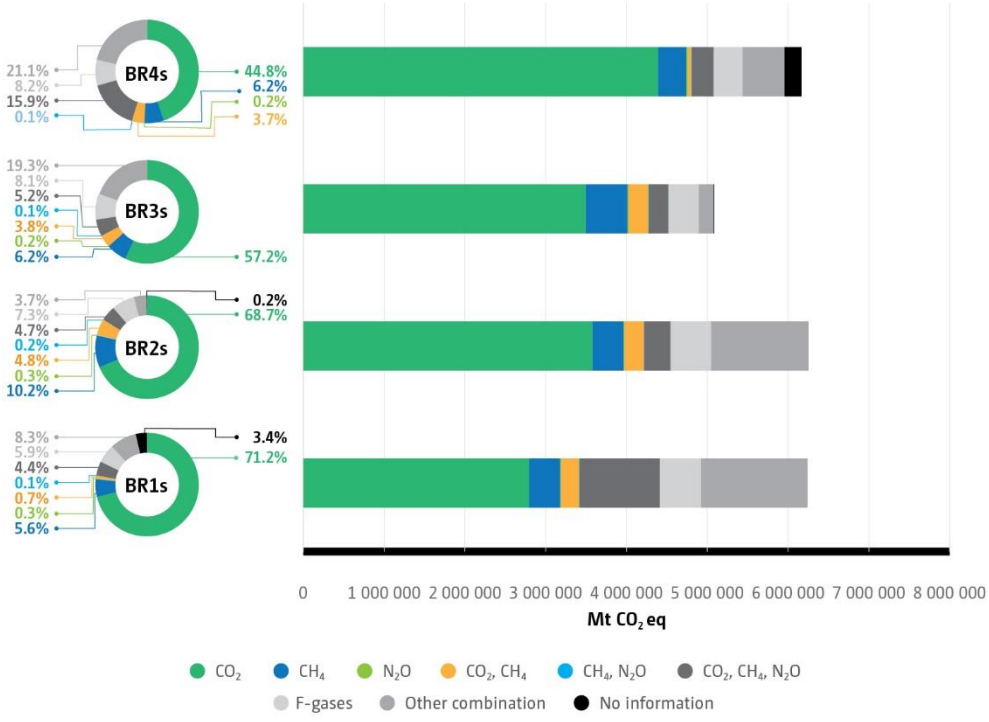
70. Parties reported in the BR4s that their PaMs have impacts on CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3, with 67.3 per cent of PaMs targeting a single GHG and 30.9 per cent affecting a combination of gases. Figure 13 shows the shares of PaMs addressing individual and groups of gases as reported in the BR4s. PaMs addressing exclusively CO_2, CH_4 and N_2O comprise 60.9, 4.1 and 2.3 per cent of the total PaMs, respectively. PaMs addressing combinations of CO_2, CH_4 and N_2O account for 20.2 per cent of PaMs, while those addressing all other combinations of gases account for well below 10 per cent and those

addressing F-gases account for 3.3 per cent. With regard to mitigation impacts, PaMs addressing CO_2 exclusively account for 44.8 per cent of the total impacts reported, while 19.6 per cent of the total impacts were reported for PaMs addressing combinations of CO_2, CH_4 and N_2O, 21.1 per cent for PaMs addressing other combinations of gases, and 8.2 per cent for PaMs addressing F-gases.

71. Throughout the four reporting cycles, the shares of PaMs addressing individual or groups of gases have remained mostly stable. As exceptions, the share of PaMs targeting CO_2 increased from 49.0 per cent of the total PaMs in the BR1s to 60.9 per cent in the BR4s, while the share of those targeting a combination of CO_2, CH_4 and N_2O fell from 23.3 to 14.4 per cent. Across all cycles, PaMs addressing CH_4 only account for 4–6 per cent, N_2O only for 2–3 per cent and F-gases only for 3–4 per cent of all the PaMs reported. PaMs addressing a combination of CO_2 and CH_4 account for 2–4 per cent, and those addressing a combination of CH_4 and N_2O account for 2–3 per cent of all the PaMs reported.

72. The trend over the reporting cycles in the shares of reported PaMs affecting individual or combinations of gases is somewhat different in terms of estimated mitigation impact (see figure 13). The PaMs addressing exclusively CO_2 accounted for the most significant share of the total impact reported throughout the first three reporting cycles, ranging from 71 to 67 per cent, but this fell to 44.8 per cent of the total impacts reported in the BR4s. At the same time, the share of the total impacts reported for PaMs addressing combinations of CO_2, CH_4 and N_2O increased from 5.2 per cent in the BR1s to 19.6 per cent in the BR4s, while the share of the total impacts reported for PaMs addressing other combinations of gases was below 10 per cent in the BR1s and BR2s and above 19 per cent in the BR3s and BR4s.

Figure 13
Absolute and relative mitigation impact of policies and measures reported by gas in biennial reports



5. New and/or updated measures

73. CTF table 3 does not include a field for Parties to indicate whether a measure is new and/or updated. As such, the current reporting approach makes it difficult to identify new and/or updated measures with confidence. Furthermore, in some instances, Parties do not report on all their PaMs in each BR. Therefore, where a Party reported a measure in its BR4 that was not in its BR3, this does not necessarily indicate that it is new. Parties also do not

indicate consistently in their BRs whether measures are new or updated, and there is no common definition of when a measure is to be considered updated. For the following assessment, therefore, a starting year of 2019 or later has been used to identify measures reported in the BR4s as potentially new or updated.

74. Parties have increasingly shifted the focus of their portfolio of climate actions to beyond immediate 2020 targets. Measures with a starting year of 2019 or later make up a significant share of the PaMs reported in the BR4s (24.2 per cent), with 39.7 per cent of those PaMs having starting years after 2020. The largest share of PaMs with a starting year of 2019 onward are mostly reported as planned (73.2 per cent) or adopted (11.7 per cent), with only 14.6 per cent reported as implemented. Where such measures are reported as implemented, this can indicate that an existing measure has been updated or is planned to be updated. Of the impacts reported for 2020, 0.2 per cent relate to PaMs with starting years after 2020, which might indicate that these are existing measures that will be revamped after 2020. Therefore, it is likely that the impacts reported for 2020 stem from the measure in its current form, before the planned update.[27]

75. Similar to the case of PaMs in general, the majority of PaMs with starting years from 2019 were reported under the energy, cross-cutting and transport sectors (29.0, 21.0 and 20.8 per cent, respectively). The highest impacts were reported for the cross-cutting sector (43.7 per cent), with nearly three quarters of impacts (72.9 per cent) reported for that sector coming from implemented measures.

76. New and/or updated PaMs reported in the BR4s include the United States National Climate Strategy, the pan-Canadian approach to pricing carbon pollution, the updated French energy transition for green growth, the Spanish climate and energy plan, and measures for reducing emissions from road transport reported by various Parties.

C. Key elements for an effective portfolio of policies and measures

77. The key elements for an effective portfolio of PaMs include top-level political commitment, strong policy capacity, clear targets and midterm and long-term strategies, rigorous and comprehensive systems for measurement, reporting and verification of emissions, as well as a comprehensive suite of PaMs that effectively mitigate emissions across the key sectors. In their BR4s, Parties reported on building on, enhancing and refining existing institutional structures, as well as on existing and new mitigation measures.

1. Domestic institutional arrangements

78. Mitigation plays a key role in most Parties' national climate change agendas, underpinned by legal and institutional frameworks in the form of climate legislation like climate acts, approved planning like long-term strategies, and structures for political decision-making like interministerial committees. In their BR4s, a number of Parties reported on strengthening such frameworks, including updating and/or enhancing climate framework legislation (e.g. Switzerland), enshrining long-term targets to 2050 in legislation (e.g. United Kingdom), establishing a regular schedule for updating targets (e.g. Denmark) and strengthening and refining the role of inter-institutional committees on climate change (e.g. Austria).

79. A few Parties reported on their approaches to mainstreaming climate change, such as through climate change committees ensuring that climate change issues are considered in all proposals and bills (e.g. Denmark) or by adopting a whole-of-government approach to addressing climate change, in which federal inter-agency coordination can help to streamline processes, thereby promoting the efficient delivery of programmes and funding (e.g. United States). Other approaches include dedicating a certain share of the annual budget to climate

[27] It is important to note that the UNFCCC reporting guidelines on BRs do not require the reporting of impacts for 2030. While a number of Parties reported such impacts, the information is not sufficiently complete to be used for the purpose of this assessment.

change issues (e.g. EU) and regularly presenting climate change activities as part of the annual budget reporting (e.g. Denmark, Finland and France).

2. Long-term targets and strategies

80. Nearly all Parties reported in their BR4s on national economy-wide or sectoral mitigation targets for 2030, which are often embedded within the framework of a longer-term target or strategy up to 2050. Some Parties also noted the existence of subnational targets to be implemented in parallel to national targets, but at the state or jurisdiction level (e.g. in the United States, 24 states have their own often legally binding economy-wide emission reduction targets – see box 4 below).

Box 4
America Is All In coalition

To demonstrate a commitment to upholding the United States implementation of the Paris Agreement, a broad coalition of actors, including state, local and tribal governments, private sector entities, universities, religious groups and other non-governmental organizations, was formed in 2017 under the banner "America Is All In". With more than 2,000 members at the time the report was submitted, the coalition represents 68 per cent of GDP, 65 per cent of the population, and more than half of total GHG emissions in the United States. In recognition of the important role that subnational actors can play in driving down GHG emissions, the United States federal government supports the coalition with complementary actions, investment and other forms of assistance.

81. The targets reported have been laid down in laws or decrees in many cases so that they are unaffected by changes in government. While 2030 targets are often already underpinned by actual PaMs, the approaches to attaining 2040 or 2050 targets generally remain more abstract. Most targets for 2030 and beyond were approved as recently as 2019 or are still undergoing approval. Long-term strategies[28] or programmes aimed at implementing the targets were presented separately by a number of Parties: some in the form of regulations and others in the form of action plans. Time frames reported by Parties indicate that mitigation targets are generally established before strategies and implementation plans are developed and approved.

82. Long-term mitigation strategies consist mostly of descriptions of key sectoral approaches (sometimes including sectoral targets) indicating a transition towards reducing demand (e.g. for electricity, transport) and meeting that demand through lower-carbon approaches. They are mostly high level and indicative, with detailed PaMs or programmes for post-2030 yet to be developed. From a high-level perspective, sectoral mitigation strategies are often based on the same pillars across Parties, addressing similar emissions sources through similar approaches (see chap. IV.D below). While many strategies are technology-neutral (i.e. not preferring a specific technology), such as in relation to renewable energy, specific technologies are targeted in other cases, such as electric vehicles in the transport sector. For the majority of Parties, energy and transport strategies are the centrepiece of the overall climate strategy. While the strategies set out which changes are to be achieved generally (e.g. in road transport, a transition from combustion engines using fossil fuels to the mixed use of electric vehicles and renewable fuels), the exact timing of such changes and the specific approaches to achieving them are often not presented, except where the phase-in or -out of technologies is specified for a target.

83. Long-term strategies also include the fine-tuning and extending of existing successful PaMs (see box 5 for an example). Fine-tuning refers to making the existing elements of PaMs more successful, while extending refers to adjusting PaMs to cover a broader scope, such as where an approach has proven successful for a certain type of emissions source. Fine-tuning approaches used by Parties have many facets, such as fine-tuning related to the legal format chosen, technical implementation (e.g. monitoring and reporting requirements), setting intermediate and long-term targets (generally and/or at the sector level) or defining action to

[28] By decision 1/CP.21, para. 35, the COP invited Parties to communicate, by 2020, to the secretariat LT-LEDS. So far, 11 Annex I Parties and 17 Parties in total have submitted LT-LEDS in accordance with Article 4, para. 19, of the Paris Agreement. See https://unfccc.int/process/the-paris-agreement/long-term-strategies.

be taken if intermediate targets are not achieved. Parties also reported on how, over time, incentive frameworks are improved by increasing CO_2 prices (negative incentive), or making positive incentives more comprehensive and relevant to the user (e.g. infrastructure and cost and tax reductions for electric vehicles in Norway or providing long-term investment certainty for renewable energy generation in the United States). Conducting evaluations and collecting feedback from stakeholders play an essential role in making fine-tuning successful.

Box 5
Fine-tuning the European Union Emissions Trading System over time

The EU ETS was introduced in 2005, initially covering the traditional energy industry and heavy-industry sectors and CO_2 as a gas. Over the course of phases 2–4 of the EU ETS (2008–2012, 2013–2020 and 2021–2030) the coverage of sectors and gases has been extended to other industries (e.g. aluminium, nitric acid, adipic acid and chemical production) and gases (e.g. N_2O and PFCs). Further elements were fine-tuned over time on the basis of lessons learned. Allocation of certificates transitioned from mostly free allocation based on historical emissions to auctioning combined with best-in-class benchmarking approaches. Consistency in allocation approaches was increased by moving from national-level allocation plans to allocation at the EU level, meaning that there is now an EU-wide cap. This EU-wide cap decreases annually by a linear reduction factor. The legal framework underpinning the monitoring, reporting, verification and accreditation under the system changed from an EU decision to an EU regulation, making it directly applicable within EU member States and thus reducing potential inconsistencies in national implementation. When a surplus of allowances built up after the 2009 global financial crisis, a number of measures were taken to reduce it, including postponing auctioning and the so-called market stability reserve, which allows improving the system's resilience to major shocks by adjusting the supply of allowances for auction. The market stability reserve will be further strengthened for phase 4. Room for improvement and improvement options were identified using several measures. These include regular assessments, performed by the European Commission, such as of the implementation of monitoring, reporting and verification requirements by the EU member States, but also through regular discussion with the member States in the form of a monthly working group.

84. A small number of Parties, such as New Zealand and the United Kingdom, have constructed a GHG emissions trajectory and intend to use the concept of carbon budgets to set interim targets along the trajectory. Both Parties use a time frame of five years, for which a cumulative GHG emission target is set. This approach is intended to provide long-term guidance to policymakers and the economy, while, through the use of a target time frame, leaving flexibility to balance out inter-annual events outside government control, such as particularly cold winters.

3. Portfolios of policies and measures

85. Parties reported a wide range of types of measure used, including regulatory, economic, fiscal, voluntary agreements, information, education and research. The specific combinations applied vary widely and depend on factors like the specific mitigation potential available, cost and the legislative, administrative and economic culture. Generally, regulatory and economic measures yield the largest mitigation impacts, but are frequently underpinned by information and education measures. Regulatory measures are more typical for mitigation potential related to specific technological solutions, while economic or fiscal measures are found more frequently where the choice of the technology option is to be kept open. Particularly with regard to industrial production, Parties with a more market-oriented culture report more frequently on voluntary agreements, such as mitigation covenants or company-wide targets (e.g. Japan and Switzerland). Japan reported on the interplay of its measures, that is how laws and standards are supported by subsidies to allow existing mitigation potential to be addressed while research measures in the same area aim at accessing new mitigation potential for the future. Public recognition of mitigation efforts, alongside information campaigns, also serves to increase the uptake of targeted measures (e.g. in the United States, the Environmental Protection Agency recognizes voluntary purchases of 'green power' by municipal and tribal governments).

4. Systems for measuring, reporting and verifying emissions and effectiveness of policies and measures

86. Regular annual or biennial reporting on progress towards targets is frequently included as part of Parties' 2020 and post-2020 target frameworks (see box 6 for an example). Regular reporting on progress towards targets, annually or biennially, is frequently included as part of Parties' 2020 as well as post-2020 target frameworks. Such reporting often combines backward-looking elements (e.g. GHG inventory data) and forward-looking elements (e.g. projections data). Generally, two approaches can be distinguished. As part of the first approach, the government itself is responsible for reporting on progress (e.g. Germany). In the second approach, an independent body (e.g. a commission) is responsible for the reporting, with the report having to be approved by the government or parliament (e.g. United Kingdom). Review or evaluation is in some cases planned over longer time frames (e.g. five years) to allow a better understanding of the success of PaMs and progress towards targets to be developed. For the purpose of regular reporting on progress, a number of Parties reported strengthening institutional structures. As an example, the Danish Climate Act (2020) strengthens the Danish Council on Climate Change, created originally in 2015, to help with tracking progress towards Denmark's climate targets and provide recommendations to help shape climate policy. The Climate Act provides the Council with an increased budget, stronger political independence and a wider range of tasks.

Box 6
European Union monitoring mechanism

Under the EU monitoring mechanism regulation, the monitoring and evaluation of progress towards the EU emission targets are assessed. EU member States are required to report a GHG inventory for all sectors; GHG emission projections; information on mitigation actions to reduce GHG emissions; information on national adaptation actions; information on low-carbon development strategies; information on financial and technology support provided to developing countries; and information on national governments' use of revenue from the auctioning of allowances under the EU ETS. An additional requirement is for the European Commission to produce an annual report on the progress of the EU towards its Kyoto Protocol and other targets, covering actual (historical) emissions and projected (future) emissions. Furthermore, under the regulation, the EU introduced an annual compliance cycle requiring the review of member States' GHG inventories for the purpose of ensuring compliance with their obligations under the ESD in 2013–2020 and to enable the use of flexibilities and corrective action at the end of each year.

87. A few Parties reported on dedicated sets of indicators for the annual progress review. These include progress indicators – relating to the overall GHG emissions or activity (e.g. km driven) development; implementation indicators – relating to the level of implementation of specific PaMs; and context indicators – indicating general economic or social developments that can impact GHG emission levels (e.g. France, Japan and United Kingdom). Portugal reported on its intention to set up a reporting platform, where indicator data can be submitted and viewed by the public.

88. Parties typically reported using a review of progress to trigger specific action, such as improvement of existing PaMs or exploration of new measures (e.g. Japan). Switzerland reported on an already implemented approach under which the CO_2 levy is increased where specific renewable energy and energy efficiency targets have not been met.

89. Where the review is carried out by an independent body, that body is in some cases also responsible for suggesting updated or new measures. This requires a broader range of expertise in that body, but also allows for use of the synergies naturally present in tracking progress and mitigation planning. Austria reported that it combined two existing commissions for this purpose into a combined review commission with the aim of reducing overlap.

D. Cross-cutting and sector-specific mitigation actions reported in fourth biennial reports

90. The cross-cutting and sector-specific mitigation measures and strategies reported by Parties in their BR4s have not changed fundamentally since the BR3s, but are being enhanced and strengthened by Parties as they move towards their NDC targets for 2030 and beyond. To avoid duplication of information on sectoral measures included in the compilation and synthesis of BR3s, this report focuses on recent, long-term developments related to cross-cutting as well as sector-specific mitigation approaches.

1. Cross-cutting measures

91. Parties reported on a number of cross-cutting PaMs, which the majority of Parties understand to be measures applicable to a number of sectors or the economy as a whole. On that basis, PaMs related purely to energy generation and consumption, for example energy efficiency and/or renewable energy, are considered cross-cutting. Further examples of cross-cutting measures include clean-technology incentive systems and carbon pricing approaches.

92. Carbon pricing can cover a significant share of domestic GHG emissions and a wide range of gases and mitigation potentials in various sectors (see box 7 for an example). Typical examples include taxes or levies on fuel use, often related to the carbon intensity of fuels, and carbon trading systems in the form of cap-and-trade systems and offset systems. A majority of Parties use carbon pricing approaches in some form. Prominent examples of trading systems are the EU ETS, the Regional Greenhouse Gas Initiative, a cooperative effort involving 11 states in the United States, and the New Zealand Emissions Trading Scheme, all of which are well established, and the Output-Based Pricing System launched by Canada in 2022. Many Parties reported on combining carbon pricing approaches in the form of levies or taxes and trading systems. The approaches are used in a complementary manner, with trading systems more typically found in subsectors with larger emitters, such as power generation and industrial production, while levies and taxes are more frequently used for market segments with a large number of smaller emitters, such as in road transport and the residential and commercial sector.

Box 7
Pan-Canadian approach to pricing carbon pollution

In 2016, the pan-Canadian approach to pricing carbon pollution was announced, giving provinces and territories the flexibility to develop their own carbon pollution pricing systems and outlining stringency criteria that provincial and territorial systems must meet. The Greenhouse Gas Pollution Pricing Act, adopted on 21 June 2018, the federal carbon pollution pricing system, has two components: a regulatory charge on fossil fuels and a trading system for large industry, the Output-Based Pricing System. The federal carbon pollution pricing system applies in any jurisdiction that requested it or that did not implement its own system that meets the federal stringency requirements. All direct proceeds raised from the federal carbon pollution pricing system are being returned to the province or territory where they were generated. Direct proceeds from the federal Output-Based Pricing System will also be returned to the jurisdiction of origin. Canada published for input a discussion paper in June 2019 on the use of such direct proceeds.

2. Energy excluding transport

93. With a view to achieving their midterm and long-term targets, in their BR4s, Parties reported on PaMs introducing fundamental changes to the energy sector. A majority of Parties reported on long-term renewable energy and their aim to increase the share of renewable energy in total power generation, as well as on long-term energy efficiency, which in many cases will be combined with a move away from coal in the long term. In a number of cases, increased use of natural gas will support the move away from coal as a transitional measure. A small number of Parties also reported on their intention to use nuclear power as well as CCS.

94. The following key PaMs in the energy sector were reported by Parties:

(a) Power sector planning and permitting provisions to increase power generation from energy sources that are less carbon-intensive than coal (i.e. renewable energy sources, natural gas, nuclear energy);

(b) Incentives for increased power generation from renewable energy supplies (e.g. feed-in tariffs, competitive tendering, utility renewable portfolio standards, certificates of recognition);

(c) Financial mechanisms to extend clean energy access and energy efficiency programmes to rural areas and lower-income consumers;

(d) Incentives for utility-based energy efficiency programmes and obligations;

(e) Incentives for increased power generation, transmission and distribution efficiency through combined heat and power, grid upgrades, distributed (i.e. small-scale) generation and other means;

(f) Regulatory and/or economic measures related to emission limits (e.g. related to heat and power generation);

(g) Energy efficiency codes and standards for equipment and incentives for energy management systems in industrial facilities;

(h) Energy efficiency provisions in building codes, energy rating and labelling, and renovation incentives for residential, commercial and public buildings, including space heating, cooling and ventilation, water heating and lighting;

(i) Energy efficiency standards and labels for household appliances, home entertainment, office equipment and lighting;

(j) Voluntary agreements related to energy efficiency in industry.

95. The majority of Parties indicated their intention to strengthen their incentive systems for boosting renewable energy use as part of their energy strategies (see box 8 for an example). Newer developments include moving towards technology-neutral approaches when adding renewable power capacity through auctioning or tendering procedures for funding (e.g. Germany, Lithuania). Furthermore, a number of Parties reported on reducing feed-in tariffs owing to reduced production costs (e.g. Finland, Germany). A significant number of Parties have set renewable power or heat targets, including for 2030, 2050 and even intermediary years (e.g. Denmark, EU), with some Parties highlighting renewable or clean energy targets set at the subnational level (e.g. United States). Most Parties indicated that the majority of their power generation is to come from renewable sources by 2050. Approaches to ensure this, particularly related to the necessary financing, were not always substantiated clearly in the BR4s.

Box 8
Australia's Renewable Energy Target scheme

The Renewable Energy Target is a scheme developed by the Government of Australia to reduce GHG emissions in the electricity sector by encouraging additional generation of electricity from renewable sources. The scheme creates a guaranteed market for additional renewable energy deployment using a mechanism of tradable certificates that are created by renewable energy generators (such as wind farms) and owners of small-scale renewable energy systems (such as solar photovoltaics). Demand for certificates is created by placing a legal obligation on entities that buy wholesale electricity (mainly electricity retailers) to source and surrender the certificates to the Clean Energy Regulator to demonstrate their compliance with annual obligations. The scheme encompasses both a large-scale renewable energy target, aiming to achieve 33,000 GWh additional renewable electricity generation by 2020 by encouraging investment in renewable power stations, and a small-scale renewable energy scheme, whereby households, small businesses and community groups are assisted with the upfront costs of installing small-scale renewable energy technologies such as rooftop solar photovoltaics and solar hot water systems.

96. As part of their energy strategies, many Parties are planning to phase out coal use, some by 2030 (e.g. Canada, Finland, Netherlands), some earlier (e.g. Italy by 2025, Portugal by 2023) and some later (e.g. Germany by 2038). The specific conditions of the phase-out vary among Parties. A number of Parties intend to close down coal-fired power plants, in the case of the Netherlands even plants that have only recently started operations. Greece intends to phase out lignite specifically. A small number of Parties intend to continue constructing coal-fired power plants, partly in combination with CCS and a required minimum share of renewable power generation (e.g. Japan).

97. Many Parties envisage widely replacing coal and oil with natural gas oil in order to reduce GHG emissions from power and heat generation and in some cases as replacement for diesel or gasoline in road transport. In some cases, Parties indicated the need to enhance or construct gas distribution networks (e.g. Greece, Malta) and infrastructure for the liquefaction and distribution of liquefied natural gas (e.g. Hungary). A number of Parties indicated that natural gas use is a transitional measure and that natural gas will be replaced by a mix of biogas and hydrogen of biological origin in the long run (e.g. Italy). The BR4s however do not offer a clear indication of how this should happen in practice.

98. A few Parties intend to use nuclear energy as part of their energy strategies after 2020. Here two trends can be distinguished. Germany and Switzerland reported on their plans to phase out use of nuclear power. The capacities that will be discontinued have to be replaced, potentially leading to an increase in GHG emissions. Switzerland, not having a history of coal use and being a smaller market with a significant share of power imports, has put in place legislation for avoiding emission increases from replacing nuclear power plants. Germany, with a strong history in production and use of both lignite and coal, has used these as a fallback to replace nuclear capacities. Other Parties intend to extend their nuclear power capacities as part of their low-carbon energy strategies (e.g. Belarus, Hungary, Japan, United States).

99. All Parties have implemented PaMs with the aim of increasing energy efficiency in buildings, particularly with regard to heating demand. Box 9 presents an example of an energy efficiency measure related to power consumption in buildings. For new buildings, low-emission building standards, including near zero and net zero energy buildings (e.g. EU, Japan), play an important role and were mentioned by all Parties. For the existing building stock, a mix of renovation incentives and minimum standards to be achieved in case of substantial renovation are most common. By targeting zero-interest loans at rural utilities and energy providers, initiatives such as the Rural Energy Savings programme in the United States are increasing access to energy-efficient renovations and clean energy upgrades for low- and moderate-income families living in rural areas. The EU energy performance of buildings directive (2010/31/EU) requires EU member States to establish long-term renovation strategies aimed at decarbonizing the national building stock by 2050. Information instruments, such as labelling of energy efficiency categories for buildings and appliances, were reported by a majority of Parties. A small number of Parties reported on plans to phase out specific (e.g. heating oil in the case of Monaco) or all fossil-fuel-based heating solutions in buildings (e.g. Finland, Germany). Finland has achieved a high share of geothermal heating systems in new detached houses. In its BR4, Finland indicated that, among others, this was achieved through a tax incentive scheme for building works in private dwellings, encouraging improvements to or installation of heating systems that use renewable energy.

100. Energy efficiency measures not related to buildings, for example in the industry and services sector, are widely used and reported. Approaches include regulatory approaches and incentive and awareness schemes. Both the production (e.g. by requiring certain efficiency standards) and sale (e.g. increasing buyer awareness through rating systems) of goods are being addressed (see box 9 for an example). Measures reported in this area can be described as mostly established, with new developments happening mostly with regard to energy efficiency standards for products (e.g. EU).

Box 9
The United Kingdom's smart metering programme

The smart metering programme involves replacing 53 million meters with smart electricity and gas meters in all domestic properties and smart or advanced meters at smaller non-domestic sites in the United Kingdom by the end of 2020. Smart meters will provide consumers with near real-time information on their energy consumption to help them to control their energy use and avoid wasting energy and money. Energy networks will be built that provide better information for managing and planning activities. Smart meters will also facilitate the move towards smart grids, which support sustainable energy supply and will help to reduce the total energy needed by the system.

101. Energy efficiency in industry, particularly in production processes, is being widely addressed by Parties, such as through fuel taxation, industry-wide energy efficiency standards and mandatory energy auditing. Where primary energy is used, such as for power and heat production, cross-cutting measures are often applied, like the EU ETS. For some Parties, voluntary agreements with industry continue to play an important role with regard to energy efficiency (e.g. Japan, Switzerland). Norway reported on a voluntary agreement with aluminium-producing industries, the aim of which is to develop a production process that is 15 per cent less energy intensive than the global average. Fuel switching opportunities in industry are incentivized similarly to energy efficiency measures, but mostly involve switching to natural gas since alternatives, like hydrogen, are not yet widely available.

102. A small number of Parties mentioned carbon removal technologies, identifying CCS specifically as part of their long-term energy strategies. For example, Norway identified CCS as one of its five priority areas related to climate change. A small number of Parties reported that large-scale financing has been made available to promote carbon removal and/or CCS (e.g. Australia, Canada, EU and United States). Australia has put in place a dedicated legal framework to allow CO_2 injection at the national or regional level, the EU has included CCS in existing cross-cutting measures, such as the EU ETS, and Iceland is conducting collaborative research with its national energy provider to develop and promote permanent capture and mineral storage underground. CCS is in most cases applied to the production of fuels (e.g. oil or natural gas production) or power generation. Japan reported on incentivizing CCS in iron production. While CCS takes place at the research and operational level at a number of sites, the overall number of Parties actively working on CCS and the number of storage sites in those countries remains limited.

3. Transport

103. Over the four BR reporting cycles, Parties have reported addressing transport emissions through a combination of measures, aiming to reduce both transport demand and emission intensity per unit of demand, such as through modal shift and more efficient vehicles. The most relevant trend in this sector reported by Parties in their BR4s is a move towards low-emission vehicles with a focus on electric cars.

104. The following key PaMs in the transport sector were reported by Parties in their BR4s:

(a) Reducing the amount of energy required per km driven by increasing road vehicle fuel economy;

(b) Reducing emissions per km driven from road vehicles through CO_2 emission standards, framework targets and requirements for use of biofuels;

(c) Increasing the efficiency and effectiveness of passenger and freight transport services;

(d) Promoting public transport and non-motorized modes of transport;

(e) Supporting the development of low-emission technologies for road transport, such as hybrid, electric and hydrogen vehicles, and supporting the use of such vehicles through charging or fuelling infrastructure and economic or fiscal incentives;

(f) Reducing the emission intensity of aviation and shipping by increasing efficiency, electrification and biofuel use.

105. The majority of Parties have introduced or enhanced implementation of new(er) measures particularly aiming to achieve a low-emission road transport fleet. The focus is on electric vehicles, with renewable hydrogen fuelled vehicles also mentioned by a number of Parties (see box 10 for an example). A small number of Parties also mentioned liquefied natural gas and compressed natural gas as fuel options (e.g. Czechia, Italy, Latvia).

Box 10
Norway's electric vehicle strategy

Norway provides strong incentives for zero emission vehicles. Electric cars, including both battery and fuel cell cars, are exempt from motor vehicle registration tax, traffic insurance tax and re-registration tax. Moreover, the purchase of electric cars and equipment is exempt from value added tax and electric cars are also exempt from the road usage tax since electricity is not subject to the tax. Other benefits for electric cars include free access to bus lanes (decided locally), reduced toll fares, a rebate on car ferry crossings, and reduced fees for public parking spaces. More than 13,000 public charging points have been established to date.

106. Many Parties have set near- or medium-term regulatory targets, such as for the maximum average emission level of the fleet (e.g. Canada, EU, United States), often paired with longer-term measures aimed at transformation. A number of Parties reported on plans to ban vehicles using combustion engines with fossil fuels from being sold after a specific date (e.g. Canada from 2040, Iceland from 2030, and Sweden from 2030) or not being permitted to circulate (e.g. Netherlands from 2030). The above-mentioned low-emission technologies are supported by a number of incentives, such as reductions to registration and road tax. Lithuania has introduced a system whereby zero or low-emission vehicles used as taxis receive preferred access to clients.

107. Most BR4s do not set out clearly how the necessary infrastructure for electric and/or hydrogen vehicles will be developed, what the impacts of the increased electricity demand on the power sector will be and how transmission and distribution networks would need to be enhanced to allow for the changed consumption pattern stemming from a high share of electric vehicles in the road transport fleet. Conversely, the United States Alternative Fuels Corridors programme involves collaboration between national and subnational authorities (including state agencies, utility providers and car manufacturers) to establish national infrastructure for alternative fuelling and electric vehicle charging.

108. Many Parties (e.g. EU, Finland) reported on minimum required shares of biofuels in total fuel sales for road transport – a common approach to ensuring biofuel use. Such requirements were often already introduced before 2010, and the shares, often having started out at around 5–6 per cent at introduction, are slowly moving upward, in many cases towards 10 per cent by 2020. Biofuels are also reported as a potential solution in areas where electrification is likely to be difficult, such as aviation; however, apart from tax reductions, measures for ensuring their use are less clear.

109. Parties are using a variety of instruments to promote use of public transport and non-motorized modes of transport, such as enhancing public local, regional and national transport networks, including high-speed trains as an alternative to domestic flights (e.g. France, Spain), extending pedestrian walkways and bicycle lanes and improving cycling infrastructure (e.g. Iceland) and providing subsidies to increase the use of electric bicycles (e.g. Germany).

110. A number of Parties are undertaking measures for modal shift of goods transport from road to rail (e.g. the Rail Baltica project aiming to link Estonia, Finland, Latvia, Lithuania and Poland) and marine transport (e.g. Norway), or making the rail transport of goods more convenient and efficient (e.g. Japan). A small number of Parties mentioned moving goods (as well as people) via maritime transport using electrified and lower-emission solutions (e.g. Japan, Norway).

4. Industry and industrial processes

111. In line with the sector definitions in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, emissions from fuel use in industry are allocated to the energy sector. PaMs targeting such emissions are therefore also described under the energy sector. This section covers PaMs targeting industrial process emissions as well as emissions from product use.

112. Key PaMs in the industry sector reported by Parties in their BR4s include:

(a) Regulatory, economic and fiscal measures related to emission limits (non-energy-related emissions) or use of low-emission technologies;

(b) Limitations on imports or bringing to market of substances (e.g. HFCs);

(c) Regulatory measures on the use and handling of substances (e.g. HFCs);

(d) Voluntary agreements.

113. In their BR4s, Parties reported on PaMs addressing process emissions. The level of emissions depends mainly on the amounts of products produced and the emission intensity of each unit produced, with cement and iron and steel production as typical examples of production processes leading to process emissions. Reducing emission intensity often requires changing product inputs, which in turn changes product characteristics and is thus not easily implemented. Emissions trading systems reported by Parties cover process emissions in most cases, but do not necessarily incentivize reducing GHG emissions. Under the EU ETS, for example, production of cement, iron and steel, and glass with relevant process emissions are considered as potential carbon leakage[29] sectors and for this reason receive a certain share of required emission certificates allocated for free. An alternative to avoiding process emissions is to capture and store them. Only Iceland, Japan and the United States reported on CCS measures aimed at process emissions.

114. Parties widely reported on measures related to F-gases for compliance with the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, which came into force on 1 January 2019 and adds the phase-down of the production and consumption of HFCs to the Protocol. In response, a number of Parties have strengthened and/or extended their PaMs related to F-gases (see box 11 for examples). Such PaMs include evaluating and incentivizing use of zero or lower GWP alternatives by limiting the availability of F-gases through ceilings of imports and the amounts that can be placed on the market and by banning their use for certain functions or limiting use to low-GWP options. Emissions are further prevented through measures addressing gases in existing equipment, including checking and maintaining equipment and recovering gases at end of product life.

Box 11
New Zealand's approach to regulating hydrofluorocarbon imports

The import of bulk HFCs is covered by reporting and surrender obligations under the New Zealand Emissions Trading Scheme. Imports of HFCs in products (such as refrigerators and air conditioners) and in vehicle air-conditioning systems are subject to a levy equivalent to the cost of emissions under the Scheme.

United States' approach to regulating high-GWP substances

The Significant New Alternatives Policy, established in 1990, assesses the health and environmental impacts of various F-gases (including chlorofluorocarbons, HFCs, hydrochlorofluorocarbons and ozone-depleting substances), considers the comparative risk of available alternatives and then regulates use accordingly through restrictions or outright bans on usage.

[29] Carbon leakage refers to the situation that may arise where, as a result of the costs related to climate policies, businesses were to transfer production to other countries with laxer emission constraints.

5. Agriculture, forestry and land use

115. In line with the sector definitions in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, emissions from fuel use in agriculture and forestry are allocated to the energy sector. PaMs targeting such emissions are therefore also described under the energy sector. This chapter covers PaMs targeting emissions from non-fuel sources, such as livestock, soil management, biomass burning for non-energy purposes and changes to carbon pools.

116. For the AFOLU sector, information and research measures make up a greater proportion of the portfolio than for other sectors. Parties did not report many new or innovative measures in this sector.

117. Key PaMs in the AFOLU sector reported by Parties in their BR4s include:

(a) Reducing CH_4 and N_2O emissions from livestock through improved manure management and changes in livestock management;

(b) Reducing N_2O emissions through optimized nitrogen fertilizer use;

(c) Increasing soil carbon stock through soil management and agricultural practices;

(d) Programmes promoting afforestation, reforestation, revegetation and sustainable management of forests, grassland, wetlands and cropland;

(e) Programmes to prevent and/or manage forest fires and increase green urban areas.

118. The PaMs related to the AFOLU sector were most frequently reported as having multiple aims, with mitigation being one of them. Other targets include increasing resilience, managing the aquatic environment, improving water quality, conserving biodiversity, improving soil health and reducing soil erosion, and promoting organic farming.

119. Parties reported a wide range of measures for managing nitrogen flows from fertilization activities, including from livestock manure used as fertilizer: responsible drainage to reduce direct N_2O emissions from agricultural run-off (pollution of aquatic environment), enhancing carbon sequestration by restoring wetlands (e.g. Canada, Finland) and providing financial and technical assistance to owners of agricultural and forest land (United States); regulatory measures setting limits on the amount of nitrogen applied with livestock manure and digestate; and economic measures like payments for certain farming practices, such as practices leading to reduced run-off (e.g. Switzerland). Winter cover crop funding programmes promote carbon sequestration and help to reduce soil nutrient loss and direct and indirect losses of N_2O (e.g. Canada). Best management practices for reducing nitrogen input include fertilization planning (e.g. Latvia) and precision soil cultivation using Global Positioning System data (e.g. Netherlands).

120. A number of Parties reported measures related to forest management (see box 12 for an example), with two distinguishable aims: to enhance forest carbon stocks to maximize sinks (e.g. New Zealand, United States); or to keep carbon stocks stable while enabling increased extraction of biomass, which can be used to replace fossil fuels or building materials (e.g. Switzerland). Incentives to enhance or preserve carbon stocks come in many forms, including grants for investment, fiscal incentives and training, as well as compensation payments required where deforestation has taken place. The EU LULUCF regulation (EU/2018/841) sets a binding commitment for each EU member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO_2 from the atmosphere through action in the sector.

Box 12

Policies and measures in the agriculture, forestry and other land use sector: enhancement of Switzerland's agricultural policy and New Zealand's afforestation approach over time

Switzerland reported in its BR4 on the enhancement of its agricultural policy over time. By design, the policy influences both prices and subsidies for agricultural products and thus GHG emissions from agricultural production. Therefore, over time, support was reduced and decoupled from production,

while price support through restrictions on import and other contributions towards market price support, including export subsidies, were decreased. As a replacement, direct payments decoupled from production volume have been considerably increased. Furthermore, measures with unspecified aims were replaced by specific tools; for example, subsidies for livestock were converted to subsidies for ensuring food security, dependent on land use.

New Zealand mentioned substantial afforestation as one of three particular changes required to achieve its low-emission goals. On the basis of lessons learned, it has enhanced its existing afforestation scheme to provide a more flexible system to help plant the right trees in the right place, for the right purpose, with more targeted grant rates aiming to encourage afforestation for greater public good, such as plantings with high biodiversity value and afforestation of erosion-prone land.

121. A small number of Parties reported on carbon pricing mechanisms related to the agriculture sector, such as a sectoral emissions trading system for the horticulture sector (Netherlands) and options for agricultural projects to generate certificates in offsetting systems (e.g. Canada). New Zealand requires certain sectoral sources (livestock and fertilizer use, resulting in CH_4 and N_2O emissions) to be reported under its national Emissions Trading Scheme, although the sector is not yet covered by the system as such.

6. Waste and waste management

122. The waste sector has a direct impact on national emissions, mainly from the decomposition of organic materials in solid waste and wastewater. At the same time, from the perspective of resource efficiency and/or circular economy, considerable indirect emissions stem from avoidable production of goods.

123. Key PaMs in the waste sector reported by Parties in their BR4s include:

(a) Regulations and infrastructure for reducing CH_4 emissions from waste and wastewater, including minimizing organic waste landfilled;

(b) Incentivization and information-based measures for minimizing food waste and promoting recycling;

(c) Regulatory and economic measures related to the capture (and potentially energetic use) of landfill CH_4;

(d) Regulations for increasing resource efficiency with regard to the production and use of goods.

124. Measures for reducing CH_4 and N_2O emissions from solid waste and wastewater are already widely implemented by Parties. Key measures include regulations and infrastructure related to the composition of waste permitted to be landfilled (including prohibiting the landfilling of organic waste as in Germany, setting targets for reducing the share of organic waste landfilled over time as in the EU, or collecting emissions of CH_4 and reselling it as vehicle fuel as in Iceland). Other measures target the set-up and management of landfills, CH_4 capture and use (such as the United States voluntary initiative to capture and use landfill biogas), or the treatment of organic waste when not landfilled and the discharge and treatment of wastewater. While the majority of Parties had previously reported on use of captured CH_4 from the decomposition of waste or wastewater, such regulatory or economic incentive measures are being further strengthened as part of their renewable energy strategies.

125. In line with the United Nations Millennium Development Goal of reducing per capita food waste by half by 2030,[30] a significant number of Parties (e.g. France, Germany) are increasingly focusing on measures for reducing food waste, which is relevant to both reducing direct emissions from the decomposition of organic waste and increasing resource efficiency. Providing information (e.g. on the applicability of best-before dates) and programmes facilitating the distribution and use of food that would otherwise have been thrown away by restaurants and retailers play an important role in this regard.

[30] See www.un.org/sustainabledevelopment/blog/2015/08/transforming-our-world-document-adoption.

126. Many Parties reported on measures related to circular economy, aiming to minimize waste and move towards continual use of resources (see box 13 for an example). The aim is to reduce emissions by disincentivizing or banning specific single-use products (e.g. plastic cutlery and plates in Germany), extending product lifetimes and/or enabling reduction or reuse of materials, which is done, more specifically, by targeting products at various stages of their life cycle. With regard to design and production, the aim is to promote use of recycled and/or recyclable materials and design products that are more durable and/or can be easily repaired. In the consumption phase, measures are in place that aim to extend product lifetimes by requiring or facilitating the provision of repair infrastructure and/or of spare parts. In addition, at the end of product life, there are measures promoting the reclamation and reuse of materials, for example through infrastructure for reclaiming materials and/or generating markets for reclaimed materials. Frequently, Parties combine measures in circular economy packages or strategies (e.g. Canada, EU, United States).

Box 13
Circular economy measures

France's law on programmed obsolescence

In 2015, France approved a law punishing planned obsolescence; that is, where a manufacturer aims to deliberately reduce the life of a product to increase its replacement rate.

EU Circular Economy Action Plan

The EU Circular Economy Action Plan provides a specific and ambitious programme of action, with measures covering the whole product life cycle: from production and consumption to waste management and the market for secondary raw materials and a revised legislative proposal on waste. The proposed actions aim to contribute to 'closing the loop' of product life cycles through greater recycling and reuse and bring benefits for both the environment and the economy.

United States Sustainable Materials Management Programme

This five-year programme, launched in late 2016, aimed to expand sustainable materials management by promoting a systemic approach to reducing the use of materials and their environmental impacts over their entire life cycle.

E. Assessment of the economic and social consequences of response measures

127. In accordance with the UNFCCC reporting guidelines on BRs, each Annex I Party is encouraged to provide, to the extent possible, detailed information on the assessment of the economic and social consequences of its response measures. In addition, each Annex II Party[31] is to provide information on the financial support it has provided, committed and/or pledged for assisting non-Annex I Parties in adapting to any economic and social consequences of response measures.

128. Of the 43 Parties that submitted BR4s,[32] 25 provided information on the assessment of the economic and social consequences of their response measures. Not all Parties that submitted a BR in each cycle included such information, and so the number of Parties that did so has varied over the four reporting cycles.

129. Parties' reporting on the assessment of the economic and social consequences of their response measures in their BR4s varied widely. Some Parties included information in the BR4, while other Parties, including Denmark, Estonia, EU, Ireland, Latvia, New Zealand and Spain, either reported detailed information in line with requirements for national inventory reporting under Article 2, paragraph 3, and Article 3, paragraph 14, of the Kyoto Protocol, or provided a reference to relevant information included in their national communication and/or national inventory report.

[31] See https://unfccc.int/parties-observers.
[32] By 30 October 2021.

130. Most EU Parties reported on the assessment of the economic and social consequences of their response measures in their BR4s (Croatia, Estonia, EU, Greece, Hungary, Ireland, Latvia, Malta, Spain) and mentioned that their impact assessments were in line with the relevant EU directives, which require each member State to analyse and address significant economic, social and environmental impacts of possible new initiatives, including all legislative proposals and also other initiatives likely to have far-reaching impacts.

131. Some Parties described the nature of their impact assessment processes, such as a consultation process during impact assessment (Australia), analysis in groups depending on the possible impacts (Spain), open public consultation together with policy dialogues with other countries (Greece, Switzerland) and assessment of consequences in relation to socioeconomic cost (Denmark). Other Parties chose to refer to their national legislation for impact assessment, such as instructions for official studies and reports and an environmental impact assessment framework (Norway), a national system of PaMs (Portugal), decree 2344-r of the Government of the Russian Federation of 3 November 2016 (Russian Federation) and a policy for global development (Sweden). A few of the Parties (New Zealand, Norway, Sweden) referring to national legislation also described in detail the processes and procedures for assessing the impacts of proposed legislation or other policy initiatives.

132. Very limited information was reported by Parties on methodologies or tools used for assessing the impacts of the implementation of response measures. Slovakia reported on assessing the impacts of the implementation of response measures using the E3 modelling tool (see box 14). Most other Parties referred to an established process for assessing impacts, without including details of the tool or methodology used for quantitative assessment (Australia, Greece, New Zealand, Norway, Spain, Sweden, Switzerland). In the absence of an internationally established methodology, Japan noted difficulties in accurately assessing specific adverse impacts of the implementation of response measures and therefore evaluating efforts to minimize the impacts. In this regard, a cited example was the fluctuations in crude oil prices caused by the balance between supply and demand, as well as various other factors (e.g. trends in crude oil futures or economic fluctuations), and uncertainty regarding the direct causality and its extent between climate change measures and adverse impacts.

Box 14

Quantitative assessment of the impacts of the implementation of response measures in Slovakia using the E3 modelling tool

Slovakia reported the results of assessing the impacts of the implementation of its response measures using E3 modelling. The results are presented in three categories: economic impacts, investment expenditure and energy system costs.

On economic impacts, the analysis showed that higher investments in energy efficiency lead to lower consumption but higher GDP, which is driven by crowding out private investment resulting from higher investment in energy efficiency. The analysis highlighted that more than half of the drop in consumption is caused by lower demand from the rest of the EU as it implements environmentally friendly policies. The analysis also showed a negative impact on aggregate labour demand. In the short run, decreased labour demand translates to lower employment; in the long run, it translates mainly to decreased wages. The latter effects are substantial and dominant, especially towards the end of the projection period. These impacts are seen since sectors that expand (mainly export-oriented industries and industries supplying investment goods) attract additional labour, while those that contract (mainly industries producing consumer goods) release labour. However, not all workers who are made redundant from contracting sectors are able to find work in expanding sectors, leading to an increase in unemployment.

On investment expenditure, the analysis showed that an increase in energy efficiency and development of renewable energy systems will lead to higher investment expenditure as consumers shift towards buying more energy-efficient products, equipment, appliances and vehicles, among other things, entailing higher capital costs. These additional costs were found to be small in the short and medium term (until 2030) and considerably higher in the long term.

On energy system costs, the analysis showed that cumulative total energy system costs in the policy scenario are higher than in the reference scenario in the long term, while in the medium term (until 2030) a moderate increase of 1 per cent is projected under the policy scenario. The capital component

of the energy system costs shows an ascending trend over time, and energy-related costs shift from operative to capital expenditure. For households and services, capital costs increase over time owing to investment in more efficient appliances. In industry, fuel accounts for the largest share of energy costs, increasing in the future owing to the increasing price projection and higher EU ETS prices, while in the transport sector capital costs play an increasing role.

1. Impacts of the implementation of response measures

133. Parties noted both positive and negative impacts of the implementation of response measures, while small countries like Switzerland and Luxembourg mentioned that no significant impacts of their policies on developing countries are expected due to their small size, with most of their international trade being with the EU. Positive impacts noted by Parties include better air quality (Belgium, Spain), reduced emissions (Belgium, Japan, Spain), improved energy access, disaster preparedness and job creation through the development of new industries (Japan). France and Spain presented both positive and negative impacts: the potentially positive impact on job creation in biofuel-exporting developing countries as a consequence of developing biofuels, as well as possible negative effects on deforestation and food resources; promoting renewable energy has a positive impact of maintaining or potentially creating jobs in developing countries that export renewable energy generating equipment, as well as the negative impact of increasing demand for raw materials and potentially increasing price sensitivity; and reducing emissions from waste management has a positive impact of transferring energy-efficient technologies to other countries, but a possible negative impact of movement of waste for treatment in third countries.

134. Parties noted possible negative impacts of measures taken in response to climate change: competitive vulnerability of small businesses due to emission pricing (which is sought to be addressed by allocating emission allowances to industries to avoid carbon leakage); disproportionate impact on lower-income households (New Zealand); drop in fossil fuel prices due to lower demand as a result of energy savings and increased energy efficiency (Spain); and pressures on food prices, land and forest management, especially in developing countries, due to biofuel development (Belgium).

135. Slovakia extended its reporting to present the quantitative impacts on its economy due to domestic policies and policies implemented by other EU countries as its trade partners.

2. Steps taken and support provided to minimize the economic and social consequences of response measures

136. Some Parties reported on steps taken to minimize adverse impacts of the implementation of response measures, including not supporting biofuels from land with high biodiversity value or from land converted from wetlands, peatland or forest areas to mitigate the impact of biofuel development on food prices and land management (Belgium); ensuring project-based carbon trading mechanisms are in line with sustainability criteria (Luxembourg); gradually eliminating market imperfections, tax incentives, tax and duty exemptions and subsidies, and cooperation for technological development of non-energy uses of fossil fuels (Spain, Switzerland); and designing policies to avoid trade distortion, non-tariff barriers to trade and setting similar incentives. Switzerland notifies the World Trade Organization of all proposed non-tariff measures with a potential impact on trade.

137. The reported support provided to developing countries to minimize the impacts of the implementation of response measures in general refers to support provided for developing and promoting clean and efficient technologies through various support programmes: providing international assistance for vulnerabilities related to gender-related implications of impacts (Netherlands); supporting the developing countries participating in the Energy and Environment Partnership programme in developing, adopting and scaling up appropriate and affordable renewable energy and energy efficiency technologies for improved energy access and local employment (Finland); contributing to energy efficiency and GHG emission reduction in Eastern European countries (Estonia); supporting low-emission development in

African countries (Greece); supporting innovation in developing countries, particularly in the Middle East through Action for Climate Empowerment (Japan); providing assistance to Portuguese-speaking African countries at the sectoral level for incorporating adaptation components into cooperation programmes, advanced education and research in the field of environmental engineering, agriculture and rural development, health, and trade agreements (Portugal); supporting developing countries in developing their 2050 pathways using their own calculators instead of other countries' models while exploring their options for reducing GHG emissions, tackling energy challenges and reducing negative impacts (United Kingdom); supporting development efforts through the United States Agency for International Development and the other technical agencies, including providing assistance to programmes to foster economic development paradigms that are consistent with ambitious global climate action and measures to enhance the resilience of communities and economies in response to changes in global climate, trade partner and consumer preferences (United States).

138. Norway and Spain have support programmes specifically targeting assistance for oil-dependent developing countries in diversifying their economies, including the Oil for Development initiative (Norway). Switzerland is promoting access to its domestic markets by granting preferential tariffs on products from developing and emerging countries to support economic diversification.

139. In order to manage negative impacts on the workforce and overall economy, some Parties (New Zealand, Norway, United Kingdom) have established systems and processes for promoting a sustainable and equitable transition of jobs and the workforce (see box 15). National dialogues and national summits on just transition are organized to inform practical steps and approaches that can be taken by businesses and workers for an effective and inclusive transition (Belgium, New Zealand).

Box 15
Just transition programmes of New Zealand and the United Kingdom

New Zealand reported establishing a just transition work programme to ensure that the transition to a low-emission economy is fair and inclusive for its regions, sectors and indigenous communities. It invested USD 27 million over four years to set up and operate the National New Energy Development Centre to create new jobs and businesses; and, in a separate initiative, dedicated funding of USD 20 million over four years to early-stage research in energy technology.

The United Kingdom has started investing in high-value jobs and training, retraining and reskilling its workforce to ensure availability of the right skills to deliver the low-carbon transition. Courses have been developed for the construction industry in collaboration with employers and businesses. The United Kingdom's Just Transition Taskforce, established under the Powering Past Coal Alliance, is helping to accelerate the pace of the transition from coal-fired power generation among Alliance members such as South Africa. The Taskforce shares best practices, creates a wider pool of expert partners to provide global leadership and engages with countries where transitioning workers is the main barrier to change, offering them practical solutions. In addition, Scotland's Just Transition Commission, established in January 2019, provides Scottish ministers with practical advice on how to maximize the economic and social benefits of decarbonizing Scotland and manage the related risks and challenges. The Commission includes representation of business, industry, trade unions, the third sector and environmental groups and will report to Scottish ministers with practical advice by early 2021.

140. In accordance with the reporting requirements of Article 3, paragraph 14, of the Kyoto Protocol, a few Parties reported on the development of CCS technologies (Japan, Norway, Switzerland) under the social and economic consequences of response measures. Japan reported on the implementation of large-scale demonstration projects by 2020 while implementing research and development for cost reductions, safety improvements, environmental impact assessments, and geological surveys to identify potential offshore CO_2 storage sites in Japan. Both Japan and Norway are exchanging information and best practices with stakeholders in European countries and the United States regarding CCS. Several Swiss universities are conducting research in the field of CCS and are cooperating with other research institutions, companies and universities, primarily in Europe and North America, to further develop the technology.

F. Improvements and challenges in reporting

141. Parties have continued to improve the completeness and transparency of the information reported on mitigation actions in their BRs, including by reporting more comprehensively in the BR text and CTF table 3 and by more transparently explaining the reasons for any lack of completeness. However, a number of issues remain related to both the completeness and the transparency of the information provided, including:

(a) Comparability of reporting with regard to sectors affected: Parties sometimes reported sectors other than energy, transport, industry or industrial processes, agriculture, forestry or LULUCF, and waste or waste management, where the categories cross-cutting and other are used and/or where several sectors are reported together (see para. 60 above), which indicates that a common understanding of the purpose of the categories cross-cutting and other is lacking. Parties might benefit from additional guidance in this regard;

(b) Incomplete information in CTF table 3 on mitigation actions, such as on mitigation impact, status or gases covered. The share of PaMs for which impacts are reported has decreased over time;

(c) Inconsistencies in information reported in the BR text and CTF table 3, particularly regarding mitigation impact, status and start year in relation to PaMs;

(d) Mismatched elements of information reported for a mitigation action (e.g. the description of the measure does not fit the sector, gases, instrument or status reported);

(e) Information additional to the options provided being reported in the CTF tables for a specific information element (e.g. the lists of options for gases, sectors, instruments, status of measures), which can increase understanding but reduces comparability. Parties could instead provide such information in the body of the BR;

(f) Impact estimates being reported in the BR but not in the CTF tables, which makes evaluating the estimates considerably more difficult.

V. Greenhouse gas emission projections

A. Overview

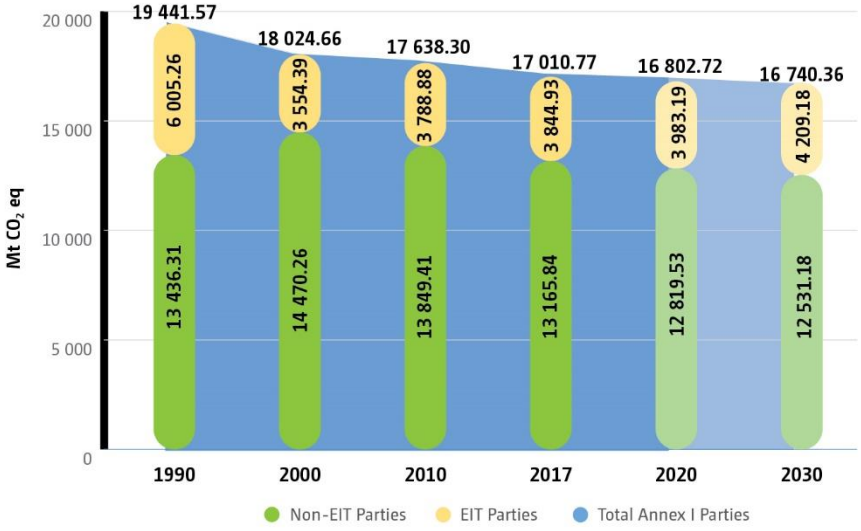
142. In accordance with the UNFCCC reporting guidelines on BRs, Annex I Parties are required to report updated projections for 2020 and 2030 consistently with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications".[33] Annex I Parties are required to report, at a minimum, projections under the WEM scenario, but may also report projections under the WAM and WOM scenarios. The WEM scenario considers the effects of PaMs that have been either implemented or adopted, whereas the WAM scenario includes, in addition to implemented or adopted PaMs, the effects of PaMs planned at the time that the projections were prepared. The WAM scenario is usually reported by Parties that have recognized the need to introduce additional measures or strengthen existing measures to attain their 2020 or NDC targets. Under the WOM scenario, PaMs implemented, adopted or planned after the year chosen as the starting point for the scenario are not considered.

143. For this updated report, information on GHG emission projections has been taken from the BR4s, except for Ukraine, which had not submitted its BR4 at the time of the preparation of this updated report. According to established practice, in such cases the latest available data on projections from previous BRs[34] were used as a proxy. The EU provided projections in its BR4, but to avoid double counting, only the projections data reported by the individual EU member States have been used for this report.

[33] FCCC/CP/1999/7, part II, paras. 27–38 and 42–48.
[34] Ukraine's BR1.

144. Projected emissions for 2020 and 2030 are presented in figure 14, along with historical data for 1990, 2000, 2010 and 2017, for the purpose of assessing potential future progress in reducing emissions by implementing the PaMs elaborated in chapter IV above. It is worth noting that historical emission levels, as reported in the BR4s, have been changed since the compilation and synthesis of BR3s owing mainly to recalculations of GHG emission data; hence, comparisons of absolute emission projections between this and the compilation and synthesis of BR3s should be viewed in that context.

Figure 14
Historical and projected greenhouse gas emissions of Annex I Parties without land use, land-use change and forestry under the 'with measures' scenario



145. Projections under the WEM scenario were reported by all Parties; 34 Parties reported projections under the WAM scenario; and 11 Parties reported projections under the WOM scenario. Parties faced several challenges in preparing the WOM scenario, such as methodological inconsistencies with other scenarios, modelling limitations and different assumptions used for estimating impacts of individual PaMs. Some Parties consider preparing the WOM scenario to be a backward-looking exercise and therefore of limited value in projections analysis.

146. Table I.5 provides an overview of the information on projections reported by Annex I Parties in their BR4s, including the scenarios covered and the years, gases and sectors included.

B. Approaches and assumptions used for preparing projections

147. The models and approaches used by Parties to estimate their projections can be broadly classified into economy-wide macroeconomic models; and models used to project emissions for specific sectors and gases, such as energy-related GHG emissions, non-energy-related GHG emissions, and GHG emissions and removals from LULUCF. Most Parties provided a comprehensive explanation of the models and approaches used.

148. Many Parties used an integrated approach to projecting energy-related emissions, whereby macroeconomic top-down models were coupled with sector- and technology-specific bottom-up models. The type and characteristics of such models differed among Parties and in most cases such models are also used for other purposes, such as energy system planning.

149. Many Parties used spreadsheet models consistent with methodologies used for preparing their GHG emission inventories to project emissions from non-energy sources other than LULUCF. The projections are based on activity data, emission factors and sector-specific growth assumptions. For projecting GHG emissions and removals from LULUCF,

Parties used models that are broadly consistent with those used for their GHG inventories combined with sector-specific assumptions.

150. The main drivers considered for projecting future aggregate and sectoral emission trends are consistent with those underpinning historical trends, encompassing demographic, economy-wide and sector-specific factors. However, projecting future trends involves forecasting the drivers and as such entails uncertainties that are often difficult to quantify or could be strongly affected by some unexpected events, such as the global coronavirus disease 2019 pandemic in 2020, which would certainly make assumptions regarding some drivers used for projections (e.g. GDP growth forecasted in BR4s) irrelevant.

151. Most Parties reported on the key drivers and assumptions behind their emission projections, which address economic growth, structural changes in economy (e.g. shift from manufacturing to services), reduction in energy intensity of economic output, decrease in carbon intensity (shift to less carbon-intensive fuels), energy prices, infrastructural choices, technological innovation and improvements and, to some extent, behavioural change. Specifically, they include, for most Parties, GDP, population and international oil prices. Other key assumptions include the expected development of individual sectors, the prices of coal and natural gas, the extent of electrification of heating and transport, and heating and cooling degree days. Less information was provided on factors and activities that will affect future emissions for each sector, with Parties reporting activity data for some emission drivers, such as industrial production, number of livestock and number of households.

152. The projected emission trends should be compared across Parties with caution owing to the diversity of the models and approaches used in preparing the projections, and the differences in the key drivers, factors and assumptions underlying the projections, to which they are highly sensitive.

C. Projected total aggregate greenhouse gas emissions

153. All Parties reported information under the WEM scenario for both 2020 and 2030. Some Parties also reported a WAM and/or WOM scenario. In order to have a set of data that allows for a rough comparison of total GHG emissions across scenarios, where projection estimates were not reported for the WAM scenario, values from the WEM scenario were used as a proxy for both 2020 and 2030. Because the methodologies and assumptions used for producing the WOM scenario varied significantly and relatively few Parties produced one, aggregate analysis of those scenarios was not undertaken.

1. Projections under the ‘with measures’ scenario without emissions or removals from land use, land-use change and forestry

154. Total projected aggregate GHG emissions without LULUCF for all Annex I Parties, including the effect of implemented and adopted PaMs (i.e. under the WEM scenario), are expected to be 19.6 per cent lower in 2020 than Parties’ aggregate base-year emissions[35] and 13.6 per cent lower than the 1990 emission level, which is consistent with the projected emission trend reported in the BR3s.[36] Although emissions increased in the years up until 2017, the projected total GHG emissions in 2020 are expected to be 1.2 per cent below the 2017 level (the most recent historical year used for the projections).

155. Despite the increased scope and expected strengthening of mitigation actions for beyond 2020, total emissions under the WEM scenario are projected to decline by only 0.4 per cent between 2020 and 2030. This suggests that implemented and adopted mitigation actions may not be sufficient to completely offset the impact of the underlying emission drivers, such as economic and population growth, and to drive emissions down after 2020. It may also suggest that the impacts of the post-2020 mitigation actions have not been fully accounted for because such impacts will depend on the exact form of the legislation and

[35] The base year for most Annex I Parties is 1990, except for Australia (2000), Canada (2005), Japan (2005) and the United States (2005).

[36] See document FCCC/SBI/2018/INF.10/Add.1, chap. IV.

regulations supporting implementation of such measures, which has yet to be finalized. Figure 14 shows Annex I Parties' total historical and projected GHG emissions without LULUCF under the WEM scenario.

156. Annex I Parties may be further grouped into EIT Parties and non-EIT Parties to provide a better understanding of future emission trends against historical emissions and their underlying drivers. It should be emphasized that such disaggregation has some limitations, particularly because the national circumstances of most EIT Parties have significantly changed since the early 1990s when their economic transition began, and over time some of the key indicators, such as GHG emissions/GDP unit using purchasing power parity and GHG emissions/capita, have demonstrated converging trends between EIT Parties and non-EIT Parties. In addition, 11 of the 15 Annex I EIT Parties became EU member States in 2004–2013 and this has accelerated their transition to market-based economies.

157. For Annex I EIT Parties, emissions in 2020 and 2030 are projected to be 33.7 and 29.9 per cent, respectively, lower than in 1990, owing mainly to significant emission decreases in the 1990s. Their emissions are projected to be above the 2017 level by 3.6 per cent in 2020 and by 9.5 per cent in 2030. Between 2020 and 2030, their emissions are expected to increase by 5.7 per cent. These projected changes for EIT Parties are consistent with the relevant historical trends: deep emission reductions occurred at the beginning of the 1990s as a consequence of the economic downturn and transition to market-based economies, but, as their economies subsequently grew, emissions also began to increase, and this growth is projected to extend at least until 2030, unless additional PaMs are implemented.

158. For non-EIT Annex I Parties, emissions in 2020 are projected to be 4.6 per cent below the 1990 level. From 2020 to 2030, their emissions are projected to decrease by 2.2 per cent, resulting in projected emissions in 2030 at 6.7 per cent below the 1990 level. This reflects at least in part the expected effects of PaMs. Compared with the 2017 level, their emissions are projected to be 2.6 per cent lower in 2020 and 4.8 per cent lower in 2030. Their emissions will continue to account for the largest share of the total aggregate GHG emissions of Annex I Parties in 2020 (76.3 per cent); however, owing to the projected increase in emissions of EIT Parties, that share is expected to become slightly smaller by 2030 (74.9 per cent).

2. Projections under the 'with additional measures' scenario without emissions or removals from land use, land-use change and forestry

159. A total of 34 Parties reported projections under the WAM scenario for 2020 and 2030. For those Parties that did not report a WAM scenario, in many cases this was because none of their PaMs were in the planning stage at the time of preparing the projections. Again, to allow a rough comparison of total GHG emission projections across the WEM and WAM scenarios, where projection estimates were not reported for the WAM scenario, values from the WEM scenario were used for both 2020 and 2030 as a proxy.

160. Taking this into account, GHG emissions for all Annex I Parties under the WAM scenario in 2020 are projected to equal 16,686 Mt CO_2 eq, 14.2 per cent lower than the 1990 level. Emissions in 2030 are projected to be 17.6 per cent lower than in 1990, owing to a further 4.0 per cent drop in emissions after 2020.

161. In comparison with the WEM scenario, emissions are projected to be 0.7 and 4.3 per cent, or in absolute values 116.8 and 726.7 Mt CO_2 eq, lower under the WAM scenario in 2020 and 2030, respectively.

3. Projections under the 'with measures' scenario including emissions and removals from land use, land-use change and forestry

162. GHG emissions including emissions and removals from the LULUCF sector for all Annex I Parties under the WEM scenario in 2020 are projected to equal 15,102 Mt CO_2 eq, which is 16.8 per cent below the 1990 level of 18,161 Mt CO_2 eq. Between 2020 and 2030, such emissions are projected to increase by 1.0 per cent, resulting in emissions being 16.0 per cent lower in 2030 than in 1990.

163. Net removals in 2020 and 2030 from the LULUCF sector are projected to be 26.0 and 10.4 per cent higher than in 1990, respectively, and an 8.8. per cent decrease in removals is projected between 2017 and 2020.

D. Emission projections by sector

1. Projected changes in sectoral greenhouse gas emissions under the 'with measures' scenario

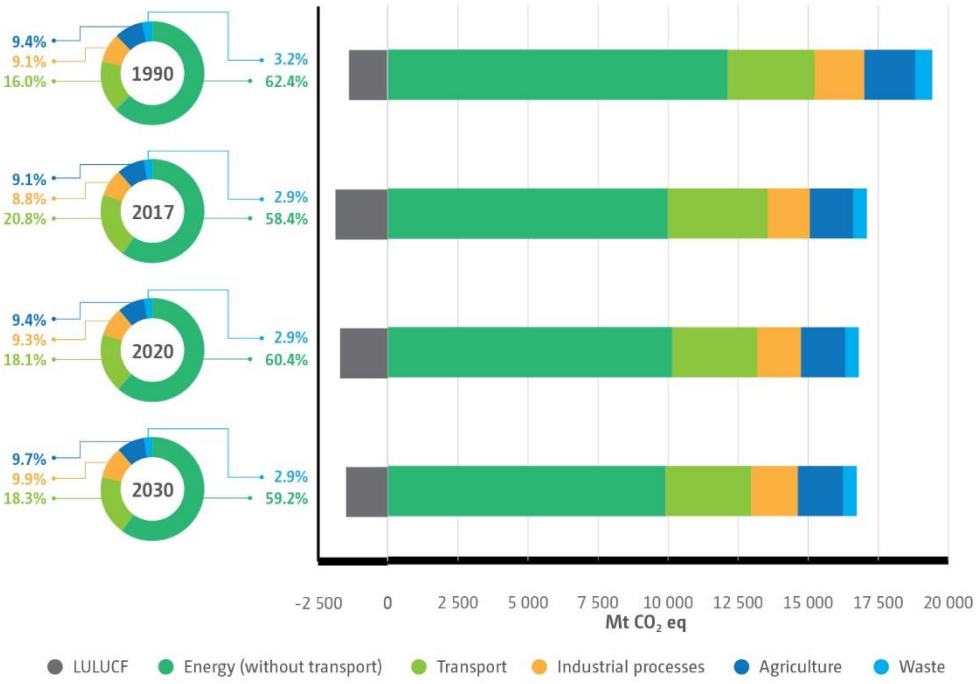
164. All Annex I Parties reported projections for 2020 and 2030 for individual sectors, including energy, transport, industrial processes, agriculture, LULUCF and waste. In some cases, Parties included emissions from transport in the energy sector. Therefore, the comparison of percentage changes in the projected emissions for 2020 and 2030 from the 1990 and 2017 levels, particularly for the energy and transport sectors, should be interpreted with caution.

165. In this updated report, total emissions from all sectors are projected to decrease by 2020 compared with the 1990 level.[37] In comparison with the 2017 level, emissions from the energy sector, industrial processes and agriculture are projected to increase by 1.5, 3.7 and 1.4 per cent, respectively.

166. It is expected that the energy sector including transport will remain the dominant source of GHG emissions in 2020, contributing 78.4 per cent of the total emissions.

167. Considering the sectoral data provided by Parties for 2030, emissions from all sectors are projected to remain below their respective 1990 level; however, emissions from transport, industrial processes and agriculture are expected to be slightly higher in 2030 than in 2020. Net removals from the LULUCF sector in 2030 are projected to be below the projected 2020 level, but still above the 1990 level. Figure 15 shows sectoral historical emissions and emission projections under the WEM scenario.

Figure 15
Historical and projected greenhouse gas emissions and removals under the 'with measures' scenario by sector



[37] In the previous version of this report, emissions from transport were expected to increase by 2.3 per cent by 2020 compared with the 1990 level.

168. Many Parties provided no or only partial information on factors, activities and assumptions to help understand future emission trends for each sector. Differences in assumptions between Parties are significant; for instance, forecast international oil prices are in the range of USD 12–99/barrel for 2020. Therefore, it is not feasible to contextualize changes in future emission levels by sector using the information on factors and assumptions provided in the BR4s.

169. Drivers behind future emission trends are directly or indirectly affected by the implementation of cross-cutting and sectoral mitigation actions (see chap. IV above). It is evident that most mitigation actions target the energy sector including transport given that the two sectors combined are projected to contribute nearly 80 per cent of total emissions in 2020; however, the effect of many of them was not quantified, making it difficult to assess their aggregated effect compared with projected emissions. Nevertheless, the analysis of mitigation actions in chapter IV above provides a solid basis for understanding the directions that Parties are taking in targeting different sectors by 2020 and 2030.

2. Projected greenhouse gas emissions from international aviation and maritime transport

170. In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", emission projections related to international transport should be reported separately and not included in the totals. Only 23 Annex I Parties reported projections of GHG emissions from international aviation and maritime transport. Also, not all Parties reported international bunker emission projections separately for the aviation and maritime sectors, making sector-level analysis difficult. While these values provide insight into the general growth trend in emissions in this sector, they cover a limited number of Parties and might not be fully representative.

171. Total GHG emissions from fuel used for international transport for those 23 Parties equalled 190.87 Mt CO_2 eq in 2017 and are projected to increase until 2020 (i.e. 4.0 per cent higher at 198.59 Mt CO_2 eq). From 2020 to 2030 such emissions are expected to rise to 221.74 Mt CO_2 eq, an increase of 11.7 per cent.

E. Projections data for individual Annex I Parties

172. Figure 16 shows the projected percentage changes in GHG emissions for individual Annex I Parties by 2020 compared with the base-year and 1990 level under the WEM scenario. Figure 17 shows the projected percentage changes in GHG emissions for individual Annex I Parties by 2020 and 2030 compared with the 2017 level under the WEM scenario. More detailed information on the WEM, WAM and WOM scenarios for each individual Party is also presented in tables I.6–I.7.

Figure 16

Projected changes in the total greenhouse gas emissions without land use, land-use change and forestry of individual Annex I Parties under the 'with measures' scenario by 2020 compared with the base-year and 1990 level

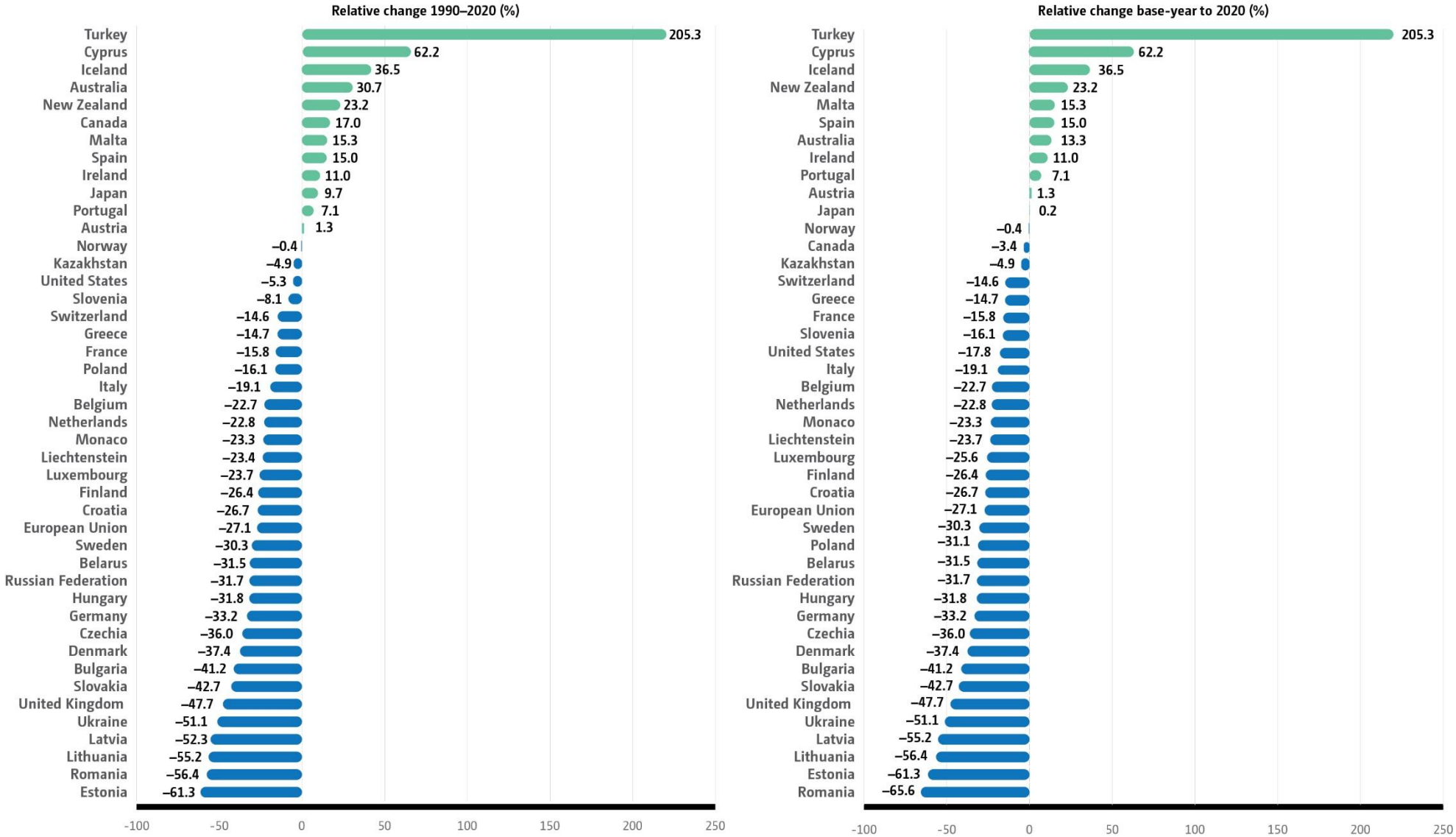
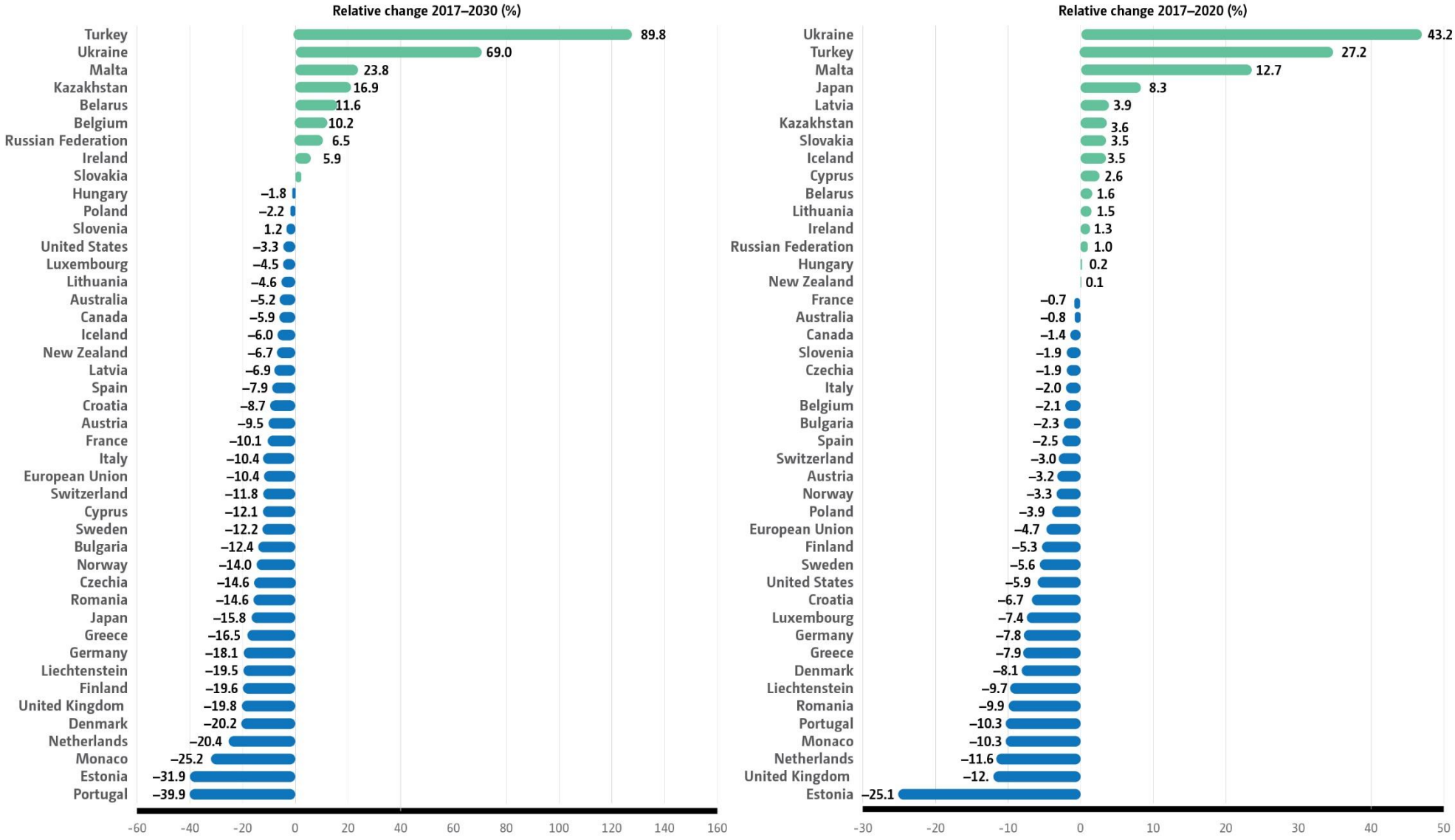


Figure 17

Projected changes in the total greenhouse gas emissions without land use, land-use change and forestry of individual Annex I Parties under the 'with measures' scenario by 2020 and 2030 compared with the 2017 level



173. The projected total GHG emissions of individual Annex I Parties in 2020 are influenced most by the emissions of the United States, the Russian Federation, Japan, Germany, Canada, Turkey and Australia, which account for about 75 per cent of the total emissions of Annex I Parties under the WEM scenario. Some key aspects of their projected GHG emission profiles without LULUCF are as follows:

(a) The United States alone will account for 36.3 per cent of the total GHG emissions of Annex I Parties in 2020. Compared with the base-year level (2005) and the 1990 level, its emissions are projected to decrease by 17.8 and 5.3 per cent, respectively, in 2020. Compared with the 2017 level, its emissions are projected to decrease by 5.9 per cent by 2020 and by 4.5 per cent by 2030;

(b) The Russian Federation's emissions are projected to be 31.7 per cent lower in 2020 than in the base year (1990); between 2017 and 2020 its emissions are expected to increase by 1.0 per cent;

(c) Japan's GHG emissions in 2020 are projected to be 0.2 per cent above the base-year level (2005) and 9.7 per cent above the 1990 level. Emissions are also expected to rise by 8.3 per cent between 2017 and 2020, but subsequently decrease by 2030 to 16.5 per cent below the 2017 level;

(d) Germany's GHG emissions in 2020 are projected to be 33.2 and 7.8 per cent below the base-year (1990) and 2017 levels, respectively, and decline further between 2020 and 2030 to reach 19.5 per cent below the 2017 level;

(e) Canada's GHG emissions in 2020 are projected to decrease by 3.4 and 1.4 per cent below the base-year (2005) and 2017 level, respectively. However, its emissions in 2020 are projected to be 17.0 per cent above the 1990 level. Between 2020 and 2030, its emissions are projected to further decrease by 4.6 per cent;

(f) Turkey's GHG emissions in 2020 are expected to have risen by 205.3 per cent compared with the 1990 level and by 27.2 per cent compared with the 2017 level. It is worth noting that Turkey has no quantified economy-wide emission reduction target for 2020;

(g) Australia's GHG emissions in 2020 are projected to be 13.3 above the base-year level (2000) but 0.8 per cent below the 2017 level. Compared with the 1990 level, its projected emission level in 2020 is 30.7 per cent higher. Emissions are projected to decline between 2020 and 2030 to reach 5.9 per cent below the 2017 level.

F. Improvements and challenges in reporting

174. Overall, the quality of reporting on projections in the BRs has improved over time, both in terms of completeness and transparency. Many Parties have built a comprehensive modelling capacity and increased the level of available expertise with each BR reporting cycle. Still, Parties face some challenges, such as reporting on non-mandatory projection scenarios, such as the WAM and WOM scenarios; sensitivity analysis; projections of emissions related to international aviation and maritime transport separately from totals; types of models used and their characteristics; and factors and activities driving future emission trends for each sector.

VI. Progress towards 2020 targets by 2017 and outlook for achieving midterm and long-term emission reduction goals

A. Overview

175. This chapter presents an assessment of Annex I Parties' progress towards and efforts needed to achieve their 2020 targets on the basis of the information reported in their BR4s on GHG emissions, the contribution of LULUCF and units from market-based mechanisms and GHG emission projections in accordance with the UNFCCC reporting guidelines on BRs. This is further contextualized through a discussion of the evolution of GHG emission

trends in individual Annex I Parties focusing on a few key indicators, namely GHG emissions/GDP unit, GHG emissions/capita and GDP/unit of TPES. Finally, an outlook is presented for Parties' achievement of their midterm and long-term targets on the basis of the information on PaMs and projections reported in their BR4s.

B. Progress towards and efforts needed to achieve 2020 targets[38]

176. The assessment of Parties' individual progress towards their 2020 targets is based on a comparison of the latest levels of GHG emissions reported for 2017 by Parties in their BR4s (in CTF table 4), including the contribution of LULUCF and use of units from market-based mechanisms, where applicable and available, with the base-year emission level and the targeted emission level for 2020. In quantitative terms, progress towards a target is assessed as the percentage of the targeted emission reduction, expressed as an emission level or budget depending on the nature of the target, achieved by 2017 (see para. 181 below). In addition, for Parties whose emissions in 2017 were above their targeted emission levels for 2020, the outlook for achieving their 2020 targets is presented on the basis of their projected emissions for 2020,[39] together with any plans to use units from market-based mechanisms to make up the shortfall.

177. A few Parties, namely Australia, Iceland, New Zealand, Norway and Switzerland, have implemented their targets under the Convention using an emission budget approach (e.g. on the basis of their targets under the Kyoto Protocol for the second commitment period) and, as such, have defined emissions trajectories consistent with those targets. The emission budget for these Parties represents the cumulative emissions below the emissions trajectory. In such cases, the Party's progress towards the target is assessed by comparing the cumulative emissions, including the contribution of LULUCF and use of units from market-based mechanisms, as relevant, in 2013–2017 as well as the cumulative projections for 2020 with the emission budget for 2013–2020.

178. Although Parties are required to report ex post information relevant to assessing progress towards their targets, including total annual GHG emissions and the contribution of LULUCF and use of units from market-based mechanisms, there is no specific guidance outside the Kyoto Protocol rules on accounting for such emissions and contributions towards the achievement of the 2020 targets, which would ensure, for instance, the avoidance of double counting of units from market-based mechanisms across Parties. However, for the purpose of this analysis, the contribution of LULUCF and use of units from market-based mechanisms towards achieving targets have been added and subtracted, respectively, from the total GHG emissions excluding LULUCF, as relevant, to calculate GHG emissions including the contribution of LULUCF and the use of units from market-based mechanisms, which have then been compared with the target to assess progress.

179. Tables I.8–I.9 provide an overview of the information on progress provided by Annex I Parties in their BR4s, including emissions in the base year and 2017, the contribution of LULUCF and use of units from market-based mechanisms, as applicable, and a comparison of emission levels and projections with the targeted emission levels.

180. In this context, and given that all 2020 targets require a degree of emission reduction below the base-year level, the latest emission levels reported in the BR4s for 2017 can be categorized as follows:

(a) Below both the base-year emission level and the 2020 targeted emission level, which implies that the 2020 target is likely to be achieved, provided emissions do not increase by 2020;

(b) Below the base-year emission level but still above the 2020 targeted emission level, which implies that progress towards the 2020 target has been made but that further

[38] The information in this section covers 42 Annex I Parties, including the EU. It does not include Ukraine, which had not submitted its BR4 by the time of the preparation of this report; nor does it include Turkey, which did not communicate its 2020 target under the Convention.

[39] Projections excluding or including LULUCF are used depending on whether or not the Party intends to make use of LULUCF towards achieving its target.

efforts are required to achieve it. For Parties applying the emission budget approach, this corresponds to their cumulative emissions in 2013–2017 not exceeding their total emission budget for 2013–2020;

(c) Above the base-year emission level, which means that current emission trends diverge from the trajectory towards achieving the 2020 target. For Parties applying the emission budget approach, this corresponds to their cumulative emissions in 2013–2017 having already exceeded their total emission budget for 2013–2020.

181. Taking into account emission levels until 2017, reported contributions of LULUCF and use of units from market-based mechanisms, where applicable, and emission projections for 2020, it can be concluded that Parties have made varying individual progress towards their 2020 targets, as shown in figures 18 and 19:

(a) For all Parties, emissions in 2017 were below the base-year level. The emission levels of Belarus, the EU, Japan, Liechtenstein, Monaco and the Russian Federation in 2017 were already lower than their respective base-year level and 2020 targeted emission level. However, the projected emissions for 2020 of Japan under the WEM scenario and Monaco under both the WEM and WAM scenarios are higher than the targeted emissions for 2020;

(b) Among the Parties not using an emission budget approach, the emissions of Canada, Kazakhstan and the United States for 2017, including the contribution of LULUCF and/or use of units from market-based mechanisms, where applicable, are between the base-year level and the 2020 targeted emission level. The emission reductions achieved by 2017 as a percentage of the targeted emission reductions range from 26 to 81 per cent. Moreover, the projected 2020 emission levels of Canada and Kazakhstan under both the WEM and WAM scenarios are above their targeted emission levels. On the other hand, the projected 2020 emission level of the United States under the WEM scenario is below its targeted emission level;

(c) In the case of Parties using an emission budget approach (Australia,[40] Iceland,[41] New Zealand,[42] Norway[43] and Switzerland[44]), their cumulative emissions

[40] Australia follows an emission budget approach in accounting for its target, calculated by plotting a trajectory of linear decrease from 2010 to 2020 starting from the target level under the first commitment period of the Kyoto Protocol (8 per cent above the 1990 level) and ending at 5 per cent below the 2000 level over 2013–2020. The emission budget represents cumulative emissions below the trajectory. Australia's cumulative emissions for 2013–2017 were 2,658,760.00 kt CO_2 eq, 59 per cent of its emission budget for 2013–2020 (4,508,000.00 kt CO_2 eq).

[41] For its target under the Convention, Iceland committed to a joint effort with the EU and its member States in accordance with Article 4 of the Kyoto Protocol. Under its bilateral effort-sharing agreement with the EU, Iceland's cumulative emission allocation for non-ETS sectors for 2013–2020 is 15,327.22 kt CO_2 eq. Its cumulative emissions including the contribution of LULUCF for 2013–2017 are 12,004.00 kt CO_2 eq, which corresponds to 78.3 per cent of its emission allocation. Iceland therefore has 3,323.00 kt CO_2 eq remaining of its non-ETS emission budget for 2013–2020. Non-ETS emissions under the WEM scenario are projected to amount to 2,965.00 kt CO_2 eq for 2020 (excluding LULUCF), which indicates that Iceland is unlikely to meet its 2020 target for non-ETS sectors without using units from market-based mechanisms.

[42] New Zealand's emission budget for 2013–2020 is 509,775.00 kt CO_2 eq. Its cumulative emissions including the contribution of LULUCF for 2013–2017 are 337,705.14 kt CO_2 eq, 66.2 per cent of its emission budget.

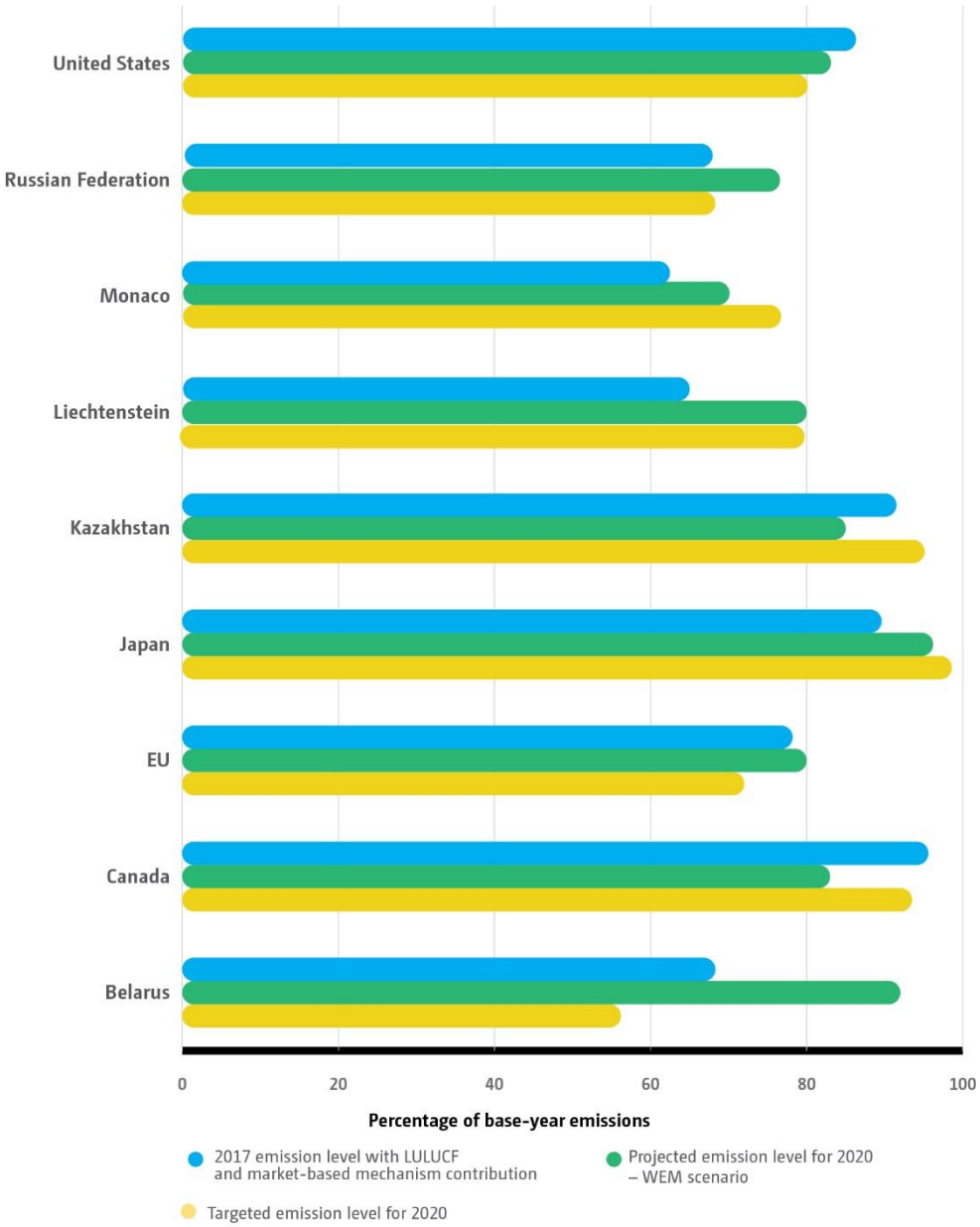
[43] Norway's 30 per cent emission reduction target under the Convention was operationalized through its quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol (2013–2020), which corresponds to an average emission reduction of 16 per cent compared with the 1990 level. Between 2013 and 2017, Norway's total GHG emissions including the contribution of LULUCF and use of units from market-based mechanisms amounted to 218,083.78 kt CO_2 eq, 62.5 per cent of its assigned amount for the second commitment period of the Kyoto Protocol (348,914.30 kt CO_2 eq).

[44] Switzerland assesses progress towards its target under the Convention by accounting against its quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol, which is to reduce emissions by 15.8 per cent below the 1990 level in 2013–2020. In 2013–2017 Switzerland's cumulative emissions, including the contribution of LULUCF but excluding use of units from market-based mechanisms, amounted to 243,841.79 kt CO_2 eq, 67.4 per cent of its assigned amount for the second commitment period of the Kyoto Protocol (361,768.52 kt CO_2 eq).

(including the contribution of LULUCF and use of units from market-based mechanisms, as relevant) for 2013–2017 are at 59–78 per cent of their emission budgets (see table I.8). According to projections under the WEM scenario, Australia expects to achieve its emission budget target without using units from market-based mechanisms. On the other hand, New Zealand, Norway and Switzerland plan to use units from market-based mechanisms to achieve their respective emission budget target. Iceland's projected emissions from non-ETS sectors for 2020 under the WEM scenario indicate that Iceland is unlikely to meet its 2020 target for non-ETS sectors without using units from market-based mechanisms.

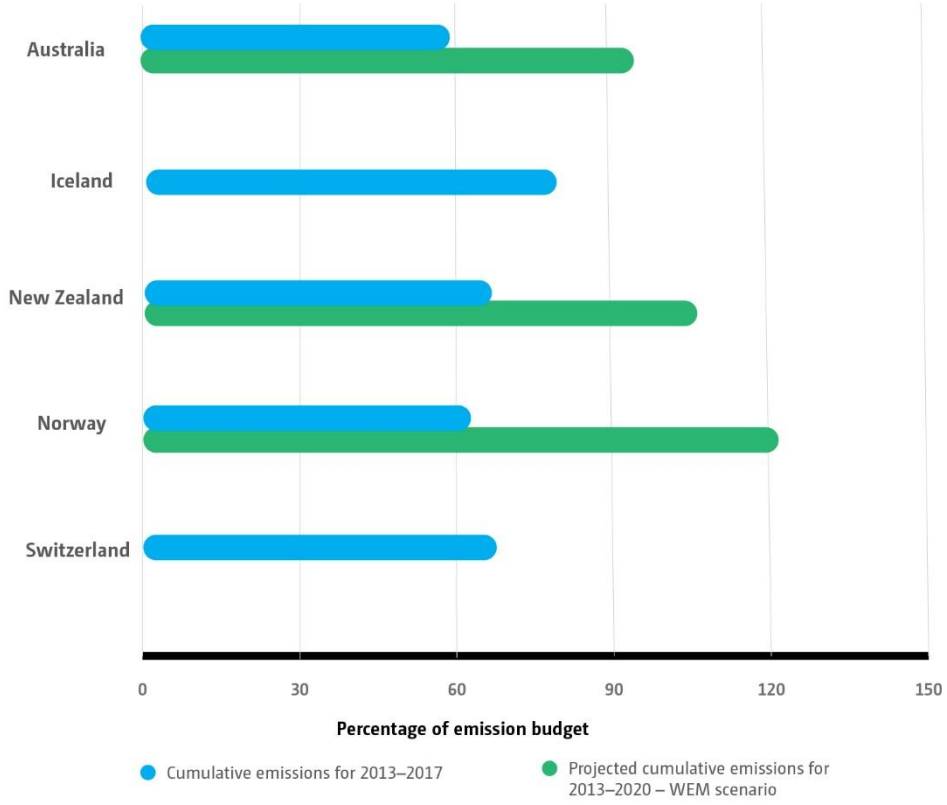
Figure 18

Progress towards emission reduction targets for 2020 by Parties with a single-year target



Note: Percentages presented for the EU represent the sum of the emissions of the 27 member States and the United Kingdom.

Figure 19
Progress towards emission reduction targets for 2020 by Annex I Parties using an emission budget approach to achieving their target



Note: Projected cumulative emissions for 2013–2020 in the WEM scenario for Iceland and Switzerland are not included in the graph because relevant data were not available.

C. Evolution of emission trends and indicators

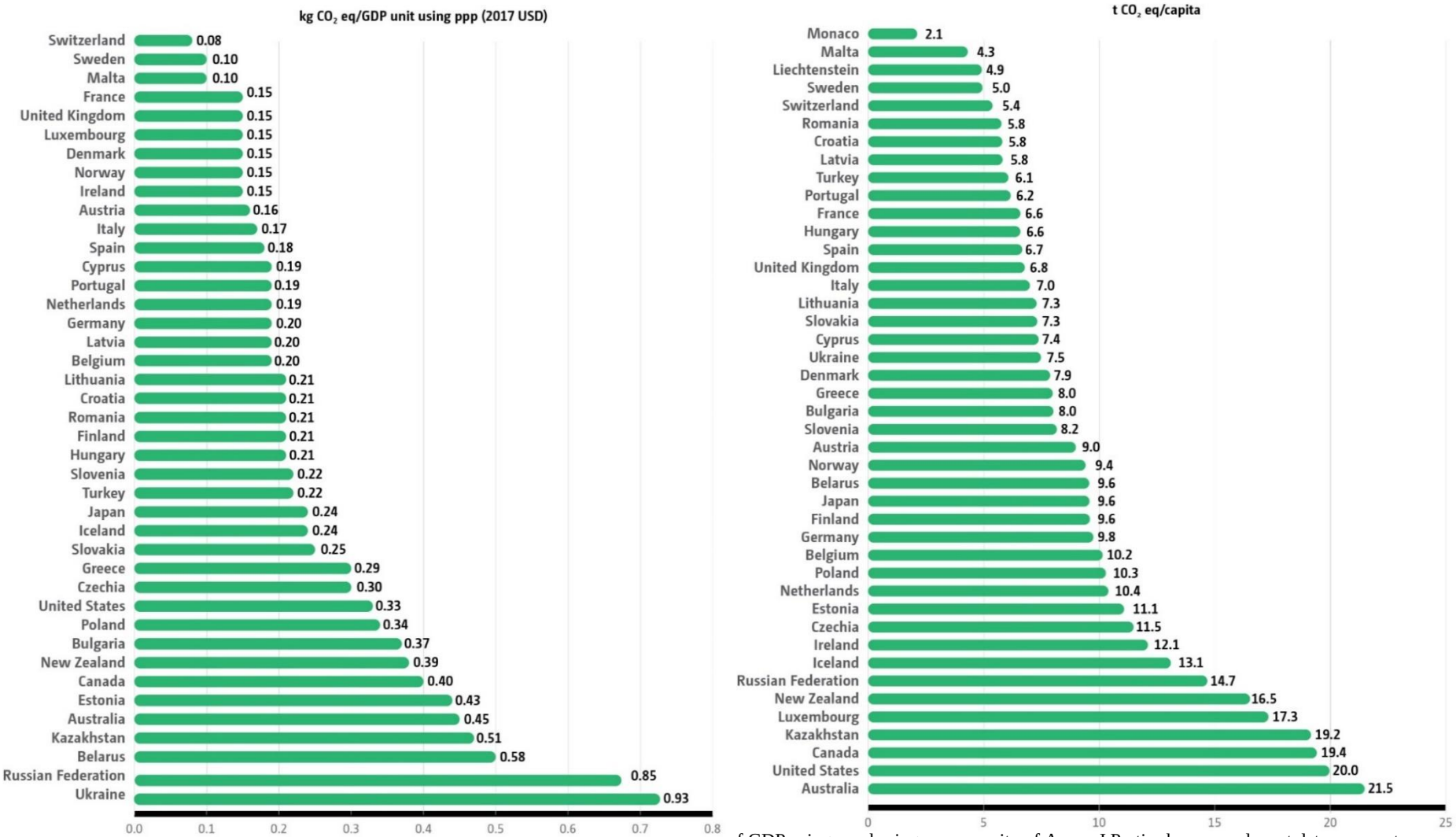
182. GHG emission levels are driven by a range of factors, including changes in economy, population and technology, as well as implementation of mitigation actions. This section contextualizes the past trends in the emissions of Annex I Parties by presenting several aggregate indicators that capture the decarbonization of energy supply, societies and economies by combining emissions and additional statistical data in various configurations: the level of GHG emissions, population, TPES and GDP unit using purchasing power parity, an economic comparison that accounts for the difference in the cost of living among countries. These indicators are useful for understanding what is driving changes in emissions and for evaluating trends.

183. The data sources for the indicators are the World Bank Open Data for information on population and GDP, and the International Energy Agency for TPES. GHG emission data are taken from Parties' 2020 GHG inventory submissions.

184. Figure 20 shows GHG emissions/capita and GHG emissions/GDP unit using purchasing power parity in 2019 for Annex I Parties, including individual EU member States. Figures 21 and 22 show the trends in 1990–2019 for all Parties, taking the EU as a whole. Overall, from 1990 to 2019, the levels of GHG emissions/capita and GHG emissions/GDP unit using purchasing power parity showed a downward trend for most Parties; only a few Parties experienced small increases. This downward trend is much more prominent for emissions/GDP unit using purchasing power parity, reflecting that for most Annex I Parties there has been a decoupling of emissions from economic growth. The more gradual downward trend for most Parties of per capita emissions reflects the broader changes to society and the effects of mitigation actions, particularly in terms of increased energy efficiency and use of renewable energy.

Figure 20

Greenhouse gas emissions per unit of gross domestic product using purchasing power parity and per capita of Annex I Parties in 2019



Note: Liechtenstein and Monaco are not included in the graph of GHG emissions per unit of GDP using purchasing power parity of Annex I Parties because relevant data were not available.

Figure 21
Trends in greenhouse gas emissions per capita for Annex I Parties in 1990–2019

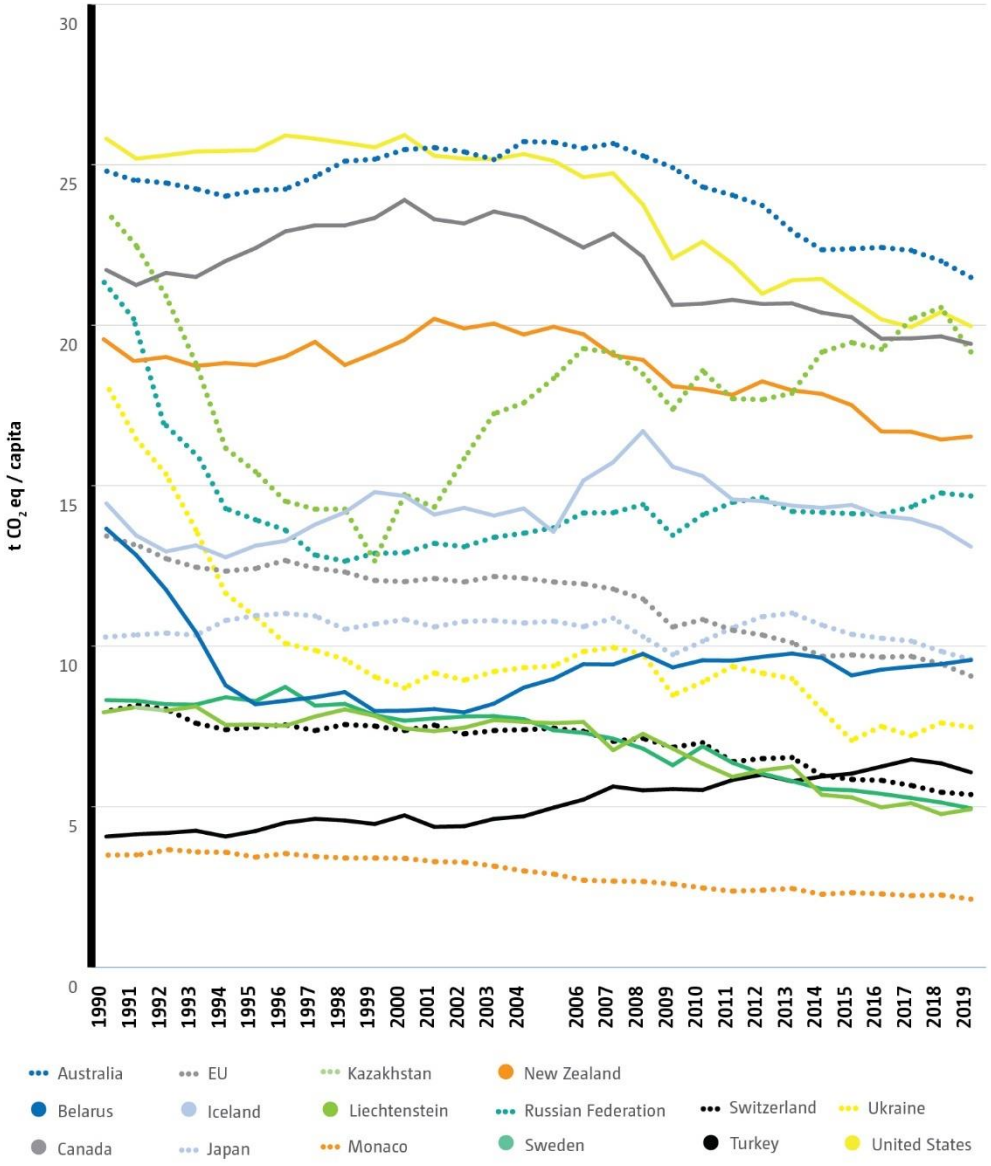
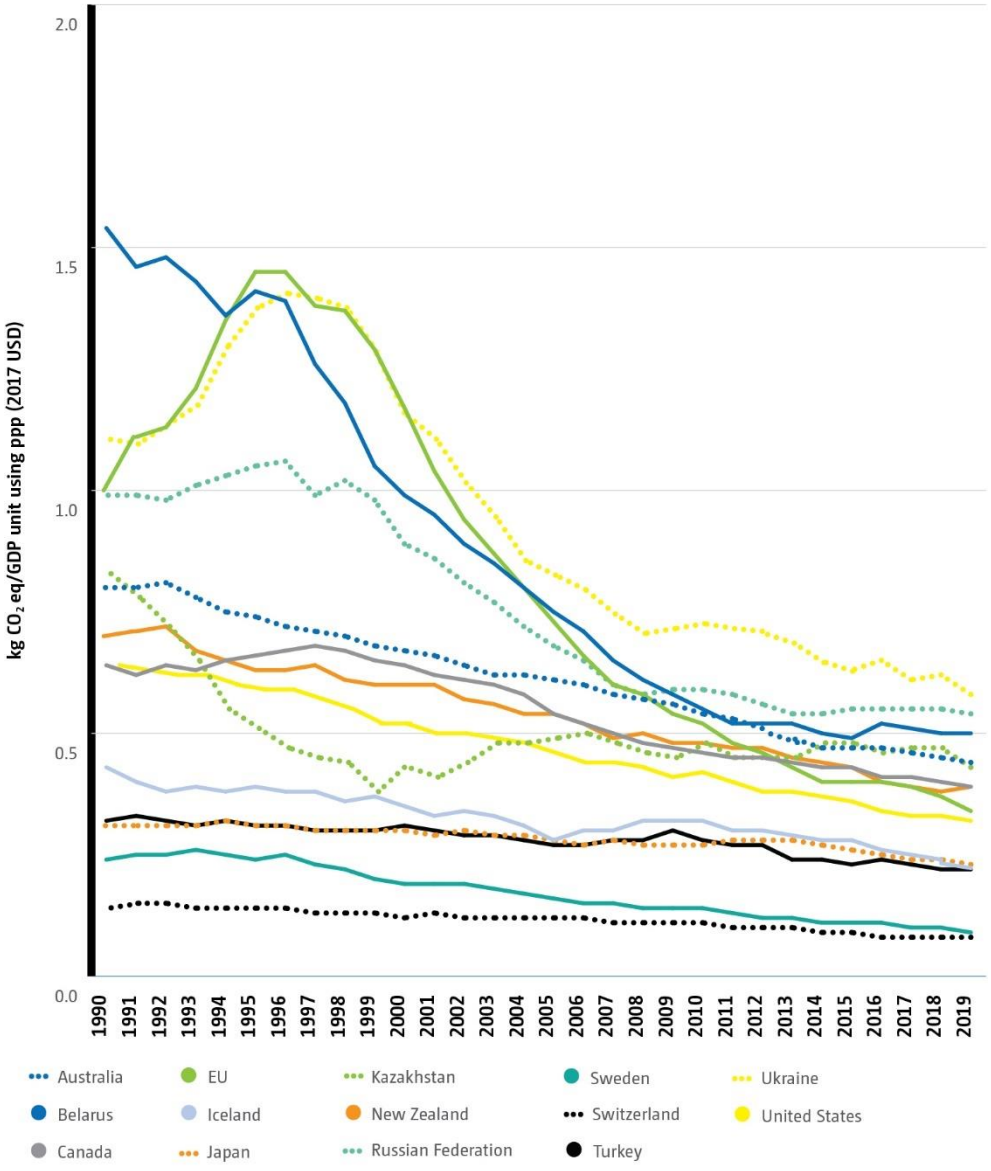


Figure 22
Trends in greenhouse gas emissions per unit of gross domestic product using purchasing power parity for Annex I Parties in 1990–2019

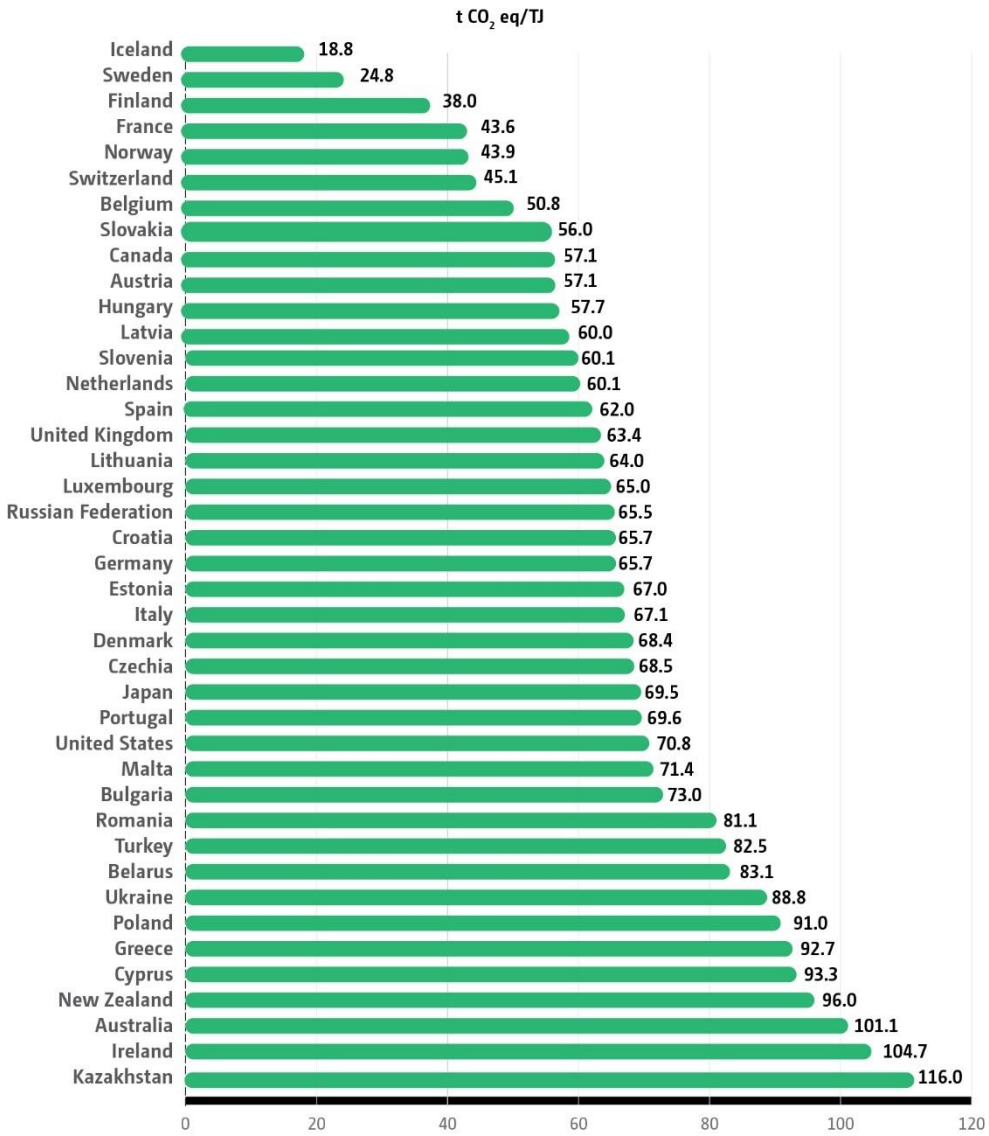


Note: Liechtenstein and Monaco are not included because relevant data were not available.

185. Indicators that include TPES can provide additional insight into the causes of changes in emissions. TPES/GDP unit using purchasing power parity is an indication of how the energy needs of a Party have changed with respect to economic growth. Figure 23 shows the values of TPES/GDP unit using purchasing power parity (2017 USD) for 2019 for all Parties, including individual EU member States. Figure 24 shows the trend in TPES/GDP unit using purchasing power parity in 1990–2019 for Annex I Parties, taking the EU as a whole. For most Parties, there has been a gradual downward trend for this indicator, with Iceland, the Russian Federation and Ukraine being notable exceptions.

Figure 23

Greenhouse gas emissions per unit of total primary energy supply and total primary energy supply per unit of gross domestic product of Annex I Parties in 2019



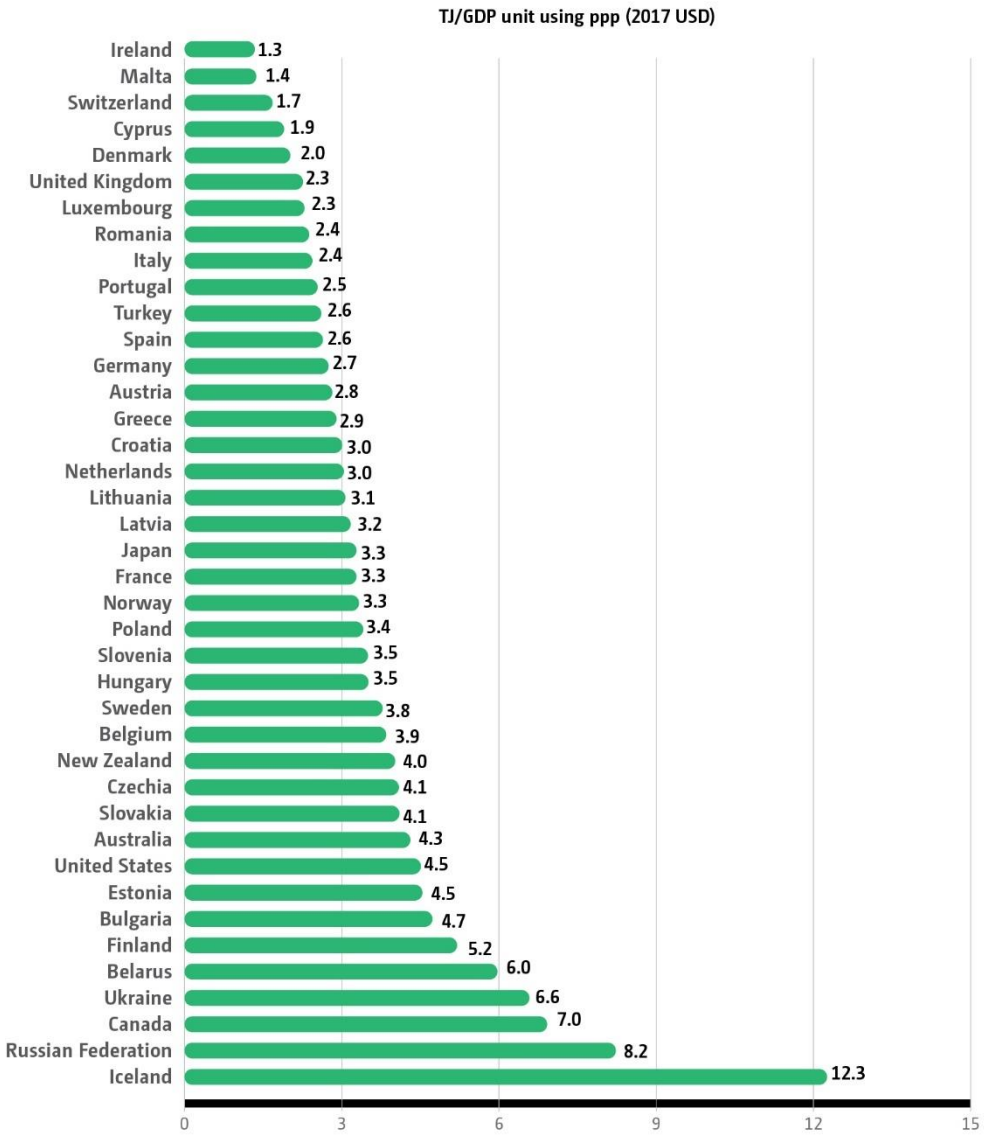
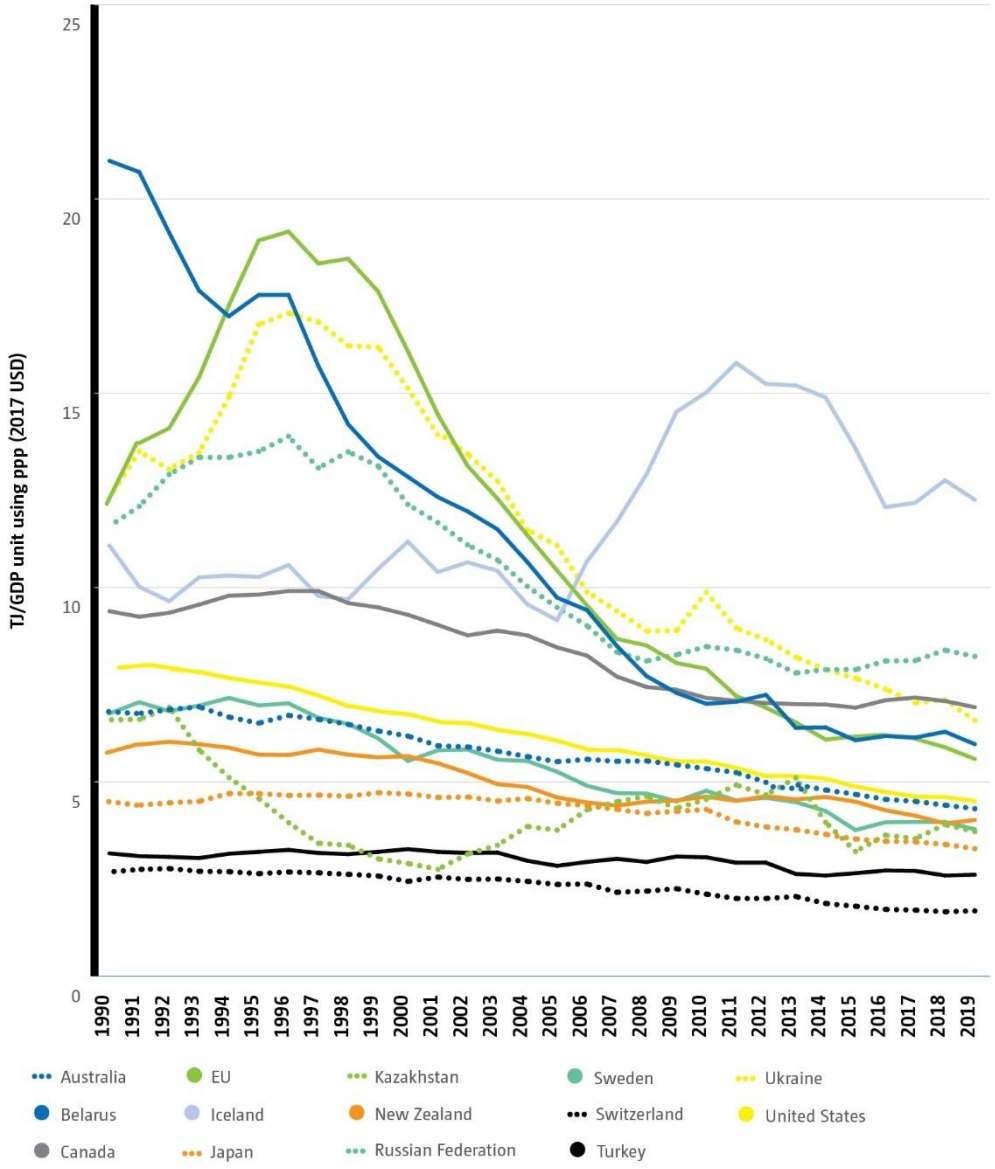


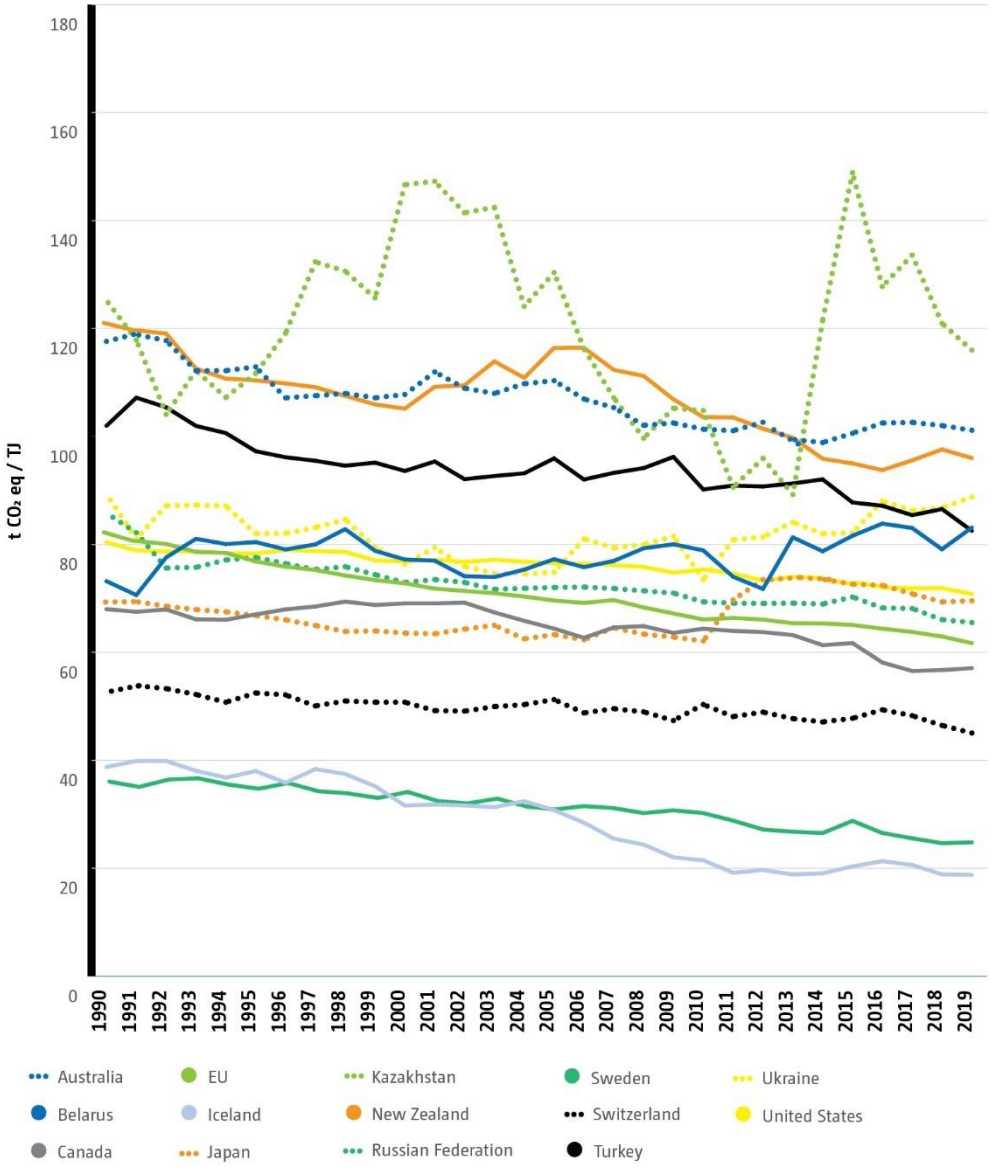
Figure 24
Trends in total primary energy supply per unit of gross domestic product using purchasing power parity for Annex I Parties in 1990–2019



Note: Data on TPES/GDP unit for Liechtenstein and Monaco were not available for the entire time series.

186. The trends in emissions/unit of TPES provide insight into changes in the electricity generation mix, in particular transition to low-emission or renewable sources, as well as a greater use of biofuels in transportation and improved energy efficiency. Figure 23 shows the values of GHG emissions/unit of TPES for 2019 for all Parties, including individual EU member States. Figure 25 shows the trend in GHG emissions/unit of TPES in 1990–2019 for Annex I Parties, taking the EU as a whole. Annex I Parties differ greatly in this regard, with those that are more coal dependent at the higher end of the range and those with high levels of renewable generation at the lower end. The trend for most Parties is gradually downward, which reflects the continued adoption of renewable energy sources and phasing out of coal power plants, as discussed in chapter III above.

Figure 25
Trends in greenhouse gas emissions per unit of total primary energy supply for Annex I Parties in 1990–2019



Note: Data on emissions/TPES unit for Liechtenstein and Monaco were not available for the entire time series.

187. Overall, it is difficult to accurately attribute GHG emission reductions to specific factors over time using indicators across all Annex I Parties as emission trends have been influenced by a combination of demographic, economy-wide and sector-specific drivers, including, but not limited to, population changes; structural changes in economies (i.e. the shift in the ratio of economic outputs from manufacturing and services, which was particularly pronounced in EIT Parties); technological improvements in production processes and the shift to less carbon-intensive fossil fuels (i.e. from coal to natural gas); the increased share of renewable energy sources in electricity and heat generation; and increased energy efficiency. However, the analysis of indicators above provides evidence that, since 2000, individual Parties have gradually intensified their efforts in implementing mitigation actions aimed at decarbonizing their economies.

D. Outlook for midterm and long-term emission reduction goals

188. The following is a preliminary assessment of the difference between projected emissions in 2030 under the WEM and WAM scenarios reported in the BR4s or the latest available BRs, as applicable, and emission levels that correspond to the 2030 targets communicated in Parties' NDCs (see table 3). The post-2020 midterm and long-term emission reduction targets of all Parties are shown in table 1. Where a Party reported its 2030 target as a range (e.g. a 50–55 per cent reduction below the base-year emission level), the lower value was used for the estimation in table 3.

189. It should be emphasized that it is not possible to fully assess the likelihood of Parties' achieving their 2030 targets because most, if not all, plan to considerably strengthen existing and/or introduce new mitigation actions in the medium term. Also, potential contributions of internationally transferred mitigation outcomes or use of units from other eligible market-based mechanisms or LULUCF were not taken into account because relevant information was not available. There could also be differences between the scope of sectors and/or gases covered by the NDCs of individual Parties and those included in the projections for 2030 as reported in the BR4s.

190. WEM projections from the BR4s indicate that none of the Parties will achieve its targeted level of emissions in 2030 (positive percentage difference in table 3 shows that projected emissions are above the 2030 target level). This means that the emission reduction potential of the current portfolio of mitigation actions may not be sufficient to achieve the 2030 targets. Additional PaMs and use of units from market-based mechanisms are therefore needed. According to their BR4s, Parties are taking steps to respond to these needs.

Table 3
Comparison of projections under the 'with measures' and 'with additional measures' scenarios and targeted greenhouse gas emission levels for 2030

	Emissions (kt CO_2 eq)				*Difference from target (%)*	
Party	*Base year*	*Target 2030*	*WEM 2030*	*WAM 2030*	*WEM*	*WAM*
Australia	521 801	386 133	521 303	NE	35.0	NA
Belarus	139 274	90 528	104 903	102 917	15.9	13.7
Canada	730 300	438 180	672 900	602 900	53.6	37.6
EU	5 649 529	2 542 288	3 814 252	3 491 274	50.0	37.3
Iceland	3 613	1 626	4 447	NE	173.5	NA
Japan	1 410 298	761 561	1 079 000	NE	41.7	NA
Kazakhstan	385 931	328 041	414 038	402 110	26.2	22.6
Liechtenstein	229	137	156	143	13.3	3.9
Monaco	102	46	59	51	29.2	11.2
New Zealand	65 668	32 834	75 266	74 702	129.2	127.5
Norway	51 210	25 605	45 009	NE	75.8	NA
Russian Federation	3 186 796	2 230 757	2 296 300	2 104 300	2.9	–5.7
Switzerland	53 641	26 820	41 535	35 049	54.9	30.7
Turkey[a]	NA	–	–	–	–	–
Ukraine	938 603	328 511	541 981	520 462	65.0	58.4
United Kingdom	797 970	255 350	378 358	374 642	48.2	46.7
United States	7 423 400	3 711 700	6 193 900	NE	66.9	NA

[a] Turkey, in its intended nationally determined contribution, communicated a target of a 21 per cent emission reduction by 2030 against a 'business as usual' scenario.

191. Many Parties outlined their ambitious trajectories to meeting their long-term net zero, climate or carbon neutrality goals (see table 1). The EU, which comprises 27 Annex I Parties, has committed to becoming climate-neutral by 2050, and submitted in 2020 a long-term strategy that encompasses all sectors of the economy. The European Commission's European Green Deal, launched in 2019, calls for increasing the ambition of the 2030 emission

reduction target to at least 50 per cent and towards 55 per cent compared with the 1990 level in a responsible way.

192. The United States has developed a National Climate Strategy that sets out priority PaMs to be taken to ensure that the country continues on a path towards net zero emissions by no later than 2050, and to keep within reach the objective of limiting global warming to 1.5 °C.

193. New Zealand passed a law that sets the following long-term emission reduction targets: net zero emissions of all GHGs other than biogenic CH_4 by 2050, and for biogenic CH_4 emissions a 24–47 per cent reduction below the 2017 level by 2050, including to 10 per cent below the 2017 level by 2030.

194. Germany established its goal of achieving extensive GHG neutrality by 2050 in its Climate Action Plan 2050. To this end, it plans to gradually reduce GHG emissions by at least 55 per cent by 2030 and by at least 70 per cent by 2040 compared with the 1990 level.

195. Sweden has set a goal of net zero emissions by 2045 and negative emissions thereafter. It outlined ambitious interim reduction targets for its emissions not covered by the EU ETS of at least 63 per cent by 2030 and at least 75 per cent by 2040 relative to the 1990 level.

196. Norway highlighted its target of becoming a low-emission society by 2050, outlining that the aim is to promote its long-term transformation in a climate-friendly direction. Its target has been translated into a quantitative target of an 80–95 per cent emission reduction below the 1990 level.

197. The Netherlands has set a 49 per cent emission reduction target by 2030 and France an interim emission reduction target of 40 per cent by 2030 relative to the 1990 level. Such targets, objectives and strategies provide long-term direction to climate policy and ensure that near-term and midterm targets are consistent with that direction.

E. Improvements and challenges in reporting

198. In general, Annex I Parties have made significant improvements in their reporting on progress towards their targets since their BR1s, such as reporting more complete and transparent information on the contribution of LULUCF and use of units from market-based mechanisms in CTF table 4, including by using appropriate notation keys wherever information cannot be provided. However, a few significant reporting issues persist, such as:

(a) Incomplete or incorrect information on the use of units from market-based mechanisms in CTF tables 4 and 4(b), which, in some cases, stems from Parties' lack of clarity regarding their current and future use of market-based mechanisms;

(b) Lack of appropriate explanation in the CTF tables and/or textual part of the BR in case of missing information;

(c) Technical challenges in using the BR CTF application.

VII. Provision of financial, technological and capacity-building support to developing country Parties

A. Overview

199. Annex II Parties[45] reported quantitative and qualitative information on financial, technological and capacity-building support provided to non-Annex I Parties in 2017–2018 in their BR4s.[46] Information on financial support is provided in the main body of the BR, with quantitative information presented in three CTF tables for each reporting year: CTF table 7 for summary information on public support provided; CTF table 7(a) for information

[45] See https://unfccc.int/parties-observers for an explanation of the classification of Parties by their commitments.

[46] In accordance with decision 2/CP.17, annex I, para. 13.

on public financial support provided through multilateral channels; and CTF table 7(b) for information on public financial support provided through bilateral, regional and other channels. CTF table 8 outlines information on support provided for technology development and transfer, while CTF table 9 covers capacity-building support provided.

200. Parties have continued to improve and expand their reporting on climate finance in the BR4s. The reported total amount of climate finance provided continued to increase in 2017–2018, continuing the longer-term trend since the BR1s (2011–2012). The share of climate-specific finance continues to grow, while the share of core/general support continues to decline, also in line with long-term trends. Of the total amount of multilateral climate-specific finance reported in the BR4s, over half was allocated to mitigation; however, it is clear that support for adaptation remains a priority for many Parties. Climate-specific finance provided through bilateral, regional and other channels continues to account for a larger share than climate-specific multilateral finance, constituting just over two thirds of the total climate finance provided, increasing slightly since the BR3s. Similar to multilateral support, climate-specific support delivered through bilateral, regional and other channels is mainly focused on mitigation. In contrast to previous BRs, the BR4s presented some new reporting developments, including a move towards more complex sectoral reporting, the expanded use of innovative financial instruments such as insurance, and the introduction of new reporting areas, such as gender. Additionally, more Annex I Parties not included in Annex II reported on climate finance voluntarily in the BR4s than in any previous BRs. Parties demonstrated that they have improved and expanded their tracking and reporting of relevant private sector financial contributions, which helps to clarify the bigger climate finance picture.

201. On technological support, almost all Annex II Parties provided information in the BR4s on steps taken to promote, facilitate and finance the transfer of, or access to, climate technologies for non-Annex I Parties. Annex II Parties reported on a larger number of activities for providing technological support to non-Annex II Parties than reported in the BR3s. More than half of the supported activities were mitigation technology activities (56 per cent) and a quarter were adaptation technology activities (27 per cent), which are consistent proportions with those reported in previous BRs. As reported in the BR3s, support for adaptation technology activities reported in the BR4s mainly targeted the agriculture, cross-cutting and water sectors, while support for mitigation technology efforts continues to focus on the energy sector. Almost half of all technology support focused on the Asia-Pacific region (43 per cent). Support for technology for the Africa region (26 per cent) and Latin America and the Caribbean (13 per cent) has not changed significantly since the BR3s. Technological support provided by Annex II Parties responded to the technology needs identified by non-Annex I Parties. Parties underlined that activities were undertaken according to the specific needs and circumstances of receiving countries, acknowledging the different technological and capacity-building needs. The technology activities reported in the BR4s were predominantly for the deployment of mature technologies. However, support for the early stages of the technology cycle, technology research and development and demonstration, has increased since previous BRs.

202. According to the qualitative descriptions in the BR4s, overall the capacity-building activities reported address the 15 priority areas outlined in the framework for capacity-building in developing countries established under decision 2/CP.7.

203. Parties reported on capacity-building activities at the individual, institutional and systemic level. Capacity-building at the individual level refers to developing educational, training and awareness-raising activities. Institutional-level capacity-building refers to fostering the development of organizations and institutions, including their missions, mandates, cultures, structures, competencies, and human and financial resources, as well as promoting cooperation between organizations, institutions and sectors. Systemic-level capacity-building refers to creating enabling environments through economic and regulatory policies and the accountability frameworks within which institutions and individuals operate.

B. Climate finance

204. This section summarizes the information on financial support provided by Annex II Parties in 2017–2018 to non-Annex I Parties reported in accordance with the UNFCCC reporting guidelines on BRs in the BR4s and CTF tables 7, 7(a) and 7(b).

205. This report is one of several compilations of climate finance information prepared by the secretariat. In parallel, the Standing Committee on Finance produces a biennial assessment and overview of climate finance flows, drawing on available sources of information (including BRs) to provide information on the geographical and thematic balance of flows.[47] Additionally, an overview of current climate finance related issues, including international negotiations, long-term climate finance, workstreams, funds and entities, as well as links to relevant publications, is provided on the UNFCCC website.[48]

206. In total, 39 Parties reported information in their BR4s on climate finance provided to developing countries. This number includes Annex II Parties and Annex I Parties not included in Annex II that voluntarily reported on climate finance provided to developing countries. Although there is no legal requirement for Annex I Parties not included in Annex II to provide financial resources, technology transfer or capacity-building support to developing countries, nor to report thereon, a number of Annex I Parties not included in Annex II did so voluntarily. In such cases, the information provided by Annex I Parties not included in Annex II varied from the detailed completion of the CTF tables to more narrative and qualitative descriptions in the main body of the BR. The voluntary provision of this information helps to paint a more comprehensive picture of the climate finance landscape (see para. 212 below).

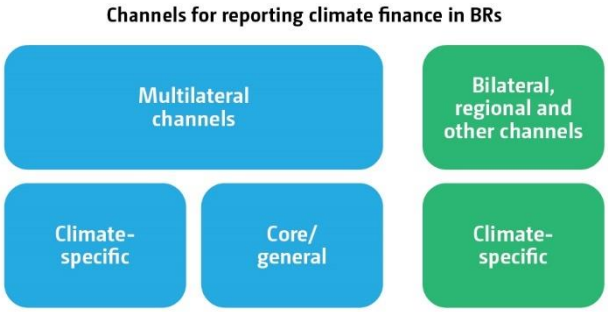
1. Climate finance profile and trends

(a) Total support

207. As reported in CTF table 7 in the BR4s, the total financial support provided to developing countries includes support provided through multilateral as well as bilateral, regional and other channels. Support provided through multilateral channels includes climate-specific contributions and core/general contributions provided to institutions and/or for uses that Parties do not consider to be climate-specific.[49] For the purpose of this report, contributions from Annex II Parties and Annex I Parties not included in Annex II have been combined to provide the total value reported.

208. As many Parties are still developing or further improving their financial systems for tracking and reporting private sector finance leveraged by public investment, private sector finance is considered separately (see figure 26 for the various climate finance channels reported in BRs, and chap. VII.D below for a more detailed discussion on leveraging private sector support).

Figure 26
Climate finance channels reported in biennial reports

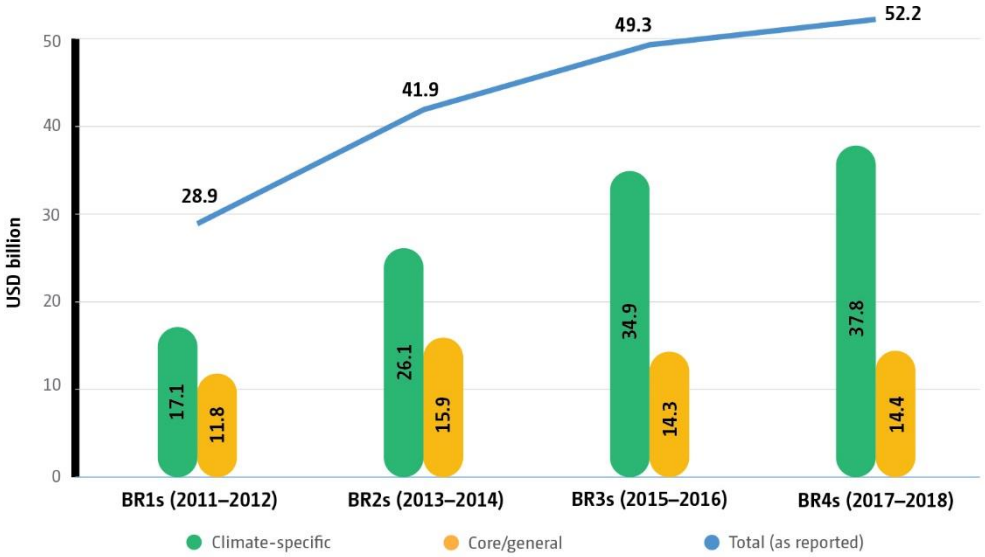


[47] See https://unfccc.int/topics/climate-finance/resources/biennial-assessment-of-climate-finance.
[48] See https://unfccc.int/topics#:11565fd6-dd29-4d61-8085-27dba428982f.
[49] One Party reported all bilateral development finance as bilateral core/general support.

209. Overall, climate finance provided by developed to developing countries continues to increase over time, reflecting a continued commitment to supporting the global transition to a low-emission and climate-resilient future. Total climate finance, as reported in the BR4s, averaged USD 52.2 billion annually in 2017–2018; this represents an increase of 5.9 per cent over the previous biennium 2015–2016 (see figure 27).[50]

210. Also as reflected in figure 27, Annex I Parties reported an annual average increase over the biennium 2017–2018 in their provision of total climate finance, confirming the trends observed between the BR1s and BR2s (45.1 per cent increase) and the BR2s and BR3s (17.7 per cent increase).

Figure 27
Total climate finance contributions, including climate-specific and core/general support, in 2011–2018 as reported in biennial reports



211. In terms of volume, nearly all climate finance is provided by Annex II Parties (99.8 per cent). However, reporting on climate finance by Annex I Parties not included in Annex II is increasing over time, as these Parties diversify the pool of donors and increase the overall volume of climate finance provided to non-Annex I Parties. In the BR4s, 13 of 20 Annex I Parties not included in Annex II voluntarily provided quantitative information, and four Annex I Parties not included in Annex II provided qualitative information on climate finance, in either the BR text or the CTF tables (compared with 14 Annex I Parties not included in Annex II that provided quantitative information in the BR3s, 11 in the BR2s and 10 in the BR1s). Moreover, over the four reporting cycles, six Annex I Parties not included in Annex II have reported consistently (i.e. in each BR) on climate finance provided. Although the level of detail of information reported ranges from short, qualitative descriptions to fully quantified and completed CTF tables, the trend demonstrates a growing desire to transparently report on efforts to support other Parties.

212. As reported in the BR4s, total climate-specific support averaged USD 37.8 billion/year in 2017–2018, representing almost three quarters of the total support reported in the BR4s and an increase of 8.3 per cent over the previous biennium. Core/general support amounted to an annual average of USD 14.4 billion over the biennium, representing a 27.5 per cent share of the total. The growth in climate-specific support is likely the result of a number of factors: Parties have been under growing international pressure to provide more climate finance and are therefore responding with individual and collective commitments to fund climate-dedicated initiatives instead of contributions to more general environment and

[50] Comparisons with data from previous BRs have been calculated directly, without adjusting for inflation, and take into account submissions received since the compilation and synthesis of the BR3s. Data on BR3s will therefore differ from those published in the compilation and synthesis of the BR3s in 2018.

development funds; Parties have improved their reporting methodologies and are increasingly able to track and report their contributions in the relevant categories.

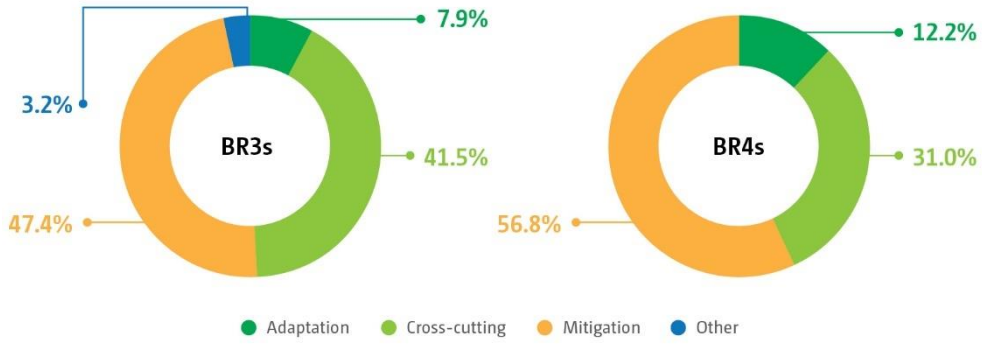
(b) Climate finance contributions through multilateral channels

213. Total multilateral support, including both climate-specific and core/general funding, averaged USD 18.4 billion per year in 2017–2018, representing an average increase of 5.7 per cent since the previous biennium.

214. In 2017–2018, 65 per cent (equivalent to USD 12.0 billion) of all multilateral funding was allocated as core/general funds, with the remaining approximately 35 per cent (equivalent to USD 6.4 billion) allocated through climate-specific channels.[51] As additional climate-dedicated funds and new initiatives emerge over time (e.g. the GCF), the share of climate-specific funding in total multilateral climate finance continues to grow. In the BR3s, for example, reported multilateral climate-specific funds amounted to roughly 27 per cent of the total climate finance, which in itself represented an increase since the BR2s. Consequently, the share of core/general funding continues to fall over the reporting cycles, with the largest decline occurring between the BR2s and BR3s, as Parties increase their overall support, they also tend to shift their support towards climate-specific initiatives (see para. 213 above).

215. Over half of all multilateral climate-specific finance was allocated to mitigation according to the BR4s; however, support for adaptation is a growing priority for many Parties. In 2017–2018, 56.8 per cent of climate-specific finance was allocated to mitigation, 31.0 per cent to cross-cutting measures and 12.2 per cent to adaptation. According to the BR3s, a larger share (41.5 per cent) of climate-specific finance in 2015–2016 was allocated to cross-cutting measures, slightly less than mitigation and considerably more than adaptation and 'other', respectively. The decline in cross-cutting and 'other' support as reported in the BR4s reflects the ongoing improvement and refinement of how Parties track, report and categorize their financial allocations, allowing more clearly defined allocations in the BR4s than previously. Figure 28 presents a comparison of multilateral support provided by thematic area as reported in the BR3s and BR4s.

Figure 28
Shares of climate-specific multilateral support by thematic area as reported in third (2015–2016) and fourth (2017–2018) biennial reports



216. Consistent with trends observed in previous BRs, multilateral climate finance continues to be allocated through a wide variety of institutions, including multilateral climate change funds, other climate change funds, multilateral financial institutions (including regional development banks) and specialized United Nations bodies, among others.

217. As reflected in the BR4s and as summarized in table 4, a larger volume of multilateral support was allocated through core/general channels compared to climate-specific channels, with the majority being provided through multilateral financial institutions (including regional development banks), the most notable being the World Bank. For climate-specific

[51] This value reflects a revision in the reporting of support from the European Investment Bank, a change that was made in the EU BR4 and applied retroactively to the BR3 to determine consistent trends.

support, the largest share was also channelled through multilateral financial institutions (including regional development banks) but allocated to the category other, which includes all other institutions not included in table 4.

218. A significant share of climate-specific support was also channelled through multilateral climate change funds, with the GCF receiving the largest share. Since 2015, 26 Parties (including six Annex I Parties not included in Annex II) have made at least one contribution to the GCF, with 12 of these having contributed once in 2015–2016 and once in 2017–2018, and nine having contributed every year since 2015 (for further information on the GCF, see box 16).

Box 16
The Green Climate Fund

The GCF (see www.greenclimate.fund) was founded in 2010 as an operating entity of the Financial Mechanism with the aim of responding to the pressing mitigation and adaptation needs of developing countries. With a goal of raising USD 100 billion per year by 2020, the GCF accepts funds from a range of donors, from developed country Parties to the UNFCCC to other public, non-public and alternative sources, in the form of grants, capital and loans. Over the initial mobilization period of the Fund, USD 10.3 billion was pledged, of which USD 8.2 billion has been subsequently confirmed. In the recent first replenishment period, which launched in October 2018, an additional USD 9.8 billion has been pledged to date.

From a donor's perspective, the GCF is rather unusual in that it includes donors from Annex II, non-Annex II and nine developing country Parties (Chile, Colombia, Indonesia, Mexico, Mongolia, Panama, Peru, Republic of Korea and Viet Nam). Additionally, the GCF aims for a 50:50 balance between mitigation and adaptation investments over time. To date, it has funded 56 adaptation projects, 35 mitigation projects and 32 cross-cutting projects. Recognizing that emissions from AFOLU are responsible for close to one quarter of all anthropogenic GHG emissions, the GCF has dedicated a portion of its funding to supporting a range of REDD+ activities, from readiness funding to results-based payments for reductions already achieved. Other focal areas include buildings, cities, industries and appliances; ecosystems and ecosystem services; energy; health, food and water security; infrastructure; livelihoods of vulnerable communities; and transport.

Given the critical role the private sector plays in leveraging the trillions of dollars needed to combat climate change, the GCF Private Sector Facility mobilizes private sector actors, including institutional investors, in support of its work. The primary aim of the Facility is to change the current financial paradigm by de-risking the delivery of private capital and scaling up private sector investment flows for low-carbon and climate-resilient development. As at October 2019, 25 private sector projects had been approved, amounting to USD 2.2 billion in resources, ranging from loans to guarantees, grants and equity, which has mobilized an additional USD 7 billion in co-financing. Approved projects through the Facility are expected to deliver 1.1 Gt CO_2 eq in mitigation, reaching an estimated 47 million beneficiaries.

219. The channels used for core/general contributions reported in the BR4s differ in a number of ways from those reported in the BR3s. While the overall amount of core/general funding provided through multilateral channels has increased slightly (by 3.1 per cent), the amount of core/general support channelled through multilateral climate change funds and specialized United Nations bodies has declined (by 10.0 and 16.1 per cent, respectively). Climate-specific support has slightly increased since the BR3s, with overall contributions increasing by 8.9 per cent.[52] Although climate-specific contributions to multilateral climate change funds and specialized United Nations bodies have declined since the BR3s (by 29.0 and 9.8 per cent, respectively), climate-specific allocations through multilateral financial institutions (including regional development banks) have increased substantially (by 40.9 per cent).

[52] This value reflects a revision in the reporting of support from the European Investment Bank, a change that was made in the EU BR4 and applied retroactively to the BR3 to determine consistent trends.

Table 4
Financial contributions provided through multilateral channels as reported in fourth biennial reports
(Millions of United States dollars)

	2017		*2018*	
	Core/general	*Climate-specific*	*Core/general*	*Climate-specific*
Total contributions through multilateral channels	**11 008.4**	**6 035.7**	**12 938.8**	**6 720.5**
Multilateral climate change funds	**774.3**	**1 882.7**	**602.1**	**1 613.1**
1. Global Environment Facility	607.2	265.2	481.7	277.4
2. Least Developed Countries Fund	2.0	111.1	4.0	87.0
3. Special Climate Change Fund	0.5	0.5	0.5	0.5
4. Adaptation Fund	0.0	82.2	0.0	109.7
5. GCF	120.4	1 288.9	66.8	975.1
6. UNFCCC Trust Fund for Supplementary Activities	1.1	3.5	0.5	4.3
7. Other multilateral climate change funds	43.1	131.2	48.7	159.2
Multilateral financial institutions, including regional development banks	**8 950.1**	**3 861.1**	**11 035.4**	**4 859.2**
1. World Bank	5 237.5	350.7	6 924.8	754.4
2. International Finance Corporation	98.6	92.6	11.4	15.2
3. African Development Bank	1 141.4	97.2	1 232.3	140.4
4. Asian Development Bank	559.2	29.5	412.6	33.1
5. European Bank for Reconstruction and Development	3.5	0.0	6.3	2.9
6. Inter-American Development Bank	50.0	11.8	18.2	7.0
7. Other	1 859.8	3 279.2	2 429.8	3 906.2
Specialized United Nations bodies	**1 284.1**	**291.9**	**1 301.3**	**248.2**

220. A notable change observed between the BR3s and BR4s is the increased channelling of support through the GCF. Parties are increasingly turning to the GCF to channel both core/general funding and climate-specific funding. According to the BR4s, the GCF has become the second-leading channel for core/general funding (after the Global Environment Facility). The GCF has also become the dominant channel for climate-specific funding, holding a 64.8 per cent share of multilateral climate change funds.

(c) Climate finance contributions through bilateral, regional and other channels

221. Total support through bilateral, regional and other channels includes both climate-specific and core/general funds and amounted to an annual average of USD 33.8 billion in 2017–2018. As reported in the BR4s, a larger volume of support was channelled through bilateral, regional and other channels (around two thirds) than through multilateral channels (approximately one third). Since the biennium 2015–2016, average bilateral, regional and other support has increased by 6.1 per cent.

222. Climate-specific support delivered through bilateral, regional and other channels accounted for 93.1 per cent of the total provided through these channels, amounting to an annual average USD 31.4 billion in 2017–2018. The remaining 6.9 per cent was considered core/general funding.

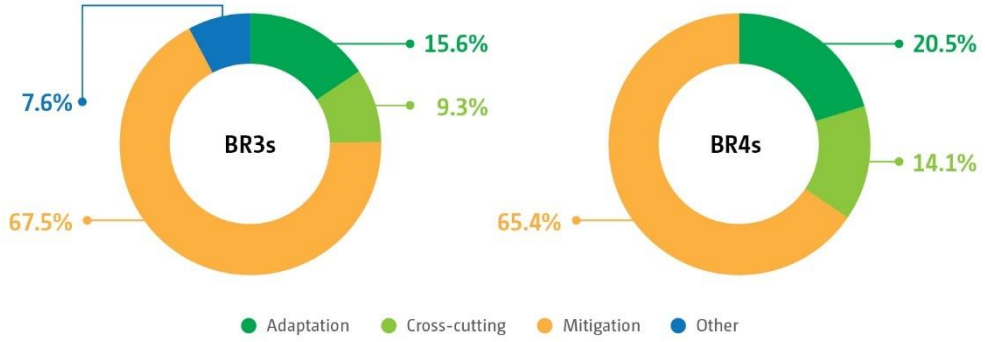
223. While a similar split between climate-specific and core/general was reported in the BR3s (i.e. a large majority was reported as climate-specific), it is not possible to directly compare bilateral, regional and other channels between the two bienniums owing to discrepancies across Parties' reporting (see chap. VII.B.2 below).

224. According to the BR4s, the largest share of climate-specific finance delivered through bilateral, regional and other channels was dedicated to mitigation (65.4 per cent, with the annual average in 2017–2018 amounting to USD 20.6 billion), followed by adaptation (20.5 per cent, USD 6.4 billion) and cross-cutting activities (14.1 per cent, USD 4.4 billion).

Despite a greater total volume of support being allocated to mitigation as reported in the BR4s, 18 Parties provided more support for adaptation than mitigation.

225. Since the BR3s, average bilateral, regional and other support for adaptation has increased by 42.5 per cent, support for cross-cutting activities by 63.7 per cent, and support for mitigation by 4.6 per cent. Figure 29 presents a comparison of the shares of bilateral, regional and other finance by thematic area as reported in the BR3s and BR4s.

Figure 29
Shares of bilateral, regional and other support by thematic area as reported in third (2015–2016) and fourth (2017–2018) biennial reports



226. In their BR4s, nearly all Parties identified how support channelled through bilateral, regional and other channels was allocated by sector. As reported in CTF table 7(b), Parties categorized their sectoral funding under energy, transport, industry, agriculture, forestry, water and sanitation, cross-cutting and other or not applicable. However, the way in which Parties reported support provided by sector differed greatly, making it challenging to report estimated values.

227. For example, where funding targeted multiple sectors, instead of allocating each portion to its respective sector, some Parties reported the entire amount under the sector that received the largest share, thereby skewing the sectoral distribution. In other cases, Parties classified their support as multisectoral or other, instead of identifying (a) specific sector(s), thereby obscuring more detailed allocations. While the classification of support as multisectoral or other was widespread in the BR3s because Parties faced difficulties allocating support to specific sectors, the sectoral reporting in the BR4s reflects a growing trend towards using more specific OECD DAC purpose codes for identifying the sectors to which funds are allocated.[53] However, while the DAC codes are more specific, they do not map directly to the sectors used in the CTF tables. As a result, the DAC codes are often reported as other in the CTF tables, even where they clearly refer to a specific sector or subsector. For example, DAC-coded support for energy generation – renewable resources is reported as other (energy generation – renewable resources) in the CTF tables, which, when aggregated, obscures sectoral trends by grouping the largest share of contributions into the category other (see chap. VII.B.2 below for a more detailed discussion of how Parties reported on sectors and the implications).

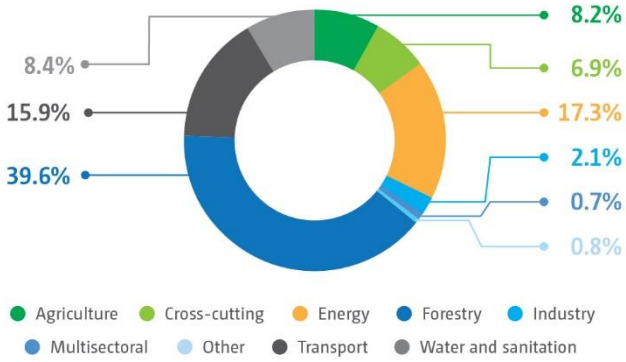
228. For this report and in order to facilitate a compilation and synthesis of climate finance by sector, the data reported by Parties have been categorized as follows: values reported as other followed by an OECD DAC sector code have been retained under the sector other; and values reported as belonging to multiple sectors have been allocated under multisectoral. The resulting values indicate that, in the BR4s, the largest share of support through bilateral, regional and other channels was allocated to other.

229. With the largest share of funding by sector (39.6 per cent) reported as other, it is challenging, if not impossible, to allocate to specific sectors, or to ascertain how sectoral trends may have changed over time. However, the finance not reported as other, which can be allocated to specific sectors, helps to provide some insight into the allocation of such

[53] See www.oecd.org/development/financing-sustainable-development/development-finance-standards/purposecodessectorclassification.htm.

funding by sector as reported in the BR4s: energy (17.3 per cent), transport (15.9 per cent), water and sanitation (8.4 per cent), agriculture (8.2 per cent), cross-cutting (6.9 per cent), forestry (2.1 per cent), industry (0.7 per cent) and multisectoral (0.8 per cent). Figure 30 illustrates the allocation of bilateral, regional and other climate finance by sector as reported in the BR4s.

Figure 30
Allocation of bilateral, regional and other support by sector as reported in fourth biennial reports (2017–2018)



230. A comparison of the allocation of climate finance by sector with that reported in the BR3s is also difficult to achieve, given that sectoral distribution was similarly limited by reporting challenges. While some of the detailed insight into sectoral reporting is lost in the BR4s owing to the allocation of financial support to the sector other, in the BR3s Parties relied heavily on classifying support as multisectoral to simplify the reporting by sector.

231. It is also worth noting that a number of Parties reported in their BR4s on an expanded range of topics relating to climate finance, including some that were not previously reported (see box 17 for an example of such reporting, on climate finance and gender).

Box 17
Climate finance and gender

In their BR3s, a number of Parties underscored the need to better integrate gender considerations into climate finance. Subsequently, six Parties voluntarily expanded the scope of their reporting to include information on climate finance and gender in their BR4s. Several included detailed qualitative descriptions of gender-related climate finance provided and/or included quantitative information in the CTF tables, where gender was identified as another sector.

Sweden reported on its efforts to champion gender integration in multilateral climate funds, including by promoting separate gender policies and gender-responsive action plans. As a result, the integration of gender is improving over time, in turn increasing the efficiency and long-term sustainability of climate projects. Sweden's voluntary use of the OECD DAC gender policy markers to track gender integration in climate finance facilitated an assessment of the level of gender integration in its operations (estimated at 87–88 per cent). While this assessment shows a slight increase in gender integration in cross-cutting target areas, Sweden noted that there is still further scope for improvement of gender integration within its mitigation and adaptation actions. Sweden's voluntary reporting on gender in its BR4 was intended to improve the tracking of progress, stimulate further integration of gender in climate finance and encourage other Parties to do the same.

Ireland highlighted the EUR 500,000 provided to the UNFCCC gender action plan with the aim of providing a significant contribution towards ensuring gender-responsiveness at all levels, including technical assistance to Parties and collaboration with other key bodies under the Convention. In the 2018 Irish Aid publication *Women as Agents of Change: Towards a Climate and Gender Justice Approach*,[a] Ireland highlighted the need for greater global support for gender equality, social movements and institutional transformation as a means of unlocking the powerful potential of women in fighting climate change. To reach this objective, Ireland urged Parties to take more action on gender and climate, including pro-poor access to clean energy, gender-sensitive climate-resilient agriculture,

strengthened social protection mechanisms, improved women's access to land tenure, and further exploration of the emerging interlinkages between gender, climate and health-care issues.

Australia reported on the USD 11 million in support it provided for a negotiator training programme for Pacific Island women delegates new to the climate negotiations process. The funding is aimed at building the capacity of women delegates from Pacific Island nations to engage more effectively in the process, as well as to increase understanding and awareness of the gender dimensions of climate change. The programme, which provides multi-year, multi-tier training and travel support, assists women leaders in 12 Pacific Island nations, enhancing their ability to advocate for improved climate policies.

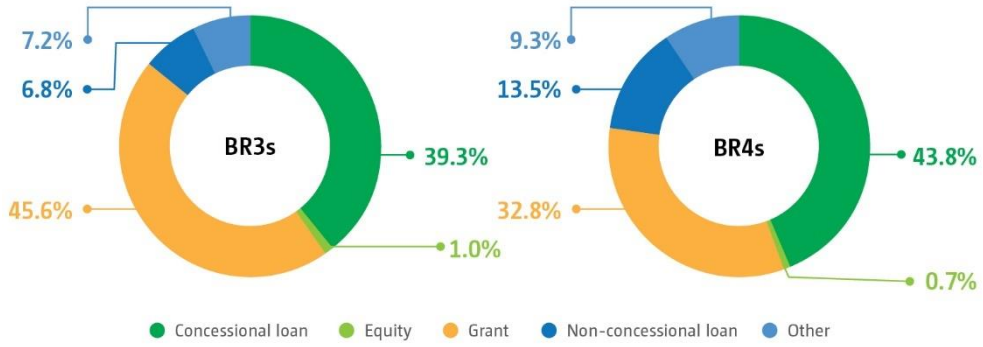
Canada noted that women and girls are disproportionately affected by climate impacts despite their key role in addressing climate change. In response, and in line with its feminist foreign aid policy, Canada's climate finance places a strong emphasis on women's empowerment and gender equality. In 2018, Canada contributed 4 million Canadian dollars to support research and capacity-building with the aim of reducing social inequality, promoting gender parity and empowering women and girls in Argentina, Bangladesh, Benin, the Democratic Republic of the Congo, Nepal and Nigeria.

[a] Irish Department of Foreign Affairs. *Women as Agents of Change: Towards a Climate and Gender Justice Approach*. Available at www.irishaid.ie/media/irishaid/publications/18-107-Women-as-agents-of-change.pdf.

232. In the BR4s, Parties reported information on financial instruments used to provide bilateral, regional and other climate finance. According to the information provided in CTF table 7(b), the largest share of finance was provided in the form of concessional loans (43.8 per cent, amounting to an annual average of USD 13.8 billion in 2017–2018), followed by grants (32.8 per cent, USD 10.3 billion), non-concessional loans (13.5 per cent, USD 4.2 billion), other (9.3 per cent, USD 2.9 billion) and equity (0.7 per cent, USD 223 million). Where specified, other instruments included capital subscriptions, shares, interest grants and subsidies, equity acquisitions and shares, guarantees, in-kind contributions, membership fees, scholarships and export credits.

233. Parties reported a larger share of concessional and non-concessional loans in the BR4s than in the BR3s, but a smaller share of grants. For the biennium 2015–2016, the annual average share by instrument was reported as follows: grants (45.6 per cent), concessional loans (39.3 per cent), non-concessional loans (6.8 per cent), other (7.2 per cent) and equity (1.0 per cent). Figure 31 presents a comparison of the reported use of financial instruments between the BR3s and BR4s.

Figure 31
Shares of bilateral, regional and other support by financial instrument as reported in third (2015–2016) and fourth (2017–2018) biennial reports



234. In a number of cases, Parties elaborated in their BR4s on the financial instruments used, including some new and innovative instruments such as climate insurance and risk reduction measures (see box 18 for an example).

Box 18
Risk reduction and insurance as an emerging form of climate finance

In the BR3s, when describing the instruments used to deliver climate finance through bilateral, regional and other channels, Parties reported using mainly traditional financial instruments such as grants, loans and concessional loans, with some indicating the instruments used as other. In the BR4s, five Parties

elaborated on using one specific instrument – insurance – as a way to provide climate support. The use of insurance reflects a growing understanding of the diversity of tools for addressing climate change, as insurance initiatives can help to manage risk, encourage private sector investment, allow for flexible cost-sharing arrangements, provide faster and more effective relief to those affected, and target those at highest risk from climate impacts.

The InsuResilience (see www.insuresilience.org) Global Partnership for Climate and Disaster Risk Finance and Insurance Solutions was launched in November 2017 on the margins of COP 23. As a multi-stakeholder initiative, InsuResilience brings countries from across the Group of 20, as well as civil society, international organizations, the private sector and academia, together in a joint effort to provide disaster risk finance and insurance solutions to developing countries. Members include Canada, France, Germany, Japan, Switzerland and the United Kingdom.

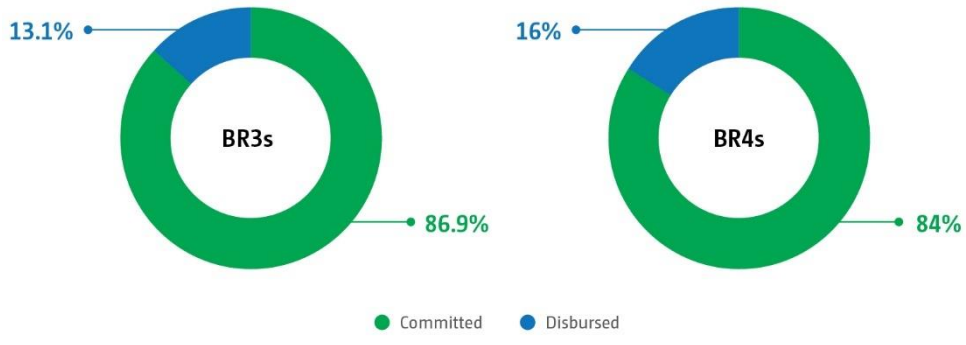
InsuResilience reflects the growing recognition that the impacts of climate change demand a step-change from reactive management to proactive investment, complemented by action to reduce and prevent risk where possible. Through new and expanded finance and insurance approaches, InsuResilience aims to strengthen developing country resilience by providing faster, more reliable and cost-effective responses to disasters.

With direct insurance for households and small businesses, and indirect insurance for governments and/or municipalities, InsuResilience aims to reduce and more effectively share risk, while helping to develop insurance markets and risk assessment tools in partner countries. Through financing for insurance and reinsurance companies, technical assistance and capacity-building, InsuResilience offers a range of tools for mitigating climate-related impacts, improving local adaptive capacity and strengthening local resilience against future impacts.

By 2020, InsuResilience aims to expand the number of poor and vulnerable people in developing countries covered by direct or indirect insurance by up to 400 million.

235. For the biennium 2017–2018, an annual average 84.0 per cent of climate-specific support was reported as committed, with the remaining 16.0 per cent reported as disbursed.[54] The reported proportion of disbursed support has slightly increased since the BR3s: for the biennium 2015–2016, Parties reported an average 86.9 per cent of climate-specific funding as committed, with the remaining 13.1 per cent being reported as disbursed. Figure 32 presents a comparison of climate-specific bilateral, regional and other climate finance by status as reported in the BR3s and BR4s.

Figure 32
Shares of bilateral, regional and other support by status of funding as reported in third (2015–2016) and fourth (2017–2018) biennial reports

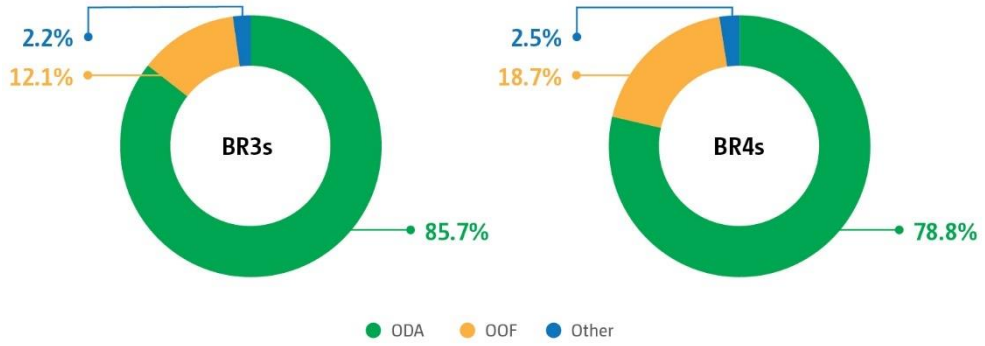


236. In the BR4s, Parties reported climate finance by source, indicating whether the source was official development assistance, other official flows or other. In 2017–2018, the largest share of support channelled through bilateral, regional and other channels was sourced from

[54] There are no agreed definitions for "committed" versus "disbursed" in the UNFCCC reporting guidelines on BRs. In the BR4s, most Parties characterized funding provided within the reporting year as disbursed; however, one Party noted that it considers such funding as committed on the basis that this is how the information is recorded for budgetary purposes. Additionally, some Parties reported only support that was disbursed over the reporting years and that was not newly pledged or committed funding.

official development assistance (78.8 per cent), followed by other official flows (18.7 per cent) and other (2.5 per cent), which represents a slightly smaller share of official development assistance and a slightly larger share of other official flows than reported in the BR3s (85.7 and 12.1 per cent, respectively). Figure 33 presents a comparison of climate-specific bilateral, regional and other climate finance by source of funding as reported in the BR3s and BR4s.

Figure 33
Shares of bilateral, regional and other support by source of funding as reported in third (2015–2016) and fourth (2017–2018) biennial reports



237. Although Parties are required to provide information on recipient country, region, project, programme and activity in the CTF tables for financial support provided through bilateral, regional and other channels, limited information was provided in the BR4s. The information provided in previous BRs by Parties on recipient countries was similarly limited and reported in varying degrees of detail. As a result, determining trends in geographic distribution of financial support continues to prove challenging.

(d) Private finance flows mobilized by public bilateral climate finance

238. From the information reported in the BR4s, it is clear that Parties are increasingly tracking and improving their reporting on climate-related private sector financial contributions. Within the narrative examples provided and the quantitative estimates reported, the BR4s reflect a growing engagement with the private sector, highlighting the critical role public funding can play in leveraging private sector support towards achieving the goals of the Convention and the Paris Agreement. Whereas only a few Annex II Parties reported quantitative information on private sector flows in the BR3s, more than half provided some form of quantified estimates in the BR4s, including information on public investments provided and estimates of the resulting private sector finance leveraged. The number of Parties not providing any information on private sector finance (i.e. neither qualitative nor quantitative) fell from 16 (of 43) in the BR3s to 11 (of 43) in the BR4s (see chap. VII.B.2 below). Table 5 provides an overview of the information reported in the BR4s on private climate-related finance mobilized.

Table 5
Private climate-related finance mobilized reported in fourth biennial reports
(millions of stated currency)

Party	*Description of contribution*	*Year/period*	*Amount provided*	*Estimated amount mobilized*
Australia	Public support for Business Partnerships Platform to provide matching finance for clean energy projects	2016–2018	AUD 0.5	AUD 0.5
Austria	Public support for climate action in developing countries	2017–2018	EUR 399.7	EUR 110.2
Canada	Official development finance assistance, including for climate action, to leverage private investment	2017–2018	USD 213	USD 309
Denmark	Public support to the Danish development financing institution	2017–2018	DKK 0.73	DKK 1.11

Party	*Description of contribution*	*Year/period*	*Amount provided*	*Estimated amount mobilized*
	(Investment Fund for Developing Countries)			
EU	European Commission direct investments in companies and/or shares in collective investment vehicles for mitigation or adaptation, including on energy and agriculture	2017–2018	EUR 374	EUR 878
Germany	Public support mobilized through the KfW Development Bank and the German Investment and Development Corporation	2018	EUR 3 426 (USD 3 800)	EUR 468 (USD 552)
Ireland	Public partnerships engaging private sector actors in developing countries	2018	EUR 0.24	EUR 0.24
Italy	Public support (grants, direct investment) in private companies and project finance	2015–2017	USD 29.53	USD 60.41
Japan	Co-financing through the Japan Bank for International Cooperation and trade insurance through Nippon Export and Investment Insurance	2017–2018	USD 20 500	USD 4 500
Netherlands	Public support for bilateral programmes, Climate Investor One, multi-donor funds, and multilateral climate funds and multilateral development banks	2017–2018	–	EUR 746
Norway	Public support mobilized through the Norwegian Investment Fund for Developing Countries invested in commercial renewable energy projects	2017–2018	–	USD 49
Sweden	Public support mobilized through Swedfund International Ltd and Climate Investor One in clean energy projects	2018	EUR 49.8	EUR 31.4
Switzerland	Public support mobilized through the Swiss Investment Fund for Emerging Markets, the Private Infrastructure Development Group and the Climate Investment Funds	2017–2018	–	USD 135.7
United Kingdom	Public support for sustainable infrastructure initiatives, and equity investments in clean energy and energy efficiency	2011–2012 to 2017–2018	GBP 3.8	GBP 1 400

Note: As the methodologies used to generate estimates of private climate-related finance mobilized differ considerably, estimates have not been aggregated for this report; rather, for indicative purposes, values (as reported by Parties) have been provided here and converted to millions of the stated currency.

239. Of the Parties that provided information on efforts to promote scaling up of private investment, various approaches were reported, such as deploying on-site expertise, mobilizing capital through various instruments, micro- and co-financing, and risk-sharing and insurance mechanisms to prevent and reduce losses. Several Parties elaborated on practices for maximizing private sector engagement, including through multisector dialogues to facilitate broad participation and strengthen and replicate successes, and using appropriately timed public support to leverage private interest at the later stages of the project cycle. Several Parties outlined how they had engaged the private sector in partner countries with the aim of building an enabling environment for future investment.

240. While few Parties provided quantitative estimates of private flows or information on leveraging ratios, a number indicated their intention to continue participating in the OECD Research Collaborative on Tracking Private Climate Finance. As a result, Parties may be better positioned to provide more detailed information on private climate finance in future BRs. For information on public–private collaboration, see box 19.

Box 19
Emerging trends in public–private climate finance collaboration

Mobilizing additional private sector finance is widely seen as key to meeting the goals of the Convention and the Paris Agreement. However, in their BR3s, fewer than half of Annex II Parties provided quantitative information on private financial flows leveraged by bilateral climate finance. As tracking and reporting systems improve, however, more and more Parties are beginning to recognize the importance of these contributions. In describing new and innovative means of engaging the private sector, the following multilateral and bilateral examples were noted.

Climate Investor One (see https://climatefundmanagers.com/funds/#CIO) is a multi-donor finance facility that uses blended finance to build renewable energy infrastructure in developing countries, with donors including the EU, the GCF, the United States Agency for International Development, the Nordic Development Fund and the Ministry of Foreign Affairs of the Netherlands. Through combined public and private funding, as well as development finance institution expertise and export credit agency guarantees, the facility aims to provide predictable financial support throughout the entire life cycle of each project. Public sector funds are used to leverage additional private investment, which in turn helps sustain projects through the early stages of design and construction through to completion.

To achieve full life cycle support, three different funds are deployed to address evolving needs in the project development cycle. At the development stage, up to 50 per cent of project costs are covered by the USD 50 million Development Fund, including loans and technical assistance. The USD 800 million Construction Equity Fund covers up to 75 per cent of construction costs via a range of donor, commercial and capital investments. Finally, once established, the USD 800 million Refinancing Fund will address long-term debt financing needs.

Denmark's **SDG Invest** (see https://sdg-invest.com), a public–private partnership launched in June 2018, will provide blended finance in the form of equity investments in partner countries across Africa, Asia, Latin America and parts of Europe, with the aim of contributing to the achievement of the SDGs.

Denmark's Investment Fund for Developing Countries provides 40 per cent of the total funds, with the remaining 60 per cent coming from private investors, including a number of Danish pension funds. By linking to an established fund, SDG Invest taps into a broad range of existing Danish expertise and collaboration with developing countries, while leveraging Danish pension funds is an innovative solution to the need for increasing private investment to achieve the SDGs.

SDG Invest targets projects across the 17 SDGs, from food security to inclusive economic growth, employment, climate change, gender equality and global health. At the close of its first round of investment (February 2019), the fund had attracted close to DKK 5 billion.

2. Improvements and challenges in reporting

241. Continuing the trend of improved reporting in comparison with previous BRs, Annex II Parties provided in their BR4s more detailed and complete information on their approaches to tracking climate finance (including private sector finance), provided information on the scope and definition of their financial support and improved the overall completeness of their reporting. Notable areas of improvement in the BR4s include the provision of more detailed information on currencies and currency conversion rates applied, use of common climate finance tracking systems for identifying and allocating climate finance to different funding areas (e.g. OECD DAC Rio markers), as well as use of common definitions for the status of support provided (committed, disbursed, etc.), financial instruments used (grants, loans, etc.) and sources of funding. Additionally, a number of Parties reported on an expanded range of sectors, including some that were not previously covered (e.g. gender).

242. Despite these overall improvements, several reporting challenges persist, which may continue to complicate future reporting, including:

(a) Data aggregation: The use of different approaches means a number of revisions are required to the reported values in order to allow aggregation, such as application of common currency conversions (where no rate was provided) and correction of any misreported information (e.g. errors in magnitude and data entry that have been confirmed by the Party). The resulting estimates more closely represent the actual sum of climate finance provided by Annex I Parties, although minor differences remain. As a further

consequence, the estimates reported here cannot be directly compared with those in the CTF tables, or with the information extracted from the BR data interface;[55]

(b) Core/general versus climate-specific support: Most Parties used the OECD DAC system to distinguish types of support, but applied different thresholds to impute the climate-specific portion of multilateral (and in some cases bilateral) support. While this increased comparability of results, not all imputed values are currently available from the multilateral institutions. As a result, some Parties were unable to impute the climate-specific share and instead reported all the relevant funding as core/general;

(c) Sectors: For multilateral support, Parties noted that sector allocations are made by the individual implementing institution and, therefore, not always known. Consequently, sector information is not always available or applicable. Parties reported as other any support for actions that fell outside of the sectors listed in the CTF tables (more than 125 unique subsectors were identified). This is in part due to the use of OECD DAC purpose codes and because Parties are seeking to showcase the breadth of their support, including in areas that are not currently listed (e.g. oceans);

(d) New and additional finance: Owing to the lack of an agreed definition, Parties defined these terms in relation to a wide range of factors, including annual budget appropriations; previous support levels (including fast-start support); previous BR reporting years; a single year (e.g. 2009); official development assistance as a percentage of gross national income; previous political decisions on official development assistance and/or climate support; or where funds are considered new and/or specific to climate change. A number of Parties provided no clarification of what they consider to be new and additional finance;

(e) Private climate-related finance: Parties emphasized that reporting on private flows is voluntary and that there is no internationally agreed standard for tracking private climate finance (with the exception of OECD efforts). As a result, a range of approaches were used, from estimation to conservative assessment, only reporting where agreed OECD reporting methods were available, and so on. Some Parties reported no estimates, noting either a lack of reporting capability or concerns about confidentiality. Few Parties provided quantitative estimates on private flows or information on leveraging ratios, but several indicated their intention to provide more detailed information on private climate finance in future BRs.

C. Technology development and transfer

243. All Annex II Parties that submitted a BR4 provided information on steps taken to promote, facilitate and finance the transfer of, or access to, climate technologies and know-how for developing countries. Those Annex II Parties also completed CTF table 8, describing a selection of technology activities that they have supported in developing countries. This reporting contributed to communicating their efforts to meet their commitments under Article 4, paragraph 5, of the Convention.

1. Support for technology development and transfer

244. Annex II Parties have more than doubled their number of technology development and transfer activities since 2012–2013. In the BR4s, 24 Annex II Parties reported a total of 425 activities (as reported in CTF table 8) relating to technological support provided to developing countries (compared with 303 activities reported in the BR3s and 170 in the BR1s). More than 70 per cent of these activities have been implemented, while the remaining are either at the planning stage or ongoing activities.

(a) Targeted areas

245. The technological support provided by Annex II Parties encompasses support for both hardware (equipment) and software (know-how, methods, practices). Annex II Parties provided equal amounts of support for hard and soft technologies, which is different from

[55] Available at https://www4.unfccc.int/sites/br-di/Pages/Home.aspx.

that reported in the BR3s (soft technology activities were supported 20 per cent more often than as reported in the BR4s). About 15 per cent of activities addressed both hard and soft technologies.

246. More than half (56 per cent) of the supported activities reported in the BR4s were mitigation technology activities. Support for adaptation technology activities made up a quarter (28 per cent) of all the supported activities. The remaining activities related to technologies that cut across both mitigation and adaptation. This distribution of mitigation, adaptation and cross-cutting activities is similar to that reported in the BR3s.

247. Several Annex II Parties highlighted that they had mainstreamed technology transfer activities in their development cooperation activities with a view to contributing to sustainable development and achievement of the SDGs. In this context, Parties provided examples of supported technology activities that, besides contributing to achieving climate action (SDG 13), also contributed to achieving other SDGs, such as no poverty (SDG 1), zero hunger (SDG 2), good health and well-being (SDG 3), clean water and sanitation (SDG 6), affordable and clean energy for all (SDG 7), decent work and economic growth (SDG 8) and industry, innovation and infrastructure (SDG 9) (see box 20).

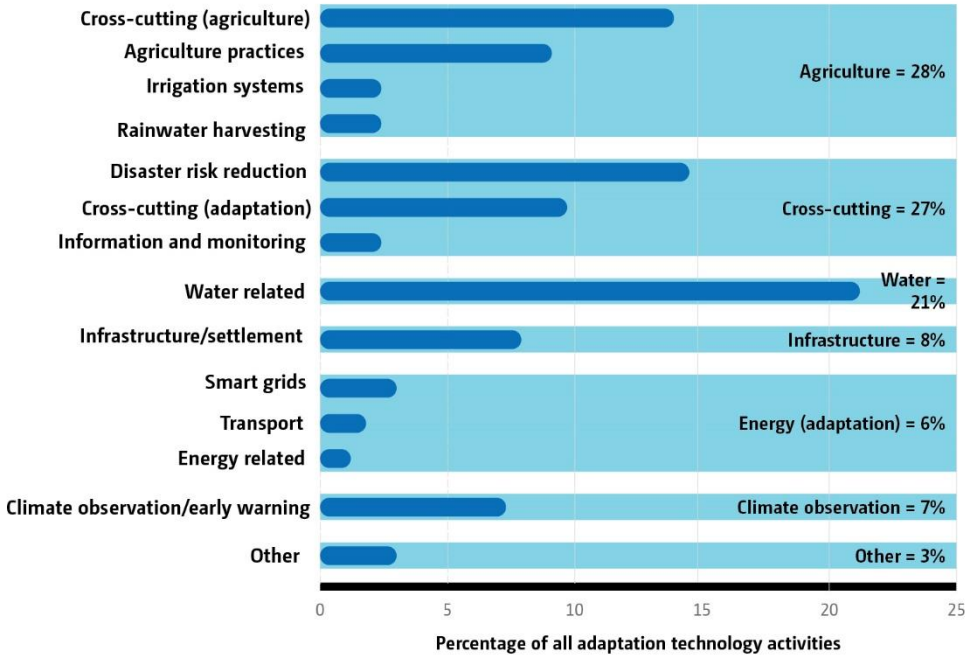
Box 20
Multilateral support for the Climate Technology Centre and Network

Canada, the EU, France, Germany, Sweden, Switzerland and the United States reported on providing support to the CTCN in their BR4s. The CTCN is the implementation arm of the Technology Mechanism, helping developing countries to scale up and speed up the development and transfer of climate technologies. It has three core services: providing technical assistance at the request of developing countries; fostering collaboration and access to information on climate technologies; and strengthening networks, partnerships and capacity-building. The United Nations Environment Programme, in collaboration with the United Nations Industrial Development Organization, hosts the CTCN, with the support of 11 partner institutions. As at 2020, the CTCN was responding to over 175 requests from developing countries on climate technology transfer activities (see www.ctc-n.org).

(b) Targeted sectors

248. Support for adaptation technology transfer activities mainly targeted the agriculture, cross-cutting and water sectors (see figure 34). This is slightly different from the support for adaptation technology activities reported in the BR3s, which was dominated by the cross-cutting sector. Many of the supported adaptation technology activities in the agriculture sector were related to agricultural practices, such as seed or crop improvements, climate-smart and/or biological farming, or general food security improvements, which were also frequently reported in the BR3s. Support for technologies that cut across adaptation sectors (cross-cutting technologies) were frequently related to general infrastructural development or research and development activities. Similar to the activities reported in the BR3s, disaster risk reduction activities were often reported by Parties, while the share of information-sharing activities has declined since the BR3s. As for the water sector, technologies such as water supply systems, water desalination and water harvesting were often reported in the BR4s.

Figure 34
Adaptation technology transfer activities reported by Annex II Parties in their fourth biennial reports

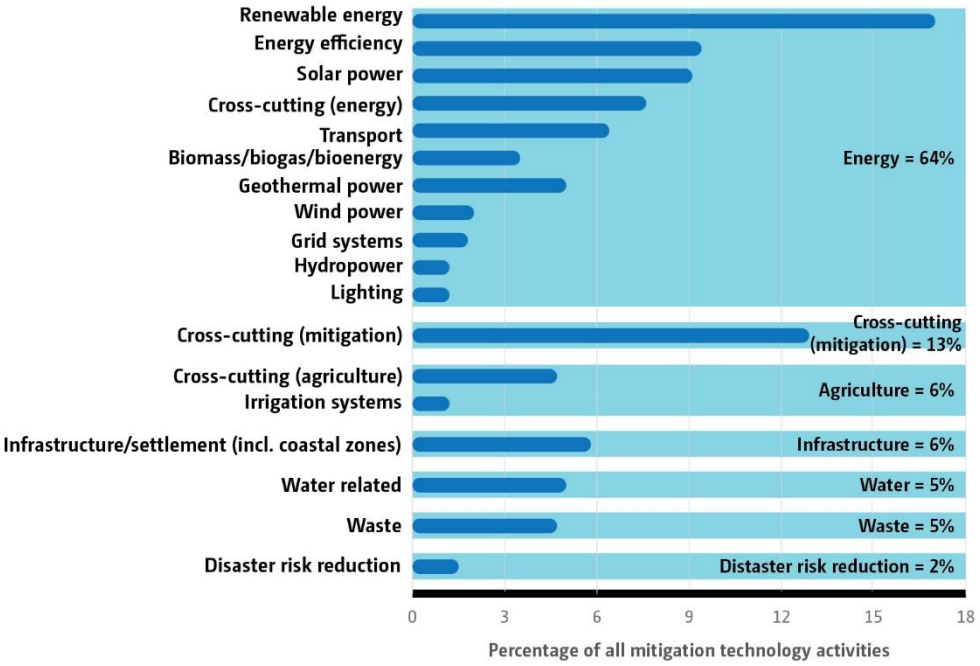


249. Support for mitigation technology transfer efforts continues to focus on the energy sector (about 64 per cent) (see figure 35). Other sectors such as agriculture, infrastructure, water and waste each represent a small share of support for mitigation technology efforts. The majority of support for mitigation efforts in the energy sector was related to renewable energy and energy efficiency. Support for renewable energy covered implementation of either general renewable energy technology efforts or specific renewable energy technologies, such as solar, biomass, geothermal, wind and hydropower. The focus on renewable energy technologies is comparable with the focus of the mitigation technology activities reported in the BR3s. Support for cross-cutting activities mainly focused on demonstration projects of specific technologies, including pilot projects and training, as well as research and development activities.

250. Some Parties highlighted that the support provided for technology transfer activities responded to the technology needs of developing countries. Parties underlined that activities were undertaken according to the specific needs and circumstances of recipient countries, acknowledging the different technological and capacity-building needs. Such activities ranged from support for renewable energy and energy efficiency equipment to training for operating and maintaining early warning systems. In this context, the technology activities reported by Parties in their BR4s are very much in line with the findings contained in the fourth synthesis report on prioritized technology needs identified by 53 non-Annex I Parties in their technology needs assessments.[56]

[56] FCCC/SBI/2020/INF.1.

Figure 35
Mitigation technology transfer activities reported by Annex II Parties in their fourth biennial reports



(c) Endogenous capacities and technologies

251. The Paris Agreement highlights the importance of developing and enhancing endogenous capacities and technologies to support developing countries in implementing the Paris Agreement. Several Parties provided support for building endogenous capacities and technologies in recipient countries so as to ensure sustainable uptake of climate technologies by target groups. In doing so, they highlighted that building endogenous capacities and technologies helps to ensure that technology transfer is implemented in country-specific ways, building on existing knowledge and practices and using local governance structures. Activities included collaborating with country partners at the proposal and design stage of activities and involving local people in installing and operating projects, followed up by tailored training programmes to ensure proper control, function and routine maintenance of the implemented climate technologies (see box 21 for examples).

Box 21
Bilateral support for endogenous capacities and technologies

Austria

Atmove – Biomethane Mobility for Brazil, a business partnership supported by the Austrian Development Agency, is working on biomethane-based mobility solutions to drastically reduce dependence on fossil fuels in rural areas of Brazil. The solutions target small and medium-sized farmers and municipalities, as well as agro-industry. In cooperation with the Brazilian partner and with funding from the Government of Austria, three targets were achieved:

- Atmove created an innovation hub to ‘tropicalize’ Austrian and European technology in the field of biogas production, methanation and mobility;
- Collaborative ties were forged with Austrian and Brazilian universities in the biogas sector and in particular with universities in the Brazilian State of Paraná;
- CH4PA, a prototype of a biomethane tractor, was constructed in line with the principles of frugal innovation and efficiency to meet local needs on the basis of a virtual prototype of an innovative mobile upgrading truck, which converts biogas to biocompressed natural gas on site and therefore massively reduces investment costs for farmers.

New Zealand

In addition to technology transfer delivered through the New Zealand Aid Programme, under the Global Research Alliance on Agricultural Greenhouse Gases, New Zealand promotes and facilitates the development of agriculture-specific endogenous and non-endogenous capacities and technologies of developing country Parties. New Zealand's support enables developing countries to implement their commitments, in particular by:

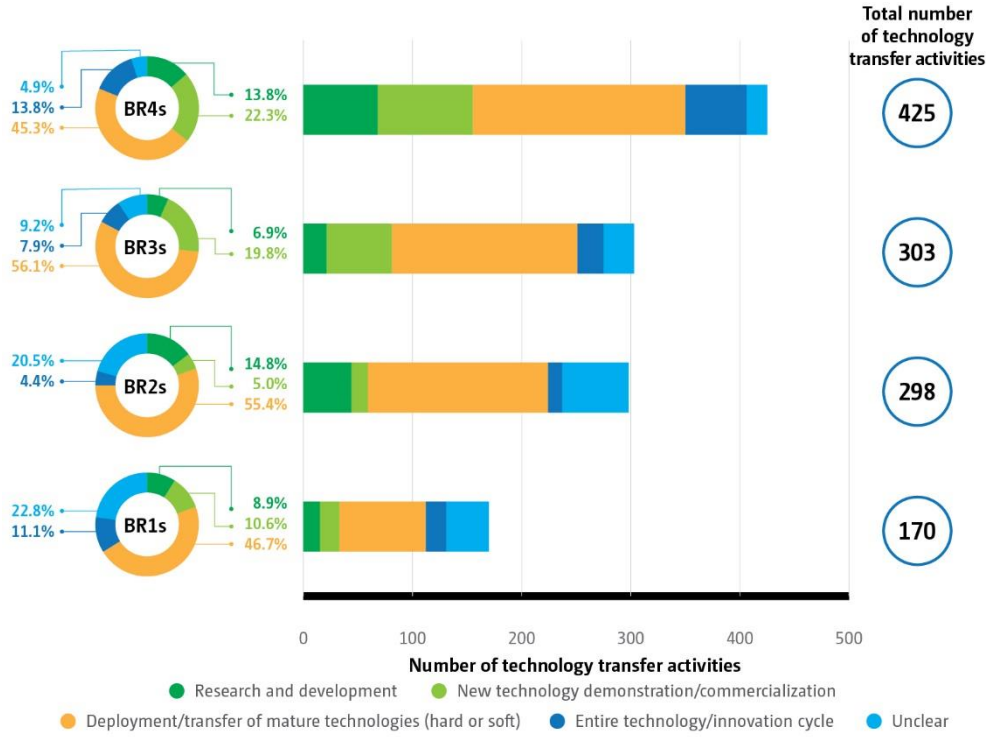
- Developing national agricultural inventories;
- Developing, applying and diffusing, including transferring, technologies, practices and processes that control, reduce or prevent GHG emissions in the agriculture sector;
- Conserving and enhancing GHG sinks and reservoirs in terrestrial ecosystems.

(d) Support by stage of technology cycle

252. Using the concept of the technology cycle, as defined in the Cancun Agreements, is a common way to differentiate the core activities involved in the process of technology development and transfer. As such, the supported activities of Parties can be distinguished by the four stages of the technology cycle: research and development, new technology demonstration, deployment of mature technologies and the entire technology cycle (from research to deployment).

253. Some Parties highlighted that the technology support they provided also aimed at contributing to achieving the goals of the Paris Agreement and implementing NDCs. The Paris Agreement highlights the need to support collaborative approaches to research and development and facilitate access to technology, in particular for the early stages of the technology cycle (research and development and technology demonstration). The technology activities reported in the BR4s are predominantly related to the later stages of the technology cycle (see figure 36). However, support for the early stages of the technology cycle has increased since previous BRs. As reported in the BR4s, technology activities in the early stages of the technology cycle represented more than one third of all supported activities, compared with about a quarter according to the BR3s (see box 22 for an example).

Figure 36
Distribution of technology support by stage of technology cycle reported by Annex II Parties in their biennial reports



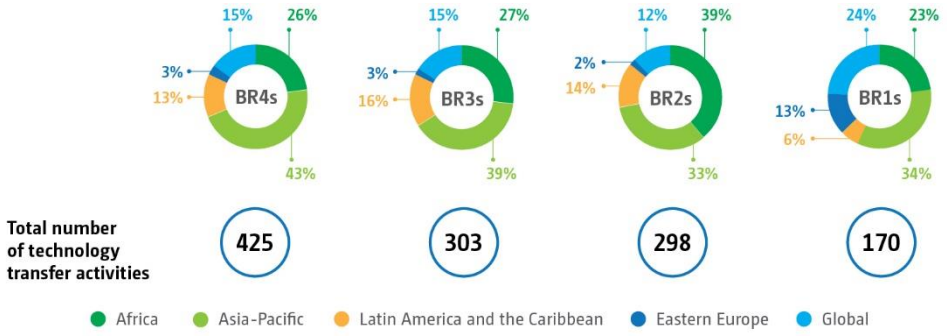
Box 22
Multilateral support for research and development through Mission Innovation

Mission Innovation is a global initiative of 24 countries and the European Commission. The 25 members have committed to seeking to double public investment in clean energy research, development and demonstration and are engaging with the private sector, fostering international collaboration and celebrating innovators. The Mission Innovation 1.5 °C Compatible Solutions Framework, developed and led by Sweden, is supporting accelerated uptake of disruptive solutions by providing increased transparency of actual and potential emission reductions, making it easier for governments, companies and investors to identify, support and fund the next generation of innovators. The Framework builds on existing initiatives of small and large companies, incubators, academia and other organizations that have begun to quantify the GHG emission impacts of goods and services.

(e) Geographical distribution of technology transfer support

254. Asia-Pacific continued to benefit most from the reported technology support (see figure 37), with almost half (43 per cent) of all technology support focusing on the region. Support for technology for the Africa region (26 per cent) and Latin America and the Caribbean (13 per cent) has also not changed significantly since the BR3s. Parties targeted more than half (62 per cent) of technology activities reported in the BR4s to activities in the least developed countries and small island developing States, which is a slight decrease compared with the proportion reported in the BR3s (68 per cent).

Figure 37
Distribution by region of technology transfer activities reported by Annex II Parties in their biennial reports



(f) Implementation channels

255. Annex II Parties engaged in supporting technology activities at the bilateral, regional and multilateral level. The focus on bilateral activities has increased (61 per cent of all technology activities in the BR4s, compared with 54 per cent in the BR3s). Regional and multilateral activities made up about 17 and 22 per cent, respectively, of all technology activities (compared with 23 per cent each in the BR3s). Bilateral cooperation continues to be the predominant channel of international support for climate technology activities.

256. While sources of funding for supporting implementation of technology activities were in most cases public (a finding consistent with that in previous BRs), the majority of activities reported in the BR3s were undertaken by public institutions (57 per cent), while in their BR4s Parties reported that the majority of activities were undertaken by public–private partnerships (58 per cent), representing a significant change in terms of the increasing role of public–private partnerships in undertaking technology transfer activities (see box 23 for examples).

Box 23
Bilateral support through public–private partnerships

Japan

Japan has been supporting the dissemination of advanced low-carbon and decarbonizing technologies through public–private partnerships via the Joint Crediting Mechanism, through which Japan has established partnerships with 17 countries and supported more than 160 projects. Japan will also support

the introduction of waste power generation as part of the environmental infrastructure and waste management systems. It will also support the optimization of existing infrastructure and operation and maintenance by private companies by utilizing the Internet of things, which contributes to emission reduction and visualization of reduction effects.

United Kingdom

The Transforming Energy Access programme is providing up to GBP 65 million over five years to support the early-stage testing and scale-up of innovative technologies and business models that will accelerate access to affordable, clean energy services for poor households and enterprises, especially in Africa. The programme will include a partnership with the Shell Foundation, enabling support to be provided to at least 30 early-stage private sector innovations; using Innovate UK's Energy Catalyst to stimulate technology innovation by United Kingdom enterprises; building other strategic clean energy innovation partnerships (e.g. testing a new peer-to-peer solar crowdfunding platform, and scoping a potential new partnership with the Gates Foundation on Mission Innovation); and developing skills and expertise.

2. Improvements and challenges in reporting

257. In their BR4s, Parties continued to improve the completeness and transparency of their reporting on technology transfer. However, they encountered a few challenges in reporting:

(a) Some Annex II Parties stated that the support provided for technology activities reported in their BR4s only represents a selection of activities and as such does not constitute an exhaustive list of support provided for technology activities;

(b) Most Annex II Parties highlighted that support provided for technology activities is an integral part of larger activities related to climate change mitigation or adaptation, encompassing both hardware (equipment) and software (know-how, methods, practices). In this respect, some Parties also highlighted challenges in reporting on technology activities regarding the disaggregation of finance, technology and capacity-building support;

(c) Several Parties did not indicate whether or not their reported technology activities were characterized as success or failure stories, with some Parties reporting the lack of a clear definition and criteria for evaluating the success or failure of a climate technology activity;

(d) Many Parties did not report on support for the development and enhancement of endogenous capacities and technologies. Some reported a lack of common understanding among various stakeholders on what endogenous capacities and endogenous technologies are and what developing and enhancing them might mean.

D. Capacity-building

258. In their BR4s, as per the UNFCCC reporting guidelines on BRs, Parties reported on capacity-building support both qualitatively in the BR text and quantitatively in CTF table 9. While the reporting requirement applies to Annex II Parties, several EIT Parties also reported on providing support to other EIT Parties or developing countries for capacity-building activities.

259. The current institutional arrangements for capacity-building under the Convention comprise the frameworks for capacity-building in developing countries established under decision 2/CP.7 and in EIT countries established under decision 3/CP.7, the Durban Forum and the Paris Committee on Capacity-building,[57] whose mandate is to address current and emerging gaps and needs in implementing and further enhancing capacity-building in developing countries.

1. Capacity-building support

260. Parties have significantly strengthened their provision of capacity-building support since the BR1s. In the BR4s, 27 Parties provided information on support provided to

[57] See https://unfccc.int/pccb.

developing countries for a total of 702 capacity-building activities, a significant increase compared with the 395 activities reported in the BR3s and the 400 projects reported in the BR2s. Most of those projects have been completed, although some are ongoing.

261. Parties reported their capacity-building support at varying levels of detail. Some included only a few representative projects that could be categorized as capacity-building projects, while others included all projects that had a capacity-building component. In addition, the classification of projects differed considerably between Parties. Table 6 provides a quantitative summary of all capacity-building projects reported in CTF table 9 of the BR4s, although it may not capture the entire range of capacity-building support provided by Annex II Parties and Annex I Parties not included in Annex II to developing countries in 2017–2018. Japan funded the highest number of capacity-building projects, followed by Italy and New Zealand, respectively, with the contribution from these Parties accounting for 51 per cent (356 projects) of the projects supported in 2017–2018. Of the total projects, 40 per cent targeted adaptation and 28 per cent supported mitigation.

Table 6
Number of capacity-building support projects reported by Annex II Parties and Annex I Parties not included in Annex II in their fourth biennial reports

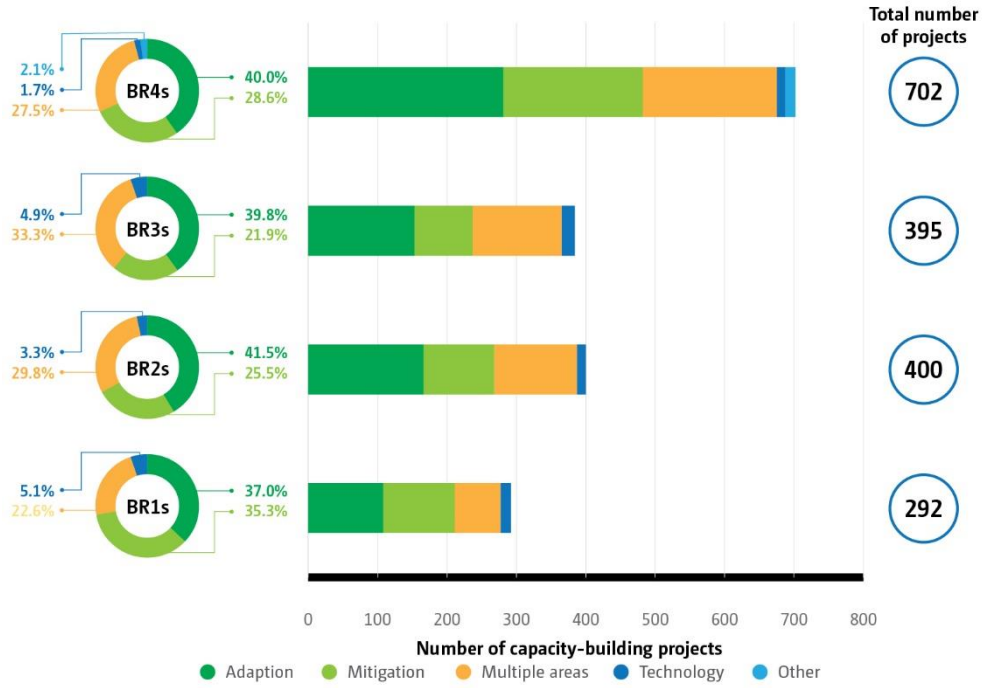
Party	*Capacity-building projects supporting mitigation*	*Capacity-building projects supporting adaptation*	*Capacity-building projects supporting multiple areas*	*Capacity-building projects supporting technology transfer*	*Capacity-building projects supporting other areas*	*Total capacity-building projects*
Australia	5	4	4	–	–	13
Austria	6	7	3	–	–	16
Belgium	10	6	3	–	–	19
Canada	5	1	4	–	8	18
Czechia[a]	6	12	4	–	–	22
Denmark	10	1	13	–	–	24
EU	5	1	3	–	–	9
Finland	2	–	3	–	–	5
France	4	2	7	–	3	16
Germany	1	1	2	–	–	4
Greece	–	2	1	–	–	3
Iceland	2	2	2	–	–	6
Ireland	3	7	7	–	–	17
Italy	4	1	49	2	–	56
Japan	91	121	38	–	–	250
Kazakhstan[a]	–	–	1	–	–	1
Latvia[a]	–	–	2	–	–	2
Luxembourg	2	6	3	4	–	15
Netherlands	3	23	7	–	–	33
New Zealand	23	23	4	–	–	50
Portugal	2	9	–	–	–	11
Russian Federation[a]	2	–	1	3	–	6
Slovakia[a]	–	27	–	–	–	27
Spain	6	8	25	3	3	45
Sweden	1	7	5	–	1	14
United Kingdom	3	6	1	–	–	10
United States	5	4	1	–	–	10
Total	**201**	**281**	**193**	**12**	**15**	**702**

[a] Not an Annex II Party.

(b) Distribution of capacity-building support across thematic areas

262. Similar to in 2015–2016, in 2017–2018 more support was provided for capacity-building action on adaptation than on mitigation: 281 projects were focused on adaptation, whereas 201 projects were reported as distinctly supporting mitigation. Figure 38 illustrates the distribution of the capacity-building activities reported across thematic areas as reported in the BRs.

Figure 38
Share of capacity-building projects by thematic area reported in biennial reports



263. As part of their capacity-building support for adaptation, Annex II Parties and Annex I Parties not included in Annex II assisted developing countries with integrating climate resiliency into existing and new infrastructure and advancing the green transformation of their agricultural and forestry practices, among other activities. The sustainable development and management of water resources, especially for agricultural irrigation, and waste management were some of the notable areas of support for adaptation (see box 24 for examples). Efforts were made to reduce the vulnerability of the rural population to climate risks, including by providing insurance coverage in developing countries.

Box 24
Capacity-building supporting adaptation

Japan–Bali
Bali Beach Conservation Project (phase II)

In addition to protecting the coast of eastern Bali, which is expected to be a new sightseeing spot, the project helps to strengthen the capacities of organizations responsible for coastal maintenance and management. Through sustainable coastal management and reduction of coastal erosion, the aim is to prevent disaster in coastal areas and contribute to promoting the Bali tourism industry, the development of regional economies and adaptation to climatic change.

Germany–Peru
Rehabilitation and prevention of climate-caused damage (water sector)

In Peru, the generally difficult conditions in the coastal drylands are exacerbated by the impacts of climate change. Effects that are already being felt include a reduction in water availability and an increase in extreme weather events leading to risks of damage and loss of water infrastructure. Therefore, to increase climate resiliency, the programme supports water utilities in vulnerable coastal cities by strengthening their drinking water and wastewater systems. Infrastructure and capacity development measures are being implemented in water system management, such as introducing

technologies in the areas of remote sensing and system control and promoting use of climate-resilient materials in urban systems.

New Zealand–Uruguay
Family Farm Improvement Project

This project aimed to improve the profitability and viability of family farms in Uruguay, using environmentally sound farming practices and technologies; developing informed policy; and through effective technology transfer and extension, particularly new monitoring systems for farm performance and environmental impacts and new pasture technologies. The project facilitated the learning process, including farmer-to-farmer learning and 'train the trainer' programmes, and strengthened rural support networks to create a platform of people, tools and practices to lay the foundation for ongoing development.

264. Capacity-building support for mitigation reported in the BR4s was primarily provided for activities aimed at strengthening measures to reduce emissions from land use, deforestation and forest degradation; increasing developing countries' readiness for carbon markets; and promoting low-carbon development, which is similar to that reported in the BR3s (see box 25 for examples).

Box 25
Capacity-building activity supporting mitigation

The Energy Sector Management Assistance Program is administered through a World Bank trust fund. It generates knowledge, provides technical support and specializes in analysis and the provision of technical assistance to low- and middle-income countries to strengthen national institutions with a view to establishing sustainable energy solutions for poverty reduction and economic development. The technical assistance and policy support are tailored to countries' needs in the areas of policy development and sector reform to enable them to access investments financed by the World Bank, other parties or by the countries themselves. The Program also supports the development of information and tools for decision makers, technical specialists and financiers and creates a forum for sharing experience and best practices. It cooperates with Sustainable Energy for All and has been developed to contribute to the achievement of the SDGs (mainly SDG 7) and intended nationally determined contributions, as well as to the implementation of the Paris Agreement and the World Bank's Climate Action Plan.

United States
Enhancing Capacity for Low Emission Development Strategies

This programme supported partner countries in designing and implementing their national low-emission development strategies to promote sustainable development and reduce GHG emissions. It supported national development and economic growth objectives by scaling up clean energy capacity, increasing the area of land under improved management, and advancing targeted actions that significantly reduce projected emissions from a 'business as usual' pathway while monitoring their progress.

265. A significant amount of support for capacity-building in relation to transparency focused on GHG inventories. Several Parties provided support for initiatives on transparency, including the Initiative for Climate Action Transparency and the Capacity-building Initiative for Transparency (e.g. Japan). Parties highlighted that, in order to promote effective implementation, each country needs to monitor and report the status of implementation of measures. An example is the French-speaking cluster initiative of the Partnership on Transparency in the Paris Agreement, the objective of which is to enable information-, expertise- and experience-sharing between French-speaking partners, developing and developed countries in relation to GHG inventories, developing mitigation measures, the measurement, reporting and verification process and preparing NDCs.

266. Many Parties reported capacity-building projects targeting multiple areas, such as climate policy awareness activities, and projects targeting multiple sectors were reported as multiple areas (see box 26 for examples). An example is Adolescents as Agents of Climate Change in their Communities – a project supported by Austria and rolled out in Armenia that promotes the integration of climate change considerations into curricula and the development

of teaching materials and capacity-building for teachers, adolescents and community leaders to enable them to integrate climate change considerations into their tuition.

Box 26
Capacity-building projects targeting multiple areas

Luxembourg
Vocational training and employment programme

The programme aims to contribute to the development of quality technical and vocational education and training, equally accessible to girls and boys, that meets economic and social development needs.

It involves soft technology transfer through the introduction of different skills for new 'green jobs' in the curricula (e.g. agroecology, horticulture, maintenance of cooling systems, renewable energy and energy efficiency in construction).

Spain
Brazil
Euroclima

This EU project is implemented by the Spanish Patent and Trademark Office and the International and Ibero-American Foundation for Administration and Public Policies. Its objective is to improve knowledge and technical capacity for promoting and granting green patents in Brazil. The idea is to train examiners and disseminate knowledge to the relevant actors in the Brazilian Government, so that intellectual property contributes to fulfilling climate change commitments.

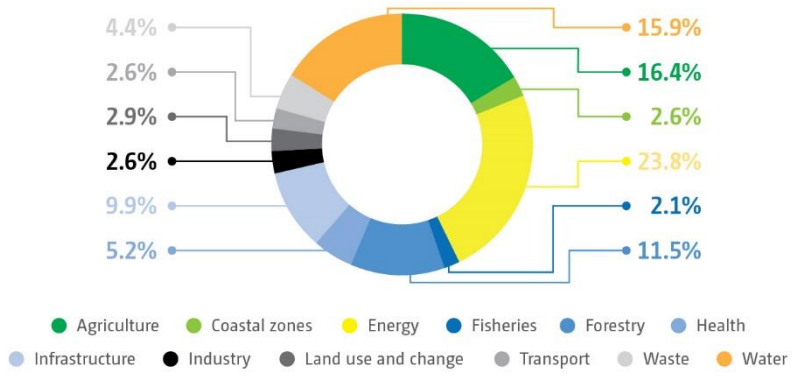
EU
Central Asia
Strengthening financial resilience and accelerating risk reduction in Central Asia

The main objective of this programme is to build disaster and climate resilience in Central Asia and lay the foundations for a future disaster risk financing solution at the regional level in line with the Sendai Framework for Disaster Risk Reduction 2015–2030. The aim is to embed an approach that shifts from managing disasters to managing risks and will allow investments to be risk-informed and livelihoods and growth to be sustainable.

(c) Priority sectors for capacity-building

267. According to the BR4s, 23.8 per cent of projects targeted the energy sector, followed by agriculture and water with 16.4 and 15.9 per cent, respectively. Most of the energy projects focused on energy efficiency or renewable energy alternatives. Figure 39 provides a breakdown of the targeted sectors for capacity-building in 2017–2018.

Figure 39
Key sectors for capacity-building support provided in 2017–2018 as reported in fourth biennial reports



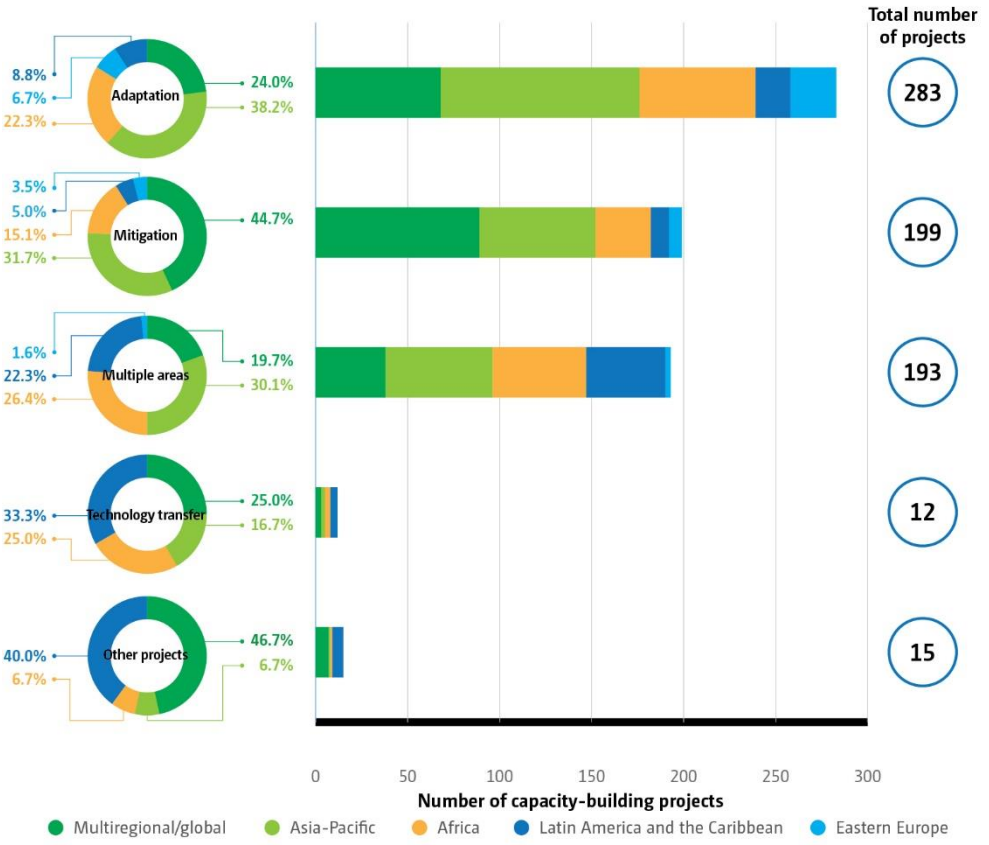
(d) Geographical distribution of capacity-building support

268. The Asia-Pacific region benefited most from the reported capacity-building support in the BR4s, accounting for 33 per cent of the total number of activities, followed by multiregional and global activities, and the Africa region with 29.2 and 21 per cent,

respectively. This is in contrast to the distribution reported in the BR3s, when Africa had the biggest share (29.3 per cent) of capacity-building support, followed by the Asia-Pacific region (25.8 per cent).

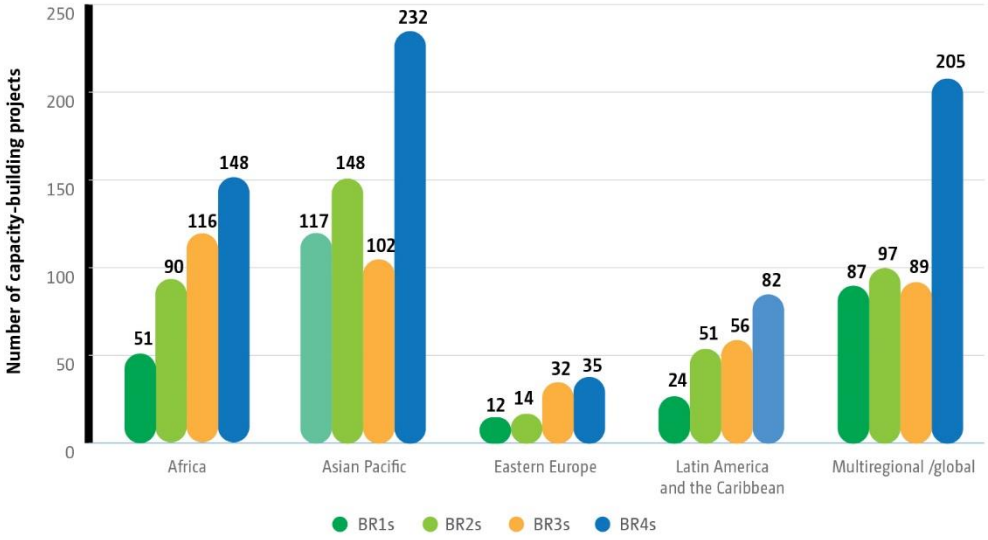
269. There has been an increase in projects targeting the Asia-Pacific region, and in multiregional and global projects. In contrast, there has been a significant decrease in the share of projects supporting the Africa region. In addition, there has been a slight decrease in the share of support for capacity-building in Latin America and the Caribbean, at 11.7 per cent in the BR4s compared with 14.2 per cent in the BR3s, and in Eastern Europe, at 5 per cent in the BR4s compared with 8.1 per cent in the BR3s (see figure 40).

Figure 40
Number of capacity-building support projects by region reported in biennial reports



270. In terms of the geographical distribution of the various types of support provided as reported in the BR4s, 38.2 per cent of the support for adaptation was provided to the Asia-Pacific region, followed by multiregional or global support accounting for 24.0 per cent and the Africa region for 22.3 per cent. In total, 44.7 per cent of the support for mitigation was provided to multiregional or global projects, followed by projects in Asia-Pacific and in Africa, which accounted for 31.7 and 15.1 per cent of the support provided, respectively. With regard to projects targeting multiple areas, 30.1 per cent of support was allocated to Asia-Pacific, followed by Africa, Latin America and the Caribbean, and multiregional or global projects, accounting for 26.4, 22.3 and 19.7 per cent, respectively (see figure 41).

Figure 41
Number of capacity-building support projects reported in biennial reports, by region



271. With the entry into force of the Paris Agreement, new and emerging capacity-building areas, including REDD+, preparedness and access to climate finance, NDC implementation and transparency, have been identified by Parties and Annex II Parties continue to respond to those needs.

272. Some Parties highlighted the importance of country ownership and the support provided taking into account the needs of developing countries. In addition, to ensure coherence and coordination, many Parties are linking capacity-building support with the SDGs. For example, Denmark established SDG Invest to support developing countries in achieving the SDGs by enhancing development-relevant, inclusive and sustainable investments in affordable and clean energy, climate, industry, food and other key SDG areas (see box 19).

273. More and more Parties are providing support in new areas, such as women's empowerment and gender integration, with most of the projects focusing on ensuring the participation of female delegates in the international climate negotiations. The Netherlands is supporting the Women Delegates Fund, the aim of which is to increase the effective participation of women from developing countries, mostly the least developed countries, in the UNFCCC climate negotiations.

(e) Implementation channels

274. Regarding support vehicles, bilateral collaboration through development agencies remains the main vehicle. A number of Parties highlighted the provision of support through the GCF and the Global Environment Facility, which are the operating entities of the Financial Mechanism, multilateral development organizations and United Nations organizations.

275. A variety of modalities have been used to provide capacity-building, including training workshops, seminars and educational activities, mainly through short- and long-term scholarship programmes. Increasingly, Parties are reporting on partnerships with academic institutions (see box 27 for examples). Apart from projects that directly target capacity-building, Parties also reported on projects that have capacity-building components.

Box 27
Partnerships with academia

The Sino-Italian Center for Sustainability is aimed at enhancing collaboration between Italian research centres and the Chinese Research Centre on Greener Cities to promote research and capacity-building in the areas of climate change adaptation and mitigation, energy efficiency and renewable energy, and resource efficiency and circular economy. The aim of the collaboration is to promote the Sino-Italian Center for Sustainability as a centre of excellence for research and innovation in the development of

green technologies and solutions for green cities and in advancing sustainable development. The main objectives are to improve the quality of the urban environment to tackle climate change, well-being and health in cities and to actively participate in global environmental governance through Sino–Italian cooperation within the framework of several national and international development scenarios and strategies, including the Paris Agreement.

2. Improvements and challenges in reporting

276. The BR4s demonstrate an increase in reporting on projects targeting capacity-building compared with that in previous BRs. However, Parties identified a few key challenges in reporting information on capacity-building support provided:

(a) Several Parties underlined that the cross-cutting and integrated nature of capacity-building makes it challenging to separately track capacity-building support, indicating that capacity-building is often integrated into various types of project and is therefore difficult to isolate. In general, the information contained in the BR4s suggests that most of the projects implemented through official development assistance contain capacity-building elements. For example, Switzerland noted that most projects supporting developing countries contain both capacity-building and technology transfer elements and that it would not "do justice to the integrated approach underpinning Switzerland's climate change interventions" to single out different components of support in the reporting. This can be seen in Parties' narrative reporting, where the information on finance, technology and capacity-building is combined;

(b) Parties observed that separating technology and capacity-building funding from climate finance for reporting purposes can be challenging.

Annex

Supplementary data

Table I.1
Annex I Parties' quantified economy-wide greenhouse gas emission reduction targets for 2020 reported in their fourth biennial report common tabular format tables

Party	*Emission reduction target (change from base-year level) (%)*	*Base year (CO_2, CH_4 and N_2O)*	*Base year (HFCs, PFCs and SF_6)*	*Base year (NF_3)*	*Gases (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6)*	*Gases (other)*	*Source of GWP values*	*Sectors (energy, transport, industrial processes, agriculture and waste)*	*LULUCF included*	*LULUCF accounting approach*	*MBMs under the Convention used*
Australia	5	2000	2000	2000	All	NF_3	AR4	All	Yes	Other[a]	Yes
Belarus	5–10	1990	1995	1995	All	–	AR4	All	No	–	No
Canada	17	2005	2005	2005	All	NF_3	AR4	All	Yes	Other[a]	To be determined
EU	20	1990	1990	–	All[b]	–	AR4	All[c]	No	–	Yes
Iceland	20	1990	1990	1990	All	NF_3	AR4	All	Yes	Activity	Yes
Japan	At least 3.8	Fiscal year 2005	2005	2005	All	NF_3	AR4	All	Yes	Activity	Yes
Kazakhstan	15	1990	1995	2000	All	NF_3	AR4	All	No	–	No
Liechtenstein	20	1990	1990	–	All	–	AR4	All	Yes	Land	Yes
Monaco	30	1990	1995	1990	All	NF_3	AR4	All	Yes	–	No
New Zealand	5	1990	1990	1990	All	NF_3	AR4	All	Yes	Activity	Yes
Norway	30	1990	1990	2000	All	NF_3	AR4	All	Yes	Activity	Yes
Russian Federation	15–25	1990	1990	1990	All	NF_3	AR4	All	No	–	No
Switzerland	20	1990	1990	1990	All[b]	NF_3	AR4	All	Yes	Activity	Yes
Turkey[d]	–	–	–	–	–	–	–	–	–	–	–
Ukraine	20	1990	1990	To be determined	All	NF_3	AR2	All	No	–	Yes
United States	Approximately 17 by 2020	2005	2005	2005	All	NF_3	AR4	All	Yes	Land	No

[a] Based on the Kyoto Protocol LULUCF classification system: afforestation, reforestation, deforestation, forest management, cropland management, grazing land management and revegetation.
[b] Also includes indirect CO_2.
[c] Also includes international aviation.
[d] Turkey did not communicate its quantified economy-wide emission reduction target for 2020 under the Convention.

Table I.2
Greenhouse gas emission limits of the European Union's 28 member States for the sectors not covered by the European Union Emissions Trading System

Party	*GHG emission limit by 2020 compared with 2005 level (%)*	*Party*	*GHG emission limit by 2020 compared with 2005 level (%)*	*Party*	*GHG emission limit by 2020 compared with 2005 level (%)*
Austria	–16	Germany	–14	Poland	14
Belgium	–15	Greece	–4	Portugal	1
Bulgaria	20	Hungary	10	Romania	19
Croatia	11	Ireland	–20	Slovakia	13
Cyprus	–5	Italy	–13	Slovenia	4
Czechia	9	Latvia	17	Spain	–10
Denmark	–20	Lithuania	15	Sweden	–17
Estonia	11	Luxembourg	–20	United Kingdom	–16
Finland	–16	Malta	5		
France	–14	Netherlands	–16		

Table I.3
Annex I Parties' total aggregate anthropogenic greenhouse gas emissions without emissions and removals from land use, land-use change and forestry in 1990, 2000, 2010 and 2019

	kt CO_2 eq				*Change in emissions (%)*		
Party	*1990*	*2000*	*2010*	*2019*	*1990–2019*	*1990–2000*	*2000–2019*
Australia	423 672	487 778	535 549	545 153	28.7	15.1	11.8
Austria	78 420	80 129	84 337	79 842	1.8	2.2	–0.4
Belarus[a]	139 152	79 717	90 695	90 116	–35.2	–42.7	13.0
Belgium	145 719	148 883	133 634	116 651	–19.9	2.2	–21.6
Bulgaria[a, b]	114 801	57 864	59 796	55 955	–51.3	–49.6	–3.3
Canada	601 524	733 511	702 803	730 245	21.4	21.9	–0.4
Croatia[a]	31 387	25 563	27 753	23 605	–24.8	–18.6	–7.7
Cyprus	5 571	8 309	9 444	8 842	58.7	49.1	6.4
Czechia[a]	197 072	149 272	139 606	122 639	–37.8	–24.3	–17.8
Denmark	71 098	71 748	64 664	45 812	–35.6	0.9	–36.1
Estonia	41 045	17 496	21 218	14 699	–64.2	–57.4	–16.0
EU	5 657 987	5 155 595	4 779 612	4 057 595	–28.3	–8.9	–21.3
Finland	71 075	70 163	75 622	53 021	–25.4	–1.3	–24.4
France	547 128	552 419	513 462	442 985	–19.0	1.0	–19.8
Germany	1 248 577	1 042 612	941 805	809 799	–35.1	–16.5	–22.3
Greece	103 289	126 471	118 500	85 631	–17.1	22.4	–32.3
Hungary[a, b]	110 477	74 917	66 057	64 433	–41.7	–32.2	–14.0
Iceland	3 683	4 127	4 866	4 722	28.2	12.1	14.4
Ireland	54 400	68 459	61 949	59 778	9.9	25.8	–12.7
Italy	518 720	555 466	516 474	418 281	–19.4	7.1	–24.7
Japan	1 269 015	1 373 755	1 300 452	1 209 493	–4.7	8.3	–12.0
Kazakhstan[a]	385 022	219 030	303 286	354 870	–7.8	–43.1	62.0
Latvia[a]	25 868	10 059	11 820	11 132	–57.0	–61.1	10.7
Liechtenstein	229	247	228	187	–18.1	8.1	–24.3
Lithuania[a]	47 792	19 426	20 742	20 368	–57.4	–59.4	4.8
Luxembourg	12 727	9 658	12 176	10 743	–15.6	–24.1	11.2
Malta	2 596	2 813	2 968	2 175	–16.2	8.4	–22.7
Monaco	103	109	88	83	–19.7	6.1	–24.3
Netherlands	219 604	217 578	211 675	180 441	–17.8	–0.9	–17.1

	kt CO_2 eq				Change in emissions (%)		
Party	*1990*	*2000*	*2010*	*2019*	*1990–2019*	*1990–2000*	*2000–2019*
New Zealand	65 129	75 398	78 316	82 318	26.4	15.8	9.2
Norway	51 475	55 117	55 266	50 334	–2.2	7.1	–8.7
Poland[a, b]	579 219	396 595	413 502	390 745	–32.5	–31.5	–1.5
Portugal	58 784	81 668	68 727	63 470	8.0	38.9	–22.3
Romania[a, b]	307 371	138 767	116 144	111 767	–63.6	–54.9	–19.5
Russian Federation[a, d]	3 158 804	1 891 846	2 013 432	2 119 432	–32.9	–40.1	12.0
Slovakia[a]	73 386	48 670	45 364	39 948	–45.6	–33.7	–17.9
Slovenia[a, b]	20 432	18 582	19 614	17 065	–16.5	–9.1	–8.2
Spain	290 001	388 212	357 876	314 529	8.5	33.9	–19.0
Sweden	71 239	68 149	64 557	50 920	–28.5	–4.3	–25.3
Switzerland	53 631	52 931	54 721	46 108	–14.0	–1.3	–12.9
Turkey[c]	219 572	298 954	399 143	506 080	130.5	36.2	69.3
Ukraine[a]	942 574	427 603	407 124	332 114	–64.8	–54.6	–22.3
United Kingdom	794 869	711 973	608 732	453 101	–43.0	–10.4	–36.4
United States	6 442 651	7 313 616	6 991 106	6 558 345	1.8	13.5	–10.3
Number of Parties showing a decrease in emissions by more than 1 per cent					33	22	31
Number of Parties showing a change in emissions within 1 per cent					0	3	2
Number of Parties showing an increase in emissions by more than 1 per cent					11	19	11

[a] EIT Party.
[b] The base year under the Convention is 1990, except for Bulgaria (1988), Hungary (average of 1985–1987), Poland (1988), Romania (1989) and Slovenia (1986), in accordance with decisions 9/CP.2 and 11/CP.4.
[c] In decision 26/CP.7, Parties were invited to recognize the special circumstances of Turkey, which place Turkey in a situation different from that of other Annex I Parties.
[d] Information provided by the Russian Federation. The General Assembly has addressed the status of the Autonomous Republic of Crimea and the city of Sevastopol in resolution 68/262 of 27 March 2014.

Table I.4
Annex I Parties' total aggregate anthropogenic greenhouse gas emissions with emissions and removals from land use, land-use change and forestry in 1990, 2000, 2010 and 2019

	kt CO_2 eq				Change in emissions (%)		
Party	*1990*	*2000*	*2010*	*2019*	*1990–2019*	*1990–2000*	*2000–2019*
Australia	615 478	542 258	600 322	518 866	–15.7	–11.9	–4.3
Austria	66 224	63 502	78 612	75 206	13.6	–4.1	18.4
Belarus[a]	108 473	38 930	40 429	58 352	–46.2	–64.1	49.9
Belgium	142 317	146 959	132 470	115 552	–18.8	3.3	–21.4
Bulgaria[a, b]	95 823	40 057	47 128	46 393	–51.6	–58.2	15.8
Canada	544 707	711 770	695 498	740 123	35.9	30.7	4.0
Croatia[a]	24 940	18 679	20 790	18 048	–27.6	–25.1	–3.4
Cyprus	5 352	8 274	9 046	8 457	58.0	54.6	2.2
Czechia[a]	190 111	140 515	132 196	136 203	–28.4	–26.1	–3.1
Denmark	77 606	76 330	66 692	48 225	–37.9	–1.6	–36.8
Estonia	38 086	13 711	16 775	13 984	–63.3	–64.0	2.0
EU	5 464 793	4 861 340	4 470 386	3 814 474	–30.2	–11.0	–21.5
Finland	57 527	55 058	54 811	38 320	–33.4	–4.3	–30.4
France	525 543	535 262	477 911	412 579	–21.5	1.8	–22.9
Germany	1 273 439	1 022 056	932 008	793 335	–37.7	–19.7	–22.4
Greece	101 182	124 530	115 457	82 150	–18.8	23.1	–34.0
Hungary[a, b]	108 585	73 859	61 504	58 865	–45.8	–32.0	–20.3
Iceland	12 875	13 311	14 160	13 794	7.1	3.4	3.6
Ireland	59 531	74 343	68 192	64 220	7.9	24.9	–13.6

	kt CO_2 eq				Change in emissions (%)		
Party	*1990*	*2000*	*2010*	*2019*	*1990–2019*	*1990–2000*	*2000–2019*
Italy	515 229	534 550	474 551	376 719	–26.9	3.7	–29.5
Japan	1 203 671	1 289 013	1 230 470	1 159 359	–3.7	7.1	–10.1
Kazakhstan[a]	373 392	314 490	292 954	364 483	–2.4	–15.8	15.9
Latvia[a]	13 567	–1 695	9 942	9 979	–26.4	–112.5	–688.9
Liechtenstein	235	272	249	199	–15.5	15.3	–26.8
Lithuania[a]	42 342	9 993	10 325	14 932	–64.7	–76.4	49.4
Luxembourg	12 812	8 936	12 058	10 430	–18.6	–30.3	16.7
Malta	2 603	2 821	2 972	2 175	–16.4	8.4	–22.9
Monaco	103	109	88	83	–19.6	6.1	–24.2
Netherlands	225 676	223 108	216 694	184 963	–18.0	–1.1	–17.1
New Zealand	41 115	48 582	48 624	54 893	33.5	18.2	13.0
Norway	39 507	35 529	30 992	31 697	–19.8	–10.1	–10.8
Poland[a, b]	560 081	360 187	379 629	375 702	–32.9	–35.7	4.3
Portugal	60 013	76 403	59 845	55 602	–7.4	27.3	–27.2
Romania[a, b]	282 165	110 716	87 112	81 550	–71.1	–60.8	–26.3
Russian Federation[a]	3 086 562	1 419 767	1 299 679	1 584 619	–48.7	–54.0	11.6
Slovakia[a]	63 710	38 809	39 216	33 606	–47.3	–39.1	–13.4
Slovenia[a, b]	15 612	12 237	12 277	16 964	8.7	–21.6	38.6
Spain	254 005	348 655	320 403	276 952	9.0	37.3	–20.6
Sweden	34 713	26 132	25 999	15 430	–55.5	–24.7	–41.0
Switzerland	51 616	58 132	51 894	44 175	–14.4	12.6	–24.0
Turkey[c]	163 795	237 402	325 724	422 086	157.7	44.9	77.8
Ukraine[a]	884 223	381 482	375 068	332 163	–62.4	–56.9	–12.9
United Kingdom	812 970	724 077	614 931	459 144	–43.5	–10.9	–36.6
United States	5 541 855	6 459 658	6 207 222	5 769 118	4.1	16.6	–10.7
Number of Parties showing a decrease in emissions by more than 1 per cent					34	26	29
Number of Parties showing a change in emissions within 1 per cent					0	0	0
Number of Parties showing an increase in emissions by more than 1 per cent					10	18	15

[a] EIT Party.
[b] The base year under the Convention is 1990, except for Bulgaria (1988), Hungary (average of 1985–1987), Poland (1988), Romania (1989) and Slovenia (1986), in accordance with decisions 9/CP.2 and 11/CP.4.
[c] In decision 26/CP.7, Parties were invited to recognize the special circumstances of Turkey, which place Turkey in a situation different from that of other Annex I Parties.

Table I.5
Greenhouse gas emission projection scenarios reported by Annex I Parties in their fourth biennial reports

	Scenario				*GHG projections*	
Party	*WEM*	*WAM*	*WOM*	*Projection period*	*Gases*	*Sectors*
Australia	Yes	No	No	To 2030	All seven gases	All sectors
Austria	Yes	No	No	To 2030	All seven gases	All sectors
Belarus	Yes	Yes	Yes	To 2030	NE	All sectors; transport is included in the energy sector
Belgium	Yes	Yes	No	To 2030	All seven gases	All sectors
Bulgaria	Yes	Yes	No	To 2030	All seven gases	All sectors
Canada	Yes	Yes	No	To 2030	All seven gases	All sectors
Croatia	Yes	Yes	No	To 2030	All seven gases	All sectors
Cyprus	Yes	Yes	No	To 2030	All seven gases	All sectors
Czechia	Yes	Yes	No	To 2030	All seven gases	All sectors
Denmark	Yes	No	No	To 2030	All seven gases	All sectors
Estonia	Yes	Yes	No	To 2030	All seven gases	All sectors
EU	Yes	Yes	No	To 2030	All seven gases	All sectors

	Scenario				*GHG projections*	
Party	*WEM*	*WAM*	*WOM*	*Projection period*	*Gases*	*Sectors*
Finland	Yes	Yes	No	To 2030	All seven gases	All sectors
France	Yes	Yes	No	To 2030	All seven gases	All sectors; transport is included in the energy sector
Germany	Yes	No	No	To 2030	All seven gases	All sectors
Greece	Yes	Yes	No	To 2030	All seven gases	All sectors
Hungary	Yes	Yes	Yes	To 2030	All seven gases	All sectors
Iceland	Yes	No	No	To 2030	Six gases	All sectors
Ireland	Yes	Yes	No	To 2030	All seven gases	All sectors
Italy	Yes	Yes	No	To 2030	All seven gases	All sectors
Japan	Yes	No	No	To 2030	All seven gases	All sectors
Kazakhstan	Yes	Yes	Yes	To 2030	Five gases	All sectors
Latvia	Yes	Yes	No	To 2030	All seven gases	All sectors
Liechtenstein	Yes	Yes	No	To 2030	All seven gases	All sectors
Lithuania	Yes	Yes	No	To 2030	All seven gases	All sectors
Luxembourg	Yes	Yes	No	To 2030	All seven gases	All sectors
Malta	Yes	No	Yes	To 2030	All seven gases	All sectors
Monaco	Yes	Yes	No	To 2030	All seven gases	All sectors
Netherlands	Yes	Yes	No	To 2030	Six gases	All sectors
New Zealand	Yes	Yes	Yes	To 2030	Six gases	All sectors
Norway	Yes	No	No	To 2030	Six gases	All sectors
Poland	Yes	Yes	No	To 2030	All seven gases	All sectors
Portugal	Yes	Yes	No	To 2030	All seven gases	All sectors
Romania	Yes	Yes	Yes	To 2030	All seven gases	All sectors
Russian Federation	Yes	Yes	Yes	To 2030	Six gases	All sectors; transport is included in the energy sector
Slovakia	Yes	Yes	No	To 2030	All seven gases	All sectors
Slovenia	Yes	Yes	Yes	To 2030	Six gases	All sectors
Spain	Yes	Yes	No	To 2030	All seven gases	All sectors
Sweden	Yes	Yes	No	To 2030	Six gases	All sectors
Switzerland	Yes	Yes	Yes	To 2030	All seven gases	All sectors
Turkey	Yes	No	Yes	To 2030	All seven gases	All sectors
Ukraine (BR1)	Yes	Yes	Yes	To 2030	Six gases	All sectors
United Kingdom	Yes	Yes	No	To 2030	Six gases	All sectors
United States	Yes	No	No	To 2030	All seven gases	All sectors

Table I.6

Projected changes in total aggregate greenhouse gas emissions without emissions and removals from land use, land-use change and forestry of individual Annex I Parties by 2020 and 2030 under different scenarios

		WEM scenario				*WAM scenario*				*WOM scenario*			
	Actual emissions (kt CO_2 eq)	*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*	
Party	*1990*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*
Australia	420 315	549 450	521 303	30.7	24.0	–	–	–	–	–	–	–	–
Austria	78 670	79 669	73 961	1.3	–6.0	–	–	–	–	–	–	–	–
Belarus	139 274	95 441	104 903	–31.5	–24.7	95 441	102 917	–31.5	–26.1	98 853	117 853	–29.0	–15.4
Belgium	146 587	113 306	127 546	–22.7	–13.0	109 919	111 358	–25.0	–24.0	–	–	–	–
Bulgaria	101 849	59 926	52 761	–41.2	–48.2	58 075	49 719	–43.0	–51.2	–	–	–	–
Canada	602 800	705 500	672 900	17.0	11.6	692 500	602 900	14.9	0.0	–	–	–	–
Croatia	31 858	23 355	22 649	–26.7	–28.9	23 094	21 175	–27.5	–33.5	–	–	–	–
Cyprus	5 669	9 192	7 867	62.2	38.8	9 146	7 187	61.3	26.8	–	–	–	–
Czechia	197 393	126 272	109 845	–36.0	–44.4	125 934	109 206	–36.2	–44.7	–	–	–	–
Denmark	70 291	44 030	38 110	–37.4	–45.8	–	–	–	–	–	–	–	–
Estonia	40 432	15 629	12 539	–61.3	–69.0	15 420	10 725	–61.9	–73.5	–	–	–	–
EU	5 649 529	4 120 019	3 814 252	–27.1	–32.5	4 063 598	3 491 274	–28.1	–38.2	–	–	–	–
Finland	71 300	52 457	44 425	–26.4	–37.7	52 191	39 155	–26.8	–45.1	–	–	–	–
France	548 067	461 344	416 451	–15.8	–24.0	434 375	307 094	–20.7	–44.0	–	–	–	–
Germany	1 250 993	835 608	730 031	–33.2	–41.6	–	–	–	–	–	–	–	–
Greece	103 101	87 900	78 135	–14.7	–24.2	80 309	60 855	–22.1	–41.0	–	–	–	–
Hungary	93 656	63 891	62 647	–31.8	–33.1	63 180	55 287	–32.5	–41.0	67 239	71 499	–28.2	–23.7
Iceland	3 613	4 931	4 447	36.5	23.1	–	–	–	–	–	–	–	–
Ireland	55 417	61 532	64 327	11.0	16.1	60 533	54 555	9.2	–1.6	–	–	–	–
Italy	517 746	419 023	383 227	–19.1	–26.0	406 231	327 036	–21.5	–36.8	–	–	–	–
Japan	1 275 477	1 399 565	1 079 000	9.7	–15.4	–	–	–	–	–	–	–	–
Kazakhstan	385 931	366 904	414 038	–4.9	7.3	368 858	402 110	–4.4	4.2	387 786	519 048	0.2	34.2
Latvia	26 259	11 752	10 408	–55.2	–60.4	11 578	10 262	–55.9	–60.9	–	–	–	–
Liechtenstein	229	175	156	–23.7	–32.0	174	143	–23.8	–37.7	–	–	–	–
Lithuania	48 242	21 025	19 635	–56.4	–59.3	20 979	15 920	–56.5	–67.0	–	–	–	–
Luxembourg	12 741	9 476	9 759	–25.6	–23.4	9 045	5 805	–29.0	–54.4	–	–	–	–
Malta	2 103	2 425	2 664	15.3	26.7	–	–	–	–	2 434	2 704	15.7	28.6
Monaco	102	78	59	–23.4	–41.8	74	51	–26.7	–50.0	–	–	–	–

		WEM scenario				WAM scenario				WOM scenario			
	Actual emissions (kt CO_2 eq)	*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*	
Party	*1990*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*
Netherlands	221 711	171 256	144 986	–22.8	–34.6	171 268	144 297	–22.8	–34.9	–	–	–	–
New Zealand	65 668	80 929	75 266	23.2	14.6	80 935	74 702	23.2	13.8	82 873	80 933	26.2	23.2
Norway	51 210	50 984	45 009	–0.4	–12.1	–	–	–	–	–	–	–	–
Poland	474 350	397 811	404 740	–16.1	–14.7	384 247	336 253	–19.0	–29.1	–	–	–	–
Portugal	59 092	63 288.91	42 303	7.1	–28.4	63 289	38 941	7.1	–34.1	–	–	–	–
Romania	247 994	105 302	98 457	–57.5	–60.3	104 384	96 625	–57.9	–61.0	157 718	171 809	–48.5	–43.9
Russian Federation	3 186 796	2 177 300	2 296 300	–31.7	–27.9	2 164 300	2 104 300	–32.1	–34.0	2 178 000	2 557 000	–31.7	–19.8
Slovakia	73 980	42 355	41 399	–42.7	–44.0	41 202	34 019	–44.3	–54.0	–	–	–	–
Slovenia	18 639	17 128	16 874	–8.1	–9.5	16 703	13 079	–10.4	–29.8	20 634	22 010	10.7	18.1
Spain	288 493	331 734	310 632	15.0	7.7	327 443	226 737	13.5	–21.4	–	–	–	–
Sweden	71 304	49 724	46 129	–30.3	–35.3	41 203	34 019	–42.2	–52.3	–	–	–	–
Switzerland	53 641	45 813	41 535	–14.6	–22.6	45 712	35 049	–14.8	–34.7	55 993	53 568	4.4	–0.1
Turkey	219 202	669 253	998 698	205.3	355.6	–	–	–	–	713 094	1 213 479	238.4	475.9
Ukraine	938 603	459 104	541 981	–51.1	–42.3	451 777	520 462	–51.9	–44.5	509 641	800 097	–45.7	–14.8
United Kingdom	797 970	417 483	378 358	–47.7	–52.6	417 102	374 642	–47.7	–53.1	–	–	–	–
United States	6 442 800	6 103 400	6 193 900	–5.3	–3.9	–	–	–	–	–	–	–	–

Table I.7

Projected changes in total aggregate greenhouse gas emissions with emissions and removals from land use, land-use change and forestry of individual Annex I Parties by 2020 and 2030 under different scenarios

		WEM scenario				WAM scenario				WOM scenario			
	Actual emissions (kt CO_2 eq)	*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*		*Projected emissions (kt CO_2 eq)*		*Change compared with 1990 level (%)*	
Party	*1990*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*
Australia	607 828	532 016	505 540	–12.5	–16.8	–	–	–	–	–	–	–	–
Austria	66 682	75 467	71 291	13.2	6.9	–	–	–	–	–	–	–	–
Belarus	118 169	66 452	72 755	–43.8	–38.4	–	–	–	–	–	–	–	–
Belgium	143 274	112 644	126 327	–21.4	–11.8	109 257	110 139	–23.7	–23.1	–	–	–	–
Bulgaria	89 632	51 554	43 454	–42.5	–51.5	49 585	41 276	–44.7	–53.9	–	–	–	–
Canada	602 800	682 500	657 900	13.2	9.1	669 500	587 900	11.1	–2.5	–	–	–	–

		WEM scenario				WAM scenario				WOM scenario			
	Actual emissions ($kt\ CO_2\ eq$)	Projected emissions ($kt\ CO_2\ eq$)		Change compared with 1990 level (%)		Projected emissions ($kt\ CO_2\ eq$)		Change compared with 1990 level (%)		Projected emissions ($kt\ CO_2\ eq$)		Change compared with 1990 level (%)	
Party	1990	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
Croatia	25 204	19 097	20 162	–24.2	–20.0	18 837	18 686	–25.3	–25.9	–	–	–	–
Cyprus	5 418	8 710	7 383	60.8	36.3	8 711	7 386	60.8	36.3	–	–	–	–
Czechia	192 167	126 827	108 220	–34.0	–43.7	127 177	108 715	–33.8	–43.4	–	–	–	–
Denmark	75 229	46 661	41 614	–38.0	–44.7	–	–	–	–	–	–	–	–
Estonia	38 942	14 226	12 331	–63.5	–68.3	14 017	10 517	–64.0	–73.0	–	–	–	–
EU	5 404 553	3 900 388	3 629 551	–27.8	–32.8	3 838 461	3 295 562	–29.0	–39.0	–	–	–	–
Finland	56 528	28 996	27 901	–48.7	–50.6	28 842	20 674	–49.0	–63.4	–	–	–	–
France	525 909	422 835	387 412	–19.6	–26.3	395 381	266 936	–24.8	–49.2	–	–	–	–
Germany	1 219 681	865 135	749 022	–29.1	–38.6	–	–	–	–	–	–	–	–
Greece	100 993	86 266	77 490	–14.6	–23.3	78 674	60 210	–22.1	–40.4	–	–	–	–
Hungary	91 137	61 612	62 115	–32.4	–31.8	60 388	53 272	–33.7	–41.5	64 960	70 968	–28.7	–22.1
Iceland	13 020	321	250	–97.5	–98.1	–	–	–	–	–	–	–	–
Ireland	60 185	65 492	72 383	8.8	20.3	64 493	62 612	7.2	4.0	–	–	–	–
Italy	514 462	393 043	359 799	–23.6	–30.1	380 251	303 608	–26.1	–41.0	–	–	–	–
Japan	1 213 002	1 363 161	1 054 000	12.4	–13.1	–	–	–	–	–	–	–	–
Kazakhstan	370 181	365 677	407 306	–1.2	10.0	365 771	392 523	–1.2	6.0	388 126	517 472	4.6	39.4
Latvia	16 431	13 846	15 044	–15.7	–8.4	13 672	14 563	–16.8	–11.4	–	–	–	–
Liechtenstein	236	188	168	–20.5	–28.6	187	156	–20.6	–34.1	–	–	–	–
Lithuania	43 180	16 362	16 307	–62.1	–62.2	16 316	11 986	–62.2	–72.2	–	–	–	–
Luxembourg	12 842	9 086	9 358	–29.2	–27.1	8 654	5 405	–32.6	–57.9	–	–	–	–
Malta	2 106	2 426	2 664	15.2	26.5	–	–	–	–	2 438	2 707	15.8	28.5
Monaco	102	78	59	–23.4	–41.8	74	51	–26.7	–50.0	–	–	–	–
Netherlands	228 202	176 595	150 602	–22.6	–34.0	176 607	149 913	–22.6	–34.3	–	–	–	–
New Zealand	34 506	66 597	66 073	93.0	91.5	66 132	64 015	91.7	85.5	73 010	82 435	111.6	138.9
Norway	41 242	29 261	24 705	–29.0	–40.1	–	–	–	–	–	–	–	–
Poland	447 159	366 033	383 047	–18.1	–14.3	352 469	314 560	–21.2	–29.7	–	–	–	–
Portugal	60 247	59 510	34 221	–1.2	–43.2	59 510	29 692	–1.2	–50.7	–	–	–	–
Romania	229 077	84 375	74 930	–63.2	–67.3	81 086	70 656	–64.6	–69.2	141 209	158 236	–38.4	–30.9
Russian Federation	3 113 394	1 717 300	2 051 300	–44.8	–34.1	1 679 300	1 596 300	–46.1	–48.7	–	–	–	–
Slovakia	64 434	36 210	36 965	–43.8	–42.6	35 042	29 536	–45.6	–54.2	–	–	–	–
Slovenia	14 177	12 460	11 153	–12.1	–21.3	11 133	6 658	–21.5	–53.0	–	–	–	–

		WEM scenario				WAM scenario				WOM scenario			
	Actual emissions ($kt CO_2 eq$)	Projected emissions ($kt CO_2 eq$)		Change compared with 1990 level (%)		Projected emissions ($kt CO_2 eq$)		Change compared with 1990 level (%)		Projected emissions ($kt CO_2 eq$)		Change compared with 1990 level (%)	
Party	*1990*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*	*2020*	*2030*
Spain	252 617	296 453	279 044	17.4	10.5	286 019	190 716	13.2	–24.5	–	–	–	–
Sweden	36 908	8 297	5 537	–77.5	–85.0	–	–	–	–	–	–	–	–
Switzerland	51 156	46 742	42 414	–8.6	–17.1	47 590	37 477	–7.0	–26.7	55 272	52 347	8.0	2.3
Turkey	163 437	599 217	928 987	266.6	468.4	–	–	–	–	672 901	1 174 781	270.1	546.2
Ukraine	879 311	459 104	541 981	–47.8	–38.4	451 777	520 462	–48.6	–40.8	509 641	800 097	–42.0	–9.0
United Kingdom	798 226	401 849	367 783	–49.7	–53.9	401 468	364 067	–49.7	–54.4	–	–	–	–
United States	5 541 900	5 307 400	5 337 000	–4.2	–3.7	–	–	–	–	–	–	–	–

Table I.8
Annex I Parties' progress towards their quantified economy-wide emission reduction targets (Parties with single-year targets)

Party	*Base-year emission level ($kt CO_2 eq$)*	*Emissions excluding LULUCF (2017) ($kt CO_2 eq$)*	*LULUCF contribution (2017) ($kt CO_2 eq$)*	*Use of units from MBMs (2017) ($kt CO_2 eq$)*	*2017 emission level with LULUCF and MBM contribution ($kt CO_2 eq$)*	*Targeted emission level for 2020 ($kt CO_2 eq$)*	*Difference between 2017 and targeted emission level for 2020 ($kt CO_2 eq$)*[a]	*Difference between 2017 and base-year emission level ($kt CO_2 eq$)*[b]	*Targeted emission reduction base year–2020 ($kt CO_2 eq$)*	*Emission reduction achieved by 2017 ($kt CO_2 eq$)*	*Targeted reduction achieved by 2017 (%)*
Belarus	118 169.33	93 959.64	–13 300.71	NA	80 658.94	108 715.78	–28 056.84	–37 510.39	9 453.55	37 510.39	396.8
Canada	730 300.00	715 800.00	–17 488.00	0.00	698 312.00	606 149.00	92 163.00	–31 988.00	124 151.00	31 988.00	25.8
EU[c]	5 718 653.64	4 481 383.13[d]	NA	11 829.00	4 469 554.13	4 574 922.91	–105 368.78	–1 249 099.51	1 143 730.73	1 249 099.51	109.2
Japan	1 382 144.50	1 291 748.43	–53 933.93	0.00	1 237 814.50	1 329 623.01	–91 808.51	–144 330.00	52 521.49	144 330.00	274.8
Kazakhstan	385 932.8	353 233.80	NA	NA	353 233.80	328 042.88	25 190.92	–32 699.00	57 889.92	32 699.00	56.5
Liechtenstein	235.95	193.62	10.55	50.93	153.24	188.76	–35.52	–82.71	47.19	82.71	175.3
Monaco	101.59	86.85	NA	25.00	61.85	71.11	–9.26	–39.74	30.48	39.74	130.4
Russian Federation	3 186 796.00	2 155 470.67	NA	NA	2 155 470.67	2 390 097.00	–234 626.33	–1 031 325.33	796 699.00	1 031 325.33	129.4
United States	6 634 978.19	6 483 291.33	–766 064.03	NA	5 717 227.30	5 507 031.90	210 195.40	–917 750.89	1 127 946.29	917 750.89	81.4

[a] Positive or negative values mean that a Party's emissions in 2017 are above or below its targeted emission level for 2020, respectively.
[b] Positive or negative values mean that a Party's emissions in 2017 are above or below its base-year emission level, respectively.
[c] Includes the 27 member States of the EU and the United Kingdom.
[d] Total GHG emissions including international aviation and indirect CO_2, and excluding LULUCF and NF_3.

Table I.9
Annex I Parties' progress towards their quantified economy-wide emission reduction targets (Parties with an emission budget approach to achieving their targets)

Party	*Base-year emission level* (*kt CO_2 eq*)	*Emissions excluding LULUCF (2017)* (*kt CO_2 eq*)	*LULUCF contribution (2017)* (*kt CO_2 eq*)	*Use of units from MBMs (2017)* (*kt CO_2 eq*)	*2017 emission level with LULUCF and MBM contribution* (*kt CO_2 eq*)	*Emission budget for 2013–2020* (*kt CO_2 eq*)	*Cumulative emissions (including the contribution of LULUCF and use of MBMs, as relevant) by 2017* (*kt CO_2 eq*)	*Portion of emission budget used by 2017* (*%*)
Australia[a]	540 382.16	554 126.56	–23 285.66	0.00	530 840.90	4 508 000.00	2 658 760.00	59.0
Iceland[b]	3 613.02	4 765.83	–513.00	0.00	5 278.83	15 327.22	14 257.00	78.3
New Zealand	65 668.25	80 853.47	–15 953.02	0.00	64 900.45	509 775.00	337 705.14	66.2
Norway[c]	51 921.77	52 712.54	–26.08	9 060.00	43 626.46	348 914.30	218 083.78	62.5
Switzerland[d]	53 706.73	47 240.85	–265.49	0.00	46 975.36	361 768.52	243 841.79	67.4

[a] Australia follows an emission budget approach in accounting for its target, which is calculated by plotting a trajectory of linear decrease from 2010 to 2020 starting from the target level under the first commitment period of the Kyoto Protocol (8 per cent above the 1990 level) and ending at 5 per cent below the 2000 level over 2013–2020. The emission budget represents cumulative emissions below the trajectory.

[b] Under the Convention, Iceland committed to a joint effort with the EU and its member States in accordance with Article 4 of the Kyoto Protocol. Under its bilateral effort-sharing agreement with the EU, Iceland's cumulative emission allocation for non-ETS sectors for 2013–2020 is 15,327.22 kt CO_2 eq. Its cumulative emissions including the contribution of LULUCF for 2013–2017 are 12.0 Mt CO_2 eq, which corresponds to 78 per cent of its emission allocation.

[c] Norway's 30 per cent emission reduction target under the Convention was operationalized through its quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol (2013–2020), which corresponds to an average reduction of 16 per cent compared with the 1990 level. The 2020 target under the Convention corresponds to a linear declining emissions trajectory starting from the 2010 level to a 30 per cent reduction in emissions by 2020 compared with the 1990 level.

[d] Switzerland assesses the achievement of its target under the Convention by accounting against its quantified emission limitation or reduction commitment for the second commitment period of the Kyoto Protocol, which is to reduce emissions by 15.8 per cent below the 1990 level in 2013–2020. According to Switzerland's BR4, it will account for use of units from market-based mechanisms (including carried-over units) at the end of the commitment period, and therefore it did not provide any information on the annual number of units used.

Table I.10
Annex I Parties' outlook for achieving their quantified economy-wide emission reduction targets (Parties with single-year targets)

Party	*Targeted emission level in 2020* (*kt CO_2 eq*)	*Projected emission level for 2020 – WEM scenario* (*kt CO_2 eq*)	*Projected emission level for 2020 – WAM scenario* (*kt CO_2 eq*)	*Difference between projected and targeted emission level for 2020 – WEM scenario*[a] (*kt CO_2 eq*)	*Difference between projected and targeted emission level for 2020 – WAM scenario*[b] (*kt CO_2 eq*)
Belarus	108 715.78	66 452.00	NE	–42 263.78	NA
Canada	606 149.00	682 500.00	669 500.00	76 351.00	63 351.00
EU[c]	4 574 922.91	4 120 019.04	4 063 597.72	–454 903.87	–511 325.19
Japan	1 329 623.01	1 363 161.37	NE	33 538.36	NA
Kazakhstan	328 871.80	366 902.00	368 856.00	38 030.20	39 984.20
Liechtenstein	188.76	187.55	187.26	–1.21	–1.50
Monaco	71.11	77.85	74.43	6.74	3.32
Russian Federation	2 390 097.00	2 177 300.00	2 164 300.00	–212 797.00	–225 797.00

Party	*Targeted emission level in 2020 ($kt\ CO_2\ eq$)*	*Projected emission level for 2020 – WEM scenario ($kt\ CO_2\ eq$)*	*Projected emission level for 2020 – WAM scenario ($kt\ CO_2\ eq$)*	*Difference between projected and targeted emission level for 2020 – WEM scenario[a] ($kt\ CO_2\ eq$)*	*Difference between projected and targeted emission level for 2020 – WAM scenario[b] ($kt\ CO_2\ eq$)*
United States	5 507 031.90	5 307 400.00	NE	–199 631.90	NA

[a] Positive or negative values mean that a Party's projected emissions in 2020 (WEM scenario) are above or below its targeted emission level for 2020, respectively.

[b] Positive or negative values mean that a Party's projected emissions in 2020 (WAM scenario) are above or below its base-year emission level, respectively.

[c] Includes the 27 member States of the EU and the United Kingdom.

Table I.11

Annex I Parties' outlook for achieving their quantified economy-wide emission reduction targets (Parties with an emission budget approach to achieving their targets)

Party	*Emission budget for 2013–2020 ($kt\ CO_2\ eq$)*	*Projected cumulative emissions for 2013–2020 – WEM scenario ($kt\ CO_2\ eq$)*	*Projected cumulative emissions for 2013–2020 – WAM scenario ($kt\ CO_2\ eq$)*	*Difference between projected cumulative emissions and emission budget for 2013–2020 – WEM scenario[a] ($kt\ CO_2\ eq$)*	*Difference between projected cumulative emissions and emission budget for 2013–2020 – WAM scenario[b] ($kt\ CO_2\ eq$)*	*Projected cumulative emissions for 2013–2020 – WEM scenario (% of emission budget)*	*Projected cumulative emissions for 2013–2020 – WAM scenario (% of emission budget)*
Australia	4 508 000.00	4 243 000.00	NE	–265 000.00	NE	94.1	NE
Iceland[c]	15 327.22	NE	NE	NE	NE	NE	NE
New Zealand[d]	509 775.00	537 400.00	NE	27 625.00	NE	105.4	NE
Norway[e]	348 914.30	422 840.00	NE	73 925.70	NE	121.2	NE
Switzerland	361 768.52	NE	NE	NE	NE	NE	NE

[a] Positive or negative values mean that a Party's projected cumulative emissions in 2020 (WEM scenario) are above or below its emission budget for 2013–2020, respectively.

[b] Positive or negative values mean that a Party's projected cumulative emissions in 2020 (WAM scenario) are above or below its emission budget for 2013–2020, respectively.

[c] Iceland has 3,323.00 kt CO_2 eq remaining of its non-ETS emission budget for 2013–2020. Non-ETS emissions under the WEM scenario are projected to amount to 2,965.00 kt CO_2 eq for 2020 (excluding LULUCF), which indicates that Iceland is unlikely to meet its 2020 target for non-ETS sectors without using units from MBMs.

[d] It is projected that New Zealand will use 27.7 million surplus units from MBMs carried over from the first commitment period of the Kyoto Protocol to meet its 2020 target, leaving a balance of 96.1 million units.

[e] Norway plans to offset the gap between projected cumulative emissions and its emission budget for 2013–2020 by reducing domestic emissions and by using units acquired through participation in the EU ETS and the carry-over from the first commitment period of the Kyoto Protocol.