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Quantified economy-wide emission reduction targets by developed country Parties to the Convention: assumptions, conditions, commonalities and differences in approaches and comparison of the level of emission reduction efforts

Technical paper

Summary

This technical paper presents an overview of the quantified economy-wide emission reduction targets to be implemented by developed country Parties, as well as assumptions and conditions related to individual targets and associated assumptions and conditions related to the ambition of the pledges. It explores commonalities and differences of approaches to measure progress towards the achievement of economy-wide emission reduction targets and discusses the comparison of the emission reduction efforts. This paper is intended to facilitate understanding of these assumptions and conditions. The paper updates the information contained in document FCCC/TP/2011/1 and its updated versions, documents FCCC/TP/2012/2, FCCC/TP/2012/5 and FCCC/TP/2013/7, and is based on submissions from Parties, including their first biennial reports, and their contributions to the workshops and events on assumptions and conditions related to the attainment of quantified economy-wide emission reduction targets by developed country Parties, which were held in Bangkok, Thailand, on 3 April 2011 and 2 September 2012, in Warsaw, Poland, on 12 November 2013 and in Bonn, Germany, on 9 June 2011, 17 May 2012, 6 June 2013, and 8 and 11 June 2014.

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Contents

I. Introduction

A. Mandate

1. The Conference of the Parties (COP), by decision 1/CP.16, requested the secretariat to prepare a technical paper based on Parties' submissions with the aim of facilitating understanding of the assumptions and conditions related to the attainment of their emission reduction targets and a comparison of the level of emission reduction efforts.[1]

2. The COP, by decision 2/CP.17, paragraph 5, requested the secretariat to update document FCCC/TP/2011/1 by compiling all the information contained in Parties' submissions in a structured manner, and to further update that paper as new information is provided by Parties; it also requested the secretariat to produce a technical paper exploring the commonalities and differences of approaches.[2]

3. The COP, by decision 1/CP.18:

(a) Decided to establish a work programme under the Subsidiary Body for Scientific and Technological Advice (SBSTA) to continue the process of clarifying the quantified economy-wide emission reduction targets of developed country Parties, particularly in relation to the elements contained in decision 2/CP.17, paragraph 5,[3] with a view to the following:

(i) Identifying common elements for measuring the progress made towards the achievement of the quantified economy-wide emission reduction targets;

(ii) Ensuring the comparability of efforts among developed country Parties, taking into account differences in their national circumstances;

(b) Also decided that the work programme shall commence in 2013 and end in 2014 and include focused expert meetings, technical briefings and submissions from Parties and observer organizations;

(c) Requested the secretariat to annually update the technical paper based on information provided by developed country Parties in relation to their targets;

(d) Requested the secretariat to update document FCCC/SB/2011/INF.1/Rev.1, following any developed country Party's request to include new information on its target.[4]

B. Scope of the paper

4. This paper was prepared in response to the above mandates. It covers the update of document FCCC/TP/2011/1 and its updated versions, documents FCCC/TP/2012/2, FCCC/TP/2012/5 and FCCC/TP/2013/7, using new information provided by Parties, including Japan, Kazakhstan and New Zealand, as outlined in document

[1] The technical paper was published as document FCCC/TP/2011/1.

[2] The updates of the technical paper were published as documents FCCC/TP/2012/2, FCCC/TP/2012/5 and FCCC/TP/2013/7.

[3] Assumptions and conditions related to the individual targets, in particular in relation to the base year, global warming potential values, coverage of gases, coverage of sectors, expected emission reductions, and the role of land use, land-use change and forestry, and carbon credits from market-based mechanisms, and associated assumptions and conditions related to the ambition of the pledges.

[4] The update of the document is contained in document FCCC/SBSTA/2014/INF.6.

FCCC/SBSTA/2014/INF.6,[5] information contained in Parties' first biennial reports (BR1s), information provided by Parties during relevant workshops and events, and data from Parties' 2014 greenhouse gas (GHG) inventory submissions. In addition, the paper reflects Croatia's accession to the European Union (EU) in July 2013, resulting in Croatia's previous temporary target being replaced by an arrangement in line with and as part of the EU mitigation effort.

5. It comprises an introduction (chapter I) and four substantive chapters. Chapter II provides an overview of the targets of developed country Parties, including the assumptions and conditions referred to in paragraph 2(a) above. Chapter III discusses the targets of developed country Parties, including the assumptions and conditions referred to in paragraph 2(a) above and the quantitative implications of the assumptions and conditions regarding the use of carbon credits, and land use, land-use change and forestry (LULUCF). Chapter IV explores commonalities and differences in the approaches to measure progress towards the achievement of the targets of developed countries. Chapter V discusses the comparison of the level of emission reduction efforts (hereinafter referred to as mitigation efforts) among developed country Parties, including a comparison of emission reductions to be achieved by 2020, individually and in aggregate, with respect to 1990 (the base year under the Convention) and other selected years (2000, 2005 and 2012), based on several metrics.

6. The annex contains background information based on the 2014 GHG inventories submitted by Parties included in Annex I to the Convention (Annex I Parties) and information on the emission reductions associated with the targets of developed country Parties, and related metrics. Illustrations show how different metrics affect the comparability of mitigation efforts.

C. Background

7. The COP, in decision 1/CP.18, noted with grave concern the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual GHG emissions by 2020 and aggregate emission pathways consistent with having a likely chance of holding the increase in global average temperature below 2 °C or 1.5 °C above pre-industrial levels. The COP also recognized the need to consider, in the context of the first review of the long-term global goal, as referred to in decision 1/CP.16, paragraph 138, strengthening the long-term global goal on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5 °C.

8. The COP, also by decision 1/CP.18, took note of the quantified economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention as contained in document FCCC/SB/2011/INF.1/Rev.1.[6] The COP also acknowledged the role of biennial reports and international assessment and review (IAR) in measuring progress towards the achievement of quantified economy-wide emission reduction targets. The modalities and procedures for the IAR related to targets were adopted by the COP by decision 2/CP.17. Building upon relevant elements of the existing review process under the Convention, the following elements are to be part of the IAR for each developed country Party: all emissions and removals related to its target; assumptions,

[5] The document includes information on quantified economy-wide emission reduction targets contained in document FCCC/SB/2011/INF.1/Rev.1, as well as updated information communicated by three developed country Parties.

[6] Updated by document FCCC/SBSTA/2014/INF.6.

conditions and methodologies related to the attainment of its target; and progress towards the achievement of its target.[7]

9. In accordance with decision 2/CP.17, all developed country Parties had to submit their BR1s by 1 January 2014. In accordance with the "UNFCCC biennial reporting guidelines for developed country Parties" and the adopted common tabular format, in their BR1s Parties had to provide a description of their targets, including base year, gases and sectors covered, global warming potential (GWP) values, the approach to calculating emissions and removals from the LULUCF sector and the use of international market-based mechanisms in achieving their targets.

10. The "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" were adopted at COP 19.[8] They contain provisions for reviewing the progress made by Parties towards the achievement of their emission reduction targets; however, they do not establish common approaches or rules for assessing such progress.

11. In addition, 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" (hereinafter referred to as the UNFCCC Annex I inventory reporting guidelines)[9] define some of the elements referred to in decision 2/CP.17, paragraph 5, such as GWP values and coverage of gases and sectors.

12. In contrast to the Convention, approaches and modalities for reporting, accounting and review developed under the Kyoto Protocol[10] establish the rules for the coverage of sectors and GHGs, for the use of GWP values and treatment of emissions and removals in the LULUCF sector in relation to the targets and commitments inscribed in Annex B to the Kyoto Protocol. In addition, these modalities set rules for the use of assigned amount units (AAUs) and carbon credits, for example, from joint implementation (JI) and the clean development mechanism (CDM). The use of such modalities provides for common approaches in assessing the progress towards achieving the targets.

13. This paper is based on information provided by developed country Parties concerning:

(a) The targets contained in document FCCC/SBSTA/2014/INF.6 to be implemented by Annex I Parties;

(b) Assumptions and conditions related to the attainment of the targets of developed country Parties, as provided during the workshops and events on this matter held on 3 April 2011 and 2 September 2012 in Bangkok, Thailand, on 12 November 2013 in

[7] Decision 2/CP.17, annex II, paragraph 4.

[8] They are contained in the annex to decision 23/CP.19.

[9] The UNFCCC Annex I inventory reporting guidelines have been recently revised by decision 15/CP.17.

[10] Under the Kyoto Protocol's second commitment period, only certain sectors – those included in Annex A – are assessed with an inventory approach. Annex A also defines the sectoral and GHG coverage of the targets. Emissions and removals from the LULUCF sector are accounted for separately with rules governing each activity, with the reporting and accounting of some activities being mandatory (activities under Article 3, para. 3, and forest management and activities that the Party elected during the first commitment period under Article 3, para. 4) and others voluntary (remaining activities under Article 3, para. 4). Furthermore, rules were established in decision 13/CMP.1 for accounting of the use of the flexible mechanisms of emissions trading, joint implementation and the clean development mechanism towards the target.

Warsaw, Poland, and on 9 June 2011, 17 May 2012, 6 June 2013, and 8 and 11 June 2014 in Bonn, Germany (hereinafter referred to as the workshops);[11]

(c) Submissions from developed country Parties, as part of the process of clarifying their targets, in response to paragraph 5 of decision 2/CP.17, a submission from Nauru on behalf of the Alliance of Small Island States (AOSIS) contained in document FCCC/AWGLCA/2012/MISC.1 and Add.1 and 2 (hereinafter referred to as the 2012 submissions) and the submissions from Japan and New Zealand outlined in document FCCC/SBSTA/2014/INF.6;[12]

(d) The 2014 GHG inventory submissions[13] and the sixth national communications and BR1s under the Convention from Annex I Parties;

(e) The possible contribution from LULUCF and Kyoto Protocol mechanisms in attaining the pledges for emission reductions submitted by Annex I Parties that are also Parties to the Kyoto Protocol, as given in document FCCC/KP/AWG/2010/INF.2/Rev.1,[14] for Parties for which information on the contribution of carbon credits and LULUCF was not available in the sources listed in paragraph 11(a–d) above.[15]

D. Possible action by the Subsidiary Body for Scientific and Technological Advice

14. SBSTA 41 may wish to consider this paper in its considerations of agenda item 13, "Work programme on clarification of quantified economy-wide emission reduction targets of developed country Parties".

[11] Workshop reports and presentations can be found at <http://unfccc.int/bodies/awg-lca/items/5928.php>, <http://unfccc.int/bodies/awg-lca/items/5988.php>, <http://unfccc.int/meetings/bonn_may_2012/workshop/6659.php>, <http://unfccc.int/meetings/bangkok_aug_2012/workshop/7026.php>, <http://unfccc.int/meetings/bonn_june_2013/events/items/7651.php> and <http://unfccc.int/focus/mitigation/items/7884.php>.

[12] As footnote 4 above.

[13] Document FCCC/TP/2013/7 was based on data from the 2013 GHG inventory submissions from Annex I Parties, while this document is based on the more recent data from the 2014 GHG inventory submissions.

[14] Using information in document FCCC/KP/AWG/2010/INF.2/Rev.1 is relevant for the purposes of the preparation of this paper, since for Annex I Parties that are also Parties to the Kyoto Protocol, pledges included in that document are the same as the targets included in document FCCC/SB/2011/INF.1. In addition, both the COP, by decision 1/CP.16, and the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, by decision 1/CMP.6, took note of the targets to be implemented by Annex I Parties, as communicated by them and contained in document FCCC/SB/2011/INF.1.

[15] Since the publication of document FCCC/KP/AWG/2010/INF.2/Rev.1, the adoption of the Doha Amendment (decision 1/CMP.8) and of rules for the implementation of the second commitment period of the Kyoto Protocol have been adopted (decisions 1/CMP.7, 2/CMP.7 and 2/CMP.8) has taken place, and four Parties, namely Canada, Japan, New Zealand and Russian Federation, did not assume commitments under Annex B for the second commitment period of the Kyoto Protocol. Except for New Zealand, it remains unclear at the time of preparation of this paper to what extent these Parties intend to follow the Kyoto Protocol rules for the second commitment period, bearing in mind that Canada withdrew from the Kyoto Protocol.

II. Compilation of the quantified economy-wide emission reduction targets of developed country Parties, including assumptions and conditions

15. The COP, by decision 1/CP.18, decided to establish a work programme under the SBSTA to continue the process of clarifying the developed country Parties' quantified economy-wide emission reduction targets contained in document FCCC/SBSTA/2014/INF.6, with the objective of understanding the assumptions and conditions related to the individual targets, and associated assumptions and conditions related to the ambition of the pledges, as outlined in decision 2/CP.17, paragraph 5, and with a view to identifying common elements for measuring the progress and ensuring comparability of efforts.[16] The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP), by decision 1/CMP.6, took note of the targets to be implemented by Annex I Parties that are also Parties to the Kyoto Protocol, as communicated by them and contained in the same document.[17]

16. Table 1 provides a compilation of information available as of 01 November 2014 on the targets of developed country Parties, and information on assumptions and conditions related to the attainment to these targets, in general and in relation to the ambition of the pledge, as well as assumptions and conditions on the use of carbon credits from market-based mechanisms[18] and LULUCF. Table 1 reproduces the relevant table from document FCCC/TP/2011/1 and includes several updates. For Kazakhstan, information was updated with the latest available information from its 2012 submission[19] regarding the base year. For Parties where updated information on carbon credits and LULUCF was available from their 2012 submissions,[20] this information was presented in table 2 and relevant outdated information was removed from table 1. New Zealand's target was updated with information from its 2013 submission regarding the adoption of a firm and unconditional target, while Japan's target was updated with information from its 2013 submission regarding a new target.[21] A discussion of the information contained in table 1 and of the quantitative implications of these assumptions and conditions is provided in chapter III.

[16] Decision 1/CP.18, paragraph 8. In accordance with decision 1/CP.16, Parties' communications included in document FCCC/SBSTA/2014/INF.6 are considered communications under the Convention.

[17] Decision 1/CMP.6, paragraph 3. In accordance with this decision, the information in document FCCC/SB/2011/INF.1 is presented without prejudice to the position of the Parties or to the right of Parties under Article 21, paragraph 7, of the Kyoto Protocol.

[18] "Carbon credits from market-based mechanisms" is a general term that refers to emission reductions or removals achieved outside the domain of a country or entity having an emission reduction target. They may be used to meet part of an emission reduction target of a Party or entity, as they offset part of the emissions. Carbon credits are usually expressed in tonnes of carbon dioxide equivalent saved. In the context of the Kyoto Protocol, carbon credits include certified emission reduction units under Article 12, emission reduction units under Article 6 and assigned amount units under Article 17. Carbon credits also include those generated from LULUCF activities, as the LULUCF sector is not included in the sectors listed in Annex A to the Kyoto Protocol.
In the future it might also be possible to generate carbon credits, for example, through the new market mechanisms established under the Convention (decision 2/CP.17), and from reduced deforestation and forest degradation and/or from nationally appropriate mitigation measures. Unless specified otherwise, this paper refers to international carbon credits or offsets, for example, those that can be used for adhering to the targets of developed countries under the Convention.

[19] FCCC/AWGLCA/2012/MISC.1 and Add.1 and 2.

[20] FCCC/AWGLCA/2012/MISC.1 and Add.1 and 2.

[21] See document FCCC/SBSTA/2014/INF.6.

17. Table 2 provides a compilation of information on assumptions and conditions related to individual targets of developed country Parties in relation to the base year, GWP values, coverage of gases and sectors, expected emission reductions and updated information compared with that presented in table 1 on the role of LULUCF and carbon credits. This table reflects the most recent information available from submissions from Parties in 2012,[22] some information presented during the workshops and the latest information contained in the BR1s submitted by Parties in 2014. A discussion of the information contained in table 2 is contained in chapter III and a discussion exploring commonalities and differences in the approaches to measure progress towards the achievement of the targets of developed countries is provided in chapter IV.

18. Information submitted in 2012 by Nauru on behalf of AOSIS is not included in tables 1 and 2 owing to its different nature; it addresses broader issues than just individual targets, such as the role of common accounting rules in delivering an assessment of mitigation ambition and a call for Parties to express their targets as unconditional single values. This submission highlights, inter alia, the link between the targets and the clarification of targets needed to assess the gap to the global goal of keeping the average global temperature increase below 2 °C; and the link between assessing the gap and the facilitation of the identification of ways to close the gap through greater mitigation ambition.

[22] FCCC/AWGLCA/2012/MISC.1 and Add.1 and 2.

Table 1

Compilation of information on quantitative economy-wide emission reduction targets of developed country Parties and on assumptions and conditions related to the attainment of these targets, including general assumptions and conditions, assumptions and conditions related to the ambition of the pledge and assumptions and conditions on the use of carbon credits from market-based mechanisms and land use, land-use change and forestry

	Quantified economy-wide emission reduction targets for 2020 and related general assumptions and conditions as well as assumptions and conditions related to the ambition of the pledge	*Assumptions and conditions relating to LULUCF*	*Assumptions and conditions relating to carbon credits from market-based mechanisms*
Australia[a]	Target of 5 per cent up to 15 per cent or 25 per cent emission reduction relative to 2000 Australia's 5 per cent target presents a minimum unconditional commitment. The 15 per cent target is conditional on a global agreement which falls short of securing atmospheric stabilization at 450 ppm CO_2 eq, under which all major developing economies substantially restrain emissions, in the context of a strong international financing and technology cooperation framework, and advanced economies take on commitments comparable to Australia's, in the range of 15–25 per cent below 1990 levels. In addition, the 25 per cent target is conditional on an ambitious global deal capable of stabilizing levels of GHGs in the atmosphere at 450 ppm CO_2 eq or lower, including a clear pathway to achieving an early global peak in emissions, advanced economy reductions in aggregate of at least 25 per cent below 1990 levels by 2020, major developing economies with a collective reduction of at least 20 per cent below business as usual by 2020, and the nomination of a peaking year for major developing economies	In defining its targets for 2020, Australia considered that these targets refer to its net emissions from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities, for the base year (2000) and 2020. The 25 per cent target is conditional on the inclusion of forests (reducing emissions from deforestation and forest degradation in developing countries) and the land sector in the global agreement, while the 15 per cent target is conditional on progress for their inclusion	The 15 per cent target is conditional on access to deeper and broader functional carbon markets The 25 per cent target is conditional on global action that mobilizes greater financial resources, including from major developing economies, and results in fully functioning global carbon markets
Belarus	Target of 5–10 per cent emission reduction relative to 1990[b] Belarus's target is premised on the existence of and the Party's access to the flexibility mechanisms under the Kyoto Protocol; the intensification of technology transfer, capacity-building and enhancing the experience of Belarus, taking into consideration the special conditions of the Annex I Parties undergoing the process of transition to a market economy; and there being clarity on the use of new rules and modalities for LULUCF		Participation of Belarus in the mechanisms is conditional on access to other Kyoto Protocol mechanisms
Canada	The Canadian target of 17 per cent emission reduction relative to 2005 is to be aligned with the final economy-wide emission reduction target of the United States of America in enacted legislation. The target was made with the expectation that other Annex I Parties and major non-Annex I Parties would submit		Although rules on the use of international offsets have not been finalized, Canada does not assume or provide for significant use of Kyoto Protocol mechanisms for its 2020 target. According to preliminary

	Quantified economy-wide emission reduction targets for 2020 and related general assumptions and conditions as well as assumptions and conditions related to the ambition of the pledge	*Assumptions and conditions relating to LULUCF*	*Assumptions and conditions relating to carbon credits from market-based mechanisms*
	information on their emission targets		estimates, use of mechanisms could account for less than 5 per cent of total reductions by 2020
Croatia[c]	Upon the accession of Croatia to the European Union (EU) in July 2013, Croatia's previous target was replaced by an arrangement in line with and as part of the EU mitigation effort (see European Union and its 28 member States below)		
European Union and its 28 member States	Target of 20 per cent/30 per cent emission reduction relative to 1990 The 20 per cent emission reduction target by 2020 is unconditional and supported by legislation in place since 2009 (Climate and Energy Package). The EU would move to a 30 per cent target as part of a global comprehensive agreement for the period beyond 2012, provided that all Parties contribute their fair share to a cost-effective global emission reduction pathway, where other developed countries commit themselves to comparable emission reductions and developing countries contribute adequately according to their responsibilities and respective capabilities		The EU in the context of the AWG-LCA is more ambitious in the use of market-based mechanisms compared with such use in the context of the Kyoto Protocol: for example, inclusion of international aviation, higher CDM quality standards, supplementarity defined, recognition of early action, no carry-over of assigned amount units, a single base year of 1990, annual compliance cycle, higher penalties for non-compliance in emissions trading sectors, taking into account the direct and indirect effects of biofuels on land-use change
Iceland	Target of 20 per cent/30 per cent emission reduction relative to 1990[d] The 20 per cent target assumes that the rules governing the Kyoto Protocol will continue to apply after 2012 and that there is an extension of decision 14/CP.7. The 30 per cent target is to be achieved in a joint effort with the EU, with Iceland adhering fully to the EU Climate and Energy Package, as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities. Iceland expects joint target setting with other Parties (in accordance with Article 4 of the Kyoto Protocol, or a similar arrangement)	A substantial share of mitigation efforts by Iceland will have to be achieved through the LULUCF sector, since there is almost no mitigation potential in the energy sector Actions in the LULUCF sector will allow Iceland to take on targets comparable with other developed countries, but large changes in LULUCF rules might call for a recalculation of Iceland's target	Iceland intends to fulfil its pledge mostly or even fully through domestic efforts and expects the role of market-based mechanisms in achieving its target to be small. However, Iceland does not rule out the need to buy offsets
Japan	Japan announced a target of a 3.8 per cent emission reduction		To be determined

	Quantified economy-wide emission reduction targets for 2020 and related general assumptions and conditions as well as assumptions and conditions related to the ambition of the pledge	*Assumptions and conditions relating to LULUCF*	*Assumptions and conditions relating to carbon credits from market-based mechanisms*
	by 2020 compared with 2005 levels[e]		
Kazakhstan[f]	Kazakhstan communicated a target of a 15 per cent emission reduction by 2020 compared with 1990 levels[g]		To be determined
Liechtenstein	Target of 20 per cent/30 per cent emission reduction relative to 1990 Liechtenstein's 20 per cent target is unconditional. Liechtenstein communicated that it is prepared to raise this target to 30 per cent if other developed countries agree to comparable reductions and emerging economies contribute according to their respective capabilities and responsibilities within the framework of a binding agreement		Liechtenstein is planning to use Kyoto Protocol mechanisms as an additional tool for being in compliance with the provisions of the Kyoto Protocol. The Party provided preliminary estimates in the range of 10 per cent to 40 per cent
Monaco	Monaco is committed to an unconditional target of a 30 per cent emission reduction by 2020 compared with 1990 levels. Also, Monaco aims to become carbon neutral by 2050 at the latest and as such maintains the possibility of exceeding its emission reduction target for 2020 through the use of mechanisms	Not applicable	Monaco intends to use the Kyoto Protocol mechanisms, in particular the CDM, in achieving its target
New Zealand	Firm and unconditional target of a 5 per cent emission reduction relative to 1990, expressed as a carbon budget (a QELRO of 96.8)	Application, mutatis mutandis, of Kyoto Protocol second commitment period accounting rules	Application, mutatis mutandis, of Kyoto Protocol second commitment period accounting rules
	Target of 10–20 per cent emission reduction relative to 1990 New Zealand's target is conditional on a comprehensive global agreement, whereby: (a) The global agreement sets the world on a pathway to limiting temperature rise to no more than 2 °C; (b) Developed countries make comparable efforts to those of New Zealand; (c) Advanced and major emitting developing countries take action fully commensurate with their respective capabilities; (d) There is an effective set of rules for LULUCF; (e) There is full recourse to a broad and efficient international carbon market	New Zealand's 10–20 per cent target is conditional on an effective set of rules for LULUCF	New Zealand's 10–20 per cent target is conditional on the full recourse to a broad and efficient international carbon market
Norway	Target of 30–40 per cent emission reduction relative to 1990 The 30 per cent target is unconditional, based on a political	Norway provided preliminary estimates for the LULUCF	An important feature of Norwegian climate change policy is the flexible and

	Quantified economy-wide emission reduction targets for 2020 and related general assumptions and conditions as well as assumptions and conditions related to the ambition of the pledge	*Assumptions and conditions relating to LULUCF*	*Assumptions and conditions relating to carbon credits from market-based mechanisms*
	agreement on Norwegian climate policy made in Parliament in 2007. Norway will move to a target of 40 per cent as part of a global and comprehensive agreement for the period beyond 2012 whereby major emitting Parties agree on emission reductions in line with the objective of a maximum 2 °C global temperature rise. Under the same conditions Norway presented the target of becoming carbon neutral by 2030 The continuation of the Kyoto Protocol or its basic elements as part of a future framework, in particular the availability of flexibility mechanisms for compliance with emission reduction commitments, is therefore an underlying premise for Norway's emission reduction target	contribution of around 6 per cent of 1990 emissions (3 Mt CO_2 eq), in accordance with current Kyoto Protocol rules. In addition, Norway stated that it intends to revise its commitments in accordance with rule changes, with the aim of keeping the overall high ambition level unchanged	cost-effective Kyoto Protocol based approach. Norway underlined the importance of pursuing various approaches, including opportunities to use markets post-2012. The aim of Norway is that about two thirds of emission reductions in 2020 will be cuts in domestic emissions; preliminary estimates indicate that this represents 15–17 Mt CO_2 eq by 2020
Russian Federation	Target of 15–25 per cent emission reduction relative to 1990 The range of the target of the Russian Federation depends on the following conditions: (a) Appropriate accounting of the potential of the Russian Federation's forestry sector in the context of its contribution to meeting the obligations of anthropogenic emission reductions; (b) The undertaking by all major emitters of legally binding obligations to reduce anthropogenic GHG emissions	Appropriate accounting of the potential of the forestry sector of the Russian Federation	To be determined
Switzerland	Target of 20 per cent/30 per cent emission reduction relative to 1990 The 20 per cent target is unconditional. Switzerland reiterated its conditional offer to move to a 30 per cent reduction as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities. Switzerland noted that bunker fuels have to form part of global reduction objectives covered under a sectoral approach		
Ukraine	The target of Ukraine of 20 per cent emission reduction relative to 1990 was communicated under the following conditions: (a) That developed countries have an agreed position on the quantified emission reduction targets of Annex I Parties; (b) That Ukraine maintains its status as a country with an	To be determined	The conditions associated with the target state that the existing flexibility mechanisms under the Kyoto Protocol are to be kept

	Quantified economy-wide emission reduction targets for 2020 and related general assumptions and conditions as well as assumptions and conditions related to the ambition of the pledge	*Assumptions and conditions relating to LULUCF*	*Assumptions and conditions relating to carbon credits from market-based mechanisms*
	economy in transition and the relevant preferences arising from such a status; (c) That the existing flexibility mechanisms under the Kyoto Protocol are kept; (d) That 1990 is kept as the single base year for calculating Parties' commitments; (e) That the provisions of Article 3, paragraph 13, of the Kyoto Protocol are used for the calculation of the quantified emission reductions of Annex I Parties under the Kyoto Protocol for the relevant commitment period		
United States of America	The target communicated by the United States is in the range of a 17 per cent emission reduction by 2020 compared with 2005, in conformity with anticipated United States energy and climate legislation, recognizing that the final target will be reported to the secretariat in the light of the enacted legislation. In addition, the pathway set forth in pending legislation would entail a 30 per cent emission reduction by 2025 and a 42 per cent emission reduction by 2030, in line with the goal to reduce emissions by 83 per cent by 2050. The submission of the target by the United States was made on the assumption that other Annex I Parties, as well as more advanced non-Annex I Parties, would associate with the Copenhagen Accord and submit mitigation actions	For the United States the target is economy-wide and will create incentives to reduce net emissions from all sectors that have mitigation potential, including the LULUCF sector. The United States will undertake a comprehensive, land-based approach that takes advantage of the broadest array of mitigation actions	There is no current federal law in the United States that provides for emissions trading or international offsets, but some States provide credit towards emissions for allowances/reductions secured abroad. In addition, any mechanisms in the United States would meet high standards for environmental integrity and transparency

Notes: Information provided in italics is on the possible contribution of LULUCF and Kyoto Protocol mechanisms to attaining the targets for emission reductions, as submitted by Annex I Parties that are also Parties to the Kyoto Protocol, and is taken from document FCCC/KP/AWG/2010/INF.2/Rev.1 for those Parties for which information was not available from the sources listed in paragraph 11 (a–d) of this document. Since the publication of document FCCC/KP/AWG/2010/INF.2/Rev.1, the rules for the implementation of the second commitment period of the Kyoto Protocol have been adopted (decisions 1/CMP.7 and 2/CMP.7), and four Parties, Canada, Japan, New Zealand and the Russian Federation, do not assume commitments under Annex B for the second commitment period of the Kyoto Protocol. It remained unclear at the time of the preparation of this paper to what extent Canada, Japan, and the Russian Federation intend to follow the Kyoto Protocol rules for the second commitment period notwithstanding that Canada withdrew from the Kyoto Protocol. In its 2013 submission, New Zealand stated that it, mutatis mutandis, will apply Kyoto Protocol second commitment period rules to accounting for the 5 per cent emission reduction target. With a view to presenting the emission reduction targets consistently for all of the Parties, and given that the word "reduction" appears in the title of the table, all emission reduction targets have been presented as positive numbers.

Abbreviations: AWG-KP = Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol, AWG-LCA = Ad Hoc Working Group on Long-term Cooperative Action under the Convention, CDM = clean development mechanism, CO_2eq = carbon dioxide equivalent, EU = European Union, GHG = greenhouse gas, JI = joint implementation, LULUCF = land use, land-use change and forestry, QELRO = quantified emission limitation or reduction objective.

[a] Most of the information for Australia comes from its presentation at the workshop on assumptions and conditions related to the attainment of quantified economy-wide emission reduction targets by developed country Parties held in April 2011 and the fact sheet presented there; see <http://www.climatechange.gov.au/government/reduce/national-targets/factsheet.aspx>. In that fact sheet, Australia clarified that "advanced economies" refers to Annex I Parties and at least some other high/middle income economies, and that "major developing economies" refers to non-Annex I Party members of the Major Economies Forum.

[b] According to the information contained in its first biennial report, Belarus, taking into account its national circumstances and commitments, in order to prevent climate change, has increased its quantified emission limitation [commitment?] for the second commitment period of the Kyoto Protocol to 12 per cent as compared with the 1990 emission level.

[c] Croatia's previous temporary target, prior to its accession to the European Union, was a 5 per cent emission reduction relative to 1990, with its level of emissions for 1990 (the base year) calculated in accordance with decision 7/CP.12.

[d] The quantified emission limitation or reduction commitment (QELRC) for Iceland for the second commitment period of the Kyoto Protocol is based on the understanding that it will be fulfilled jointly with the European Union and its member States, in accordance with Article 4 of the Kyoto Protocol.

[e] Japan initially communicated a target of a 25 per cent emission reduction by 2020 compared with 1990 levels. The original communication is available at <http://unfccc.int/home/items/5264.php>.

[f] Kazakhstan is an Annex I Party for the purposes of the Kyoto Protocol, in accordance with Article 1, paragraph 7, of the Kyoto Protocol, but not an Annex I Party for the purposes of the Convention. Under the Kyoto Protocol, Kazakhstan committed to a quantified emission reduction commitment of 95 per cent of the base year level for the second commitment period.

[g] In its first communication of 26 January 2010, Kazakhstan defined 1992 as the base year for its target. In a letter of 27 January 2012, the Party announced that it is considering changing the base year from 1992 to 1990, in the context of increasing the level of ambition to reduce GHG emissions. This change of base year was confirmed in Kazakhstan's submission of 11 April 2012.

Table 2

Compilation of information on assumptions and conditions related to individual targets of developed country Parties in relation to the base year, global warming potential values, coverage of gases and sectors, expected emission reductions and the role of land use, land-use change and forestry, and carbon credits from market-based mechanisms

	Base year	*Global warming potential values*	*Coverage of gases*	*Coverage of sectors*	*Expected emission reductions*	*Role of land use, land-use change and forestry*	*Carbon credits from market-based mechanisms*
Australia	2000	Australia's target was set based on current GWPs from the IPCC SAR. Updated values will be adopted in the national inventory in 2015 consistent with decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	NA	*Included* Contribution of LULUCF is calculated using an activity-based approach	Australia's targets represent net emissions and include credible Kyoto-compliant units from emission reduction activities overseas as to be reflected in the Australian National Registry of Emissions Units
Belarus	1990	Belarus's target is based on current GWPs from the IPCC SAR	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Energy, transport, IPPU, agriculture, waste	NA	*Excluded*	NA
Canada	2005	As contained in decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sources and sectors	NA	Canada intends to include the LULUCF sector in its accounting of GHG emissions by using either the 2005 base year or a reference level. Non-anthropogenic emissions and related removals resulting from natural disturbances will be excluded, and accounting for harvested wood products would follow a production approach	No significant use assumed
European Union and its 28 member States	1990[a]	The GWPs used under the existing EU legislation are based on IPCC SAR. The EU welcomes decision 15/CP.17,[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Energy, IPPU, agriculture, waste, aviation	NA	The EU pledge does not include emissions/removals from LULUCF to deliver its unconditional commitment to reduce GHG emissions by 20 per cent compared with 1990 by 2020. The EU LULUCF sector is, however, estimated to be a net sink over that	CERs, ERUs and possible recognition of units from new market-based mechanisms; for the use of units the EU ETS is capped at 50 per cent of the required reduction below 2005 levels; other sectors: annual use capped at 3–4 per cent of each member State's

	Base year	*Global warming potential values*	*Coverage of gases*	*Coverage of sectors*	*Expected emission reductions*	*Role of land use, land-use change and forestry*	*Carbon credits from market-based mechanisms*
		reflecting recent scientific developments (IPCC AR4) and is reviewing the implications of this decision				period	non-ETS GHG emissions in 2005 No use of surplus AAUs from the first commitment period under the Kyoto Protocol to meet the targets set in EU legislation, but EU ETS allows for banking of surplus EU emission allowances into subsequent periods
Iceland	1990	As contained in decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Energy, IPPU, agriculture, LULUCF, waste, aviation	NA	Afforestation/reforestation and deforestation; revegetation; forest management and wetland drainage and rewetting to be confirmed	No significant use assumed
Japan	2005	IPCC SAR and IPCC AR4 (NF_3)	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	NA	*Included* Contribution of LULUCF is calculated using the activity-based approach	NA
Kazakhstan	1990	100-year GWPs from the IPCC SAR	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	All IPCC sectors	NA	Included	NA
Liechtenstein	1990	IPCC SAR	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	All IPCC sectors	NA	*Included* Contribution of LULUCF is calculated using the land-based approach	Use is planned for compliance under the Kyoto Protocol
Monaco	1990[c]	IPCC AR4	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	NA	*Included* Contribution of LULUCF is calculated using the activity-based approach	CERs from CDM; Monaco does not intend to use the carry-over of AAUs or to purchase foreign AAUs
New Zealand[d]	1990	As contained in decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	Energy, IPPU, agriculture, LULUCF, waste	NA	Afforestation/reforestation and deforestation; forest management to be confirmed; as per the conditions of New Zealand's target range, an effective set of rules for LULUCF would include the flexible land use, 'afforestation-reforestation debit-credit' and harvested wood product rules	CDM, JI, IET, carry-over, REDD; New Zealand expects to meet its target through a mixture of domestic emission reductions, including through afforestation, reforestation and forest management, and the purchase of carbon credits

	Base year	*Global warming potential values*	*Coverage of gases*	*Coverage of sectors*	*Expected emission reductions*	*Role of land use, land-use change and forestry*	*Carbon credits from market-based mechanisms*
Norway	1990	As contained in decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	NA	*Included* Contribution of LULUCF is calculated using the activity-based approach	Availability of flexible mechanisms is an underlying premise for Norway's emission targets Expected use of CDM, JI, IET and any other market-based mechanism that may be established under the UNFCCC Norway will continue to make use of the Kyoto Protocol mechanisms. If Norway should move from a 30 per cent to a 40 per cent reduction target , this would entail considerable use of carbon credits
Russian Federation	1990	IPCC AR4	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	NA	*Included* Appropriate accounting of the potential of the forestry sector of the Russian Federation	NA
Switzerland	1990	As contained in decision 15/CP.17[b]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sectors	10.5 Mt CO_2 eq for –20 per cent target; 15.8 Mt CO_2 eq for –30 per cent target	Switzerland uses the Kyoto Protocol rules for its pledge under the Convention. Reporting of LULUCF under the Convention follows a comprehensive land-based approach. In the first commitment period of the Kyoto Protocol, Switzerland is accounting for afforestation, reforestation and deforestation under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4. Accounting for additional activities under Article 3, paragraph 4, of the Kyoto Protocol in the second commitment period is yet to be decided	Switzerland plans to use CDM, JI and the new market-based mechanism under the Convention if the quality of the mechanism is guaranteed; it does not support the use of AAUs outside of the Kyoto system. The Swiss CO_2 Law for the 2013–20 period defines the –20 per cent target as domestic, but carbon credits might be used in limited cases.[e] Accordingly carbon credits could be used for up to 75 per cent of the additional emission reductions beyond the –20 per cent target by 2020 compared with 1990. Qualitative restrictions on the use of carbon credits are to be applied as of 2013 for the –20 per cent target.
Ukraine	1990	IPCC SAR	CO_2, CH_4, N_2O, HFCs,	All IPCC sectors	NA	*Included* Contribution of LULUCF is	One condition for the target is that the provisions of Article 3,

	Base year	*Global warming potential values*	*Coverage of gases*	*Coverage of sectors*	*Expected emission reductions*	*Role of land use, land-use change and forestry*	*Carbon credits from market-based mechanisms*
			PFCs, SF_6			calculated using the land-based approach	paragraph 13, of the Kyoto Protocol are used for the calculation of the quantified emission reductions of the Annex I Parties under the Kyoto Protocol for the relevant commitment period
United States of America	2005	100-year GWPs from the IPCC AR4	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	All IPCC sources and sectors	In the range of 17 per cent below 2005 levels	Comprehensive emissions and removals from the LULUCF sector will be accounted using a net–net approach and a 2005 base year, including a production approach to account for harvested wood products. Methodological approaches for excluding emissions resulting from non-anthropogenic natural disturbances are under consideration	There is no current federal law in the United States that provides for emissions trading or international offsets, but some states provide credit towards emissions for allowances/reductions secured abroad. In addition, any mechanisms in the United States would meet high standards for environmental integrity and transparency

Note: Information provided in italics is information derived from table 1 and more detailed information can be found there.

Abbreviations: AAUs = assigned amount units, CDM = clean development mechanism, CERs = certified emission reductions, CH_4 = methane, CO_2 = carbon dioxide, EU = European Union, ERUs = emission reduction units, ETS = emissions trading scheme, GHG = greenhouse gas, GWPs = global warming potential values, HFCs = hydrofluorocarbons, IET = international emissions trading, IPCC = Intergovernmental Panel on Climate Change, IPCC AR4 = Fourth Assessment Report of the IPCC, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, IPCC SAR = Second Assessment Report of the IPCC, IPPU = industrial processes and product use, JI = joint implementation, LULUCF = land use, land-use change and forestry, NA = information not available, NF_3 = Nitrogen fluoride, N_2O = nitrous oxide, PFCs = perfluorocarbons, REDD = reducing emissions from deforestation and forest degradation in developing countries, SF_6 = sulphur hexafluoride.

[a] Whereas the base year of the EU and its member States is 1990 for the purposes of the target as reflected in document FCCC/SB/2011/INF.1/Rev.1, the information on quantified emission limitation and reduction objectives by the EU and its member States will reflect the flexibilities to set individual base years provided under the Kyoto Protocol.

[b] Revision of the UNFCCC "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".

[c] Party defined base year as 1990 for CO_2, CH_4 and N_2O and 1995 for HFCs, PFCs and SF_6.

[d] In its 2013 submission, New Zealand stated that it, mutatis mutandis, will apply Kyoto Protocol second commitment period rules to accounting for the 5 per cent emission reduction target.

[e] Switzerland, in its submission, lists the following cases: "fossil fuel power plants, companies included in the ETS, companies exempted from the CO_2 levy that are not involved in the ETS, and in the sanction mechanism".

III. Discussion on the assumptions and conditions related to the attainment of quantified economy-wide emission reduction targets by developed country Parties

A. Overview of the assumptions and conditions

19. The targets communicated by most Parties are generally not represented as a single unconditional value, but as a single conditional value or a range of values. While for a number of Parties the lower targets are unconditional and higher targets[23] are dependent on conditions and assumptions about a new global agreement on climate change, other Parties communicated their single target value or range of values with conditions. With some nuances in the language, conditions relate to the following: achieving a comprehensive global agreement, with the participation of all major economies; advanced economies agreeing to comparable mitigation efforts and actions; developing countries taking action in accordance with their differentiated responsibilities and respective capabilities; and all Parties contributing their fair share to a cost-effective global emission reduction pathway. Other conditions and assumptions relate to an effective set of rules for LULUCF, use of market-based mechanisms and extension of certain provisions relevant for specific Parties (see table 1).

20. Only two Parties (Kazakhstan[24] and Monaco) presented a single unconditional target, while six Parties (Australia, European Union (EU), Liechtenstein, Norway, Russian Federation and Switzerland) presented their lower targets as unconditional. Four Parties (Canada, Japan, Ukraine and United States of America) presented single targets linked to certain conditions and assumptions, while three Parties (Belarus, Iceland and New Zealand) presented ranges of values linked to such conditions and assumptions. In its 2013 submission, New Zealand announced an unconditional target in addition to its conditional target range.[25]

Overview of Parties' general conditions

21. **Australia** specifically linked its higher target with a global deal capable of stabilizing GHG concentrations in the atmosphere at 450 ppm CO_2 eq or lower, while setting a clear pathway to achieving an early global peak in emissions; advanced economies achieving reductions in aggregate of at least 25 per cent below 1990 levels by 2020; major developing economies achieving a collective reduction of at least 20 per cent below business as usual by 2020; and the nomination of a peaking year for major developing economies. The **EU** made reference to the overall goal of keeping the average global temperature increase below 2 °C, which requires global GHG emissions to peak by 2020 at the latest and then to be reduced by at least 50 per cent below 1990 levels by 2050. The EU higher target is conditional on a global comprehensive agreement for the period beyond 2012, provided that all Parties contribute their fair share to a cost-effective global emission reduction pathway, where other developed countries commit themselves to comparable emission reductions and developing countries contribute adequately according to their responsibilities and respective capabilities. Similarly, **Liechtenstein, Norway,** the **Russian Federation** and **Switzerland** linked their higher targets with a global and comprehensive agreement and **New Zealand** linked its range of targets to similar conditions. In their 2012

[23] Targets associated with larger emission reductions by 2020.

[24] Kazakhstan did not provide information on conditions and assumptions.

[25] As footnote 4 above.

submissions, Australia, the EU, New Zealand and Norway again emphasized the link between their targets and the 2 °C goal.

22. In addition, in its 2013 submission, **Japan** noted that its target does not currently take into account the emission reduction effect resulting from nuclear power, given that the energy policy and energy mix, including the utilization of nuclear power, are still under consideration. Japan announced that a firm target, which will be based on further review of the energy policy and energy mix, will eventually be set.

23. The submission of the target by the **United States** is made on the assumption that other Annex I Parties, as well as more advanced Parties not included in Annex I to the Convention, would associate with the Copenhagen Accord and submit mitigation actions. The United States emphasized during the workshops that its target should be in conformity with its anticipated energy and climate legislation, recognizing that the final target will be reported to the secretariat in the light of the enacted legislation. **Canada**'s target is to be aligned with the target of the United States. **Iceland** linked its target with the joint efforts of the EU countries. **Ukraine**[26] and **Belarus** made a reference to maintaining their status under the Convention as countries with economies in transition, with Belarus specifically mentioning related provisions on technology transfer and capacity-building.

Overview of assumptions and conditions in relation to land use, land-use change and forestry and use of carbon credits

24. The targets of many Parties are conditional on the definition of the rules for the use of market-based mechanisms and LULUCF. Overall, for a number of Parties, moving to the upper end of their targets is conditional on a more comprehensive inclusion of LULUCF within their target or within a global agreement, and access to more options for the use of carbon credits from market-based mechanisms.

25. The **EU** acknowledged during the workshops that rules for the use of market-based mechanisms and LULUCF considerably influence the stringency of their targets and stressed the need for robust, rigorous and consistent accounting rules, in particular on the coverage of sectors and gases, and common metrics to calculate the CO_2 equivalence of GHGs. **Norway** noted as a condition for its target the continuation of the Kyoto Protocol or its basic elements as part of a future framework, in particular the availability of market-based mechanisms. For **Australia**, meeting the more stringent targets (of 15 and 25 per cent) is conditional on access to deeper, broader and fully functional carbon markets. Similarly, **New Zealand** referred to a full recourse to broad and effective international markets as a condition of its target. Some Parties, for example, **Belarus**, **Iceland**, **New Zealand** and the **Russian Federation**, specifically noted that their target is conditional on the set of rules and appropriate accounting for LULUCF.

26. Overall, there is recognition that the use of carbon credits from market-based mechanisms is essential in order to achieve cost-efficiency of the mitigation effort to attain the targets and to enhance their stringency. However, there is little clarity on the anticipated use of such credits or on their sources and scale of contribution to attaining the targets. Among the Parties that submitted relatively detailed information on the use of carbon credits in 2012, such as the EU and New Zealand, there is a recognition, as stated by the EU, that more precise information on the use of such credits would be available once the final data on the use of such credits during the period 2008–2012 and relevant GHG emissions data become available. Nevertheless, the EU and Switzerland provided specific information on the limit on the use of carbon credits as of 2013 in their 2012 submissions.

[26] Specifically for the Kyoto Protocol, Ukraine noted that its target is subject to continuation of the use of the Kyoto Protocol mechanisms and the provisions of Article 3, paragraph 13, of the Kyoto Protocol.

27. Developed country Parties provided in their 2012 submissions and in their BR1s more information that brought further clarity on the rules governing the accounting of domestic LULUCF actions in relation to the attainment of their targets under the Convention (see table 2). Currently, all Parties use a land-based approach for reporting on emissions and removals from LULUCF under the Convention, but there are no accounting rules agreed on how these emissions and removals could contribute to their targets under the Convention.[27] In defining its target, New Zealand included emissions and removals from afforestation, reforestation and deforestation, while Canada stated that it would use an approach based on the LULUCF reporting categories under the Convention. The United States noted that comprehensive emissions and removals from the LULUCF sector will be accounted for in its target, while Japan noted that the contribution of LULUCF to its target is calculated using the activity-based approach. In addition, many Parties that are also Parties to the Kyoto Protocol clarified that they would use the Kyoto Protocol accounting rules for LULUCF also under the Convention; in other words, they would use the activity-based approach for calculating the contribution of LULUCF to their targets.

28. Some Parties' submissions also contain succinct and transparent descriptions of the policies that have been put in place or are under development to support the targets (see paras. 48, 53–58, 60, 62 and 63 below).

B. Assumptions and conditions of individual Parties on the use of carbon credits from market-based mechanisms and land use, land-use change and forestry, including quantitative implications

29. In most cases, Parties referred to the use of carbon credits, including from existing and possible new mechanisms, in qualitative terms and emphasized that the majority of the overall mitigation effort will take place domestically, although for some of them moving to a higher target may entail an increased use of carbon credits. Similarly, Parties define approaches for the use of LULUCF in achieving their targets, but do not necessarily provide quantitative estimates.

30. Information relating to the quantitative implications of the assumptions and conditions of individual developed country Parties on the use of LULUCF and carbon credits is available only for certain Parties. For a number of Parties, the contribution of emissions trading and international credits either is yet to be determined or is uncertain. Even when quantitative information on the use of these credits or on the contribution from LULUCF is available, it is based on preliminary estimates, and should be considered with due caution. Only few Parties, for example the EU, mentioned the need to ensure that the use of mechanisms be supplemental to domestic action under the Convention.

31. In its BR1, **Australia** reported that it would use the activity-based approach for including emissions and removals from LULUCF in its target. The Party also reported that, in 2013, it announced its decision to further broaden the coverage of the land sector to include net emissions from cropland management, grazing land management and revegetation activities within its second commitment period target under the Kyoto Protocol.

[27] Since the publication of document FCCC/KP/AWG/2010/INF.2/Rev.1, the rules for the implementation of the second commitment period of the Kyoto Protocol have been adopted, including with regard to LULUCF (decision 2/CMP.7). These rules suggest that Parties that assume commitments under Annex B for the second commitment period under the Kyoto Protocol will continue with activity-based approaches under the Protocol and the major change is the adoption of forest management under Article 3, paragraph 4, as a mandatory activity under the Kyoto Protocol.

32. On the use of carbon credits, for Australia the 15 per cent target is conditional on access to deeper and broader carbon markets and the 25 per cent target is conditional on global action that mobilizes greater financial resources, including from major developing economies, and to a fully functioning global carbon market. Australia assumes that all available units from international market mechanisms, including the Kyoto Protocol mechanisms, will contribute to meeting its 2020 targets. The use of these units in Australia's Carbon Pricing Mechanism will be governed by domestic legislation and regulations. Under this legislation from 2015, certain credits from the CDM may be used to meet obligations under the Carbon Pricing Mechanism, and these credits would be counted towards Australia's targets.

33. **Canada** stated in its 2012 submission that emissions and removals from the LULUCF sector will be accounted for using either 2005 as the base year or a reference level. Non-anthropogenic emissions and related removals resulting from natural disturbances will be excluded, and accounting for harvested wood products would follow a production approach. In its BR1, the Party specified that it would use an approach based on the LULUCF reporting categories under the Convention. Canada does not assume or provide for significant use of Kyoto Protocol mechanisms for its 2020 target.

34. The **EU** does not envisage a contribution from LULUCF for its lower target of 20 per cent. Moving to its possible higher target of 30 per cent would require some contribution from LULUCF, which is estimated to be a net sink over that period. However, as a Party with a commitment for the second commitment period of the Kyoto Protocol, the EU has to account for LULUCF following an activity-based approach.[28]

35. The EU considers the access to global carbon markets as indispensable, but emphasized the need to ensure that the use of market-based mechanisms is supplementary to domestic action. It foresees limited use of certified emission reductions (CERs) and emission reduction units (ERUs) and possibly of units from the new market-based mechanisms. Under the EU emissions trading system (ETS) the use of carbon credits is limited to up to 50 per cent of the required reduction below 2005 levels over the period from 2008 to 2020. In the sectors not covered by the ETS, the annual use of carbon credits is limited to up to 3 per cent of each member State's non-ETS emissions in 2005, with a limited number of member States allowed to use an additional 1 per cent, from projects in least developed countries or small island developing States, subject to conditions.

36. EU legislation does not allow for the use of surplus AAUs from the first commitment period under the Kyoto Protocol to meet the targets set in the EU legislation. However, the EU ETS allows for the banking of surplus EU emissions allowances allocated under the EU ETS from the period 2008–2012 into subsequent periods. The total allowed emissions in the ETS over the period 2013–2020 are therefore determined by the sum of the total amount allocated within that period, the banking of allowances by companies under the ETS into the period 2013–2020 as well as the purchase of international credits described in paragraph 33 above. The number of EU ETS allowances that will be banked into the period 2013–2020 can only be determined following the finalization of the compliance cycle for 2012.

37. **Iceland** intends to reach its 2020 target mainly through domestic action in reducing emissions and increasing carbon sequestration. Mitigation efforts in the LULUCF sector are expected to play a major role and the Party plans to follow an activity-based approach, including afforestation, reforestation, deforestation and revegetation activities, while the

[28] It seems unlikely that the EU will define its target under the Convention using an approach different from that used under the Kyoto Protocol. This suggests that the lower target set by the EU would cover all sectors, but LULUCF will be treated on the accounting side like in the first commitment period, although the EU did not make a formal submission in that regard.

inclusion of forest management and wetland drainage and rewetting is yet to be confirmed. Although no acquiring of carbon credits through mechanisms is expected in its climate mitigation action plan, Iceland will retain the option to engage in carbon markets in addition to its participation in the EU ETS. The Party anticipates zero carry-over of credits from the first commitment period of the Kyoto Protocol.

38. On LULUCF, **Japan** reported in its BR1 that it would include the contribution of LULUCF in its target using the activity-based approach. **Liechtenstein**, in its BR1, clarified that the contribution of LULUCF to its target will be calculated using the land-based approach. Furthermore, the Party explained that its aim is to prioritize domestic GHG emission reductions. In case the envisaged reductions would be higher than 20 per cent by 2020, Liechtenstein would need to increase its use of carbon credits in order to achieve the respective target. The precise amount of additional credits required has not yet been estimated. To that end, Liechtenstein envisages taking the option of continuing its engagement with the Kyoto Protocol flexibility mechanisms.

39. **Monaco** reports that LULUCF does not play a major role in achieving the target as there is no forest or agricultural activity in the country. However, to calculate the contribution of LULUCF towards its target, the land-based approach will be used. In addition to the implementation of domestic measures, Monaco will purchase CERs and does not intend to use the carry-over of AAUs or the purchase of foreign AAUs.

40. In defining its target, **New Zealand** includes afforestation, reforestation and deforestation activities, while the inclusion of forest management is yet to be confirmed. It also specified that as per the conditions of New Zealand's target range, an effective set of rules for LULUCF would include the flexible land use, 'afforestation-reforestation debit-credit' and harvested wood product rules. New Zealand expects to meet its target through a mixture of domestic emission reductions, including through afforestation, reforestation and forest management, and the purchase of emission reductions in other countries, including carbon credits from all available existing and potential new market-based mechanisms.

41. **Norway** reported in its BR1 that, as a Party to the Kyoto Protocol, it will follow the established rules for accounting for LULUCF using an activity-based approach under the Convention as well. Norway estimated that the contribution of LULUCF to its target is of the order of 6 per cent of 1990 emissions based on the current LULUCF accounting rules under the Kyoto Protocol, which is equivalent to 3 Mt CO_2 eq. In the event that the LULUCF rules change, Norway would modify its target for 2020 with a view to maintaining the overall high ambition of this target. On the use of market-based mechanisms, Norway estimates that about two thirds of emission reductions in 2020 would be achieved through domestic emission reduction efforts, which is equivalent to 15–17 Mt CO_2 eq, with the remaining part coming from CDM, JI, international emissions trading and any other market-based mechanisms that may be established under the Convention. If Norway should move to its higher target of 40 per cent reduction, this would entail considerable use of carbon credits.

42. The **Russian Federation** acknowledges the need for an appropriate accounting for the potential of its LULUCF sector in meeting its target and that LULUCF can contribute to a net removal of 121.1 Mt CO_2 eq per year according to current rules.[29] However, this estimate is uncertain given that the forest sink could be expected to decrease by between 15 per cent and 20 per cent by 2020.

43. **Switzerland** uses the rules of the Kyoto Protocol for its target under the Convention, but has not yet estimated possible LULUCF contribution to its target. However, using the

[29] Further details available at <http://unfccc.int/files/essential_background/library/application/pdf/awg_russianfederation.pdf>.

rules under the first commitment period of the Kyoto Protocol and applying the accounting approach of the forest management reference level, emissions or removals from forest management in Switzerland are estimated to be zero in 2020. Switzerland plans to use carbon credits from the mechanisms under the Kyoto Protocol (CERs and ERUs) and from the new market-based mechanism under the Convention (see para. 98 below) to achieve its target under the Convention. The estimate of the amount of carbon credits to be used is not available yet. The Swiss CO_2 Law for the 2013–2020 period defines Switzerland's –20 per cent target as domestic; however, carbon credits are planned to be used in some limited cases.[30] In accordance with the same law, in addition to the carbon credits that will be used for achieving the –20 per cent target, such credits are also planned to be used for up to 75 per cent of the additional emission reductions beyond the –20 per cent target by 2020 compared with 1990. Switzerland does not support the use of AAUs outside of the Kyoto system.

44. The **United States** stated in their 2012 submission that comprehensive emissions and removals from the LULUCF sector will be accounted using a net–net approach and a 2005 base year, including a production approach to account for harvested wood products. Methodological approaches for excluding emissions resulting from non-anthropogenic natural disturbances are under consideration. The Party acknowledges that, in accordance with the full land-based approach, LULUCF contributed around 1,057 Mt CO_2 eq net removals in 2005, which is around 15 per cent of the total emissions from all other sectors. It also acknowledges that this contribution comprises a relatively significant portion of the total emissions and removals of the United States.[31] The Party noted in the context of its target that currently there is no federal law that provides for emissions trading or offsets, although some states provide credits towards emission reductions resulting from activities undertaken abroad, and that any mechanisms that could be used in the United States would meet high standards for environmental integrity and transparency.

45. A few Parties, namely **Belarus**, **Kazakhstan** and **Ukraine**, have not yet provided very detailed information on their use of carbon credits and LULUCF. However, Belarus stated that it excludes LULUCF and considers access to the Kyoto Protocol mechanisms essential for achieving its target. **Ukraine** takes LULUCF into account in its target, using the land-based approach for its calculation. Also, its target is conditional upon the continued use of the mechanisms under the Kyoto Protocol. Kazakhstan will include LULUCF in its target, but has not yet specified the approach that will be used.

46. The use of LULUCF by developed country Parties in achieving their targets and the related rules could influence the level of emission reductions for the other sectors, namely, energy, industrial processes, solvent and other product use, agriculture and waste. For example, if changes in rules were to lead to a higher contribution from LULUCF, smaller reductions would be needed from the other sectors. However, this is not necessarily the case for all Parties (see para. 39 above for the example of Norway).

47. Similarly, the use of carbon credits by developed country Parties to achieve their 2020 targets can influence the scale of their domestic emission reduction efforts. In a number of cases, for example, Australia, the EU, Liechtenstein, Norway and Switzerland, adhering to a more stringent target from the range that was communicated by them would require a higher level of use of carbon credits than would be the case with a less stringent target.

[30] In its submission, Switzerland lists the following cases: "fossil fuel power plants, the ETS, companies exempted from the CO_2 levy that are not involved in the ETS, and the sanction mechanism".

[31] Further details available at <http://unfccc.int/bodies/awg-lca/items/5928.php>.

C. Assumptions and conditions of individual Parties in relation to the base year, global warming potential values, coverage of gases and sectors, expected emission reductions and mitigation policies, legislation and institutional arrangements in relation to the targets

48. Owing to the submissions in 2012 and the BR1s submitted in 2014, comprehensive information is available for many Parties on assumptions and conditions in relation to GWP values, coverage of gases and sectors, expected emission reductions and mitigation policies, legislation and institutional arrangements, as summarized in table 2 and below. **Australia** formulates its target with 2000 as its base year for all GHGs covered, namely, CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). The Party's target is economy-wide covering all Intergovernmental Panel on Climate Change (IPCC) sectors and was set based on the GWP values from the IPCC Second Assessment Report (SAR) and on the UNFCCC Annex I reporting guidelines.[32] The Party stated that updated GWP values and inventory methodology will be used in the national inventory starting in 2015 consistent with the revised UNFCCC Annex I inventory reporting guidelines adopted by decision 15/CP.17. The emission reduction of 5 per cent would result in a decrease in emissions per capita of 29 per cent and a decrease in emission intensity of 47 per cent between 2000 and 2020, whereas the 25 per cent emission reduction would lower per capita emissions by 44 per cent and the emission intensity by 58 per cent in the same period.

49. In 2011, Australia passed into law the Clean Energy Future package, which provides the framework to help Australia to meet its 2020 targets. The package has four key elements, including the introduction of a carbon price mechanism applying to 60 per cent of its emissions, which was repealed in 2014; the promotion of innovation and investment in renewable energy; the encouragement of energy efficiency; and the creation of opportunities in the land sector to cut pollution, including through the Carbon Farming Initiative.

50. **Belarus** defines 1990 as the base year for its target, but specifies that 1995 will be used for HFCs, PFCs, SF_6 and NF_3 emissions. The target was set on the basis of the current GWPs from the IPCC SAR and covers all gases, including NF_3, and sectors, except LULUCF.

51. **Canada** refers to 2005 as the base year for its target. The Party will use the most recent GWP values contained in the IPCC AR4 and its target will cover CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions and all IPCC sources and sectors. The Party presented at the latest workshop information on action taken to implement the target at both the federal and the provincial level. At the federal level, a sector by sector regulatory approach makes it possible to tailor regulations to sector circumstances and integrate environmental and economic considerations, supporting green growth. The Government has already implemented measures targeting two of the largest emitting sectors in Canada, transportation and electricity, and is working towards reducing emissions from the oil and gas sector and other priority industrial sectors. In addition, provinces and territories are implementing GHG reduction strategies that reflect their individual circumstances, including carbon taxes, cap and trade and feed-in tariffs.

52. The **EU** and its member States defines 1990 as its base year for the purposes of the target under the Convention, but emphasized that the information on quantified emission limitation and reduction objectives will reflect the flexibilities to set individual base years provided under the Kyoto Protocol. The EU mentioned that the GWP values used to aggregate EU GHG emissions up to 2020 under existing EU legislation are those based on

[32] FCCC/SBSTA/2006/9.

the IPCC SAR. Nevertheless, the Party also welcomed decision 15/CP.17 on the mandatory reporting of GHG inventories under the Convention starting from 2015, which contains provisions on the use of the GWP values from the most recently available scientific information contained in the IPCC AR4,[33] and indicated that the implications of this decision for EU legislation are currently under review. On coverage of gases, the EU communicated that CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 will be covered. The target covers the IPCC sectors energy, industrial processes and product use, agriculture and waste and includes aviation emissions, but excludes LULUCF, in the 20 per cent reduction target.

53. On the expected emission reductions expressed in Mt CO_2 eq, the EU estimated emissions in 1990 within the scope of its Climate and Energy Package (i.e. excluding emission/removals from LULUCF, including civil aviation) to be equal to 5,657 Mt CO_2 eq; and emissions in 2020 in accordance with the 20 per cent reduction target were estimated to equal 4,523 Mt CO_2 eq. This emission reduction would result in 8.8 t CO_2 eq emissions per capita compared with more than 12 t CO_2 eq in 1990 and an emission intensity of 0.3 kg CO_2 eq per gross domestic product (GDP) (2005 Euro prices) in 2020, corresponding to less than half the 1990 levels of 0.7 kg CO_2 eq per GDP, which would be equivalent to an efficiency improvement of almost 60 per cent.

54. The EU also submitted other information related to the clarification of the target, including the inventory methodology. Currently, the EU inventory is compiled in accordance with the recommendations for inventories set out in the UNFCCC Annex I reporting guidelines applying accordingly the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), where appropriate and feasible. Within the EU, for the sectors covered by the ETS, specific monitoring, reporting and verification rules exist at the operator level, defined by a number of European Commission decisions. Concerning mitigation policies in relation to the target, the EU GHG ETS directive[34] and the effort sharing decision[35] combined define the EU GHG targets up to 2020. A 20 per cent renewable target by 2020 (for total energy) is defined at member States level.[36] This legal framework is fully implemented and in addition a large number of policies already exist that have the direct aim of reducing GHG emissions or indirectly contribute to this effect.

55. **Iceland** defines 1990 as the base year for all gases covered under its target, namely CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions. The Party referred to the most recent GWP values contained in the IPCC AR4 and to the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the preparation of its GHG emissions inventory. The target covers all IPCC sectors and includes aviation. Concerning the expected emission reduction, Iceland provided emission estimates for the base year excluding LULUCF as 3.45 Mt CO_2 eq and stated that this value does not include NF_3 or the effect of revised GWP values. Owing to Iceland's small

[33] As listed in the column entitled "Global warming potential for given time horizon" in table 2.14 of the errata to the contribution of Working Group I to the IPCC AR4, based on the effects of GHGs over a 100-year time horizon.

[34] Consolidated version of directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community.

[35] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020.

[36] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

population, the commissioning and decommissioning of single industrial projects can affect total emissions significantly. Per capita emissions are expected to either decrease from 13.6 t CO_2 eq in 1990 to 9.9 t CO_2 eq in 2020 assuming no expansion in heavy industry or to remain approximately at 1990 levels if heavy industry were to be expanded.

56. The basis for Iceland's mitigation efforts is a 2010 Action Plan, outlining key actions aimed at limiting emissions and increasing carbon sequestration. Implemented economy-wide actions include the introduction of a carbon tax, revisions of taxes on and fees for vehicles and the participation in the EU ETS, which is mainly applicable to heavy industry and aviation. In addition, several actions target sectoral emissions, mainly from transport and fisheries. The LULUCF sector is of major importance in Iceland's mitigation efforts, which involve an increase in carbon sequestration through afforestation and revegetation and plans to restore drained or damaged wetlands to limit emissions. Iceland is currently updating its climate legislation.

57. **Japan**, in its BR1, defines 2005 as the base year for all gases covered by its target, namely CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions. The Party referred to the most recent GWP values contained in the IPCC AR4 and to those in the IPCC SAR. Its target covers all IPCC sectors.

58. **Kazakhstan** refers to 1990 as the base year for its target and specifies 1995 as the base year for HFCs, PFCs and SF_6. The Party will use the GWP values contained in the IPCC SAR, and its target covers all gases except NF_3 and all IPCC sectors. Concerning the expected emission reduction, Kazakhstan provided emission estimates for the base year excluding LULUCF (376.5 Mt CO_2 eq) as the value used for calculating the target. To implement the target, the Party reports on activities being undertaken, including the establishment of a national cap and trade system, development of renewable energy resources, energy efficiency and saving programmes and projects, and incentives for the introduction of innovative technologies.

59. **Liechtenstein** defines 1990 as the base year for its target. The target was set on the basis of the current GWPs from the IPCC SAR and covers all gases, except NF_3, and all IPCC sectors.

60. **Monaco** plans to apply the flexibilities under the Kyoto Protocol to reporting under the Convention, using 1990 as the base year for CO_2, CH_4 and N_2O and 1995 for HFCs, PFCs and SF_6, while the base year for NF_3 is still to be determined. Concerning inventory methodology, Monaco referred generally to the IPCC guidelines and specified the IPCC AR4 as the source for GWP values. The Party noted that the inventory covers all IPCC sectors, but, as the whole area of Monaco is urbanized, there is no agricultural activity and green spaces consist of parks and gardens but no forests. Removals from trees in parks and gardens are extremely low, so the sectors responsible for emissions are energy, industry and waste treatment. To achieve Monaco's target, a Climate Energy Plan has been set up and is piloted by the Department of Public Works, the Environment and Urban Development.

61. **New Zealand** refers to 1990 as the base year for its target. The Party referred to the most recent GWP values contained in the IPCC AR4.[37] On coverage of gases and sectors, New Zealand communicated that its targets cover CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions[38] and all IPCC sectors. The Party indicated the use of the 2006 IPCC Guidelines for the preparation of its GHG emissions inventory. The New Zealand Government's principal policy response to climate change is its ETS,[39] which puts a price

[37] Several Parties referred to decision 15/CP.17 in this context.

[38] Decision 1/CMP.7 includes NF_3 in the 'basket' of GHGs listed under proposed amendments to Annex A to the Kyoto Protocol for its second commitment period.

[39] <http://www.climatechange.govt.nz/emissions-trading-scheme/>.

on GHG emissions to incentivize emission reductions through, for example, investments in energy efficiency and afforestation. The ETS is accompanied by several supporting mitigation policies and measures in all sectors.

62. **Norway** formulates its target with 1990 as its base year. The Party indicated that it plans to use GWP values as contained in the IPCC AR4 and follow the current IPCC guidelines[40] for its GHG emissions inventory until 2015, when it will start to use the 2006 IPCC Guidelines. The target covers CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions and the Party stated that it will include all IPCC sectors. Concerning the expected emission reduction, Norway provided emission estimates for the base year including LULUCF as 41.2 Mt CO_2 eq and stated that this value reflects the most recent national GHG emissions inventory submitted by Norway to the secretariat and thus does not include NF_3 or the effect of revised GWP values. The emission reduction of 30 per cent would result in a decrease in emissions per capita of 9 per cent and a decrease in emission intensity of 44 per cent between 1990 and 2020.

63. A main principle of the Norwegian climate policy is to put a price on emissions, through economy-wide measures. Since 2008, Norway has participated fully in the EU ETS and, from 2013, about 80 per cent of Norwegian emissions will be covered by economic instruments (CO_2 taxes or emissions trading). Carbon dioxide capture and storage from gas processing is implemented at two sites in Norway and by May 2012 a technology centre for carbon capture technologies will open in the country. Norway has also introduced several sector-specific measures, such as differentiated levies on vehicles and energy efficiency standards in buildings, and has prohibited the deposition of organic waste.

64. **The Russian Federation** defines 1990 as the base year for its target. The target was set on the basis of the GWPs from the IPCC AR4 and covers all gases and all IPCC sectors.

65. **Switzerland** defines 1990 as the base year for CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions, the gases covered under its target. The Party referred to the most recent GWP values contained in the IPCC AR4 and to the 2006 IPCC Guidelines for the preparation of its GHG emissions inventory. The target covers all IPCC sectors and does not include international bunker fuels.[41] The expected emission reduction is estimated at 10.5 Mt CO_2 eq for its –20 per cent target and 15.8 Mt CO_2 eq for a –30 per cent target, taking into account base year emissions of 52.7 Mt CO_2 eq. The emission reductions of 20 per cent and 30 per cent would result in a decrease in emissions per capita of 36 per cent and 44 per cent, respectively, and a decoupling of the emission trend from the Party's economic growth between 1990 and 2020.

66. Switzerland's new legislation for the 2013–2020 period, the Federal Act on the Reduction of CO_2 Emissions, will enter into force on 1 January 2013. It sets several instruments, including: a CO_2 levy on fuels used for energy and an ETS for large industries; emission reduction targets for small and medium-size industries; offsetting mechanisms for emissions from thermal power plants and motor fuels; and regulations for buildings and cars. Several other measures targeting, inter alia, increasing energy efficiency and the use of renewable energies are already in place and therefore outside of the scope of the new legislation. In addition, the CO_2 legislation for the 2013–2020 period allows flexibility in some of the above-mentioned instruments to increase the level of ambition beyond the – 20 per cent target.

[40] The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

[41] This was mentioned during the workshop in April 2011. Further details are available at <http://unfccc.int/bodies/awg-lca/items/5928.php>.

67. **Ukraine**, in its BR1, defines 1990 as the base year for all gases covered by its target, namely CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions. The Party referred to the most recent GWP values contained in the IPCC SAR. Its target covers all IPCC sectors.

68. The **United States** refers to 2005 as the base year for its target. The Party will use the most recent GWP values contained in the IPCC AR4 and its target will cover CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions and all IPCC sources and sectors. The expected emission reduction reported is in the range of 17 per cent below 2005 levels. The Party presented at the latest workshop information on mitigation action taken domestically, including the introduction of light-duty vehicle standards; the coverage of GHG emissions from the largest stationary sources under the Clean Air Act permitting programme through requirements for best available control technologies; the promotion of clean energy through investments, tax incentives and loan programmes; actions targeting energy efficiency, including standards for appliances; and the proposal of national standards for CO_2 emissions from new power plants.

D. Developments relevant for assumptions and conditions related to the ambition of the pledges

69. As outlined above, most Parties are clear about the conditions attached to their targets and the conditions under which they can move to the higher range of the target. However, until now no Party has communicated whether the assumptions and conditions related to the ambition of the target have been met, partially or fully. Information is lacking on the extent to which the conditions have been met or some of the assumptions clarified, for example on certain rules, and on the progress made in resolving any conditionality attached to the single value targets. In this regard, New Zealand notified in its 2013 submission that its government has adopted a firm and unconditional emissions target for 2020. However, the conditional target range remains on the table and New Zealand also recognized that some important progress has been made towards meeting those conditions (see table 1).

70. Since the submission of pledges in 2010, there have been important developments relevant to many of the assumptions and conditions that were attached by developed country Parties to their targets, such as the following:

(a) All developed country Parties have pledged quantified economy-wide emission reduction targets for 2020;

(b) The second commitment period of the Kyoto Protocol was adopted with the Doha Amendment;[42]

(c) The UNFCCC inventory reporting guidelines for Annex I Parties under the Convention were adopted by decision 15/CP.17; the work on the framework for various approaches and the new market-based mechanism has advanced under the SBSTA, which is expected to recommend a draft decision to COP 19 on this matter;

(d) Fifty-seven developing country Parties have submitted nationally appropriate mitigation actions (NAMAs).[43]

71. By the time developed country Parties pledged their targets, the remaining pledges had not all necessarily been submitted. Thus, some developed Parties' targets are

[42] Decision 1/CMP.8.

[43] A compilation of the information on all NAMAs communicated by developing country Parties by May 2013 can be found in document FCCC/SBI/2013/INF.12/Rev.2.

contingent on comparable commitments by other developed country Parties. For further discussion on the comparability of the level of mitigation efforts, see chapter V below.

72. Inscribed in Annex B to the Kyoto Protocol, as modified by the Doha Amendment, are quantified emission limitation or reduction commitments for the period 2013–2020 from 9 Parties (Australia, Belarus, EU-28, Kazakhstan, Liechtenstein, Monaco, Norway, Switzerland and Ukraine), leading to a reduction in their overall emissions of at least 16 per cent below 1990 levels for the commitment period 2013–2020.[44]

73. The Doha Amendment also clarified rules and procedures for emission trading and project-based mechanisms for the second commitment period of the Kyoto Protocol. Moreover, the CMP, in its decision 2/CMP.7, adopted the definitions, modalities, rules and guidelines relating to LULUCF activities under the Kyoto Protocol for application in the second commitment period. This means that for Parties that are also Parties to the Kyoto Protocol, there is now clarity on the use of carbon credits and LULUCF rules.

74. As mentioned before, conditions attached by a number of developed country Parties to the ambition of pledges refer to action by other Parties. Several Parties make reference to developing countries taking action in accordance with their respective responsibilities and capabilities. Although about one-third of developing countries submitted nationally appropriate mitigation actions, in terms of emissions coverage these Parties account for about three-quarters of the total GHG emissions from developing country Parties.

75. As discussed in paragraphs 65–69 above, the developments after 2010 suggest that the conditions of many developed country Parties attached to their pledges might be at least partly met. Also, at least for developed country Parties that assumed commitments under the second commitment period of the Kyoto Protocol, the assumptions attached to their pledges, in particular, the role of LULUCF and carbon credits may have been clarified.

IV. Discussion of commonalities and differences in approaches to measure progress towards the achievement of economy-wide emission reduction targets of developed countries

76. This chapter provides an overview of approaches to measure progress towards the achievement of economy-wide emission reduction targets, as far as this information is available, and explores commonalities and differences in approaches. It also discusses issues that are relevant to such approaches but are still unknowns and explores potential implications.

A. Overview of commonalities and differences of approaches

77. Table 3 provides a summary of the information submitted by Parties in relation to the base year, GWP values, coverage of gases, coverage of sectors, expected emission reductions, and LULUCF, and carbon credits from market-based mechanisms[45] that are discussed in paragraphs 78–111 below. The information presented suggests that information on most of the approaches that are relevant to and important in assessing the progress made by developed country Parties towards their targets is available. Especially the additional information that Parties provided in their BR1s helped to fill in gaps that

[44] The Doha Amendment requests these Parties to revisit their commitments for the second commitment period at the latest by 2014, and encourages them to increase the ambition of their commitments, in line with an aggregate reduction, by Annex I Parties, of greenhouse gas emissions not controlled by the Montreal Protocol of at least 25–40 per cent below 1990 levels by 2020.

[45] FCCC/AWGLCA/2012/MISC.1 and Add.1.

were identified previously.[46] Although there is still some information pending, it can be expected that the IAR process, including its technical review and multilateral assessment, will help in further clarifying developed country Parties' targets. The IAR process for BR1s is currently ongoing, with 17 review reports having already been published[47] and the first Subsidiary Body for Implementation (SBI) working group session of the multilateral assessment[48] to take place in conjunction with SBI 41.

[46] See document FCCC/TP/2013/7.

[47] Available at <http://unfccc.int/national_reports/biennial_reports_and_iar/technical_reviews/items/8446.php>.

[48] For more information, see <http://unfccc.int/national_reports/biennial_reports_and_iar/international_assessment_and_review/items/8451.php>.

Table 3
Summary of information on approaches to measure progress towards the achievement of economy-wide emission reduction targets of developed countries (further and pending information)

	Information on approaches to measure progress	*Further information on approaches*	*Pending information on approaches*
Base year	Information available for all Parties. Most Parties defined 1990 as base year; different base years for four Parties (2000, 2005)	–	–
Global warming potential values	Seven Parties refer to the IPCC SAR, of which three also make reference to the IPCC AR4; in addition, eight Parties refer to the IPCC AR4	Recommendation in decision 15/CP.17[a] for using values from the IPCC AR4 Values from the IPCC AR4 for the second commitment period of the Kyoto Protocol[b]	–
Coverage of gases	Twelve Parties included CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3; three Parties included all gases except NF_3	Minimum requirements in decision 15/CP.17:[c] CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 Greenhouse gases included in Annex A to the Kyoto Protocol: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3[d]	–
Coverage of sectors	IPCC sectors covered by all Parties: energy, IPPU, agriculture and waste; two Parties did not include LULUCF in the target; two Parties included aviation	Minimum requirements in decision 15/CP.17:[e] All IPCC sectors Sectors included in Annex A to the Kyoto Protocol (energy, IPPU, agriculture and waste) and activity-based accounting for LULUCF in accordance with Article 3, paragraphs 3 and 4[d]	–
Role of land use, land-use change and forestry	Five Parties envisaged using the land-based approach and six Parties envisaged using the activity-based approach; some of the remaining Parties referred to clear, uniform and environmentally robust accounting rules	Reporting on full land-based approach in accordance with decision 15/CP.17[f] Modalities, rules and guidelines for the activity-based approach under the Kyoto Protocol[g]	Information from two Parties is pending
Carbon credits from market-based mechanisms	With few exceptions, Parties stated their intention to make use of carbon credits in achieving their targets; carbon credits are expected to come from a number of sources/mechanisms that may follow different rules	Modalities and procedures for the new mechanism under the Convention (see para. 98 below) that will be available for achieving the targets under the Convention are expected to be adopted at COP 19 Rules and procedures for emission trading and project-based mechanisms under the Kyoto Protocol[d]	Information from most Parties is pending regarding the types of sources/mechanisms for carbon credits and their quantitative contribution towards achieving the target

	Information on approaches to measure progress	*Further information on approaches*	*Pending information on approaches*
Methodologies	Three Parties refer to the Revised 1996 IPCC Guidelines[h] and the IPCC good practice guidance,[i] of which two envisage using the 2006 IPCC Guidelines[j] from 2015 onwards; three Parties refer to the 2006 IPCC Guidelines	Use of methodologies provided in the 2006 IPCC Guidelines,[j] as recommended in decision 15/CP.17[f] Use of methodologies provided in the 2006 IPCC Guidelines[j] for the second commitment period of the Kyoto Protocol[b]	

Abbreviations: AR4 = Fourth Assessment Report, IPCC = Intergovernmental Panel on Climate Change, IPPU = industrial processes and product use, LULUCF = land use, land-use change and forestry, SAR = Second Assessment Report.

[a] Annex I, chapter II, paragraph 31: "Annex I Parties should report aggregate emissions and removals of GHGs, expressed in CO_2 equivalent (CO_2 eq), using the global warming potential values as agreed by decision 15/CP.17 or any subsequent decision by the COP on global warming potentials."

[b] Decision 4/CMP.7, paragraph 5.

[c] Annex I, chapter II, paragraph 28: "As a minimum requirement, inventories shall contain information on the following GHGs: CO_2, CH_4, N_2O, PFCs, HFCs, SF_6 and NF_3.

[d] Decision 1/CMP.8.

[e] Annex I, chapter II, paragraph 4(d): as a minimum requirement, inventories shall cover all sources and sinks for which the methodologies are provided in the 2006 IPCC Guidelines.

[f] Annex I, chapter II, paragraph 9.

[g] Decision 2/CMP.7, Annex.

[h] *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.*

[i] *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.*

[j] *2006 IPCC Guidelines for National Greenhouse Gas Inventories.*

B. Exploring commonalities and differences of approaches

1. Base year

78. Developed country Parties define their targets as relative emission reduction with regard to a specific base year. This can be 1990, which is the base year under the Convention, or a different year, which, for example, could reflect a reference point for the Party's national climate change policies. Any difference in base year does not affect the way the progress is measured towards the achievement of targets of individual Parties as long as all relevant base year data are provided. However, any such difference has consequences for the outcome of the assessment of comparability of the mitigation efforts given that certain rules might be applied to different base years (e.g. such as applying Article 3, para. 7, of the Kyoto Protocol) (see also para. 137 below).

79. As shown in table 2, all Parties except four (Australia, Canada, Japan and the United States) used 1990 as the base year in defining their targets. Among these four Parties, Australia uses 2000 as a base year, and Canada, Japan and the United States use 2005.

2. Coverage of gases

80. For the purposes of the Convention, all Parties shall develop national emissions inventories of all GHGs not controlled by the Montreal Protocol and the developed country Parties shall report relevant information following the UNFCCC Annex I inventory reporting guidelines, which contain minimum requirements for the GHGs to be covered by the inventories. This provides a basis for consistent coverage of gases in the reporting of GHG inventories across Parties. However, the coverage of gases reported by a Party is not necessarily the same as the coverage of gases included in the targets. For developed country Parties that are also Parties to the Kyoto Protocol, the list of greenhouse gases in Annex A to the Kyoto Protocol is consistent with the minimum requirements of the UNFCCC Annex I inventory reporting guidelines.

81. Different coverage of gases between Parties does not have consequences for the outcome from assessing the progress towards the achievement of targets of individual Parties as long as such coverage is transparently presented ex ante, but it could affect the comparability of effort in achieving the targets across Parties, the estimated total emission reductions of developed country Parties and the calculation of the overall impact on increasing the level and concentrations of GHG emissions in the atmosphere.

82. Most Parties followed decision 15/CP.17 on the coverage of gases for their targets, which requests Annex I Parties to include as a minimum information on CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 emissions in their GHG emissions inventories reported under the Convention starting from 2015. Consistent with GHGs that are currently covered under the reporting requirements under the Convention, Kazakhstan, Liechtenstein and Ukraine communicated that their targets cover CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 emissions.

83. Although the coverage of gases under the target could be expected to be guided by the revised UNFCCC Annex I inventory reporting guidelines, from 2015 onwards at the latest, many Parties are yet to confirm whether the same gases as those reported in the GHG inventories will be covered under their targets or whether any other gases will be covered.

3. Global warming potential values

84. GWP values are used by Parties for aggregating their emissions and removals of the different GHGs to a national total. The absence of common GWP values used by all developed country Parties would affect the ability to assess comparability between targets,

since the same targets could represent a different nature and scale of effort in different countries. In addition, this might complicate the use of carbon credits from existing or new market-based mechanisms since such credits would no longer have the same value, and conversion factors such as exchange rates would need to be defined, which in turn could increase the complexity of the use of the market-based mechanisms.

85. When referring to GWP values in their 2012 submissions and BR1s, Parties referred to the IPCC AR4 (Canada, Iceland, Monaco, New Zealand, Norway, Russian Federation, Switzerland, the United States) or to the IPCC SAR (Belarus, Kazakhstan, Liechtenstein, Ukraine). The latter contains noticeably different GWP values, since the values contained in the IPCC AR4 reflect changes in the concentration of GHGs in the atmosphere since the time of publication of the IPCC SAR. In addition, the IPCC AR4 contains GWP values for several gases that were unknown at the time of the IPCC SAR, including NF_3 and six new species of HFCs.

86. Most Parties, for the purposes of assessing the progress towards their targets, appear to move towards the use of the GWP values from the IPCC AR4 that are introduced for GHG inventories under the Convention through decision 15/CP.17 as opposed to the values from the IPCC SAR that are used by Annex I Parties under the current UNFCCC Annex I reporting guidelines. The EU, for example, noted that it used for its target the GWP values from the IPCC SAR and acknowledged that it is currently reviewing the implications of decision 15/CP.17 (and the GWP values from the IPCC AR4) for its legislation. Similarly, Australia noted that its target was based on the GWP values from the IPCC SAR and updated values will be adopted in the national inventory starting in 2015, consistent with the revised UNFCCC Annex I inventory reporting guidelines. In addition, Japan noted the use of GWP values from the IPCC SAR for all gases, except for NF_3, for which the use of GWP values from the IPCC AR4 is envisaged.

87. Overall, the revised UNFCCC Annex I inventory reporting guidelines provide, from 2015 onwards at the latest, a basis for Parties to use the same GWP values for reporting on GHG inventories and for measuring the progress towards their GHG emission reduction target. This is consistent with the requirements for the second commitment period of the Kyoto Protocol, according to which Parties must calculate their carbon dioxide equivalence of emissions and removals by using the GWPs from the IPCC AR4.

4. Coverage of sectors

88. While decision 1/CP.16 refers to economy-wide emission reduction targets,[49] developed countries may have a different understanding of the definition of "economy-wide", in particular, the list of sectors that are covered under their targets. Different coverage of sectors by developed country Parties may lead to targets becoming difficult to compare. This is because of issues such as the omission of emissions and emission reductions for certain sectors or possible double counting of emission reductions for a sector (e.g. if developed countries define the scope of international bunkers differently) and emission leakages across sectors that are and those that are not covered under the targets.

89. Most Parties that provided information in their 2012 submissions and BR1s confirmed that their targets are economy wide, covering all relevant IPCC sectors: energy, industrial processes and product use, agriculture, LULUCF and waste. The EU identified different coverage from that of other Parties, by excluding LULUCF from its 20 per cent target (the 30 per cent target includes LULUCF), while Belarus reported that LULUCF will also be excluded from its target. In addition, the EU, together with Iceland, includes emissions from aviation in both of its targets.

[49] Decision 1/CP.16, paragraph 36.

90. UNFCCC Annex I inventory reporting guidelines include a minimum requirement that inventories shall cover all sources and sinks for which methodologies are provided in the 2006 IPCC Guidelines. The 2006 IPCC Guidelines provide methodologies for complete emission and removal estimates in all PCC sectors (energy, IPPU, agriculture, LULUCF and waste). In addition, UNFCCC Annex I inventory reporting guidelines require, in accordance with the 2006 IPCC Guidelines, that emissions from international aviation and marine bunker fuels should not be included in national totals.

5. Expected emission reductions

91. Many Parties provided succinct yet transparent information on the policies put in place or under development for implementing their targets. However, with one exception, Parties do not seem to be in a position yet to provide the estimates of the effect of these policies in terms of emission reductions expressed in Mt CO_2 eq. One reason is the uncertainty in relation to the contribution of LULUCF and carbon credits towards the emission targets (see chapter IV.B.6 and 7). Even when provided, estimates of the expected emission reductions should be considered with due caution as methodologies used for the calculation, including GWP values, and coverage of gases might still be subject to changes, as suggested by Norway. Switzerland, for example, estimated its absolute emission reductions in 2020 for the two values of its target (see para. 61 above). The EU, Iceland, Kazakhstan and Norway did not provide estimates of emission reductions, but provided information on the absolute emissions in 1990, expressed in Mt CO_2 eq, from which the expected emission reductions in 2020 can be derived. New Zealand, in its 2013 submission, stated that its target will be expressed as a quantified emission limitation or reduction commitment of 96.8 percentage of base year.

92. Decision 1/CP.16, which takes note of the economy-wide emission reduction targets of developed country Parties for 2020, does not specify the pathway of emissions and emission reductions in the period 2013–2020 towards the targets for 2020. This is different from the Kyoto Protocol accounting for the Annex B target, which is based on the assigned amount established for the entire commitment period and a comparison of cumulative emissions over this period with the assigned amount.

93. Only one Party, the EU, noted that legally binding target trajectories for the period 2013–2020 are enshrined in both the EU ETS and EU decision 406/2009/EC on effort sharing. These legally binding trajectories not only result in a 20 per cent GHG reduction in 2020 compared with 1990 but also define the target pathway to reduce EU GHG emissions from 2013 to 2020. Certain flexibility is provided to the member States, in adhering to this pathway, on the issuance, transfer and carry-over of units between years within the period, to compensate for annual variations in climatic conditions or the time to implement the necessary measures, and to provide for continuity in the issuance and use of credits from market-based mechanisms.

94. From the reporting point of view, the UNFCCC biennial reporting guidelines for developed country Parties[50] require that for each reported year, information on progress made towards the emission reduction targets include information on the use of units from market-based mechanisms that essentially represent carbon credits. However, it remains to be seen whether such credits will be used to offset emissions for the entire period 2013–2020 in a single year, such as 2020, or whether carbon credits will be used for each year or every two years throughout the period 2013–2020, forming a pathway towards the target.

[50] Adopted by decision 2/CP.17.

6. Role of land use, land-use change and forestry

95. Owing to its different nature, the LULUCF sector is treated differently from other sectors under the Convention, where, in accordance with the UNFCCC Annex I reporting guidelines, emissions and removals from LULUCF are estimated following a comprehensive land-based approach, and then national totals of emissions and removals are presented including and excluding LULUCF. Similarly, under the Kyoto Protocol, LULUCF is treated differently by applying specific rules for accounting of certain activities, some mandatory and other elected, with a subsequent issuance or cancellation of units, but without including emissions and removals from LULUCF in the national totals.

96. A lack of common or consistent rules for measuring emissions and removals from LULUCF could lead to substantial differences in: the coverage of activities and carbon pools; the caps on the extent to which LULUCF removals can offset emissions; definitions (e.g. what constitutes a "forest"); the definitions of baseline emissions or removals, for example, for the reference levels of emissions for forest management; the treatment of natural disturbances; the treatment of harvested wood products; and/or considerations of emissions and removals in the base year when establishing target levels. The choices made by Parties on many of the issues in relation to LULUCF, such as forest definitions, may have significant implications for the amount of emission reductions delivered under the targets from LULUCF and other sectors.

97. In their submissions, several Parties either referred to clear, uniform and environmentally robust accounting rules, including on LULUCF, which need to be defined under the Convention, or mentioned that clarity on the use of rules and modalities for LULUCF is needed. Most Parties also acknowledged that the rules for LULUCF have significant implications for the level of ambition of their target.

98. In addition, in their 2012 submissions and BR1s, Parties specified the role of LULUCF for their targets under the Convention, by either referring to a comprehensive land-based approach (United States, Ukraine), or to an activity-based approach (Australia, Iceland, Japan, Monaco New Zealand, Norway, Switzerland). Other Parties did not include emissions/removals from LULUCF. For example, Belarus excluded LULUCF from its target and the EU did not include LULUCF in its 20 per cent target (see paras. 34 and 45 above). Meanwhile, Canada expressed its intention to include the LULUCF sector in its accounting of GHG emissions on the basis of the LULUCF reporting categories under the Convention.

99. For some Parties that are also Parties to the Kyoto Protocol, additional information on LULUCF can be retrieved from document FCCC/KP/AWG/2010/INF.2/Rev.1 (see table 1). However, since that document was compiled, the CMP decided on modalities and rules relating to LULUCF activities under the Kyoto Protocol,[51] which might affect the previous decisions and estimates of some Parties on LULUCF.

100. Overall, on the role of LULUCF, most Parties defined their targets including this sector, but envisage different approaches on how to do this. Some Parties plan to follow a comprehensive land-based approach, while others, Parties that are also Parties to the Kyoto Protocol, plan to follow an activity-based approach. As discussed during the workshops and outlined in the most recent workshop report,[52] regarding the comparability of the land-based and activity-based approaches, some Parties emphasized that the coverage of sectors, sources and sinks within LULUCF is a more significant factor for comparability than reporting methods, while some other Parties acknowledged that the use of different approaches for the accounting of LULUCF may undermine the comparability of efforts.

[51] Decision 2/CMP.7.
[52] FCCC/SBSTA/2014/INF.16.

Furthermore, it was noted that the transparency of the reported information is a key element, and that both approaches could be equally accurate and consistent in terms of results if the methodological guidance of the IPCC[53] were followed.

7. Carbon credits from market-based mechanisms

101. There is recognition that the use of carbon credits from market-based mechanisms is essential in order to achieve cost-efficiency of the mitigation effort by developed country Parties when attaining to their targets and when striving to enhance the stringency of the targets. However, in the absence of uniform approaches to the market-based mechanisms and programmes that generate carbon credits, and their use, the boundaries for such mechanisms and programmes could be drawn differently for different Parties, potentially resulting in double counting of emission reductions and/or leakages (see para. 127 below). These issues are currently being addressed in discussions under SBSTA agenda item 12, "Market and non-market mechanisms under the Convention".

102. At its seventeenth session, the COP defined a new market-based mechanism, operating under the guidance and authority of the COP, which, subject to conditions to be elaborated, may assist developed countries to meet part of their mitigation targets or commitments under the Convention. Modalities and procedures for the mechanism are being elaborated and a decision to that end is expected by the end of 2014.[54] The option that some NAMAs by developing countries and activities related to reducing emissions from deforestation and forest degradation in developing countries could generate carbon credits remains under consideration by the SBSTA. In addition, while some Parties such as the EU are exploring options for linking compatible emissions trading systems on a bilateral basis, and bilateral and regional offset programmes are being planned or implemented, it is not clear whether and how credits generated through these or other arrangements could be used to attain the targets under the Convention.

103. Information on the intention to use carbon credits from market-based mechanisms to meet their targets is available for many Parties, as shown in tables 1 and 2, and a number of Parties even specified which type of mechanisms they plan to include or exclude when measuring the progress towards their target. Almost all Parties plan to use carbon credits from the new market-based mechanism established under the Convention referred to in paragraph 102 above, for which modalities are yet to be agreed and any other mechanisms for which the rules are not necessarily known. In contrast, several Parties that are also Parties to the Kyoto Protocol plan to use carbon credits from the mechanisms under the Kyoto Protocol that are subject to common and well-established rules. Among these Parties, the EU, Iceland, Monaco and Switzerland do not intend to use the carry-over of AAUs from the first commitment period under the Kyoto Protocol. Canada, Iceland and the United States do not assume use or significant use of market-based mechanisms in attaining their targets.

104. Taking into account the available information provided by Parties, significant uncertainties can still be identified regarding the role of carbon credits to measure the progress towards the achievement of the targets under the Convention. Many Parties acknowledge the plans to use carbon credits, although the sources of the credits fall within a broad range between the Kyoto Protocol mechanisms, with clearly defined rules, to bilateral and regional offset programmes or credits generated through other arrangements, which are not likely to be subject to a common set of rules. In addition, there is little clarity

[53] The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* and the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*.

[54] FCCC/SBSTA/2014/2.

relating to the overall amount of carbon credits that could be used for achieving the targets under the Convention.

8. Methodologies

105. In accordance with the UNFCCC Annex I reporting guidelines and their revision adopted by decision 15/CP.17, all developed country Parties use the IPCC methodologies for preparation of their GHG emissions inventories. This includes either the Revised 1996 IPCC Guidelines together with the IPCC good practice guidance or the most recent 2006 IPCC Guidelines. Although the methodologies from the most recent 2006 IPCC Guidelines are consistent with the previous IPCC guidelines, some differences exist and this may have implications if Parties are using the same methodologies for reporting of their GHG inventory and for measuring the progress towards their target. These differences could lead to some level of inconsistency across Parties, for example, in coverage of some categories for which methodologies are provided in the 2006 IPCC Guidelines, but not in the previous guidelines, and can complicate the assessment of comparability of effort.

106. Implications from the use of different methodologies in assessing the progress towards the targets are not major, assuming that they will be the same as the methodologies used for reporting, because from 2015 developed country Parties will use the same methodologies for their GHG inventories, as set out in decision 15/CP.17. These are the methodologies provided in the 2006 IPCC Guidelines and any supplementary methodologies agreed by the COP to estimate anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol. In addition, Parties usually use the same methodology consistently when setting the target and associated emission levels and when assessing the progress towards the targets.

107. Assuming that developed country Parties will apply the revised UNFCCC Annex I inventory reporting guidelines adopted by decision 15/CP.17 not only for reporting, but also for measuring the progress towards their targets, provisions of this decision could be a good basis for harmonizing not only the coverage of gases and GWP values as mentioned in paragraphs 80 and 87 above, but also methodologies. However, this needs to be confirmed by Parties.

9. Cross-cutting issues

108. Parties have noted during the workshops[55] that the approaches and ways in which emission reductions and enhanced removals achieved by developed countries when attaining their targets are assessed, including the accounting rules, can have a significant bearing on the understanding of the targets set by developed countries and their level of ambition.

109. . Overall, the revised UNFCCC Annex I inventory reporting guidelines provide, from 2015 onwards at the latest, a basis for Parties to use the same coverage of gases, GWP values and methodologies for reporting on GHG inventories and for measuring the progress towards their GHG emission reduction target. In that regard, the progress made towards the target could be assessed by reporting emissions following the relevant reporting guidelines under the Convention, noting that this is a valid approach only if a comprehensive land-based approach for LULUCF is used in defining the target and carbon credits from international market-based mechanisms are not used for attaining the target.

[55] Workshop reports and presentations can be found at <http://unfccc.int/bodies/awg-lca/items/5928.php>, <http://unfccc.int/bodies/awg-lca/items/5988.php> and <http://unfccc.int/meetings/bonn_may_2012/workshop/6659.php>. See, for example, the presentation by the EU in June 2011.

110. However, while the UNFCCC biennial reporting guidelines for developed country Parties[56] require these Parties to report for each year information on progress made towards the emission reduction targets, including information on the use of units from market-based mechanisms, it is still not clear how the assessment of the contribution from such mechanisms will be done, whether for each year or every two years through the period 2013–2020, or for the entire period. Finally, it seems that developed country Parties that are also Parties to the Kyoto Protocol will use approaches analogous to those that will be used during the second commitment period of the Kyoto Protocol, to assess progress towards their targets under the Convention.

111. The implications of using different approaches to assessing the progress towards the targets could lead to an increased complexity of the reporting system under the Convention. In that regard, some Parties highlighted during the workshops that, owing to the complexity of some of the reporting elements, for example the role of LULUCF, the information on individual targets reported in the BR1s can be difficult to comprehend. However, it is expected that the technical review and multilateral assessment under the IAR process will provide an opportunity to continue the clarification of assumptions and conditions regarding the individual targets and their role in the progress made by developed countries towards the achievement of their targets.

V. Comparison of the level of mitigation efforts

A. Scope of consideration of comparison of mitigation efforts

112. One of the objectives of this paper, in accordance with decisions 1/CP.16, 2/CP.17 and 1/CP.18 is to provide information that could facilitate the understanding of comparability of developed country emission reduction efforts (referred to in this chapter as the comparability of mitigation efforts). Although the topic of comparability of mitigation efforts has been under consideration by the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) for some time and by the SBSTA in 2013 and 2014, the approach, methodology and metrics for assessing comparability have not been agreed to under the Convention. In response to the mandate from decision 1/CP.16, paragraph 44, an approach for assessing the comparability of mitigation efforts was applied, and the results were presented in document FCCC/TP/2011/1 with a view to supporting further discussions by Parties on this topic. The approach, which is based on different metrics as described in chapter V.B below, was again applied to this update of the document. The metrics and quantitative estimates presented in this paper are intended to be illustrative only and should not be considered proposals on how to determine comparability of mitigation efforts.

113. Comparability of mitigation efforts in this paper is limited to the efforts required to attain the economy-wide emission reduction targets of Annex I Parties set out in document FCCC/SB/2011/INF.1/Rev.1 and document FCCC/SBSTA/2014/INF.6[57] (see also table 1). This paper does not take into account any financial contributions that could be made by developed country Parties to developing country Parties to facilitate achieving the global goal of limiting global temperatures to less than 2 °C above pre-industrial levels. In addition, the comparability of mitigation efforts does not take into account the cost considerations associated with the emission reduction targets, despite the importance of such information. As Parties were not requested to submit information on mitigation costs, one of the options to obtain such information was to run macroeconomic models or to use

[56] Adopted by decision 2/CP.17.
[57] As footnote 4 above.

data from scientific literature. Yet, obtaining data and information on macroeconomic mitigation costs is challenging, as estimates are generated from a variety of economic models run under specific and wide-ranging sets of assumptions. Even when information on cost is available from literature, cost estimates can vary for any given Party within a relatively wide range.

114. The comparability of mitigation efforts discussed in this chapter does not take into consideration possible differences in the coverage of gases and sectors, and methodologies used to estimate emissions and removals, despite the fact that it is clear that such differences exist and have important implications when comparing the mitigation efforts associated with targets (see chapter III).[58]

115. Further, the comparability of mitigation efforts across Parties could be discussed in a more systematic way if there were further clarity on the contribution of domestic mitigation actions, carbon credits from the market-based mechanisms and the LULUCF sector for each Party. The 2012 submissions from Parties made in response to the request for submissions contained in decision 2/CP.17, as well as the Parties' BR1s, helped clarify Parties' views on such contributions. However, at the time of the preparation of this paper, the quantitative information available in the submissions was still not sufficient to enable the credible estimates of the proportion of domestic action to the use of carbon credits or the contribution from LULUCF and these issues remained uncertain. This is why this chapter provides a comparison of the overall mitigation efforts in relation to the targets and a preliminary assessment of the quantitative implications of the use of carbon credits and LULUCF (see chapter I.C below). In particular, for LULUCF, the uncertainty is addressed by providing two sets of data for the metrics discussed in this paper, one that includes the LULUCF sector and one that excludes it.

116. The availability and quality of data and information are highly relevant when considering the analytical aspects of the comparability of mitigation efforts and related metrics. A few Parties, namely the EU, Norway, Switzerland and Iceland, in their submissions on the clarification of economy-wide emission reduction targets, provided information on GDP, population and related emission indicators, and on how these indicators are expected to change when countries reach their targets; this information was also taken into consideration in the preparation of this paper. However, since information was provided only by a few Parties, information relevant to indicators in this paper was taken from the same source for all Parties, to ensure consistency in the comparison, as had been done in previous versions of this technical paper.

117. The most important source of high-quality data and information is the GHG inventory information submitted by Annex I Parties to the secretariat, which allows for the assessment of emission levels and associated reductions. Similarly, high-quality information on population and GDP is readily available from national and international statistics. For this paper, historical data on GDP are taken from the World Bank[59] and population data are taken from the United Nations Statistics Division. The data on GDP were presented in purchasing power parity (PPP)[60] and in market prices. Data on projected

[58] For example, the target of the EU includes emissions from international aviation, while those of the other Parties do not.

[59] World Bank World Development Indicators <http://databank.worldbank.org>.

[60] PPP is the rate of currency conversion that equalizes the purchasing power of different currencies. A given sum of money, when converted into different currencies at the PPP rates, buys the same basket of goods and services in all countries. For the purposes of this paper, GDP values were presented in United States dollars at 2005 market prices and in constant 2011 international United States dollars in PPP. GDP values from the World Bank *World Development Indicators* were available at market prices for the period 1990–2012 and constant 2011 PPP for the period 1990–2013.

economic growth rates come from the International Monetary Fund's World Economic Outlook database.[61]

B. Approach to comparability

Metrics used for comparison of mitigation efforts

118. Regarding the analytical aspect of comparability, different metrics can be considered, with each metric based on a number of different factors. The key requirements for the metrics are that they are based on readily available information, they take into account specific national circumstances, they are easily understandable, and are credible, verifiable, and measurable.

119. Comparison of the mitigation efforts amongst Parties cannot be based on a single metric due to differing national circumstances of each developed country Party, as recognized by the Convention. Different and diverse national circumstances can complicate the consideration of comparability of mitigation efforts, such as climate, geography, population, economic profile, governmental structure, natural resource endowment, transport systems, energy production and consumption patterns, and trade profile (particularly in terms of trade in energy and fuel). Information on these national circumstances and related factors is included in the national communications under the Convention submitted by Annex I Parties.

120. Comparison across Parties, given these different and diverse national circumstances, is very difficult and can only be done in a simplified manner. As there is no single metric[62] that could be used to capture the entirety of national circumstances in a uniform way across all countries, metrics such as GDP, total population and GHG emissions are used in this paper as the proxy indicators to describe the national circumstances of developed country Parties in relation to their mitigation efforts. Each of these factors and metrics can reveal specific aspects of national circumstances relevant to the comparability of mitigation efforts. Therefore, with a certain degree of confidence, the analytical aspects of comparability of mitigation efforts by developed country Parties are assessed in this paper using the following metrics:

(a) Absolute and relative changes in GHG emission levels over different periods of time and relative to different reference years;

(b) Absolute and relative changes in per capita GDP and per capita GHG emissions over different periods of time;

(c) GHG emission intensity in relation to economic output expressed through GDP.

121. Several criteria are often referred to in the negotiation process under the Convention when considering actions in response to climate change, such as capacity, responsibility, early action measures and mitigation potential. The metrics listed in paragraph 116 above could be associated with such criteria. For example, capacity could be associated with GDP

[61] Available at <http://www.imf.org/external/pubs/ft/weo/2014/02/weodata/index.aspx>. Data on GDP values at market prices were taken from this database. It includes projections up to 2019, except for Monaco and Liechtenstein. GDP values for each country for the year 2020 were estimated using the projections of GDP at market prices, as drivers, based on the data on an average growth rate for the period 2014–2019. An average growth rate calculated based on the projected GDP data for the period 2014–2019 was applied for each country for 2020.

[62] Even in a theoretical case, whereby the metrics are found that could be applied across Parties, it would be extremely difficult to assign a weight factor to each factor to combine and formulate a composite indicator, although such attempts are known from the literature.

per capita and mitigation cost per GDP, while early action measures could be associated with the emission reduction measures being implemented at a given point in time.

Approach

122. The comparison of the mitigation efforts in this paper was made for both the low and high target ranges provided by developed country Parties. In cases where Parties provided more than two targets, or more than one target range, only the two options at the respective extremes were considered. In cases where Parties provided only one target, it was considered as both the low and the high target for the respective Parties.

123. The time period used in the comparison of mitigation efforts by developed country Parties is 1990–2020, with specific focus on the years 1990, 2000, 2005, 2012 and 2020. 1990 is the base year under the Convention used by most Parties in presenting their targets, and 2000 and 2005 are the reference years[63] used by other Parties.[64] 2012 is the latest year for which GHG emissions data are available.

124. In this analysis, some specific provisions and decisions have been applied to reflect the information submitted by Parties and their specific national circumstances. For Australia, in accordance with its 2014 annual inventory submission, the targets are presented with respect to Australia's net emissions from the sectors and source categories other than LULUCF, but adding net emissions and removals from afforestation, reforestation and deforestation. Iceland clarified during the workshops (see para. 11(b) above) its intention to continue to make use of the provisions of decision 14/CP.7 in adhering to its 15 per cent target. This decision affects the accounting of emissions in the years of implementation of the target and does not affect the base and reference year emissions; hence it has not been taken into account in presenting the information in this chapter.

C. Implications of the use of carbon credits from market-based mechanisms and land use, land-use change and forestry in comparing mitigation efforts

125. As mentioned in paragraph 111 above, at the time of the preparation of this paper there was little clarity on the use of carbon credits from market-based mechanisms in terms of their source and their contribution to attaining the targets of developed country Parties. Among the concerns expressed during the negotiations under the AWG-LCA and SBSTA, including during the workshops, were issues related to additionality of the mitigation efforts related to the use of carbon credits from market-based mechanisms and possible double counting of such credits and related mitigation efforts.

126. There is a common understanding amongst Parties that any international project-based mechanism used to generate emission reductions and related carbon credits should ensure that such reductions are additional to any that would occur in the absence of the certified project activity. However, operationalization of this requirement has not been an easy task in the past. In addition, modalities are yet to be elaborated for the new market-based mechanism established under the Convention by decision 2/CP.17 that could also address additionality.

[63] In their submissions of information on the economy-wide emission reduction targets, Parties called the years that they used to express their targets "base years". To bring clarity and avoid confusion with 1990, which is the base year under the Convention, these different years (the years other than 1990) are called "reference years".

[64] The reference years used in this paper are the base years used by some Parties in presenting their targets, including 2000 used by Australia, and 2005 used by Canada, Japan and the United States.

127. Also, when carbon credits are generated from project-based mechanisms they could be used and counted towards the targets of developed country Parties. However, given that now a large number of developing countries have their NAMAs recognized under decision 1/CP.16, there is a possibility that the same emission reductions are double counted as reductions of emissions in developed and developing country Parties. The avoidance of such double counting will depend heavily on the accounting rules that have yet to be developed for the new market-based mechanism.

128. At the time of preparation of this paper, a number of developed country Parties had made submissions in response to decision 2/CP.17 regarding how they intend to include LULUCF in their targets and what approaches they will follow in their accounting methodologies; a full land-based approach or an activity-based approach.[65] Nevertheless, consistent estimates of the possible contributions of LULUCF to achieving the targets set by developed country Parties are still lacking. In addition, even when such estimates are available from the previous submissions, they are not necessarily updated. For example, the EU[66] assessed the contribution from forest management in 2020 to be in the range of 250 Tg CO_2 eq[67] to 450 Tg CO_2 eq, but acknowledged that it does not include LULUCF in its 20 per cent target under the Convention. The AOSIS[68] assessed the contribution of LULUCF towards the targets for Annex I Parties taken together to be in the range of 60 Tg CO_2 eq to 940 Tg CO_2 eq in 2020, which is similar to estimates by the United Nations Environment Programme.[69]

129. While there is a lack of sufficient data and clarity regarding the contribution of carbon credits and LULUCF towards the targets for developed country Parties, the available data suggest that the contribution could be sizeable. This underlines the need for more transparency and clarity of the assumptions by Parties and for rules that govern the use of carbon credits and LULUCF in attaining the targets of developed country Parties in order to ensure that such use leads to the necessary emission reductions.

D. Discussion on the comparison of mitigation efforts

1. Greenhouse gas emission levels and trends in developed country Parties in relation to their quantitative economy-wide emission reduction targets for 2020

Information basis

130. In this section, the discussion focuses on emission trends and projected emission levels in relation to the targets of developed country Parties in 2020, individually and in aggregate. The analysis is supported by the information presented in tabular and graphical formats in tables 4–8 and figures 1–3 (in the annex). Some information relating to absolute and relative changes in emissions, including and excluding LULUCF, over the period 1990–2020 was provided in the submissions made by the EU, Norway and Switzerland,

[65] For more detailed information refer to document FCCC/AWGLCA/2012/MISC.1, Add.1 and 2 containing submissions from Parties on additional information relating to the quantified economy-wide emission reduction targets contained in document FCCC/SB/2011/INF.1/Rev.1 and its update document FCCC/SBSTA/2014/INF.6.

[66] Presentation available at <http://unfccc.int/kyoto_protocol/items/5685.php>.

[67] Million metric tonnes of carbon dioxide equivalent.

[68] Presentation available at <http://unfccc.int/kyoto_protocol/items/5685.php>.

[69] United Nations Environment Programme. 2010. *The Emissions Gap Report – Are the Copenhagen Accord Pledges Sufficient to Limit Global Warming to 2°C or 1.5°C?* Available at <www.unep.org/publications/ebooks/emissionsgapreport>.

whereby the Parties provided emissions for 1990 and estimated emissions for 2020 in relation to their economy-wide emission targets.[70]

131. Table 4 contains information on historical GHG emission trends of Annex I Parties, including and excluding LULUCF. Table 5 presents, in addition to historical data on GHG emission trends, information on emission levels in 2020 in relation to the targets for these Parties, individually and in aggregate, including and excluding LULUCF. Tables 6 and 7 provide information on expected changes in emissions, excluding and including LULUCF, respectively, by developed country Parties in comparison to selected years (1990, 2000, 2005 and 2012) for their low and high targets for 2020. Table 8 provides information on the relative emission reductions over the period 1990–2012 and the expected changes in emissions, excluding and including LULUCF, over the period 2012–2020 in relation to their low and high targets for 2020.

Aggregate absolute and relative changes in emissions

132. The aggregate emission reductions of developed country Parties over the period 1990–2012 are estimated to be about 10 per cent and 15 per cent, excluding and including LULUCF, respectively (see table 4). As shown in Table 5, the aggregate emission reductions of these Parties over the period 1990–2020 are estimated for the low target to be about 10 per cent and 11 per cent, excluding and including LULUCF, respectively, and for the high target to be about 16 per cent and 17 per cent, excluding and including LULUCF. According to this information, the aggregate emissions of developed country Parties in 2012, excluding LULUCF, are 1 per cent below the estimated emission level in 2020 in relation to the low target and 5 per cent above the estimated emission level in 2020 in relation to the high target.

133. In 2012, the aggregate emissions of developed country Parties decreased by 11 per cent below the 1990 level, excluding LULUCF. The aggregate emissions of developed country Parties mask some major differences in emission trends among Parties in relation to the 2020 targets. For example, a number of developed country Parties with economies in transition (EIT) expect their emission levels, in accordance with their targets, to increase between 2012 and 2020, while most of the remaining developed country Parties expect their emission levels to decrease. The emission trends of the individual Parties are discussed below (see paras. 130–135 below).

134. The low targets could lead to absolute aggregate emission reductions by developed country Parties of around 1,993 Tg CO_2 eq, 586 Tg CO_2 eq, and 1,019 Tg CO_2 eq in 2020 relative to the level of emissions in 1990, 2000, and 2005 respectively, excluding LULUCF (see table 6). A potential emissions increase of 190 Tg CO_2 eq in 2020 relative to the level of emissions in 2012 may occur, mainly owing to the emission trend in the Russian Federation and Ukraine. The high targets could lead to absolute aggregate emission reductions of around 3,017 Tg CO_2 eq, 1,610 Tg CO_2 eq, 2,043 Tg CO_2 eq and 834 Tg CO_2 eq in 2020 relative to the level of emissions in 1990, 2000, 2005 and 2012, respectively, excluding LULUCF. According to table 7, when LULUCF is taken into consideration, the low targets could lead to absolute aggregate emission reductions by developed country Parties of 1,986 Tg CO_2 eq, 42 Tg CO_2 eq, and 164 Tg CO_2 eq in 2020 relative to the level of emissions in 1990, 2000 and 2005. A potential emissions increase of 1,053 Tg CO_2 eq in 2020 relative to the level of emissions in 2012 may occur, mainly owing to the emission trend in the Russian Federation. The high targets could lead to absolute aggregate emission reductions of around 3,006 Tg CO_2 eq, 1,061 Tg CO_2 eq, and 1,184 Tg CO_2 eq in 2020 relative to the level of emissions in 1990, 2000, and 2005 respectively, including LULUCF. A potential emissions increase of 33 Tg CO_2 eq in 2020 relative to the level of emissions in 2012 may occur.

[70] See footnote 65 above.

Absolute and relative changes in emissions of individual Parties

135. A comparison of the emission reduction levels of developed country Parties in relation to their targets for 2020 and of emission levels in selected years, namely 1990, 2000, 2005 or 2012, highlights differences in the mitigation efforts of the Parties over time. Comparison of emission reductions in 2020 relative to 1990 shows the overall mitigation efforts across Parties. Higher emission reductions in 2020 relative to 1990 suggest higher overall mitigation efforts over the entire 1990–2020 period, including any early action in the 1990s. On the other hand, comparison of mitigation efforts relative to 2000, 2005 and 2012 provides an indication of the mitigation efforts made in more recent years and of the efforts that need to be made between now and 2020 to achieve the target, and does not capture early action in the 1990s.

136. The comparison of the mitigation efforts in relation to the low and high targets among the developed country Parties, excluding and including LULUCF, suggests that there are two different emission reduction patterns specific to developed country EIT Parties and other developed country non-EIT Parties (hereinafter referred to as other developed country Parties). However, despite these similarities, the emission trends within each group are not necessarily homogenous and may not necessarily suggest the same level of mitigation efforts within these groups.

137. The emission trends presented in table 4 provide the context in considering the absolute and relative changes in emission reductions of individual Parties in accordance with their targets. For most developed country Parties, emissions increased in the 1990s and then saw a decrease after 2007–2008 that reflects the impact of the global economic crisis and to some extent the effect of mitigation policies. The negative emission trends after 2007–2008 are more pronounced for larger economies, such as Canada, the United States and the EU (within the EU, Italy, Spain, Portugal and the United Kingdom of Great Britain and Northern Ireland). For most developed country EIT Parties, namely, Belarus, Kazakhstan and the Russian Federation, emissions increased as of the end of 1990s and the beginning of 2000s after the significant drop in the level of emissions during the 1990s.

138. Comparison of the mitigation efforts of developed country Parties (see figures 1, 2 and 3) and their early actions suggests that while Belarus, Kazakhstan, the Russian Federation and Ukraine saw a major decline in emissions in the 1990s, they expect their emissions to increase, in accordance with their targets, between 2005 and 2020. On the other hand, while the emissions of Australia, Canada and the United States increased since the 1990s, these Parties envisage sizeable emission reductions in 2020 relative to 2000 and 2005, which implies that their emissions will decline substantially in the future towards the target levels of 2020. For two Parties, Australia (for the low target) and Canada, the estimated 2020 target emission levels are higher than their 1990 emissions levels.

139. The EU saw a decline in emissions in the 1990s and broadly stable emissions in the beginning of the 2000s. It expects a further decline in emissions between 2005 and 2020 in accordance with the estimated target emission levels. According to table 6, for the high target, excluding LULUCF, the expected decline in emissions for the EU between 2005 and 2020 is 24 per cent, which is much higher than the observed decline between 1990 and 2005 of about 8 per cent, and for the low target the expected decline is lower, 13 per cent.

140. It might be of interest to take note of the absolute emission reductions by developed country Parties between 2005 and 2020 needed to attain their targets as an indication of their efforts. For example, based on information in table 6, excluding LULUCF, the United States would need to reduce its emissions by 1,229 Tg CO_2 eq, while the EU would need to reduce its emissions by 677 Tg CO_2 eq or 1,240 Tg CO_2 eq (for its low and high targets, respectively) when comparing the 2005 levels with the 2020 levels. For most developed country Parties, emission reductions between 2012 and 2020 appear smaller than those

between 2005 and 2020 because of the lower emission levels in 2012 compared with 2005 resulting from the economic downturn in the late 2000s. For example, based on information in table 6, excluding LULUCF, the United States would need to reduce its emissions by 488 Tg CO_2 eq, while the EU would need to reduce its emissions by 43 Tg CO_2 eq or 606 Tg CO_2 eq (for its low and high targets, respectively) when comparing the 2012 levels with the 2020 levels.

Summary

141. The overview of the past and future GHG emission trends and the targets of developed country Parties suggests that a choice of the reference year against which the emission reductions are measured and compared has major implications for the consideration of comparability of mitigation efforts. This is of particular relevance when comparing mitigation efforts between the developed EIT country Parties and the other developed country Parties. However, this is also relevant when comparing the mitigation efforts among the developed country Parties excluding the EIT country Parties. For example, the overall mitigation efforts by the EU for the period 1990–2020 appear higher than that of Canada and the United States for both the high and low targets, but for the period 2012–2020 that mitigation efforts appear lower for the low target and comparable for the high target. Efforts by New Zealand, Norway and Australia, for the high target, also appear high when 2005 is taken as a starting point. The same holds true for some small economies, such as Iceland and Liechtenstein.

2. Absolute and relative changes in per capita gross domestic product and per capita greenhouse gas emissions over different periods of time

Information basis

142. In the comparison of Parties based on the changes in per capita GDP and per capita emissions, the assumption used is that these metrics capture the specific national circumstances of Parties with different population growth patterns and different levels of economic output. When per capita GDP is used as a metric in the consideration of comparability, the assumption is that the wealthier nations have more capability to act to address climate change and to pursue greater mitigation efforts. The comparison of efforts in this section is based on information in tables 9–11 and figures 4–7, where information is presented on trends in population, GDP, per capita GDP and per capita emissions.

Aggregate changes in per capita gross domestic product and per capita emissions

143. As mentioned above (see para. 115 above), the climate, geography, population, economic profile, governmental structure, national resource endowment, transport systems, energy production and consumption patterns and trade profiles of developed country Parties vary greatly. This is reflected in the historical and projected trends of GDP, total population and emissions.

144. On population, as shown in tables 9 and 10, many developed country Parties expect to have a growing population by 2020 relative to 1990, with the overall growth amounting to 12 per cent. In the same period, the economic output expressed in terms of GDP is expected to almost double, growing by 75 per cent. This is expected to result in a major increase of GDP per capita of developed countries, growing by 57 per cent for the same period.

145. Because of the expected growth in population, developed country Parties are expecting a higher rate of cumulative reductions of the aggregate emissions per capita in relation to their targets by 2020 compared with the expected rate of aggregate emission reduction. In particular, according to table 11, developed country Parties expect to see a reduction in the aggregate emissions per capita, excluding LULUCF, from 20 per cent to

25 per cent in 2020 relative to the 1990 level for the low and high targets, respectively. The expected emission reductions including LULUCF are the same at 20 per cent and 25 per cent for the low and high targets, respectively. In absolute terms, aggregate emissions per capita are expected to be reduced from 16.6 CO_2 eq in 1990 and 13.5 CO_2 eq in 2012 to 13.3 CO_2 eq in 2020 for the low target and to 12.5 CO_2 eq for the high target, excluding LULUCF.

Changes in per capita gross domestic product and per capita emissions of individual Parties

146. The expected overall population growth over the period 1990–2020 referred to in paragraph 140 above is underpinned by the expected population growth in a number of countries, for example, Australia (49 per cent), the United States (32 per cent) and Canada (36 per cent). On the contrary, almost all developed country EIT Parties expect their population to decrease over the same period, for example, Belarus (13 per cent), the Russian Federation (6 per cent) and Ukraine (16 per cent). On GDP, after the major decline in the 1990s, developed country EIT Parties have seen relatively high growth rates in the 2000s and expect this growth to increase by 2020. This is expected to result in a level of convergence across Parties in terms of GDP per capita.

147. Although the changes in GDP and population are expected to result in some level of convergence in GDP per capita, expressed in PPP, the information shown in table 9 and figure 4 suggests that, as a continuation of existing patterns, Norway, Switzerland, the United States, Australia and Iceland are the top ranking Parties on this indicator in 2012, followed by Canada, Japan, the EU and New Zealand. The ranking of Parties in terms of GDP per capita broadly corresponds to emission reductions expected in 2020 in accordance with the targets relative to 2005, but this does not necessarily hold true when compared with 1990. Countries with a lower GDP per capita, such as Belarus, Kazakhstan, the Russian Federation and Ukraine, expect their emissions to increase in accordance with their targets between 2012 and 2020 after having their emissions well below the 1990 levels in the 1990s and 2000s because of the transition from centrally planned economies to market-driven economies and related loss of economic output.

148. Comparison of individual developed country Parties in terms of emissions per capita, as shown in table 11 and figures 6 and 7, suggests that Norway, Iceland, Liechtenstein, Monaco, and Switzerland are among the countries with the greatest decline in emissions per capita between 1990 and 2020, owing to their ambitious targets, but also because of the growing population. They are followed by Australia and New Zealand, which are expected to experience a significant population growth and are expected to see their per capita emissions being reduced significantly for the same period. Other countries with fast-growing populations, for example, Canada and the United States, expect reductions in emissions per capita in the range of 25 per cent to 27 per cent during the period 1990–2020. For Japan, its emissions per capita are expected to increase by 3 per cent from 1990 levels under its new 2020 target.

149. Among developed country EIT Parties, emissions per capita in 2020 are expected to remain broadly at the 1990 levels for Belarus and Ukraine and to reduce by 21 per cent for the Russian Federation (for the high target) and by 22 per cent for Kazakhstan, as a result of the expected decline in emissions and/or population for all these countries. The trend in per capita emissions remains largely the same for emissions excluding LULUCF and emissions including LULUCF. It is interesting to note that a few Parties, such as Iceland, Liechtenstein, Monaco and Norway, project almost halving their emissions per capita for the low and high targets relative to 1990; this is well above the aggregate reductions in emissions per capita by developed country Parties.

Summary

150. The comparison of mitigation efforts based on the per capita metrics suggests that almost all developed country Parties expect sizeable increases in their wealth expressed in GDP per capita between 1990 and 2020. A number of top ranking countries on this indicator expect sizeable reductions in per capita emissions by 2020 relative to the 1990 levels.

3. Greenhouse gas emission intensity in relation to economic output expressed through gross domestic product

Information basis

151. Comparability of mitigation efforts can also be assessed in terms of changes in emission intensity expressed through emissions per GDP. Decarbonization of the economy can signify structural changes in the economy and the effectiveness of mitigation efforts in terms of emission reductions per unit of economic output. Emission intensity can also provide a good indication of the potential for emission reductions. For example, emission reductions through enhanced energy production efficiency and through changes in the primary energy supply mix, including from fuel switching. Within this metric, GDP itself encompasses many factors relating to national circumstances, such as the size of the country and its economy.

152. The data used to assess the changes in emission intensity expressed through emissions per GDP are presented in tables 12 and 13 and figures 8–11 for two cases: GDP values expressed in PPP and GDP values expressed in market prices. The difference between these two GDP values is sizeable for developed country EIT Parties, and very small for other developed country Parties. The comparison of Parties is presented mostly using GDP values presented in PPP as it allows the elimination of the differences in price levels between different countries and fluctuations in GDP values expressed in market prices, which do not necessarily reflect underlying changes in emission intensity of economic output.

Aggregate changes in emission intensity

153. The aggregate emission intensity of developed country Parties relative to GDP, excluding and including LULUCF, has already been reduced during the period 1990–2012 by around 40 per cent and 44 per cent, respectively (see table 12). The aggregate emission intensity of developed country Parties calculated in relation to the low and high targets, excluding and including LULUCF, is expected to be between 49 and 52 per cent lower by 2020 relative to 1990 levels. This means that developed country Parties are expecting to reduce their emission intensity by 5 to 12 per cent between 2012 and 2020. The results in terms of overall trends in emission intensity of developed country Parties, collectively, do not show a major difference when calculated using GDP in PPP or GDP in market prices.

Changes in emission intensity of individual Parties

154. On the individual level, the differences in emission intensity are quite significant among developed country Parties (see figures 8–11). Belarus, Kazakhstan, the Russian Federation and Ukraine are far above other developed country Parties in terms of emission intensity throughout the entire period 1990–2020. However, these countries are expected to improve their emission intensity over time, except for Ukraine. As a result, the values of decarbonization, or changes in emission intensity by 2020 compared with the 1990 levels, are expected to become broadly the same for a wide range of Parties, except for Kazakhstan and Ukraine. Among the remaining developed countries, despite improvements in energy intensity, the absolute levels are expected to remain higher in Australia, Canada, New

Zealand and the United States compared with the EU, Iceland, Japan, Norway and Switzerland.

Summary

155. This comparison suggests that all developed country Parties expect major improvements in emission intensity between 1990 and 2020, as a continuation of the observed trend between 1990 and 2012. Although these changes are expected to lead to some convergence in emissions per GDP, developed countries EIT Parties are expected to remain with relatively high emissions per GDP, followed by Australia, Canada, New Zealand and the United States.

Annex

Background information, tables and figures

Table 4
Greenhouse gas emission trends of Annex I Parties according to their 2014 submissions of emissions inventories to the UNFCCC secretariat

	GHGs excluding LULUCF in Tg CO_2 eq					*GHGs including LULUCF in Tg CO_2 eq*				
Party	*1990*	*2000*	*2005*	*2012*	*Emission change (per cent) 1990–2012*	*1990*	*2000*	*2005*	*2012*	*Emission change (per cent) 1990–2012*
Australia	415.0	489.8	523.5	543.6	31.0	545.5	513.0	548.4	558.8	2.4
Austria	78.1	80.3	92.6	80.1	2.5	68.2	65.0	85.0	76.2	11.7
Belarus	139.2	79.2	84.2	89.3	–35.8	110.6	48.3	58.0	63.8	–42.3
Belgium	143.0	145.9	142.1	116.5	–18.5	142.1	145.3	140.9	115.1	–19.0
Bulgaria	109.1	59.5	63.7	61.0	–44.1	95.6	51.1	54.9	52.8	–44.7
Canada	590.9	721.4	735.8	698.6	18.2	519.9	669.9	789.2	739.5	42.2
Cyprus	6.1	8.9	9.9	9.3	52.1	5.9	8.8	9.8	9.2	55.3
Czech Republic	196.1	146.3	146.0	131.5	–33.0	192.7	139.1	139.5	124.2	–35.5
Denmark	70.0	70.0	65.6	53.1	–24.1	75.3	73.2	70.1	52.3	–30.6
Estonia	40.6	17.2	18.4	19.2	–52.8	31.8	19.0	13.4	17.2	–45.8
EU-28[a]	5 626.3	5 121.7	5 178.2	4 544.2	–19.2	5 367.9	4 819.2	4 874.1	4 240.7	–21.0
Finland	70.3	69.2	68.6	61.0	–13.3	56.7	50.0	40.1	35.1	–38.0
France	560.4	564.6	563.6	496.2	–11.4	531.8	539.1	522.8	452.0	–15.0
Germany	1 248.0	1 040.4	994.5	939.1	–24.8	1 223.5	1 016.4	1 003.6	935.6	–23.5
Greece	104.9	126.6	135.3	111.0	5.8	102.6	124.0	132.6	108.0	5.3
Hungary	97.6	76.5	78.4	62.0	–36.5	95.6	75.9	73.4	57.6	–39.8
Iceland	3.5	3.9	3.9	4.5	26.3	4.7	4.9	4.8	5.2	9.8
Ireland	55.2	68.2	69.7	58.5	5.9	52.9	67.4	67.4	55.4	4.6
Italy	519.1	551.2	574.3	460.1	–11.4	515.4	534.3	544.7	441.5	–14.3
Japan	1 234.3	1 340.5	1 350.3	1 343.1	8.8	1 167.5	1 254.9	1 261.0	1 268.1	8.6
Kazakhstan[b]	357.6	172.0	226.3	283.5	–20.7	350.6	149.2	209.9	260.0	–25.8
Latvia	26.2	10.0	11.1	11.0	–58.1	6.3	–4.1	–2.3	–1.3	–120.8
Liechtenstein	0.2	0.3	0.3	0.2	–1.2	0.2	0.2	0.3	0.2	–0.1
Lithuania	48.7	19.6	23.3	21.6	–55.6	44.4	10.2	18.5	13.5	–69.5
Luxembourg	12.9	9.8	13.1	11.8	–8.2	13.2	9.4	12.7	11.4	–13.9
Malta[c]	2.0	2.6	3.0	3.1	57.7	2.0	2.5	3.0	3.1	57.7
Monaco	0.1	0.1	0.1	0.1	–14.7	0.1	0.1	0.1	0.1	–14.7
Netherlands	211.8	213.0	209.4	191.7	–9.5	214.9	215.4	211.7	195.2	–9.1
New Zealand	60.6	70.9	78.3	76.0	25.4	23.4	38.5	48.2	49.4	111.4
Norway	50.4	54.1	54.5	52.7	4.6	40.3	30.2	29.3	26.1	–35.3
Poland	466.4	396.1	398.8	399.3	–14.4	440.9	365.5	353.9	367.4	–16.7
Portugal	60.8	84.1	87.7	68.8	13.1	58.5	74.1	81.0	55.3	–5.4
Romania	247.7	134.1	141.3	118.8	–52.0	223.4	108.4	115.8	98.2	–56.0
Russian Federation	3 363.3	2 053.3	2 135.4	2 295.0	–31.8	3 527.9	1 646.8	1 629.2	1 753.0	–50.3
Slovakia	73.2	48.9	50.3	42.7	–41.7	64.2	39.2	45.7	34.6	-46.1
Slovenia	18.4	19.0	20.3	18.9	2.5	17.0	13.6	15.0	14.6	–14.2
Spain	283.7	380.0	431.4	340.8	20.1	260.4	348.8	399.2	307.3	18.0
Sweden	72.7	68.6	66.9	57.6	–20.8	34.0	26.1	36.0	22.2	–34.8

	GHGs excluding LULUCF in Tg CO_2 eq					*GHGs including LULUCF in Tg CO_2 eq*				
Party	*1990*	*2000*	*2005*	*2012*	*Emission change (per cent) 1990–2012*	*1990*	*2000*	*2005*	*2012*	*Emission change (per cent) 1990–2012*
Switzerland	52.9	51.8	54.2	51.4	–2.7	51.0	51.8	52.3	50.3	–1.3
Turkey	188.4	298.1	330.7	439.9	133.4	144.4	248.0	281.0	380.1	163.3
Ukraine	940.2	412.5	426.8	401.0	–57.3	870.4	361.7	388.4	373.8	–57.1
United Kingdom	778.8	693.7	678.3	584.3	–25.0	780.7	691.6	672.6	577.3	–26.0
United States	6 219.5	7 075.6	7 228.3	6 487.8	4.3	5 402.1	6 414.8	6 223.1	5 546.3	2.7
Total	**19 218.3**	**17 927.4**	**18 389.9**	**17 295.9**	**–10.0**	**18 108.8**	**16 241.5**	**16 384.1**	**15 305.9**	**–15.5**

Note: The emission estimates in this table are based on the 2014 annual submissions made by Parties, available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php>.

Abbreviations: GHGs = greenhouse gases, LULUCF = land use, land-use change and forestry.

[a] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

[b] Kazakhstan is an Annex I Party for the purposes of the Kyoto Protocol in accordance with Article 7 of the Kyoto Protocol, but not an Annex I Party for the purposes of the Convention.

[c] Malta became an Annex I Party to the Convention on 25 October 2010.

Table 5

Greenhouse gas emission trends and quantitative economy-wide emission reduction targets of developed country Parties, individual and aggregate

	Total GHGs excluding LULUCF, in Tg CO_2 eq				*Total GHGs including LULUCF, in Tg CO_2 eq*				*2020 Targets in % of reference year emissions*			*Total GHGs excluding LULUCF, in Tg CO_2 eq*			*Total GHGs including LULUCF, in Tg CO_2 eq*		
Party	*1990*	*2000*	*2005*	*2012*	*1990*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*Reference year*	*Reference year level*	*Low 2020 target*	*High 2020 target*	*Reference year level*	*Low 2020 target*	*High 2020 target*
Australia[a]	415.0	489.8	523.5	543.6	555.0	556.7	601.7	576.0	–5%	–25%	2000	489.8	465.3	367.4	556.7	528.9	417.6
Belarus	139.2	79.2	84.2	89.3	110.6	48.3	58.0	63.8	–5%	–10%	1990	139.2	132.2	125.2	110.6	105.0	99.5
Canada[b]	590.9	721.4	735.8	698.6	519.9	669.9	789.2	739.5	–17%	–17%	2005	735.8	610.7	610.7	735.8	610.7	610.7
EU-28[c]	5 626.3	5 121.7	5 178.2	4 544.2	5 367.9	4 819.2	4 874.1	4 240.7	–20%	–30%	1990	5 626.3	4 501.0	3 938.4	5 367.9	4 294.4	3 757.6
Iceland	3.5	3.9	3.9	4.5	4.7	4.9	4.8	5.2	–15%	–30%	1990	3.5	3.0	2.5	4.7	4.0	3.3
Japan	1 234.3	1 340.5	1 350.3	1 343.1	1 167.5	1 254.9	1 261.0	1 268.1	–3.8%	–3.8%	2005	1 350.3	1 299.0	1 299.0	1 261.0	1 213.1	1 213.1
Kazakhstan	357.6	172.0	226.3	283.5	350.6	149.2	209.9	260.0	–15%	–15%	1990	357.6	304.0	304.0	350.6	298.0	298.0
Liechtenstein	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	–20%	–30%	1990	0.2	0.2	0.2	0.2	0.2	0.2
Monaco	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	–30%	–30%	1990	0.1	0.1	0.1	0.1	0.1	0.1
New Zealand	60.6	70.9	78.3	76.0	23.4	38.5	48.2	49.4	–5%	–20%	1990	60.6	57.6	48.5	23.4	22.2	18.7
Norway	50.4	54.1	54.5	52.7	40.3	30.2	29.3	26.1	–30%	–40%	1990	50.4	35.3	30.2	40.3	28.2	24.2
Russian Federation	3 363.3	2 053.3	2 135.4	2 295.0	3 527.9	1 646.8	1 629.2	1 753.0	–15%	–25%	1990	3 363.3	2 858.8	2 522.5	3 527.9	2 998.7	2 645.9
Switzerland	52.9	51.8	54.2	51.4	51.0	51.8	52.3	50.3	–20%	–30%	1990	52.9	42.3	37.0	51.0	40.8	35.7
Ukraine	940.2	412.5	426.8	401.0	870.4	361.7	388.4	373.8	–20%	–20%	1990	940.2	752.1	752.1	870.4	696.4	696.4
United States	6 219.5	7 075.6	7 228.3	6 487.8	5 402.1	6 414.8	6 223.1	5 546.3	–17%	–17%	2005	7 228.3	5 999.5	5 999.5	6 223.1	5 165.1	5 165.1
Total[d]	**19 054.1**	**17 646.9**	**18 080.1**	**16 871.4**	**17 991.6**	**16 047.3**	**16 169.6**	**14 952.5**					**17 061.2**	**16 037.3**		**16 005.8**	**14 985.9**
% change from 1990 emissions		–7	–5	–11%		–11%	–10%	–17%					–10%	–16%		–11%	–17%
% change from 2000 emissions			2%	–4%			1%	–7%					–3%	–9%		0%	–7%
% change from 2005 emissions				–7%				–8%					–6%	–11%		–1%	–7%

Note: The emission estimates in this table are based on the 2014 annual submissions made by Parties, available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php>.

Abbreviations: GHGs = greenhouse gases, LULUCF = land use, land-use change and forestry.

[a] In accordance with the definition of Australia's target for 2020, the net emission levels for 1990, 2005, 2012, the reference year (2000) and for 2020, relative to total GHG emissions including LULUCF, include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

[b] Canada's estimates for LULUCF include large, highly variable impacts of natural disturbances such as forest fires and forest insect infestations. It is not possible to use these values in estimating Canada's emission reduction target. As a result, the emission levels for 2005 that were used to calculate the target for Canada using total GHG emissions including LULUCF do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

[d] The values of total emissions in this table differ from those in table 4 in this document because emissions from Turkey are not included in the total in this table, and GHG emissions including LULUCF from Australia as presented in table 4 include the full LULUCF sector, while in this table they include only net emissions and removals from afforestation, reforestation and deforestation activities.

Table 6

Expected changes in emissions of developed country Parties from the selected years in relation to their quantitative economy-wide emission reduction targets in 2020 (excluding land use, land-use change and forestry)

	Emission changes, in Tg CO_2 eq								*Emission changes in per cent of reference years*							
	Low 2020 target				*High 2020 target*				*Low 2020 target*				*High 2020 target*			
	1990–2020	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*
Australia	50.3	–24.5	–58.2	–78.3	–47.6	–122.5	–156.1	–176.3	12%	–5%	–11%	–14%	–11%	–25%	–30%	–32%
Belarus	–7.0	53.0	48.0	42.9	–13.9	46.1	41.1	36.0	–5%	67%	57%	48%	–10%	58%	49%	40%
Canada	19.8	–110.6	–125.1	–87.9	19.8	–110.6	–125.1	–87.9	3%	–15%	–17%	–13%	3%	–15%	–17%	–13%
EU-28[a]	–1 125.3	–620.6	–677.2	–43.2	–1 687.9	–1 183.3	–1 239.8	–605.8	–20%	–12%	–13%	–1%	–30%	–23%	–24%	–13%
Iceland	–0.5	–0.9	-0.9	–1.5	–1.1	–1.4	–1.4	–2.0	–15%	–23%	–22%	–33%	–30%	–37%	–36%	–45%
Japan	64.7	–41.5	–51.3	–44.1	64.7	–41.5	–51.3	-44.1	5%	–3%	–4%	–3%	5%	–3%	–4%	–3%
Kazakhstan	–53.6	132.0	77.6	20.4	–53.6	132.0	77.6	20.4	–15%	77%	34%	7%	–15%	77%	34%	7%
Liechtenstein	0.0	–0.1	–0.1	0.0	–0.1	-0.1	–0.1	–0.1	–20%	–27%	–32%	–19%	–30%	–36%	–40%	–29%
Monaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–30%	–37%	–29%	–18%	–30%	–37%	–29%	–18%
New Zealand	–3.0	–13.3	–20.7	–18.4	–12.1	–22.4	–29.8	–27.5	–5%	–19%	–26%	–24%	–20%	–32%	–38%	–36%
Norway	–15.1	–18.8	–19.2	–17.4	–20.2	–23.8	–24.2	–22.5	–30%	–35%	–35%	–33%	–40%	–44%	–44%	–43%
Russian Federation	–504.5	805.5	723.4	563.8	–840.8	469.2	387.1	227.5	–15%	39%	34%	25%	–25%	23%	18%	10%
Switzerland	–10.6	–9.5	–11.9	–9.1	–15.9	-14.8	–17.2	–14.4	–20%	–18%	–22%	–18%	–30%	–28%	–32%	–28%
Ukraine	–188.0	339.6	325.3	351.1	–188.0	339.6	325.3	351.1	–20%	82%	76%	88%	–20%	82%	76%	88%
United States	–220.0	–1 076.1	–1 228.8	–488.4	–220.0	–1 076.1	–1 228.8	–488.4	–4%	–15%	–17%	–8%	–4%	–15%	–17%	–8%
Total	–1 992.9	–585.8	–1 018.9	189.8	–3 016.8	–1 609.6	–2 042.7	–834.1	–10%	–3%	–6%	1%	–16%	–9%	–11%	–5%

Note: The estimates of changes in emissions represent the difference between emission levels in selected years (1990, 2000, 2005 and 2012) and emission levels in 2020 in relation to the targets. The estimates of changes in emissions in per cent were calculated by dividing the changes in emissions in the period between the selected years and 2020 by the emission levels in the selected year. Negative values represent emission decrease and positive values represent emission increase.

[a] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Table 7

Expected changes in emissions of developed country Parties from the selected years in relation to their quantitative economy-wide emission reduction targets in 2020 (including land use, land-use change and forestry)

	Emission changes in Tg CO_2 eq								*Emission change in per cent of reference year*							
	Low 2020 target				*High 2020 target*				*Low 2020 target*				*High 2020 target*			
	1990–2020	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*	*1990–2020*	*2000–2020*	*2005–2020*	*2012–2020*
Australia[a]	–26.1	–27.8	–72.8	–47.1	–137.4	–139.2	–184.2	–158.5	–5%	–5%	–12%	–8%	–25%	–25%	–31%	–28%
Belarus	–5.5	56.8	47.1	41.3	-11.1	51.3	41.6	35.7	–5%	118%	81%	65%	–10%	106%	72%	56%
Canada[b]	90.8	–59.1	–178.5	–128.7	90.8	–59.1	–178.5	–128.7	17%	–9%	–23%	–17%	17%	–9%	–23%	–17%
EU-28[c]	–1 073.6	–524.9	–579.7	53.7	–1 610.4	–1 061.7	–1 116.5	-483.1	–20%	–11%	–12%	1%	–30%	–22%	–23%	–11%
Iceland	–0.7	–0.9	–0.8	–1.2	–1.4	–1.6	–1.5	–1.9	–15%	–19%	–16%	–23%	–30%	–33%	–31%	–36%
Japan	45.6	–41.8	–47.9	–55.0	45.6	–41.8	–47.9	–55.0	4%	–3%	–4%	–4%	4%	–3%	–4%	–4%
Kazakhstan	–52.6	148.8	88.1	38.0	–52.6	148.8	88.1	38.0	–15%	100%	42%	15%	–15%	100%	42%	15%
Liechtenstein	0.0	–0.1	-0.1	0.0	–0.1	–0.1	–0.1	–0.1	–20%	–28%	–32%	–20%	–30%	–37%	–41%	–30%
Monaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–30%	–37%	–29%	–18%	–30%	–37%	–29%	–18%
New Zealand	–1.2	–16.3	–26.0	–27.2	–4.7	–19.8	–29.5	–30.7	–5%	–42%	–54%	–55%	–20%	–51%	–61%	–62%
Norway	–12.1	–2.0	–1.1	2.1	–16.1	–6.0	–5.2	–1.9	–30%	–7%	–4%	8%	–40%	–20%	–18%	–7%
Russian Federation	–529.2	1 351.9	1 369.5	1 245.7	–882.0	999.1	1 016.7	892.9	–15%	82%	84%	71%	–25%	61%	62%	51%
Switzerland	–10.2	–11.0	-11.5	–9.5	–15.3	–16.1	–16.6	–14.6	–20%	–21%	–22%	–19%	–30%	–31%	–32%	–29%
Ukraine	–174.1	334.7	308.0	322.5	–174.1	334.7	308.0	322.5	–20%	93%	79%	86%	–20%	93%	79%	86%
United States	–237.0	–1 249.7	–1 057.9	–381.2	–237.0	–1 249.7	–1 057.9	–381.2	–4%	–19%	–17%	–7%	–4%	–19%	–17%	–7%
Total	**–1 985.8**	**–41.5**	**–163.8**	**1 053.2**	**–3 005.7**	**–1 061.3**	**–1 183.6**	**33.4**	**–11%**	**0%**	**–1%**	**7%**	**–17%**	**–7%**	**–7%**	**0%**

Note: The estimates of changes in emissions represent the difference between emission levels in selected years (1990, 2000, 2005 and 2012) and emission levels in 2020 in relation to the targets. The estimates of changes in emissions in per cent were calculated by dividing the changes in emissions in the period between the selected years and 2020 by the emission levels in the selected year. Negative values represent emission decrease and positive values represent emission increase.

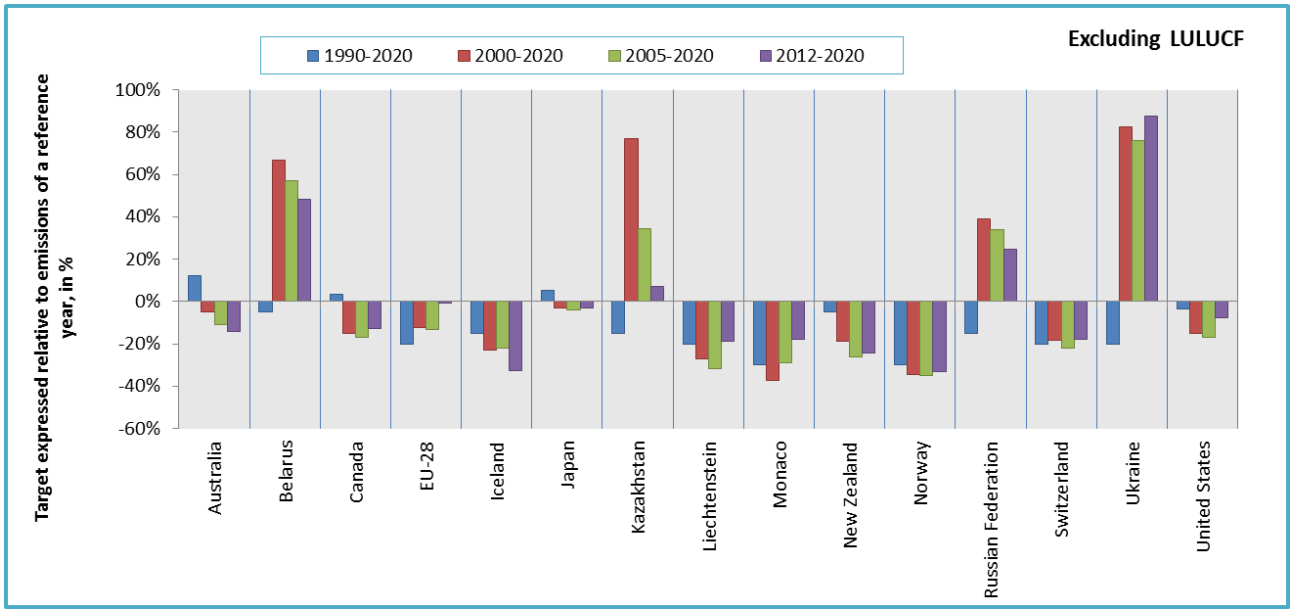
[a] In accordance with the definition of Australia's target for 2020, the net emission levels for the selected years and for 2020 include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

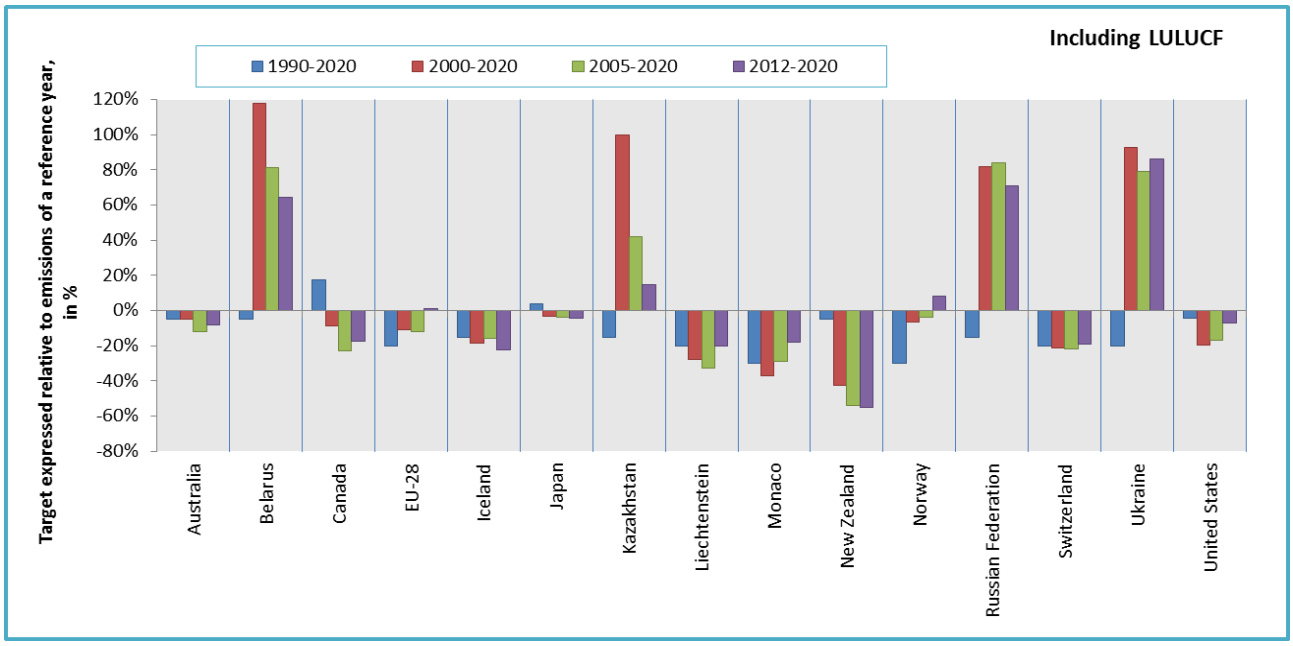
[b] The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including land use, land-use change and forestry (LULUCF) do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Figure 1

Expected changes in emissions of developed country Parties, excluding and including land use, land-use change and forestry, from the selected years in relation to their low quantitative economy-wide emission reduction targets in 2020 (expressed as per cent of emissions in the selected year)

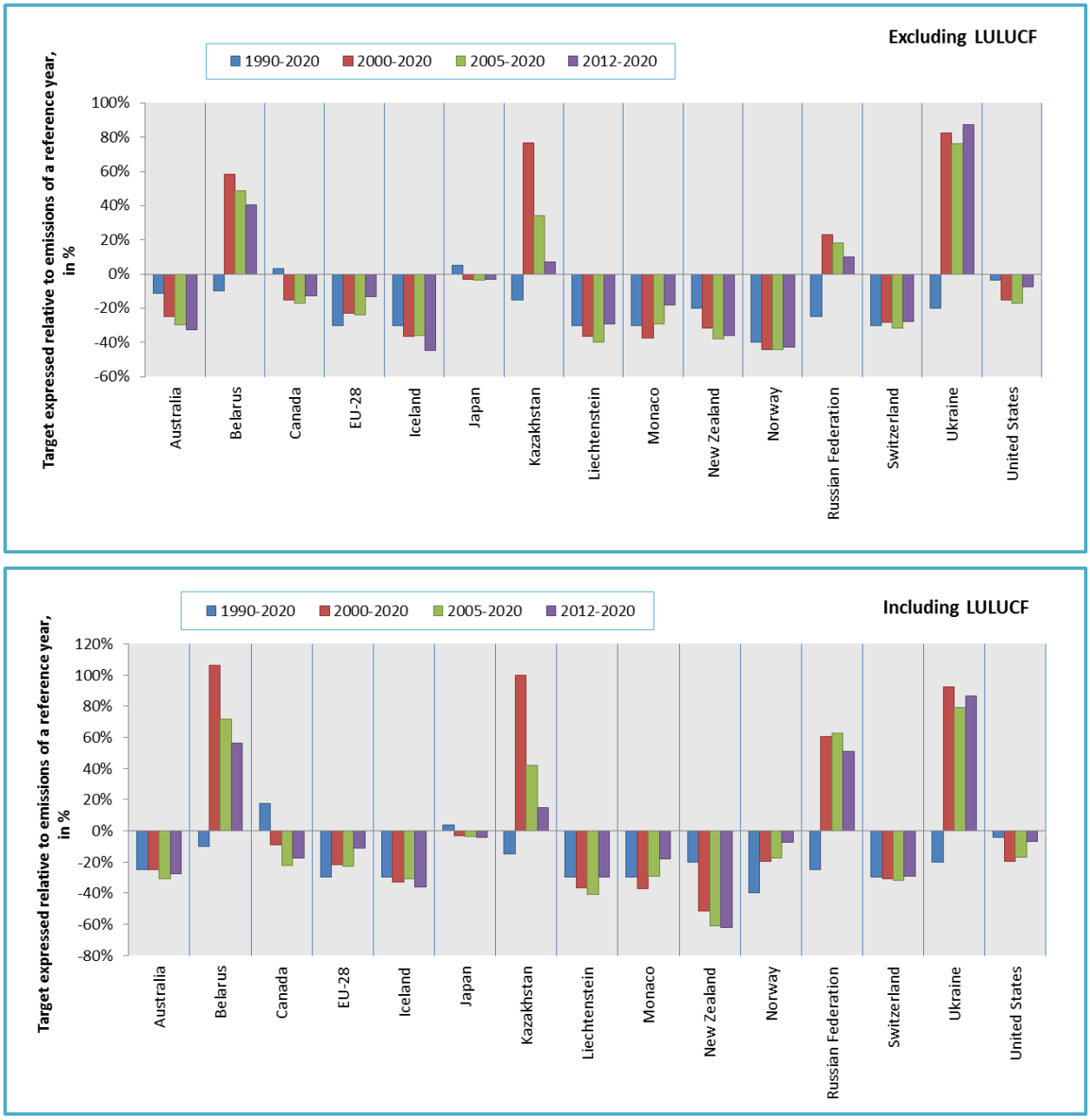




Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Figure 2

Expected changes in emissions of developed country Parties, excluding and including land use, land-use change and forestry, from the selected years in relation to their high quantitative economy-wide emission reduction targets in 2020 (expressed as per cent of emissions in the selected year)



Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Table 8

Emission trends of developed country Parties between 1990 and 2012, and expected changes in emissions between 2012 and 2020 in relation to their quantitative economy-wide emission reduction targets

	Total GHG emission trends, excluding LULUCF, (emission changes in per cent)			*Total GHG emission trends, excluding LULUCF, (emission changes in per cent)*		
		2012–2020			*2012–2020*	
Party	*1990–2012*	*Low 2020 target*	*High 2020 target*	*1990–2012*	*Low 2020 target*	*High 2020 target*
Australia[a]	31%	–14%	–32%	4%	–8%	–28%
Belarus	–36%	48%	40%	–42%	65%	56%
Canada[b]	18%	–13%	–13%	42%	–17%	–17%
EU-28[c]	–19%	–1%	–13%	–21%	1%	–11%
Iceland	26%	–33%	–45%	10%	–23%	–36%
Japan	9%	–3.3%	–3.3%	9%	–4%	–4%
Kazakhstan	–21%	7%	7%	–26%	15%	15%
Liechtenstein	–1%	–19%	–29%	0%	–20%	–30%
Monaco	–15%	–18%	–18%	–15%	–18%	–18%
New Zealand	25%	–24%	–36%	111%	–55%	–62%
Norway	5%	–33%	–43%	–35%	8%	–7%
Russian Federation	–32%	25%	10%	–50%	71%	51%
Switzerland	–3%	–18%	–28%	–1%	–19%	–29%
Ukraine	–57%	88%	88%	–57%	86%	86%
United States	4%	–8%	–8%	3%	–7%	–7%
Total	**–11%**	**1%**	**–5%**	**–17%**	**7%**	**0%**

Note: The estimates of emission trends represent the difference between emission levels in 1990 and 2012, and between 2012 and 2020 in relation to the targets. The estimates of emission trends in per cent were calculated by dividing the changes in emissions in the period between 1990 and 2012 by emission levels in 1990, and by dividing the changes in emissions in the period between 2012 and 2020 (based on targets) by emission levels in 2012. Negative values represent emission decrease and positive values represent emission increase.

Abbreviations: GHGs = greenhouse gases, LULUCF = land use, land-use change and forestry.

[a] In accordance with the definition of Australia's target for 2020, the net emission levels relative to total GHG emissions including LULUCF for 1990, 2012 and 2020 in relation to the targets include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

[b] The emission levels for 2005 that were used to calculate the target for Canada using total GHG emissions including LULUCF do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Figure 3

Greenhouse gas emission trends between 1990 and 2012, and expected changes in emissions between 2012 and 2020 in relation to the low and high targets submitted by developed country Parties, expressed as per cent of emission changes (excluding and including land use, land-use change and forestry)

Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Table 9

Trends of population, gross domestic product and gross domestic product per capita of developed country Parties (constant 2011 United States dollars in purchasing power parity)

	Population, millions					*Gross Domestic Product, billions USD 2011*					*Gross Domestic Product per capita, thousands USD 2011 per inhabitant*				
	1990	*2000*	*2005*	*2012*	*2020*	*1990*	*2000*	*2005*	*2012*	*2020*	*1990*	*2000*	*2005*	*2012*	*2020*
Australia	17.1	19.3	20.5	23.0	25.4	487.1	675.1	792.0	964.6	1 214.3	28.5	35.1	38.6	41.9	47.7
Belarus	10.3	10.0	9.7	9.4	9.0	82.3	73.0	104.8	160.0	185.1	8.0	7.3	10.8	17.0	20.5
Canada	27.7	30.7	32.3	34.8	37.6	864.8	1 146.5	1 299.8	1 299.8	1 718.8	31.3	37.3	40.3	37.3	45.7
EU-28[a]	479.9	490.3	499.8	511.1	518.7	11 486.2	14 309.5	15 831.4	16 835.4	19 160.0	23.9	29.2	31.7	32.9	36.9
Iceland	0.3	0.3	0.3	0.3	0.4	7.4	9.6	11.8	12.4	15.7	29.2	34.0	39.8	38.0	44.3
Japan	122.2	125.7	127.0	127.1	125.4	3 650.5	4 083.5	4 333.5	4 449.6	4 811.1	29.9	32.5	34.1	35.0	38.4
Kazakhstan	16.2	14.6	15.1	16.3	17.5	208.1	144.5	236.6	361.1	544.3	12.9	9.9	15.7	22.2	31.1
Liechtenstein	0.03	0.03	0.03	0.04	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Monaco	0.03	0.03	0.03	0.04	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
New Zealand	3.4	3.9	4.1	4.5	4.8	78.0	105.8	128.1	143.1	177.1	23.0	27.4	31.0	32.1	36.8
Norway	4.2	4.5	4.6	5.0	5.4	181.6	261.3	291.3	315.5	364.4	42.8	58.2	63.0	63.2	67.4
Russian Federation	148.1	146.8	143.9	143.0	140.0	2 869.3	1 931.1	2 600.3	3 337.5	3 711.6	19.4	13.2	18.1	23.3	26.5
Switzerland	6.7	7.2	7.4	8.0	8.6	301.7	336.3	358.8	410.2	471.7	45.2	46.9	48.4	51.3	54.5
Ukraine	51.7	49.1	47.1	45.5	43.2	545.2	236.9	342.8	379.9	440.0	10.6	4.8	7.3	8.4	10.2
United States	258.3	288.7	302.3	321.4	342.0	9 231.5	12 967.1	14 690.9	15 965.5	19 671.3	35.7	44.9	48.6	49.7	57.5
Total	**1 146.1**	**1 190.9**	**1 214.1**	**1 249.5**	**1 278.2**	**29 993.8**	**36 279.9**	**41 022.0**	**44 634.4**	**52 485.4**	**26.2**	**30.5**	**33.8**	**35.7**	**41.1**

Note: Population numbers and population projections to 2020 are from the United Nations World Population Prospects, 2013 Revision, available at <http://data.un.org/Data.aspx?q=population&d=PopDiv&f=variableID%3a12#PopDiv>. Gross domestic product (GDP) values are expressed in 2011 United States dollars at purchasing power parity values. GDP values for the period 1990–2013 are from the World Bank World Development Indicators. Data on GDP at market prices were taken from the International Monetary Fund's World Economic Outlook. GDP values in purchasing power parity for the period up to 2020 were estimated using the projections of GDP at market prices, as drivers, for the period 2014–2019. An average growth rate calculated based on the projected GDP data for the period 2014–2019 was applied for each country for 2020.

[a] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Table 10

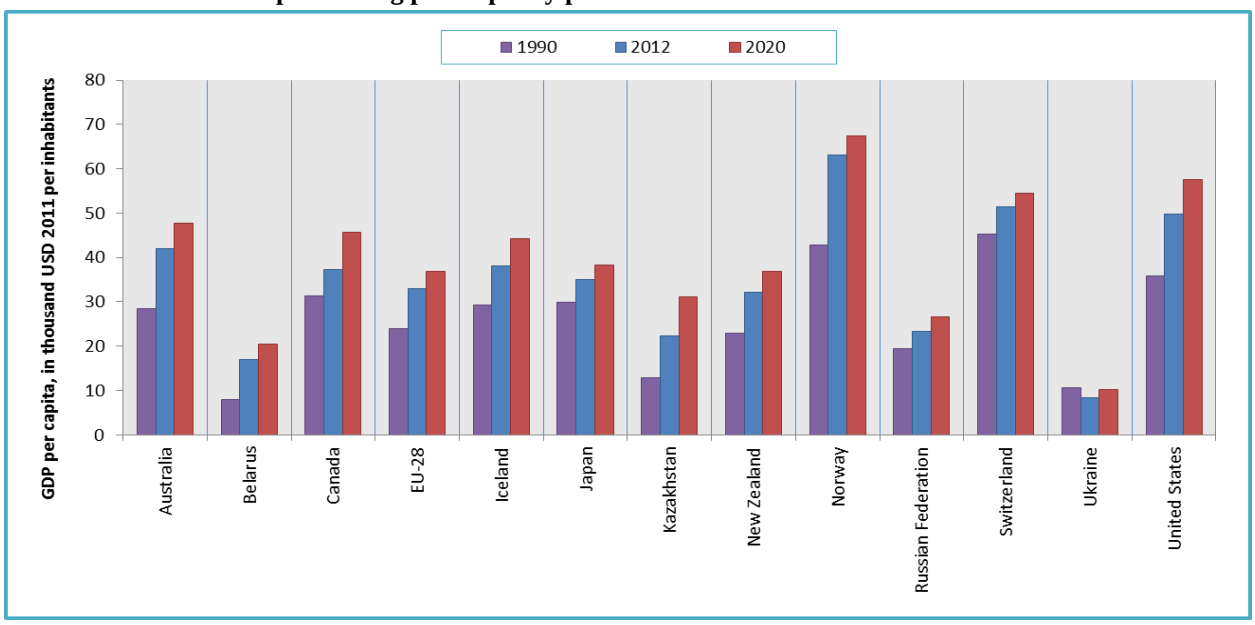
Trends of population, gross domestic product and gross domestic product per capita of developed country Parties (constant 2005 United States dollars at market prices)

	Population, millions					*Gross domestic product, billions USD 2005*					*Gross domestic product per capita, thousands USD 2005 per inhabitant*				
	1990	*2000*	*2005*	*2012*	*2020*	*1990*	*2000*	*2005*	*2012*	*2020*	*1990*	*2000*	*2005*	*2012*	*2020*
Australia	17.1	19.3	20.5	23.0	25.4	425.9	591.0	693.7	846.2	1 061.9	24.9	30.7	33.8	36.8	41.7
Belarus	10.3	10.0	9.7	9.4	9.0	23.7	21.0	30.2	46.0	53.2	2.3	2.1	3.1	4.9	5.9
Canada	27.7	30.7	32.3	34.8	37.6	749.9	999.9	1 133.8	1 255.4	1 494.6	27.1	32.6	35.2	36.1	39.7
EU-28[a]	479.9	490.3	499.8	511.1	518.7	10 044.9	12 611.8	13 871.1	14 655.4	16 628.0	20.9	25.7	27.8	28.7	32.1
Iceland	0.3	0.3	0.3	0.3	0.4	10.3	13.2	16.3	17.1	21.6	40.3	47.0	54.9	52.4	61.1
Japan	122.2	125.7	127.0	127.1	125.4	3 851.3	4 308.1	4 571.9	4 711.9	5 093.5	31.5	34.3	36.0	37.1	40.6
Kazakhstan	16.2	14.6	15.1	16.3	17.5	50.2	34.9	57.1	87.2	131.4	3.1	2.4	3.8	5.4	7.5
Liechtenstein	0.03	0.03	0.03	0.04	0.04	2.0	3.5	3.7	NA	NA	69.6	106.1	105.4	NA	NA
Monaco	0.03	0.03	0.03	0.04	0.04	3.2	3.9	4.3	NA	NA	109.7	122.5	126.6	NA	NA
New Zealand	3.4	3.9	4.1	4.5	4.8	70.3	94.4	113.8	123.9	153.8	20.7	24.5	27.5	27.8	32.0
Norway	4.2	4.5	4.6	5.0	5.4	189.6	272.7	304.1	329.5	380.7	44.7	60.7	65.8	66.0	70.4
Russian Federation	148.1	146.8	143.9	143.0	140.0	843.1	567.4	764.0	980.9	1 090.7	5.7	3.9	5.3	6.9	7.8
Switzerland	6.7	7.2	7.4	8.0	8.6	323.5	360.6	384.8	439.8	505.8	48.5	50.3	51.9	55.0	58.5
Ukraine	51.7	49.1	47.1	45.5	43.2	137.0	59.5	86.1	95.5	108.5	2.7	1.2	1.8	2.1	2.5
United States	258.3	288.7	302.3	321.4	342.0	8 280.5	11 636.9	13 178.2	14 309.1	17 689.8	32.1	40.3	43.6	44.5	51.7
Total	**1 146.1**	**1 190.9**	**1 214.1**	**1 249.5**	**1 278.2**	**25 005.2**	**31 578.8**	**35 213.0**	**37 897.8**	**44 413.5**	**21.8**	**26.5**	**29.0**	**30.3**	**34.7**

Note: Population numbers and population projections to 2020 are from the United Nations World Population Prospects, 2013 Revision, available at <http://data.un.org/Data.aspx?q=population&d=PopDiv&f=variableID%3a12#PopDiv>. Gross domestic product (GDP) values are expressed in constant 2005 United States dollars at market prices. GDP values for the period 1990–2013 are from the World Bank World Development Indicators, accessed through the United Nations database at <http://data.un.org>. Data on GDP at market prices were taken from the International Monetary Fund's World Economic Outlook. GDP values for the period up to 2020 were estimated using the projections of GDP at market prices for the period 2014–2019. An average growth rate calculated based on the projected GDP data for the period 2014–2019 was applied for each country for 2020.

[a] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

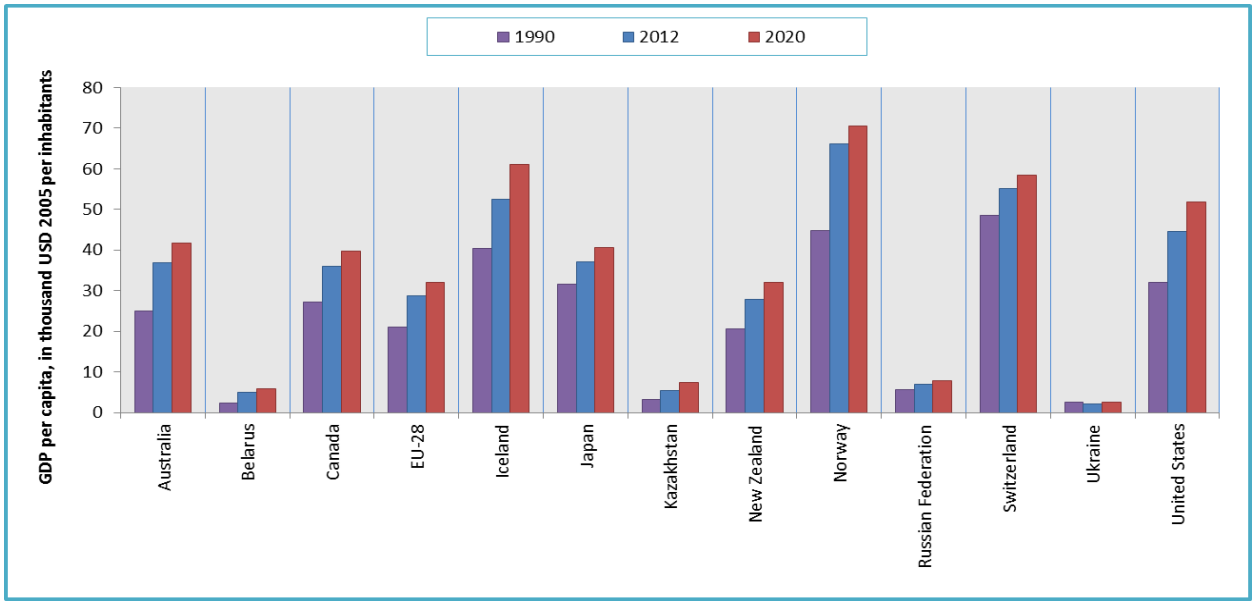
Figure 4
Gross domestic product per capita for developed country Parties, expressed in thousands of constant 2011 United States dollars in purchasing power parity per inhabitant



Note: The values for Liechtenstein and Monaco are not included in this chart, as data were not available.

Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; GDP = gross domestic product.

Figure 5
Gross domestic product per capita for developed country Parties, expressed in thousands of constant 2005 United States dollars at market prices per inhabitant



Note: The values for Liechtenstein and Monaco are not included in this chart, as data were not available

Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; GDP = gross domestic product.

Table 11
Trends of per capita total greenhouse gas emissions of developed country Parties

	Emissions per capita ,Gg CO_2 eq/1000 inhabitants												*Emissions per capita, change relative to 1990 in per cent*									
	Excluding LULUCF						*Including LULUCF*						*Excluding LULUCF*					*Including LULUCF*				
Party	*1990*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*1990*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*
Australia[a]	24.3	25.4	25.5	23.6	18.3	14.4	32.5	28.9	29.3	25.0	20.8	16.4	5%	5%	–3%	–5%	–41%	–11%	–10%	–23%	–36%	–49%
Belarus	13.6	7.9	8.7	9.5	14.6	13.9	10.8	4.8	6.0	6.8	11.6	11.0	–42%	–36%	–30%	8%	2%	–55%	–44%	–37%	8%	2%
Canada[b]	21.4	23.5	22.8	20.1	16.2	16.2	18.8	21.8	24.5	21.2	16.2	16.2	10%	7%	–6%	–24%	–24%	16%	30%	13%	–14%	–14%
EU-28[c]	11.7	10.4	10.4	8.9	8.7	7.6	11.2	9.8	9.8	8.3	8.3	7.2	–11%	–12%	–24%	–26%	–35%	–12%	–13%	–26%	–26%	–35%
Iceland	13.9	13.9	13.0	13.7	8.5	7.0	18.5	17.5	16.1	15.9	11.3	9.3	0%	–6%	–1%	–39%	–50%	–5%	–13%	–14%	–39%	–50%
Japan	10.1	10.7	10.6	10.6	10.4	10.4	9.6	10.0	9.9	10.0	9.7	9.7	6%	5%	5%	3%	3%	5%	4%	4%	1%	1%
Kazakhstan	22.1	11.8	15.0	17.4	17.3	17.3	21.7	10.2	13.9	16.0	17.0	17.0	–47%	–32%	–21%	–22%	–22%	–53%	–36%	–26%	–22%	–22%
Liechtenstein	7.9	7.6	7.7	6.1	4.7	4.1	7.6	7.3	7.5	6.0	4.5	3.9	–4%	–3%	–23%	–41%	–48%	–4%	–2%	–22%	–41%	–48%
Monaco	3.7	3.8	3.2	2.5	1.9	1.9	3.7	3.8	3.2	2.5	1.9	1.9	2%	–14%	–33%	–48%	–48%	2%	–14%	–33%	–48%	–48%
New Zealand	17.8	18.4	18.9	17.1	12.0	10.1	6.9	10.0	11.7	11.1	4.6	3.9	3%	6%	–4%	–33%	–44%	45%	70%	61%	–33%	–44%
Norway	11.9	12.0	11.8	10.6	6.5	5.6	9.5	6.7	6.3	5.2	5.2	4.5	1%	–1%	–11%	–45%	–53%	–29%	–33%	–45%	–45%	–53%
Russian Federation	22.7	14.0	14.8	16.0	20.4	18.0	23.8	11.2	11.3	12.3	21.4	18.9	–38%	–35%	–29%	–10%	–21%	–53%	–52%	–49%	–10%	–21%
Switzerland	7.9	7.2	7.3	6.4	4.9	4.3	7.6	7.2	7.1	6.3	4.7	4.1	–9%	–8%	–19%	–38%	–46%	–5%	–8%	–18%	–38%	–46%
Ukraine	18.2	8.4	9.1	8.8	17.4	17.4	16.8	7.4	8.2	8.2	16.1	16.1	–54%	–50%	–52%	–4%	–4%	–56%	–51%	–51%	–4%	–4%
United States	24.1	24.5	23.9	20.2	17.5	17.5	20.9	22.2	20.6	17.3	15.1	15.1	2%	–1%	–16%	–27%	–27%	6%	–2%	–17%	–28%	–28%
Total	**16.6**	**14.8**	**14.9**	**13.5**	**13.3**	**12.5**	**15.7**	**13.5**	**13.3**	**12.0**	**12.5**	**11.7**	**–11%**	**–10%**	**–19%**	**–20%**	**–25%**	**–14%**	**–15%**	**–24%**	**–20%**	**–25%**

Note: Emissions per capita were calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2012 and 2020 in relation to the targets by total population numbers in the same years. Population numbers and population projections to 2020 are from the United Nations World Population Prospects report, 2013 Revision, available at <http://data.un.org/Data.aspx?q=population&d=PopDiv&f=variableID%3a12#PopDiv>, and are presented in tables 9 and 10 in this document. Negative percentages represent decrease in emissions per capita.

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

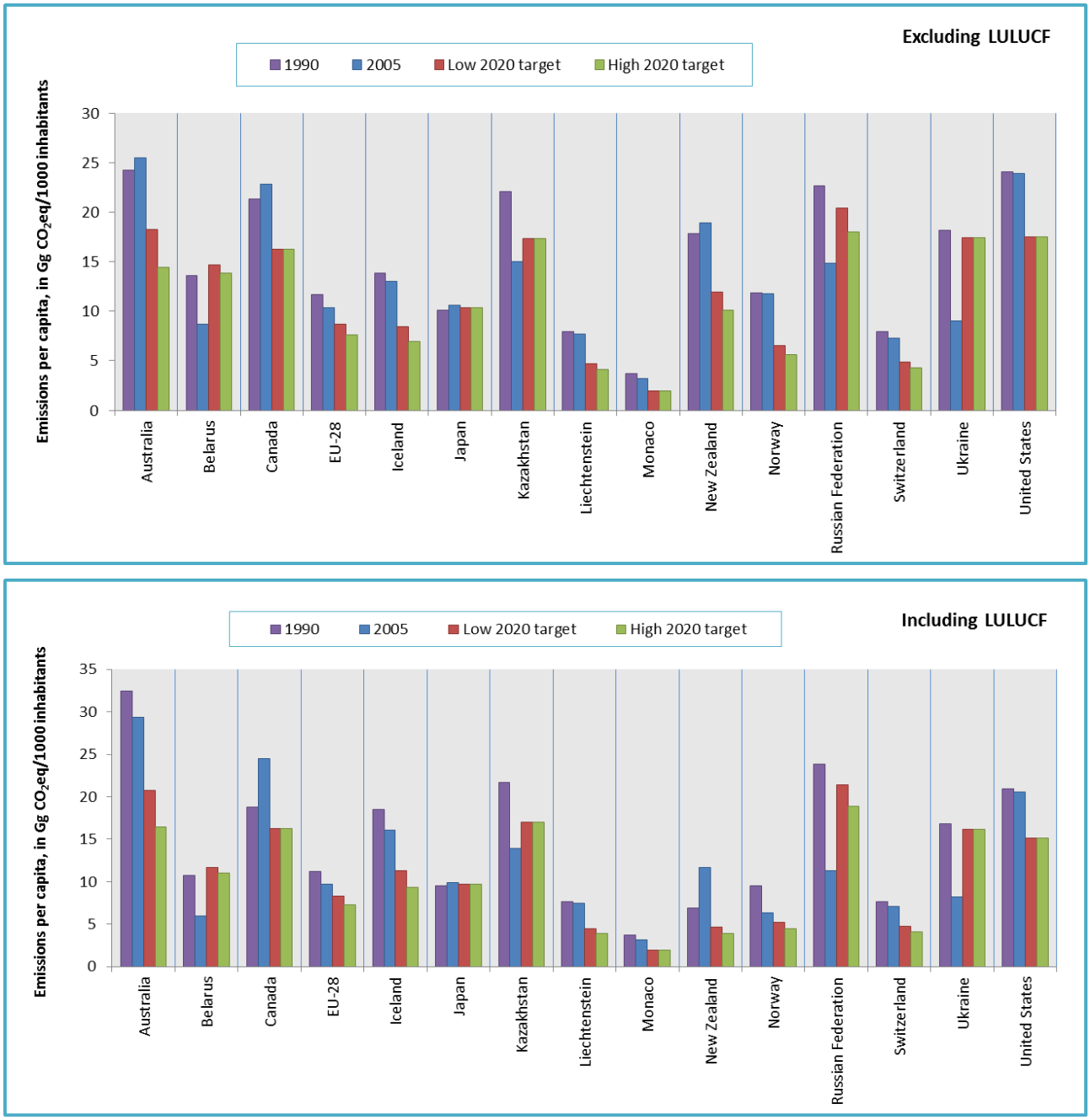
[a] In accordance with the definition of Australia's target for 2020, the net emission levels relative to total greenhouse gas emissions including LULUCF for 1990, 2000, 2005, 2012 and 2020 in relation to the targets include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

[b] The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including LULUCF do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Figure 6

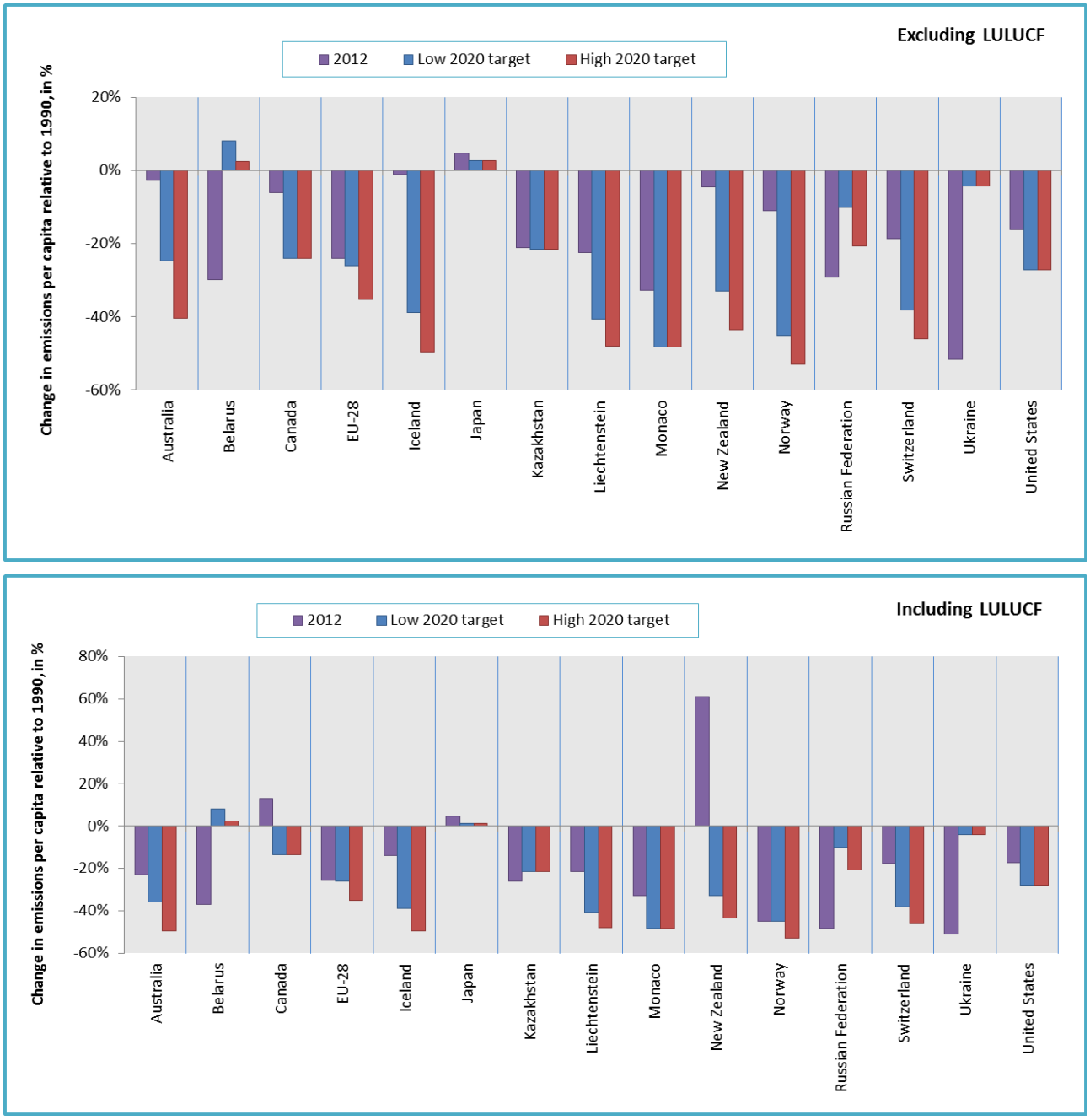
Per capita greenhouse gas emissions, excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed country Parties, expressed as Gg CO_2 eq per thousand inhabitants



Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Figure 7

Change in per capita greenhouse gas emissions for 2012 and the low and high targets submitted by developed country Parties relative to per capita emissions in 1990 (excluding and including land use, land-use change and forestry)



Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Table 12

Trends of greenhouse gas emission intensity of developed country Parties in relation to the quantitative economy-wide emission reduction targets for 2020 (calculated using GDP presented in constant 2011 United States dollars expressed in purchasing power parity)

	Emission intensity, Gg CO_2 eq/million USD 2011												*Change in emission intensity from 1990 in per cent*									
	Excluding LULUCF						*Including LULUCF*						*Excluding LULUCF*					*Including LULUCF*				
	1990	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*1990*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*
Australia[a]	0.85	0.73	0.66	0.56	0.38	0.30	1.14	0.82	0.76	0.60	0.44	0.34	–15%	–22%	–34%	–55%	–64%	–28%	–33%	–48%	–62%	–70%
Belarus	1.69	1.08	0.80	0.56	0.71	0.68	1.34	0.66	0.55	0.40	0.57	0.54	–36%	–53%	–67%	–58%	–60%	–51%	–59%	–70%	–58%	–60%
Canada[b]	0.68	0.63	0.57	0.54	0.36	0.36	0.60	0.58	0.61	0.57	0.36	0.36	–8%	–17%	–21%	–48%	–48%	–3%	1%	–5%	–41%	–41%
EU-28[c]	0.49	0.36	0.33	0.27	0.23	0.21	0.47	0.34	0.31	0.25	0.22	0.20	–27%	–33%	–45%	–52%	–58%	–28%	–34%	–46%	–52%	–58%
Iceland	0.48	0.41	0.33	0.36	0.19	0.16	0.63	0.51	0.40	0.42	0.26	0.21	–14%	–31%	–24%	–60%	–67%	–19%	–36%	–34%	–60%	–67%
Japan	0.34	0.33	0.31	0.30	0.27	0.27	0.32	0.31	0.29	0.28	0.25	0.25	–3%	–8%	–11%	–20%	–20%	–4%	–9%	–11%	–21%	–21%
Kazakhstan	1.72	1.19	0.96	0.79	0.56	0.56	1.68	1.03	0.89	0.72	0.55	0.55	–31%	–44%	–54%	–68%	–68%	–39%	–47%	–57%	–68%	–68%
Liechtenstein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Monaco	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
New Zealand	0.78	0.67	0.61	0.53	0.33	0.27	0.30	0.36	0.38	0.35	0.13	0.11	–14%	–21%	–32%	–58%	–65%	22%	26%	15%	–58%	–65%
Norway	0.28	0.21	0.19	0.17	0.10	0.08	0.22	0.12	0.10	0.08	0.08	0.07	–25%	–33%	–40%	–65%	–70%	–48%	–55%	–63%	–65%	–70%
Russian Federation	1.17	1.06	0.82	0.69	0.77	0.68	1.23	0.85	0.63	0.53	0.81	0.71	–9%	–30%	–41%	–34%	–42%	–31%	–49%	–57%	–34%	–42%
Switzerland	0.18	0.15	0.15	0.13	0.09	0.08	0.17	0.15	0.15	0.12	0.09	0.08	–12%	–14%	–28%	–49%	–55%	–9%	–14%	–27%	–49%	–55%
Ukraine	1.72	1.74	1.25	1.06	1.71	1.71	1.60	1.53	1.13	0.98	1.58	1.58	1%	–28%	–39%	–1%	–1%	–4%	–29%	–38%	–1%	–1%
United States	0.67	0.55	0.49	0.41	0.30	0.30	0.59	0.49	0.42	0.35	0.26	0.26	–19%	–27%	–40%	–55%	–55%	–15%	–28%	–41%	–55%	–55%
Total	**0.64**	**0.49**	**0.44**	**0.38**	**0.33**	**0.31**	**0.60**	**0.44**	**0.39**	**0.33**	**0.30**	**0.29**	**–23%**	**–31%**	**–40%**	**–49%**	**–52%**	**–26%**	**–34%**	**–44%**	**–49%**	**–52%**

Note: Emission intensity was calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2012 and 2020 in relation to targets by the gross domestic product (GDP) in the same years. GDP values are expressed in United States dollars at purchasing power parity values. GDP values for the period 1990–2013 are from the World Bank World Development Indicators. GDP values for the period up to 2020 were estimated using the projections of GDP at market prices, as drivers, for the period 2014–2019. Data on GDP at market prices were taken from the International Monetary Fund's World Economic Outlook. An average growth rate of the projected data for the period 2014–2019 was applied for each country for 2020. Information on emission intensity for Liechtenstein and Monaco is not included in this table because of the lack of data on GDP for these Parties. GDP values are presented in tables 9 and 10 in this document.

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

[a] In accordance with the definition of Australia's target for 2020, the net emission levels relative to total greenhouse gas emissions including LULUCF for 1990, 2000, 2005, 2012 and 2020 in relation to the targets include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

[b] The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including LULUCF do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Table 13

Trends of greenhouse gas emission intensity of developed country Parties in relation to the quantitative economy-wide emission reduction targets for 2020 (calculated using gross domestic product presented in constant 2005 United States dollars at market prices)

	Emission intensity, Gg CO_2 eq/million USD 2005												*Change in emission intensity from 1990 in per cent*									
	Excluding LULUCF						*Including LULUCF*						*Excluding LULUCF*					*Including LULUCF*				
	1990	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*1990*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*	*2000*	*2005*	*2012*	*Low 2020 target*	*High 2020 target*
Australia[a]	0.97	0.83	0.75	0.64	0.44	0.35	1.30	0.94	0.87	0.68	0.50	0.39	–15%	–23%	–34%	–55%	–64%	–28%	–33%	–48%	–62%	–70%
Belarus	5.87	3.76	2.79	1.94	2.49	2.35	4.66	2.29	1.92	1.39	1.98	1.87	–36%	–53%	–67%	–58%	–60%	–51%	–59%	–70%	–58%	–60%
Canada[b]	0.79	0.72	0.65	0.56	0.41	0.41	0.69	0.67	0.70	0.59	0.41	0.41	–8%	–18%	–29%	–48%	–48%	–3%	0%	–15%	–41%	–41%
EU-28[c]	0.56	0.41	0.37	0.31	0.27	0.24	0.53	0.38	0.35	0.29	0.26	0.23	–27%	–33%	–45%	–52%	–58%	–28%	–34%	–46%	–52%	–58%
Iceland	0.34	0.30	0.24	0.26	0.14	0.11	0.46	0.37	0.29	0.30	0.19	0.15	–14%	–31%	–24%	–60%	–67%	–19%	–36%	–34%	–60%	–67%
Japan	0.32	0.31	0.30	0.29	0.26	0.26	0.30	0.29	0.28	0.27	0.24	0.24	–3%	–8%	–11%	–20%	–20%	–4%	–9%	–11%	–21%	–21%
Kazakhstan	7.12	4.93	3.96	3.25	2.31	2.31	6.98	4.28	3.68	2.98	2.27	2.27	–31%	–44%	–54%	–68%	–68%	–39%	–47%	–57%	–68%	–68%
Liechtenstein	0.11	0.07	0.07	NA	NA	NA	0.11	0.07	0.07	NA	NA	NA	–37%	–36%	NA	NA	NA	–37%	–35%	NA	NA	NA
Monaco	0.03	0.03	0.03	NA	NA	NA	0.03	0.03	0.03	NA	NA	NA	–8%	–25%	NA	NA	NA	–8%	–25%	NA	NA	NA
New Zealand	0.86	0.75	0.69	0.61	0.37	0.32	0.33	0.41	0.42	0.40	0.14	0.12	–13%	–20%	–29%	–57%	–63%	23%	27%	20%	–57%	–63%
Norway	0.27	0.20	0.18	0.16	0.09	0.08	0.21	0.11	0.10	0.08	0.07	0.06	–25%	–33%	–40%	–65%	–70%	–48%	–55%	–63%	–65%	–70%
Russian Federation	3.99	3.62	2.80	2.34	2.62	2.31	4.18	2.90	2.13	1.79	2.75	2.43	–9%	–30%	–41%	–34%	–42%	–31%	–49%	–57%	–34%	–42%
Switzerland	0.16	0.14	0.14	0.12	0.08	0.07	0.16	0.14	0.14	0.11	0.08	0.07	–12%	–14%	–28%	–49%	–55%	–9%	–14%	–27%	–49%	–55%
Ukraine	6.86	6.93	4.95	4.20	6.93	6.93	6.35	6.07	4.51	3.92	6.42	6.42	1%	–28%	–39%	1%	1%	–4%	–29%	–38%	1%	1%
United States	0.75	0.61	0.55	0.45	0.34	0.34	0.65	0.55	0.47	0.39	0.29	0.29	–19%	–27%	–40%	–55%	–55%	–16%	–28%	–41%	–55%	–55%
Total	**0.76**	**0.56**	**0.51**	**0.45**	**0.38**	**0.36**	**0.72**	**0.51**	**0.46**	**0.39**	**0.36**	**0.34**	**–27%**	**–33%**	**–42%**	**–50%**	**–53%**	**–29%**	**–36%**	**–45%**	**–50%**	**–53%**

Note: Emission intensity was calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2012 and 2020 in relation to targets by the gross domestic product (GDP) in the same years. GDP values are expressed in United States dollars at 2005 market prices. GDP values for the period 1990–2013 are from the World Bank World Development Indicators. GDP values for the period up to 2020 were estimated using the projections of GDP at market prices for the period 2014–2019. Data on GDP at market prices were taken from the International Monetary Fund's World Economic Outlook. An average growth rate of the projected data for the period 2014–2019 was applied for each country for 2020. Information on emission intensity for Liechtenstein and Monaco after 2005 is not included in this table because of the lack of data on GDP for these Parties. GDP values are presented in tables 9 and 10 in this document.

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

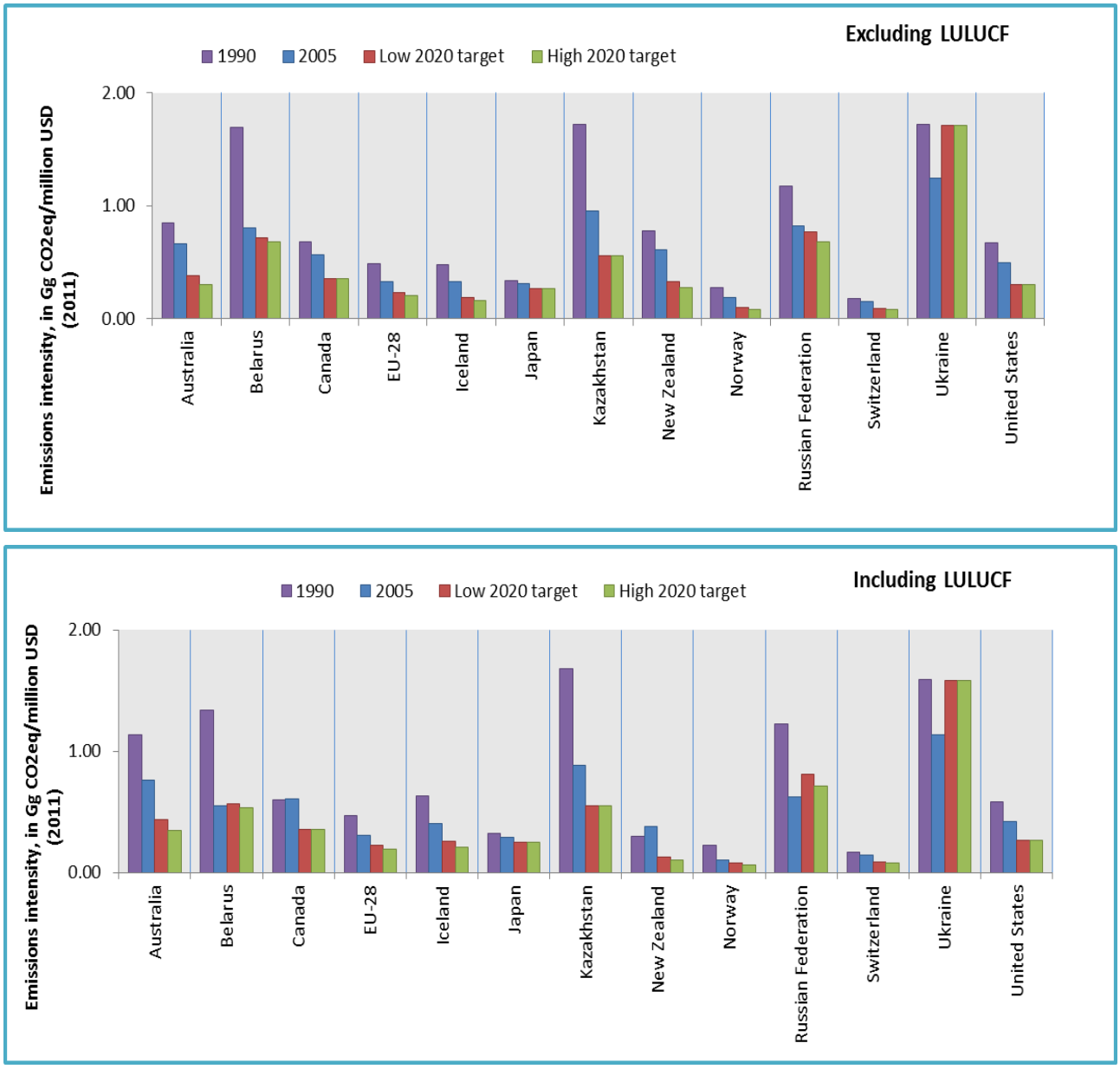
[a] In accordance with the definition of Australia's target for 2020, the net emission levels relative to total greenhouse gas emissions including LULUCF for 1990, 2000, 2005, 2012 and 2020 in relation to the targets include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation activities.

[b] The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including LULUCF do not include LULUCF.

[c] The European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland.

Figure 8

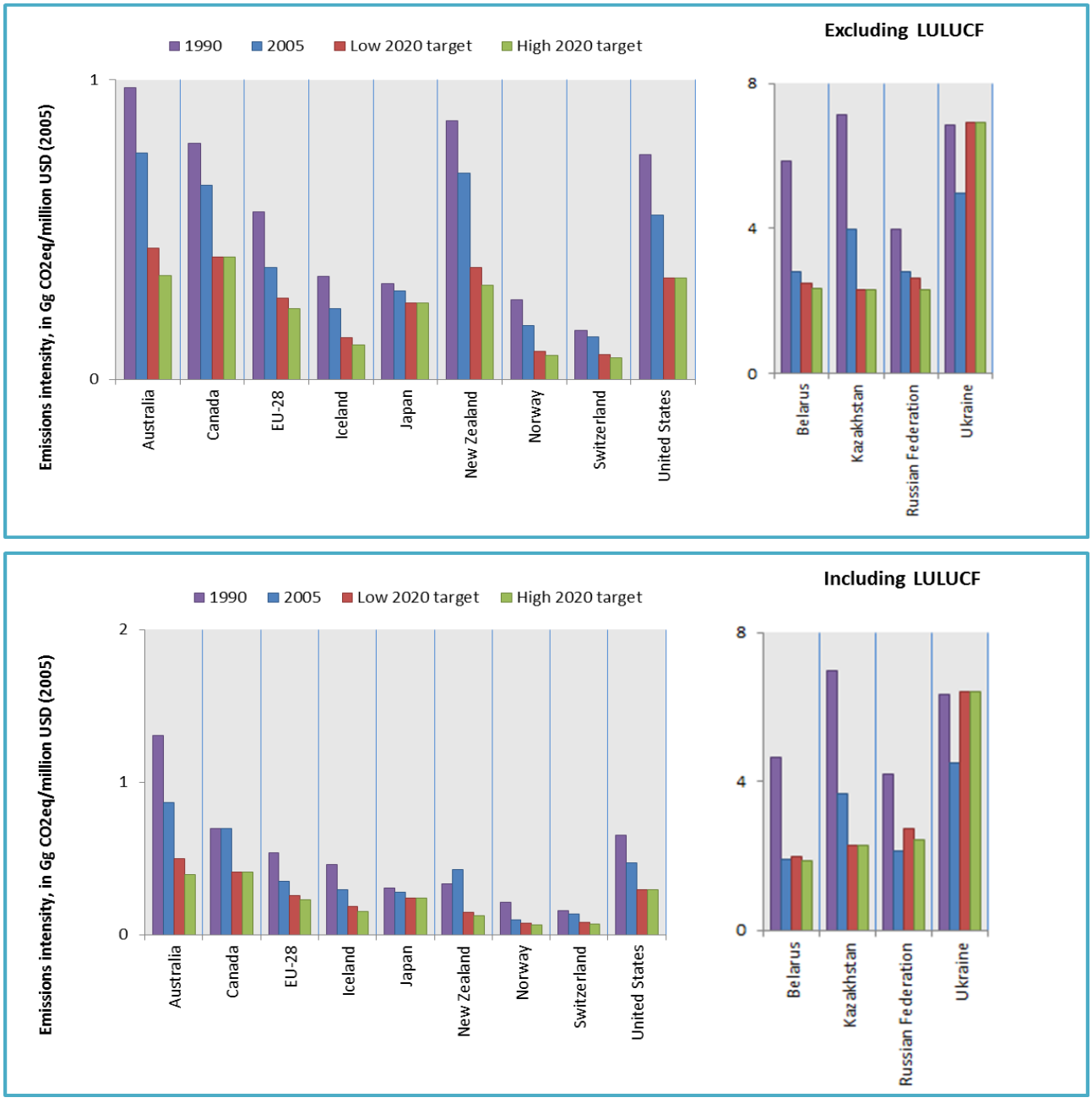
Emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2011 United States dollars in purchasing power parity), excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed country Parties



Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Figure 9

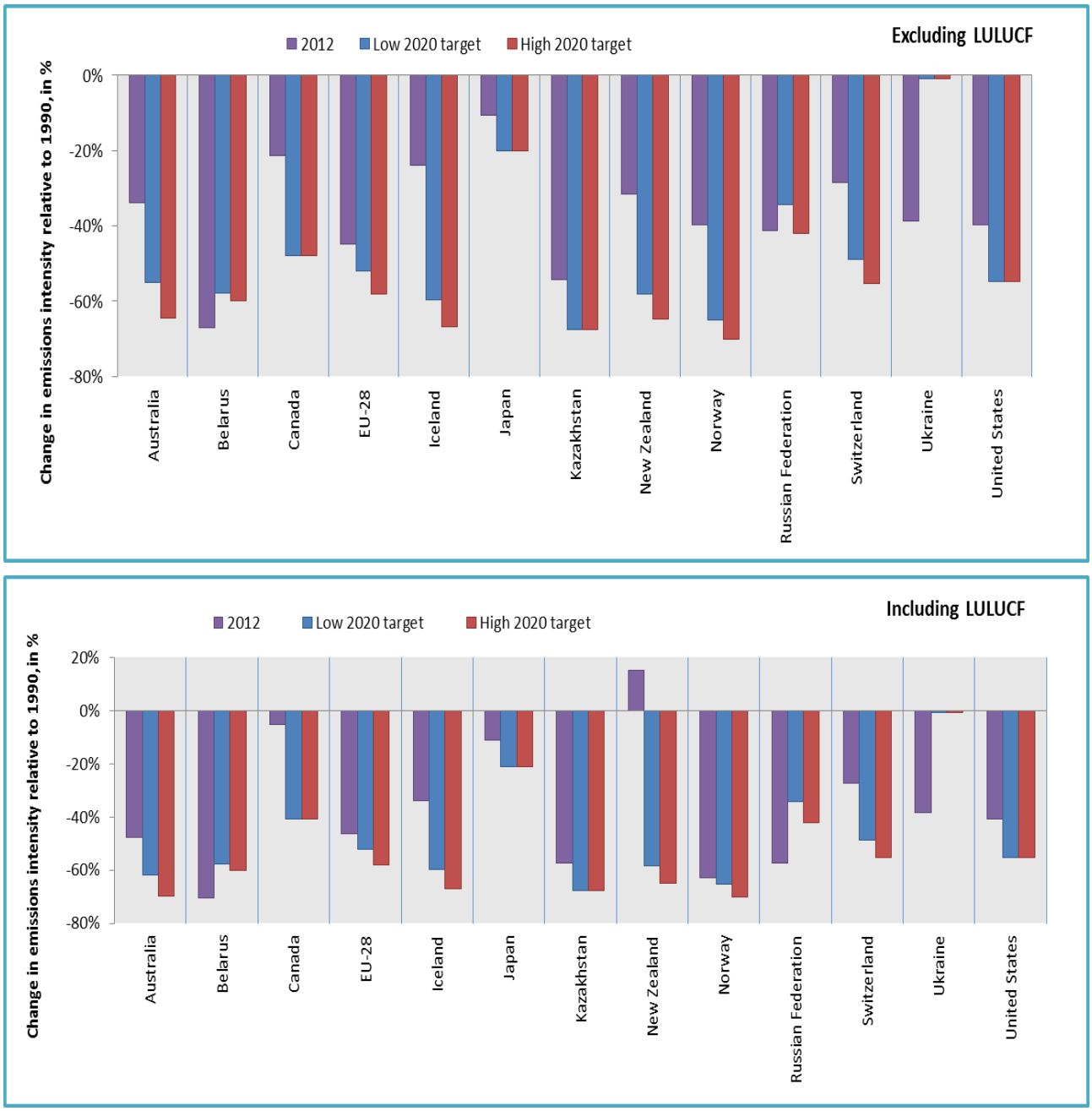
Emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2005 United States dollars at market prices), excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed country Parties



Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Figure 10

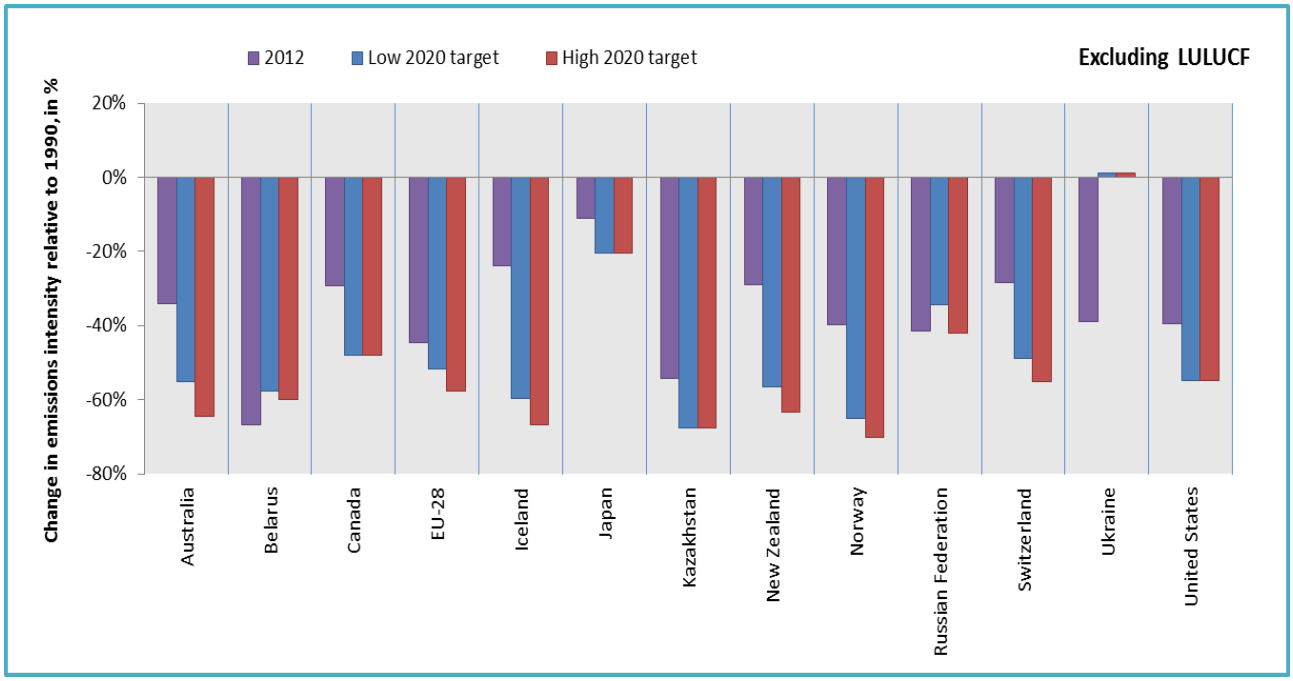
Change in emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2011 United States dollars in purchasing power parity), excluding and including land use, land-use change and forestry, relative to the emission intensity in 1990 for the low and high targets submitted by developed country Parties

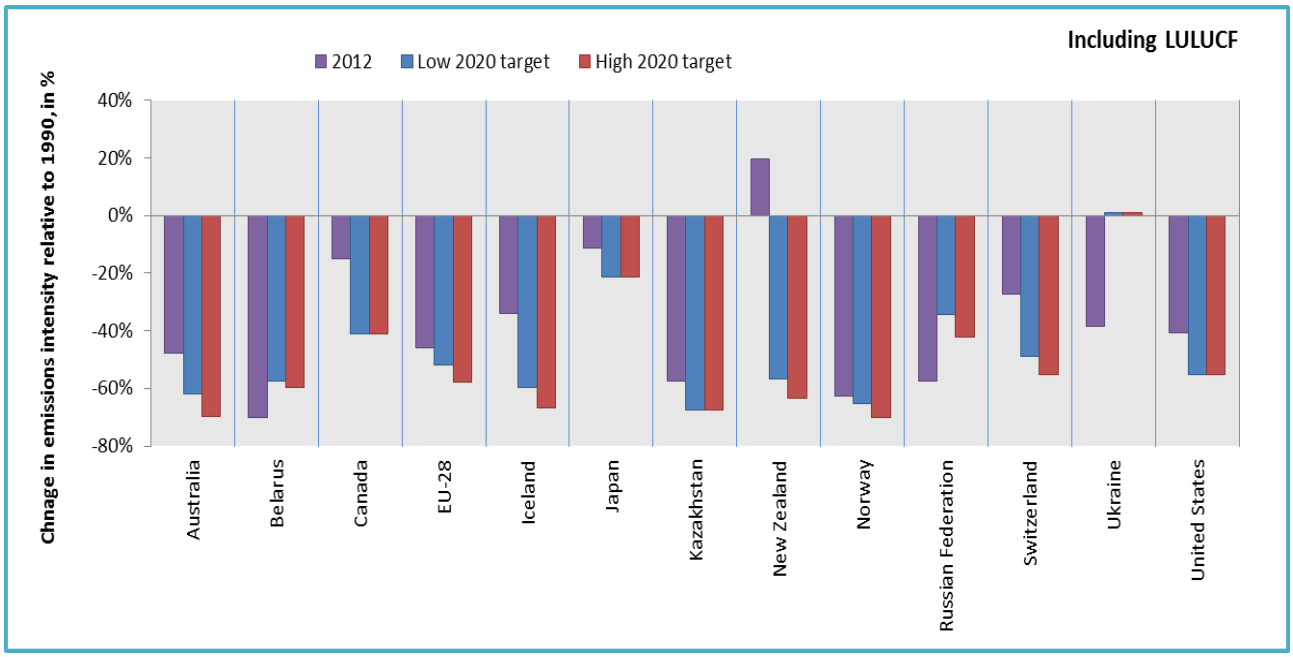


Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.

Figure 11

Change in emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2005 United States dollars at market prices), excluding and including land use, land-use change and forestry, relative to the emission intensity in 1990 for the low and high targets submitted by developed country Parties





Abbreviations: EU-28 = the European Union and its 28 member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom of Great Britain and Northern Ireland; LULUCF = land use, land-use change and forestry.