



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 is based on submissions from Parties and their contributions to the workshops 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 in Bonn, Germany, on 9 June 2011.

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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:

(a) Decided to continue in 2012 the process of clarifying the developed country Parties' quantified economy-wide emission reduction targets contained in document FCCC/SB/2011/INF.1/Rev.1, with the objective of understanding the assumptions and conditions related to the individual targets, in particular in relation to the base year, global warming potential (GWP) values, coverage of gases, coverage of sectors, expected emission reductions, and the role of land use, land-use change and forestry (LULUCF), and carbon credits from market-based mechanisms,² and associated assumptions and conditions related to the ambition of the pledges; and decided that this process should include the submission of relevant information by developed country Parties, using a common template, to the secretariat by 5 March 2012;³

(b) Acknowledged the value of ex ante information, and the need to elaborate rigorous, robust and transparent approaches in a systematic manner to measure progress towards the achievement of economy-wide emission reduction targets, building on existing processes, practices and experiences;⁴

(c) 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.⁵

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

² "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 units of 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.

³ Decision 2/CP.17, paragraph 5.

⁴ Decision 2/CP.17, paragraph 9.

⁵ Decision 2/CP.17, paragraphs 8 and 10.

B. Scope of the paper

3. This paper was prepared in response to the above mandates. It covers both the update of document FCCC/TP/2011/1, using new information provided by Parties and data from the 2011 greenhouse gas (GHG) inventory submissions from Parties, and a new section in response to the mandate in the second half of paragraph 2(c) above, which calls for the exploration of commonalities and differences in the approaches to measure progress towards the achievement of the targets of developed countries.

4. 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 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 2009), based on several metrics.

5. The annex contains background information based on the 2011 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

6. The COP, by decision 2/CP.17, reiterated the provisions of decision 1/CP.16 by which the COP recognized that deep cuts in global GHG emissions are required according to science, as documented in the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), with a view to reducing global GHG emissions so as to hold the increase in global average temperature below 2 °C above pre-industrial levels, and that Parties should take urgent action to meet this long-term goal, consistent with science and on the basis of equity. 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.

7. The COP, by the same decision, reiterated the provisions of decision 1/CP.16, by which the COP urged developed country Parties to increase the ambition of their economy-wide emission reduction targets, with a view to reducing their aggregate anthropogenic emissions of carbon dioxide (CO₂) and other GHGs not controlled by the Montreal Protocol to a level consistent with the ranges documented in the IPCC AR4 and subsequent assessment reports of the IPCC.

8. The COP, by decision 1/CP.16,⁶ established under the Subsidiary Body for Implementation (SBI) a process for international assessment of emissions and removals related to quantified economy-wide emission reduction targets, taking into account national circumstances, in a rigorous, robust and transparent manner, with a view to promoting

⁶ Decision 1/CP.16, paragraph 44.

comparability and building confidence. In response to the work programme launched by this decision, the COP, by decision 2/CP.17, adopted modalities and procedures for international assessment and review (IAR) related to targets. Accordingly, 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, conditions and methodologies related to the attainment of its target; and progress towards the achievement of its target.

9. In particular, the technical review, as part of the IAR, in accordance with decision 2/CP.17, is to build upon relevant elements of the existing review process under the Convention. The existing review process under the Convention does not contain explicit provisions for reviewing the progress towards the achievement of emission reduction targets. However, this process is linked to the reporting under the Convention being defined in the relevant guidelines, namely, 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 reporting guidelines).⁷ These guidelines define some of the items referred to in paragraph 2(a) above, such as GWP values, coverage of gases and coverage of sectors, and could be useful to take into account when reviewing the progress towards the achievement of emission reduction targets.

10. In contrast to the Convention, approaches and modalities for reporting, accounting and review developed under the Kyoto Protocol⁸ 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.

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

(a) The targets contained in document FCCC/SB/2011/INF.1/Rev.1 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 on this matter held on 3 April 2011 in Bangkok, Thailand, and on 9 June 2011 in Bonn, Germany (hereinafter referred to as the workshops);⁹

(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, and a submission from Nauru on behalf of the Alliance of Small Island States (AOSIS) contained in

⁷ The UNFCCC Annex I inventory reporting guidelines have been recently revised by decision 15/CP.17.

⁸ Under the Kyoto Protocol’s first 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 voluntary (Article 3, para. 4) and others mandatory (Article 3, para. 3). 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.

⁹ Workshop reports and presentations can be found at <<http://unfccc.int/bodies/awg-lca/items/5928.php>> and <<http://unfccc.int/bodies/awg-lca/items/5988.php>>.

document FCCC/AWGLCA/2012/MISC.1 and Add.1 (hereinafter referred to as the recent submissions);

(d) The 2011 GHG inventory submissions¹⁰ and the submissions of the fifth national communications 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.1,¹¹ 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.¹²

D. Possible action by the Ad Hoc Working Group on Long-term Cooperative Action under the Convention

12. The Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) may wish to continue its considerations on clarifying the developed country Parties' targets, taking into account the acknowledgement of the value of ex ante information and the need to elaborate rigorous, robust and transparent approaches in a systematic manner to measure the progress towards the achievement of these targets, as referred to in paragraph 2(b) above.

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

13. The COP, by decision 2/CP.17, decided to continue in 2012 the process of clarifying the developed country Parties' quantified economy-wide emission reduction targets contained in document FCCC/SB/2011/INF.1/Rev.1, 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.¹³ The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP), by decision 1/CMP.6,

¹⁰ Document FCCC/TP/2011/1 was based on data from the 2010 GHG inventory submissions from Annex I Parties, while the present document is based on the more recent data from the 2011 GHG inventory submissions.

¹¹ Using information in document FCCC/KP/AWG/2010/INF.2/Rev.1 is relevant for the purposes of the preparation of the present 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 (see para. 13 below).

¹² 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 three Parties, Canada, Japan and the Russian Federation, made it clear that they do not plan to 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 these Parties intend to follow the Kyoto Protocol rules for the second commitment period notwithstanding that Canada announced that it would withdraw from the Kyoto Protocol.

¹³ Decision 2/CP.17, paragraph 5. In accordance with decision 1/CP.16, Parties' communications included in document FCCC/SB/2011/INF.1/Rev.1 are considered communications under the Convention.

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.¹⁴

14. Table 1 provides a compilation of information 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 and LULUCF. Table 1 reproduces the relevant table from document FCCC/TP/2011/1 and includes all information available by 3 June 2011, with two exceptions. For Kazakhstan, information was updated with the latest available information from its recent submission¹⁵ regarding the base year; and for Parties where updated information on carbon credits and LULUCF was available from their recent submissions,¹⁶ this information was presented in table 2 and relevant outdated information was removed from table 1. A discussion of the information contained in table 1 and of the quantitative implications of these assumptions and conditions is provided in chapter III.

15. 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 Parties¹⁷, as well as some information presented during the workshop held in June 2011 after the publication of document FCCC/TP/2011/1. 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.

16. The additional information submitted by Japan on 5 March 2012 is not included in tables 1 and 2, but summarized in paragraph 21 below. Information submitted by Nauru on behalf of AOSIS is also 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.

¹⁴ 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.

¹⁵ FCCC/AWGLCA/2012/MISC.1 and its Addendum 1.

¹⁶ FCCC/AWGLCA/2012/MISC.1 and its Addendum 1.

¹⁷ FCCC/AWGLCA/2012/MISC.1 and its Addendum 1.

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

	<i>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</i>	<i>Assumptions and conditions relating to LULUCF</i>	<i>Assumptions and conditions relating to carbon credits from market-based mechanisms</i>
Australia^a	<p>Target of 5 per cent up to 15 per cent or 25 per cent emission reduction relative to 2000</p> <p>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 CO₂ 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 CO₂ 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</p>	<p>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</p>	<p>The 15 per cent target is conditional on access to deeper and broader functional carbon markets</p> <p>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</p>
Belarus	<p>Target of 5–10 per cent emission reduction relative to 1990</p> <p>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</p>	<p><i>The position of Belarus on the use of LULUCF is subject to the agreement on the new LULUCF rules and modalities, but if LULUCF is included, the target could increase by a further 5 per cent</i></p>	<p><i>Participation of Belarus in the mechanisms is conditional on access to other Kyoto Protocol mechanisms</i></p>
Canada	<p>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</p>	<p><i>Preliminary estimates presented by Canada suggest that LULUCF emissions and removals would be in the range of –2 per cent to +2 per cent of</i></p>	<p><i>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</i></p>

	<i>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</i>	<i>Assumptions and conditions relating to LULUCF</i>	<i>Assumptions and conditions relating to carbon credits from market-based mechanisms</i>
	information on their emission targets	<i>total 2006 emissions, depending on the rules, and assuming that natural disturbances are not accounted</i>	<i>estimates, use of mechanisms could account for less than 5 per cent of total reductions by 2020</i>
Croatia^b	Target of 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. The target communicated by Croatia is temporary and, upon the accession of Croatia to the EU, the target will be replaced by an arrangement in line with and as part of the EU mitigation effort	<i>To be determined</i>	<i>To be determined</i>
European Union and its 27 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, complementarity 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 15 per cent/30 per cent emission reduction relative to 1990 The 15 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	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	<i>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</i>

	<i>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</i>	<i>Assumptions and conditions relating to LULUCF</i>	<i>Assumptions and conditions relating to carbon credits from market-based mechanisms</i>
	other Parties (in accordance with Article 4 of the Kyoto Protocol, or a similar arrangement)	Iceland's target	
Japan	Japan's target of 25 per cent emission reduction relative to 1990 is conditional on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets	<i>The contribution of forest management for Japan may vary from -2.9 per cent to +1.5 per cent relative to the 1990 level, depending on the accounting rules for LULUCF currently under negotiation by the AWG-KP</i>	<i>To be determined</i>
Kazakhstan^c	Kazakhstan communicated a target of a 15 per cent emission reduction by 2020 compared with 1990 levels ^d		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	<i>Liechtenstein intends to refrain from using LULUCF in meeting its target</i>	<i>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</i>
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	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;	New Zealand's target is conditional on an effective set of rules for LULUCF	New Zealand's target is conditional on the full recourse to a broad and efficient international carbon market

	<i>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</i>	<i>Assumptions and conditions relating to LULUCF</i>	<i>Assumptions and conditions relating to carbon credits from market-based mechanisms</i>
	(e) There is full recourse to a broad and efficient international carbon market		
Norway	<p>Target of 30–40 per cent emission reduction relative to 1990</p> <p>The 30 per cent target is unconditional, based on a political 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</p> <p>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</p>	<p>Norway provided preliminary estimates for the LULUCF contribution of around 6 per cent of 1990 emissions (3 Mt CO₂ 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</p>	<p>An important feature of Norwegian climate change policy is the flexible and 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 CO₂ eq by 2020</p>
Russian Federation	<p>Target of 15–25 per cent emission reduction relative to 1990</p> <p>The range of the target of the Russian Federation depends on the following conditions:</p> <p>(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;</p> <p>(b) The undertaking by all major emitters of legally binding obligations to reduce anthropogenic GHG emissions</p>	<p>Appropriate accounting of the potential of the forestry sector of the Russian Federation</p>	<p>To be determined</p>
Switzerland	<p>Target of 20 per cent/30 per cent emission reduction relative to 1990</p> <p>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</p>		

	<i>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</i>	<i>Assumptions and conditions relating to LULUCF</i>	<i>Assumptions and conditions relating to carbon credits from market-based mechanisms</i>
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 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	To be determined	The conditions associated with the target state that the existing flexibility mechanisms under the Kyoto Protocol are to be kept
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 the present 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 three Parties, Canada, Japan and the Russian Federation, made it clear that they do not plan to 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 these Parties intend to follow the Kyoto Protocol rules for the second commitment period notwithstanding that Canada announced that it will withdraw from the Kyoto Protocol. 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, EU = European Union, GHG = greenhouse gas, JI = joint implementation, LULUCF = land use, land-use change and forestry.

^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 Croatia’s emission level for the base year was calculated in accordance with decision 7/CP.12.

^c 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.

^d 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

	<i>Base year</i>	<i>Global warming potential values</i>	<i>Coverage of gases</i>	<i>Coverage of sectors</i>	<i>Expected emission reductions</i>	<i>Role of land use, land-use change and forestry</i>	<i>Carbon credits from market-based mechanisms</i>
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 ₂ O, HFCs, PFCs, SF ₆ , NF ₃	Energy, IPPU, agriculture, LULUCF, waste	NA	The Australian Government is in the process of giving consideration to the Durban land sector decisions and their implications, both domestically and for Australia's accounting of its emission reduction commitments	Australia assumes that units from all available 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 CDM credits may be used to meet obligations under the Carbon Pricing Mechanism, and this abatement would be counted towards Australia's targets
Belarus	1990	NA	NA	NA	NA	<i>Included</i> Clarity on the use of new rules and modalities for LULUCF needed	NA
Canada	2005	NA	NA	NA	NA	<i>Included</i>	<i>No significant use assumed</i>
Croatia	1990	NA	NA	NA	NA	NA	NA
European Union and its 27 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 reflecting recent scientific developments (IPCC AR4) and is reviewing the implications of	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	Energy, IPPU, agriculture, waste, aviation emissions	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 period	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 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

	<i>Base year</i>	<i>Global warming potential values</i>	<i>Coverage of gases</i>	<i>Coverage of sectors</i>	<i>Expected emission reductions</i>	<i>Role of land use, land-use change and forestry</i>	<i>Carbon credits from market-based mechanisms</i>
		this decision					allowances into subsequent periods
Iceland	1990	NA	NA	NA	NA	<i>Included</i> Condition for target: clear and uniform and environmentally robust accounting rules	<i>No significant use assumed</i>
Japan	1990	NA	NA	NA	NA	NA	NA
Kazakhstan	1990	100-year GWPs from the IPCC SAR	CO ₂ , CH ₄ , N ₂ O	Energy, IPPU, agriculture, LULUCF, waste	NA	Included	NA
Liechtenstein	1990	NA	NA	NA	NA	<i>Not included</i>	<i>Use is planned for compliance under the Kyoto Protocol</i>
Monaco	1990 ^c	IPCC Guidelines	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	All IPCC sectors	NA	Not applicable as there is no forest in Monaco	CERs from CDM; Monaco does not intend to use the carry-over of AAUs or to purchase foreign AAUs
New Zealand	1990	As contained in decision 15/CP.17 ^b	CO ₂ , CH ₄ , N ₂ O, 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
Norway	1990	As contained in decision 15/CP.17 ^b	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	Energy, IPPU, agriculture, LULUCF, waste	NA	Comprehensive land-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

	<i>Base year</i>	<i>Global warming potential values</i>	<i>Coverage of gases</i>	<i>Coverage of sectors</i>	<i>Expected emission reductions</i>	<i>Role of land use, land-use change and forestry</i>	<i>Carbon credits from market-based mechanisms</i>
							carbon credits
Russian Federation	1990	NA	NA	NA	NA	<i>Appropriate accounting of the potential of the forestry sector of the Russian Federation</i>	NA
Switzerland	1990	As contained in decision 15/CP.17 ^b	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	Energy, IPPU, agriculture, LULUCF, waste	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. ^d 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	NA	NA	NA	NA	NA	<i>One condition for the target is that the provisions of Article 3, 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</i>
United States of America	2005	100-year GWPs from the IPCC AR4	CO ₂ , CH ₄ , N ₂ O, 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	<i>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</i>

<i>Base year</i>	<i>Global warming potential values</i>	<i>Coverage of gases</i>	<i>Coverage of sectors</i>	<i>Expected emission reductions</i>	<i>Role of land use, land-use change and forestry</i>	<i>Carbon credits from market-based mechanisms</i>
					natural disturbances are under consideration	<i>and transparency</i>

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, EU = European Union, ERUs = emission reduction units, ETS = emissions trading scheme, GHG = greenhouse gas, GWPs = global warming potential values, 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, REDD = reducing emissions from deforestation and forest degradation in developing countries.

^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 CO₂, CH₄ and N₂O and 1995 for HFCs, PFCs and SF₆.

^d Switzerland, in its submission, lists the following cases: “fossil fuel power plants, companies included in the ETS, companies exempted from the CO₂ 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

17. 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 targets¹⁸ 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).

18. Only two Parties (Kazakhstan¹⁹ 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. Five Parties (Canada, Croatia, 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.

19. As outlined below, most Parties are clear about the conditions attached to their targets and under which conditions they could move to the higher range of the target. However, until now, no Party communicated on whether the assumptions and conditions related to the ambition of the target have been, partly or fully, met. This relates to the extent to which the conditions have been met or some of the assumptions clarified, for example, on certain rules, or to the progress made in resolving any conditionality attached to the single value targets.

Overview of Parties' general conditions

20. **Australia** specifically linked its higher target with a global deal capable of stabilizing GHG concentrations in the atmosphere at 450 ppm CO₂ 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

¹⁸ Targets associated with larger emission reductions by 2020.

¹⁹ Kazakhstan did not provide information on conditions and assumptions.

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 **Japan and New Zealand** linked their range of targets to similar conditions. In their recent submissions, Australia, the EU, New Zealand and Norway again emphasized the link between their targets and the 2 °C goal.

21. In addition, in its recent submission, **Japan** noted that it is now developing the Strategy for Energy and Environment which includes new energy policies from scratch and policies to tackle global warming after 2012 under the Energy and Environment Council. This council was established after the major earthquake that occurred in eastern Japan in 2011. Japan plans to establish a Strategy for Energy and Environment in mid-2012 and plans to submit relevant information of its quantified economy-wide emission reduction target when it concludes its consideration.

22. 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. **Croatia and Iceland** linked their targets with the joint efforts of the EU countries. **Ukraine**²⁰ 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

23. 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.

24. 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 CO₂ 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.

25. Overall, there is a 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

²⁰ 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.

use of such credits or on their sources and scale of contribution to attaining the targets. Among the Parties that recently submitted relatively detailed information on the use of carbon credits, 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 recent submissions.

26. Developed country Parties provided in their recent submissions 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. Currently, these 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 the target.²¹ In defining its target, New Zealand included emissions and removals from afforestation, reforestation and deforestation and Switzerland uses the rules of the Kyoto Protocol for its target under the Convention. The United States noted that comprehensive emissions and removals from the LULUCF sector will be accounted for in its target and Norway noted that the comprehensive land-based approach under the Convention should be the basis for developing an accounting framework under the Convention.

27. 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, 51–54, 46 and 58 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

28. 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.

29. 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

²¹ 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 Protocol. However, it remains unclear to what extent Parties with commitments under Annex B to the Kyoto Protocol will apply the rules for LULUCF accounting under the Protocol to accounting under the Convention. It is also unclear whether the three Parties, Canada, Japan and the Russian Federation, that made it clear that they do not plan to assume commitments under Annex B for the second commitment period would apply the rules for LULUCF accounting under the Kyoto Protocol to accounting under the Convention.

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.

30. In its recent submission, **Australia** selected neither a comprehensive land-based nor an activity-based approach for including emissions and removals from LULUCF under its target, but noted that the Australian Government is in the process of giving consideration to the Durban land sector decisions and their implications, both domestically and for Australia's accounting of its emission reduction commitments. In addition, the Party noted that the new rules contained in decision 2/CMP.7 on LULUCF provide a good basis for the measurement of land sector emissions and the future contribution of the land sector to overall emission reductions. Australia intends to apply the decision on managing the risks of highly variable emissions from natural disturbances. Australia welcomes the flexibility provided to Parties to elect to account for additional land management activities, which enables Parties to adopt domestically appropriate policies and programmes to create incentives for land sector abatement. Australia's 2020 target range assumes land sector accounting rules that support broad land sector coverage, without restriction on the use of abatement from land management activities.

31. 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 this credits would be counted towards Australia's targets.

32. **Canada** preliminarily estimates that LULUCF can contribute around -2 per cent to 2 per cent of total emissions in 2006 to attaining its target. According to preliminary estimates, market-based mechanisms are expected to contribute less than 5 per cent of the total emission reductions needed to attain its target.

33. The **EU** does not envisage a contribution from LULUCF for its lower target of 20 per cent. However, 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. To prepare a robust basis for addressing emissions/removals from LULUCF in the future and building on decisions from the seventeenth session of the COP, the EU is planning to consider soon a proposal to account for these emissions/removals in the EU, and for member States. It also plans to prepare LULUCF Action Plans that will provide information on actions undertaken to reduce emissions, increase removals and protect carbon stocks in the sector.

34. 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 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.

35. 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 34 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.

36. On LULUCF, **Japan** acknowledges that the contribution of forest management, which accounts for the bulk of the possible LULUCF contribution to its target in 2020, might be within the range from –2.9 per cent to 1.5 per cent (with negative values being removals) of their total GHG emissions in the base year under the Kyoto Protocol.²²

37. **Monaco** reports that LULUCF does not play a role in achieving the target as there is no forest or agricultural activity in the country. 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.

38. 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.

39. **Norway** believes that a comprehensive land-based approach should be the basis for developing an accounting framework under the Convention, although as a Party to the Kyoto Protocol, it will follow the established rules for accounting for LULUCF, with an activity-based approach. 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 CO₂ 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 CO₂ eq, with the remaining part coming from CDM, JI, international emissions trading and any other market-based mechanism that may be established under the UNFCCC. If Norway should move to its higher target of 40 per cent reduction, this would entail considerable use of carbon credits.

40. 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 CO₂ eq per year according to current rules.²³ 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.

²² Further details available at
<http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/japan_lulucfwskp13.pdf>.

²³ Further details available at
<http://unfccc.int/files/essential_background/library/application/pdf/awg_russianfederation.pdf>.

41. **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 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. 85 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 CO₂ 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.²⁴ 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 up for 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.

42. The **United States** stated in their 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 CO₂ 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.²⁵ 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.

43. A number of Parties, for example, **Belarus, Croatia, Iceland, Kazakhstan, Liechtenstein** and **Ukraine**, have not yet provided specific information on the use of carbon credits and LULUCF, although Belarus considers access to the mechanisms of the Kyoto Protocol essential for achieving its target.

44. 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).

45. 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, 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.

46. This overview of the implications of the assumptions and conditions of individual Parties and, in particular, the discussions during the workshops, underline the need to enhance further the transparency of these assumptions and conditions, and the understanding of the approaches that have been used or will be used by Parties in

²⁴ In its submission, Switzerland lists the following cases: “fossil fuel power plants, the ETS, companies exempted from the CO₂ levy that are not involved in the ETS, and the sanction mechanism”.

²⁵ Further details available at <<http://unfccc.int/bodies/awg-lca/items/5928.php>>.

accounting for the use of carbon credits and LULUCF. This is of particular relevance in 2012 given that the rules for accounting for LULUCF for the second commitment period of the Kyoto Protocol were agreed at CMP 7²⁶ and also that the revised guidelines for reporting GHG inventory information were adopted at COP 17,²⁷ as referred to in paragraph 9 above. This is linked to a broader question in relation to the targets of developed countries on the coverage of sectors and gases, common metrics to calculate the CO₂ equivalence of GHGs and the methodologies to estimate emissions and removals, as discussed in chapter III.C and chapter IV.

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

47. In consequence of the recent submissions in 2012, for several Parties comprehensive information is available 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. Even for Parties that did not submit further information, information in relation to the base year is available from their communication of information on their targets:²⁸ **Belarus, Croatia, Iceland, Japan, Liechtenstein, the Russian Federation and Ukraine** defined 1990 and **Canada** defined 2005 as the base year for estimating their emission reduction targets (see table 2). However, a credible IAR (see para. 8 above) will be possible only if all the information in relation to the targets is available for each Party.

48. **Australia** formulates its target with 2000 as its base year for all GHGs covered, namely, CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃). The Party's target is economy-wide covering all 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.²⁹ 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. 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; 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.

49. 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 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

²⁶ Decision 2/CMP.7.

²⁷ Decision 15/CP.17.

²⁸ See document FCCC/SB/2011/INF.1/Rev.1.

²⁹ FCCC/SBSTA/2006/9.

information contained in the IPCC AR4,³⁰ and indicated that the implications of this decision for EU legislation are currently under review. On coverage of gases, the EU communicated that the gases regulated by the Climate and Energy Package are CO₂, CH₄, N₂O, HFCs, PFCs and SF₆, which is consistent with the GHGs that are currently covered under the reporting requirements under the Convention. 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.

50. On the expected emission reductions expressed in Mt CO₂ 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 CO₂ eq; and emissions in 2020 in accordance with the 20 per cent reduction target were estimated to equal 4,523 Mt CO₂ eq. This emission reduction would result in 8.8 t CO₂ eq emissions per capita compared with more than 12 t CO₂ eq in 1990 and an emission intensity of 0.3 kg CO₂ eq per gross domestic product (GDP) (2005 Euro prices) in 2020, corresponding to less than half the 1990 levels of 0.7 kg CO₂ eq per GDP, which would be equivalent to an efficiency improvement of almost 60 per cent.

51. 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 directive³¹ and the effort sharing decision³² 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.³³ 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.

52. **Kazakhstan**, in its latest submission in 2012, refers to 1990 as the base year for its target. The Party will use the GWP values contained in the IPCC SAR and its target covers CO₂, CH₄ and N₂O emissions and all IPCC sectors. Concerning the expected emission reduction, Kazakhstan provided emission estimates for the base year excluding LULUCF (376.5 Mt CO₂ 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.

³⁰ 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.

³¹ 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.

³² 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.

³³ 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.

53. **Monaco** plans to apply the flexibilities under the Kyoto Protocol to reporting under the Convention, by using 1990 as a base year for CO₂, CH₄, N₂O and 1995 for HFCs, PFCs, and SF₆, the gases covered under its target. Concerning GWP values and inventory methodology, Monaco referred generally to the IPCC guidelines without specifying the set of guidelines or the 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.

54. **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 AR4.³⁴ On coverage of gases and sectors, New Zealand communicated that its targets cover CO₂, CH₄, N₂O, HFCs, PFCs, SF₆ and NF₃ emissions³⁵ and all IPCC sectors. The Party indicated the use of 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 New Zealand Government's principal policy response to climate change is its ETS,³⁶ which puts a price 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.

55. **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 guidelines³⁷ for its GHG emissions inventory until 2015, when it will start to use the 2006 IPCC Guidelines. The target covers CO₂, CH₄, N₂O, HFCs, PFCs, SF₆ and NF₃ 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 CO₂ 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 NF₃ 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 emissions intensity of 44 per cent between 1990 and 2020.

56. 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 (CO₂ 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.

57. **Switzerland** defines 1990 as the base year for CO₂, CH₄, N₂O, HFCs, PFCs, SF₆ and NF₃ 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

³⁴ Several Parties referred to decision 15/CP.17 in this context.

³⁵ Decision 1/CMP.7 includes NF₃ in the 'basket' of GHGs listed under proposed amendments to Annex A to the Kyoto Protocol for its second commitment period.

³⁶ <<http://www.climatechange.govt.nz/emissions-trading-scheme/>>.

³⁷ The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

not include international bunker fuels.³⁸ The expected emission reduction is estimated at 10.5 Mt CO₂ eq for its –20 per cent target and 15.8 Mt CO₂ eq for a –30 per cent target, taking into account base year emissions of 52.7 Mt CO₂ 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.

58. Switzerland's legislation for the 2013–2020 period, which was approved by the Parliament in December 2011 and is subject to an optional referendum, sets several instruments, including: a CO₂ 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 CO₂ 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.

59. **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 CO₂, CH₄, N₂O, HFCs, PFCs, SF₆ and NF₃ emissions and all IPCC sources and sectors. The expected emission reduction reported is in the range of 17 per cent below 2005 levels.

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

60. 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

61. Table 3 provides a summary of the information submitted by Parties in relation to the base year, global warming potential (GWP) values, coverage of gases, coverage of sectors, expected emission reductions, and the role of land use, land-use change and forestry (LULUCF), and carbon credits from market-based mechanisms³⁹ that is discussed in paragraphs 62–94. The information presented there suggests that the approach on all issues that are relevant and important in assessing the progress made towards the targets by developed country Parties, except for the base year, are yet to be clarified by many Parties. Thus, exploring commonalities and differences at this stage as reflected in the summary below is limited to available information from several Parties and the trends identified might change as new and updated information from Parties becomes available.

³⁸ This was mentioned during the workshop in April 2011. Further details are available at <<http://unfccc.int/bodies/awg-lca/items/5928.php>>.

³⁹ FCCC/AWGLCA/2012/MISC.1 and Add.1.

Table 3

Summary of commonalities and differences of approaches to measure progress towards the achievement of economy-wide emission reduction targets of developed countries

	<i>Commonalities</i>	<i>Differences</i>	<i>Unknown</i>
Base year	Information available for all Parties. Most Parties defined 1990 as base year	Different base years for three Parties (2000, 2005)	–
Global warming potential values	Recommendation in decision 15/CP.17 ^a for using values from the IPCC AR4	Three Parties refer to the IPCC SAR, of which two also make reference to the IPCC AR4; four Parties refer to the IPCC AR4	Information from 9 Parties is pending
Coverage of gases	Minimum requirements in decision 15/CP.17: ^b CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ and NF ₃	One Party included CO ₂ , CH ₄ and N ₂ O; seven Parties included CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ , of which five Parties also include NF ₃	Information from 8 Parties is pending
Coverage of sectors	IPCC sectors covered by all Parties: energy, IPPU, agriculture and waste	One Party did not include LULUCF in its low target and included aviation	Information from 8 Parties is pending
Role of land use, land-use change and forestry	–	Two Parties envisaged using the land-based approach and two Parties envisaged using the activity-based approach; some of the remaining Parties referred to clear, uniform and environmentally robust accounting rules	Information from 9 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 of the new mechanism under the Convention (see para. 85 below) that will be available for achieving the targets under the Convention are yet to be developed Approaches for assessing carbon credits from international offset programmes and mechanisms are not always known
Methodologies	Use of methodologies provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (the 2006 IPCC Guidelines) recommended in decision 15/CP.17 ^c	Three Parties refer to the Revised 1996 IPCC Guidelines and the IPCC good practice guidance ^d and two of them envisage using the 2006 IPCC guidelines from 2015 onwards; two Parties refer to the 2006 IPCC Guidelines	Information from 11 Parties is pending

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, part II, paragraph 31: Annex I Parties should report aggregate emissions and removals of greenhouse gases, expressed in CO₂ equivalent, using the global warming potential values as agreed by decision 15/CP.17 or any subsequent decision by the Conference of the Parties on global warming potentials.

^b Annex I, part II, paragraph 28: as a minimum requirement, inventories shall contain information on the following GHGs: CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ and NF₃.

^c Annex I, part II, paragraph 9.

^d Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories

B. Exploring commonalities and differences of approaches

1. Base year

62. 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. 125 below).

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

2. Coverage of gases

64. For the purposes of the Convention, all Parties shall develop national emission 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 does not necessarily imply that the same coverage would apply for the targets.

65. 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.

66. Several Parties (Australia, New Zealand, Norway, Switzerland and the United States) 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 CO₂, CH₄, N₂O, HFCs, PFCs, SF₆ and NF₃ 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, the EU and Monaco communicated that their targets cover CO₂, CH₄, N₂O, HFCs, PFCs and SF₆ emissions. Kazakhstan referred to CO₂, CH₄ and N₂O emissions for its target.

67. 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

68. 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.

69. When referring to GWP values in their recent submissions, Parties referred to the IPCC AR4 (New Zealand, Norway, Switzerland, the United States) or to the IPCC SAR (Kazakhstan). 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 NF₃ and six new species of HFCs.

70. 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.

71. 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.

4. Coverage of sectors

72. While decision 1/CP.16 refers to economy-wide emission reduction targets,⁴⁰ 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.

73. Most Parties that provided information in their recent submissions confirmed that their targets are economy wide, covering all relevant IPCC sectors: energy, industrial processes and product use, agriculture, LULUCF and waste. Only the EU identified a different coverage from that of other Parties, by excluding LULUCF in its 20 per cent target (the 30 per cent target includes LULUCF) but including emissions from international aviation.

5. Expected emission reductions

74. Many Parties provided succinct and 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 CO₂ eq. One reason is the uncertainty in relation to LULUCF and carbon credits (see chapter IV.B.6 and 7). Even when provided, estimates of the expected emission reductions should be considered with

⁴⁰ Decision 1/CP.16, paragraph 36.

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. 57 above). The EU, Kazakhstan and Norway did not provide estimates of emission reductions, but provided information on the absolute emissions in 1990, expressed in Mt CO₂ eq, from which the expected emission reductions in 2020 can be derived.

75. 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.

76. 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 to the issuance and use of credits from the market-based mechanism.

77. From the reporting point of view, the UNFCCC biennial reporting guidelines for developed country Parties⁴¹ 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.

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

78. Owing to its different nature, the LULUCF sector is treated differently from other sectors under 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, the 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.

79. 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.

⁴¹ Adopted by decision 2/CP.17.

80. 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. Thus, Parties have not yet considered whether individual developed country Parties could use their preferred approaches to LULUCF by transparently describing them *ex ante*, bearing in mind that these approaches might not necessarily be comparable across Parties, or whether uniform rules for assessing LULUCF emissions and removals are deemed necessary for assessing the progress towards the targets.

81. In addition, in their recent submissions, Parties specified the role of LULUCF for their targets under the Convention, by either referring to a comprehensive land-based approach (United States, Norway), or to an activity-based approach (New Zealand, Switzerland). Other Parties did not include emissions/removals from LULUCF, for example, the EU did not include LULUCF in its lower target (see para. 33 above) and Monaco did not do so because the sector is considered irrelevant for the country. Australia did not specify its approach for considering the LULUCF sector for its target, but referred to its Government being in the process of giving consideration to the Durban land sector decisions.

82. For some Parties that are also Parties to the Kyoto Protocol, 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,⁴² which might affect the previous decisions and estimates of some Parties on LULUCF.

83. 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. Several Parties that are also Parties to the Kyoto Protocol are yet to communicate information on whether they will follow the activity-based approach under the Convention in the same way as under the Kyoto Protocol. Norway has already announced that it will follow two different approaches on LULUCF accounting under the Kyoto Protocol and under the Convention and Australia has not yet decided on its approach.

7. Carbon credits from market-based mechanisms

84. There is a 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. 111 below).

85. 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 yet to be elaborated and a decision to that end is expected by the end of 2012.⁴³ The option that some nationally appropriate mitigation actions (NAMAs) by developing countries and

⁴² Decision 2/CMP.7.

⁴³ Decision 2/CP.17, paragraphs 83–84.

activities related to reducing emissions from deforestation and forest degradation in developing countries could generate carbon credits remains under consideration by the AWG-LCA. 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.

86. 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 85 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, Monaco and Switzerland do not intend to use the carry-over of AAUs from the first commitment period under the Kyoto Protocol. Canada and Iceland do not assume significant use of market-based mechanisms in attaining their targets.

87. 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. These are similar to the uncertainties in relation to the role of LULUCF for measuring the progress towards the targets. 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 relating to the overall amount of carbon credits that could be used for achieving the targets under the Convention.

8. Methodologies

88. 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 emission 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.

89. 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 reporting methodologies, 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.

90. 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 67 and 71 above, but also methodologies. However, this needs to be confirmed by Parties.

9. Cross-cutting issues

91. Parties have noted during the workshops,⁴⁴ 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.

92. In relation to such approaches, developed countries have not yet considered whether to use a system where different coverage of sectors, gases, common metrics, methodologies and use of LULUCF and carbon credits would be possible under the condition that these are presented in a transparent way ex ante, or to use common accounting approaches and modalities for all or part of the issues. 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 emissions reduction target.

93. However, while the UNFCCC biennial reporting guidelines for developed country Parties⁴⁵ 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 remains to be seen whether developed country Parties that are also Parties to the Kyoto Protocol would use the same approaches, such as those that will be used during the second commitment period of the Kyoto Protocol, to assess the achievements towards their targets under the Convention.

94. 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 and of the IAR. As already mentioned in paragraph 47 above, if the targets are not clarified regarding the main assumptions (as listed in para. 2(a) above), and approaches by developed countries differ substantially, the SBI could face difficulties in assessing and reviewing the progress towards the achievement of developed countries' targets when conducting the IAR. Also, in relation to the need expressed by several Parties for broad and fully functioning global carbon markets, common or consistent approaches could give confidence to these markets on the environmental integrity of the carbon credits, as they would be assessed following consistent or common rules and modalities.

⁴⁴ Workshop reports and presentations can be found at <<http://unfccc.int/bodies/awg-lca/items/5928.php>> and <<http://unfccc.int/bodies/awg-lca/items/5988.php>>. See, for example, the presentation by the EU in June 2011.

⁴⁵ Adopted by decision 2/CP.17.

V. Comparison of the level of mitigation efforts

A. Scope of consideration of comparison of mitigation efforts

95. One of the objectives of this paper, in accordance with decisions 1/CP.16 and 2/CP.17, is to provide information that could facilitate understanding of comparability of the level of emission reduction efforts, referred to in this chapter as comparability of mitigation efforts. Although the topic of comparability of mitigation efforts has been under consideration by the AWG-LCA for some time, the approach, methodology and metrics for assessing comparability have not been agreed under the Convention. An approach for assessing comparability of mitigation efforts was applied in response to the mandate from decision 1/CP.16, 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, was again applied for this update of document FCCC/TP/2011/1. The metrics and quantitative estimates presented in this paper are intended to be illustrative only and should not be considered as proposals on how to determine comparability of mitigation efforts.

96. Comparability of mitigation efforts in this paper is limited to the efforts needed to attain the economy-wide emission reduction targets of Annex I Parties set out in document FCCC/SB/2011/INF.1/Rev.1. It 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. Comparability of mitigation efforts is discussed in this chapter without taking 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).⁴⁶

97. Further, comparability of mitigation efforts in attaining the targets across Parties could be discussed in a more systematic way if there is further clarity on the contribution of domestic action, carbon credits from the market-based mechanisms and the LULUCF sector for each Party, and associated efforts in the context of the overall mitigation efforts by Parties. The recent submissions from Parties made in response to the request contained in decision 2/CP.17 enhanced the clarity on 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 V.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.

98. Cost considerations associated with the emission reduction targets are not included in the analysis of the comparability. This is not to suggest that mitigation cost considerations are not important when considering comparability of mitigation efforts. As Parties were not requested to submit information on mitigation cost, one of the options to obtain such information was to run macroeconomic models or to use data from scientific literature. Yet obtaining data and information on macroeconomic mitigation cost is

⁴⁶ For example, the target of the EU includes emissions from international aviation, while those of the other Parties do not.

challenging, as estimates are generated from a variety of economic models that are run under specific and wide-ranging sets of assumptions. Even when information on cost is available from the literature, cost estimates can vary for any given country within relatively wide ranges.

99. Availability and quality of data and information are highly relevant when considering the analytical aspects of comparability of mitigation efforts and related metrics. A few Parties, namely the EU, Norway and Switzerland, in their submissions on the clarification of economy-wide emission reduction targets, provided information on GDP, population and related emission indicators, and how these indicators are expected to change when countries reach their targets; this information was also taken into consideration in preparation of this paper. However, as information was provided by only a few Parties and for reasons of consistency of comparison across all Parties, in this paper information relevant to indicators is taken from the same source for all Parties as was done in the previous version of the technical paper, document FCCC/TP/2011/1.

100. The most important source of high-quality data and information is the GHG inventory information submitted by Annex I Parties to the secretariat, which allow the assessment of emission levels and their reductions. Similarly, high-quality information on population and GDP is readily available from national and international statistics. For this paper, historical data on GDP and population are taken from the World Bank,⁴⁷ the United Nations Statistics Division and the National Accounts data of the Organisation for Economic Co-operation and Development. The data on GDP were presented in purchasing power parity (PPP)⁴⁸ and in market prices. Data on projected economic growth rates come from the International Monetary Fund's World Economic Outlook.⁴⁹

B. Approach to comparability

Metrics used for comparison of mitigation efforts

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

102. Any comparison of the mitigation efforts among Parties cannot be based on a single metric, because of the differing national circumstances of each developed country Party as recognized by the Convention. Different and diverse national circumstances complicate any consideration of comparability of mitigation efforts, as these circumstances can encompass

⁴⁷ World Bank World Development Indicators <<http://databank.worldbank.org>>.

⁴⁸ 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 2000 market prices and in constant 2005 international United States dollars in PPP. GDP values for the period 1990–2009 were available at market prices from the World Bank World Development Indicators.

⁴⁹ International Monetary Fund's World Economic Outlook <<http://www.imf.org/external/pubs/ft/weo/2011/01/weodata/download.aspx>>. Data on GDP at market prices were taken from the International Monetary Fund's World Economic Outlook. This database includes projections up to 2016, except for Monaco and Liechtenstein. GDP values for each country for the years 2017–2020 were estimated using the projections of GDP at market prices, as drivers, based on the data on an average growth rate for the period 2010–2016. An average growth rate calculated based on the projected GDP data for the period 2010–2016 was applied for each country for the period 2017–2020.

a wide array of factors, such as climate, geography, population, economic profile, governmental structure, natural resource endowment, transport systems, energy production and consumption patterns, and trade profile, in particular 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.

103. Comparison across Parties, given these different and diverse characteristics, is hardly possible and could be done only in a highly simplified manner. As there is no single metric⁵⁰ that could be used to capture the concept of national circumstances in a uniform or similar way across all countries, owing to the diversity of national circumstances, metrics such as GDP, total population and 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 for comparability of mitigation efforts.

104. With a certain degree of confidence the analytical aspects of comparability of mitigation efforts by developed country Parties could be assessed 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.

105. In determining the relevant metrics for assessing mitigation efforts, several criteria are often referred to in the negotiation process under the Convention when considering action to be taken in responding to the problem of climate change, such as capability, responsibility, early action and mitigation potential. Particular metrics could be associated with these criteria, for example, capability could be associated with, but not limited to, GDP per capita and mitigation cost per GDP, while early action could be associated with the emission reduction measures being implemented at a given point in time. Certain metrics could be associated with several criteria and the relationship between the metrics and the comparability criteria is not straightforward.

Approach

106. The comparison of the mitigation efforts in this paper was made for 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 are considered here. In cases where Parties provided only one target, it was considered as both the low and the high target options.

107. The time horizon used in the comparison of mitigation efforts by developed country Parties covers the period 1990–2020 and specific years such as 1990, 2000, 2005, 2009 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 years⁵¹ used by other Parties.⁵² 2009 is the latest year for which GHG emissions data are available.

⁵⁰ 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.

⁵¹ 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

108. In this analysis, some specific provisions and decisions have been applied to reflect the information submitted by Parties and their specific circumstances. For Australia, in accordance with its 2011 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. For Croatia, base year emissions in 1990 were calculated in accordance with the provisions of decision 7/CP.12. Iceland clarified during the workshops (see para. 11 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

109. As mentioned in paragraph 97 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, including during the workshop conducted in June 2011, 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.

110. There is a common understanding among 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.

111. Also, when carbon credits are generated from project-based mechanisms they could be used and counted towards achieving 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, depending on accounting rules that are yet to be developed, that the same emission reductions are double counted as reductions of emissions in developed and developing country Parties.

112. On LULUCF, at the time of the preparation of this paper a number of developed country Parties had made submissions in response to decision 2/CP.17 on how they intend to include LULUCF in their targets and what approaches to follow in accounting for it – a full land-based approach or an activity-based approach.⁵³ Nevertheless, a consistent set of estimates of the possible contribution of LULUCF to attaining the targets across developed country Parties is still lacking. Even when such estimates are available from the previous

with 1990, which is the base year under the Convention, these different years (the years other than 1990) are called “reference years”.

⁵² 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 and the United States.

⁵³ For more detailed information refer to document FCCC/AWGLCA/2012/MISC.1 and Add.1 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.

submissions, they are not necessarily updated. For example, the EU⁵⁴ assessed the contribution from forest management in 2020 to be in the range of 250 to 450 Tg CO₂ eq, but acknowledged that it does not include LULUCF in its 20 per cent target under the Convention. The Alliance of Small Island States⁵⁵ assessed the contribution of LULUCF towards the targets for Annex I Parties taken together to be in the range of 60 to 940 Tg CO₂ eq in 2020, which is similar to estimates by the United Nations Environment Programme.⁵⁶

113. While the lack of sufficient data and clarity regarding rules on carbon credits and LULUCF does not allow for a comparison of mitigation efforts relating to targets taking into account the contribution of carbon credits and LULUCF across Parties, the available data suggest that overall for developed country Parties this 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.⁵⁷

D. Discussion on the comparison of the mitigation efforts

1. Absolute and relative changes in greenhouse gas emission levels over different periods of time and relative to different reference years

Information basis

114. In this section, the discussion focuses on emission reductions estimated with regard to historical emission levels 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, whereby the Parties provided emissions for 1990 and estimated emissions for 2020 in relation to their economy-wide emission targets.⁵⁸

115. 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 the targets and associated 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 emission reductions, excluding and including LULUCF, respectively, by developed country Parties in relation to their targets in 2020 relative to 1990, 2000, 2005 and 2009 for the low and high targets. Table 8 provides information on the relative emission reductions over the periods 1990–2009 and 2009–2020, excluding and including LULUCF, for the low and high targets.

⁵⁴ Presentation available at <http://unfccc.int/kyoto_protocol/items/5685.php>.

⁵⁵ Presentation available at <http://unfccc.int/kyoto_protocol/items/5685.php>.

⁵⁶ 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>.

⁵⁷ Also, the possibility to set a cap on the contribution from LULUCF and international offsets is still under consideration in the context of the negotiations on a second commitment period of the Kyoto Protocol.

⁵⁸ See footnote 53 above.

Aggregate absolute and relative changes in emissions

116. The aggregate emission reductions of developed country Parties over the period 1990–2009 are estimated to be about 12 per cent and 18 per cent, excluding and including LULUCF, respectively (see table 5). The aggregate emission reductions of these Parties over the period 1990–2020 are estimated for the low target to be about 12 per cent and 13 per cent, excluding and including LULUCF, respectively, and for the high target to be about 18 per cent, excluding and including LULUCF. According to this information, the aggregate emissions of developed country Parties, excluding LULUCF, in relation to their targets in 2020 are expected to remain broadly at the 2009 level for the low target and to decrease to below the 2009 level by 6 per cent for the high target.

117. However, it is important to note that in 2009, the aggregate emissions of developed country Parties, excluding LULUCF, reached historically low levels, 12 per cent lower than in 1990, as a result of the economic and financial crises. 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 2009 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. 119–125 below).

118. The low targets could lead to absolute aggregate emission reductions by developed country Parties of around 2,357 Tg CO₂ eq, 955 Tg CO₂ eq, 1,376 Tg CO₂ eq and 62 Tg CO₂ eq in 2020 relative to the level of emissions in 1990, 2000, 2005 and 2009, respectively, excluding LULUCF (see table 6). Similarly, the high targets could lead to absolute aggregate emission reductions of around 3,375 Tg CO₂ eq, 1,974 Tg CO₂ eq, 2,395 Tg CO₂ eq and 1,081 Tg CO₂ eq in 2020 relative to the level of emissions in 1990, 2000, 2005 and 2009, respectively, excluding LULUCF. Taking into consideration LULUCF, according to table 7, the absolute aggregate emission reductions by developed country Parties are expected to be around the same levels relative to 1990 as is the case excluding LULUCF and much lower relative to 2000, 2005 and 2009, mainly owing to the emission trend of the Russian Federation.

Absolute and relative changes in emissions of individual Parties

119. 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 2009, 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 2009 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.

120. 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 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.

121. 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 Japan, 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, Croatia, 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. Ukraine is an exception within this group as its emissions followed broadly a downward trend since the 1990s.

122. Comparison of the mitigation efforts of developed country Parties (see figures 1, 2 and 3) and their early actions suggests that while Belarus, Croatia, 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 in the 1990s, these Parties envisage sizeable emission reductions in 2020 relative to 2000 and 2005. This implies that while their emissions increased in the 1990s, these Parties are projecting 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.

123. 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 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. Japan's emissions remained relatively stable in the 1990s and the 2000s. However, in accordance with its target, Japan envisages achieving major emission reductions between 2005 and 2020.

124. 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 1,221 Tg CO₂ eq, while the EU would need to reduce its emissions by 678 Tg CO₂ eq or 1,237 Tg CO₂ eq (for its low and high targets, respectively) and Japan would need to reduce its emissions by 401 Tg CO₂ eq when comparing the 2005 levels with the 2020 levels. For most developed country Parties, emission reductions between 2009 and 2020 appear smaller than those between 2005 and 2020 because of the lower emission levels in 2009 compared with 2005 resulting from the economic downturn. For example, based on information in table 6, excluding LULUCF, the United States would need to reduce its emissions by 645 Tg CO₂ eq, while the EU would need to reduce its emissions by 144 Tg CO₂ eq or 702 Tg CO₂ eq (for its low and high targets, respectively) and Japan would need to reduce its emissions by 259 Tg CO₂ eq when comparing the 2009 levels with the 2020 levels.

Summary

125. 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 2009–2020 that mitigation efforts appear lower for the low target and comparable for the high target. Efforts by Japan, 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

126. 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, expressed through GDP. 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 make a greater mitigation effort. This may not be necessarily true in the short term. 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

127. As mentioned above (see para. 102 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 different levels and historical and projected trends of GDP, total population and emissions.

128. 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 11 per cent. In the same period, the economic output expressed in terms of GDP is expected to almost double, namely, to grow by 84 per cent. This is expected to result in a major increase of GDP per capita of the developed countries, namely, by 74 per cent for the same period.

129. Because of the expected growth in population, developed country Parties, as a group, are expecting a higher rate of 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, of about 22 per cent and 26 per cent in 2020 relative to the 1990 level for the low and high targets, respectively. The expected emission reductions including LULUCF are very close to these levels. In absolute terms, aggregate emissions per capita are expected to be reduced from 16.7 CO₂ eq in 1990 and 13.6 CO₂ eq in 2009 to 13.1 CO₂ eq in 2020 for the low target and to 12.3 CO₂ eq for the high target, excluding LULUCF.

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

130. The expected overall population growth over the period 1990–2020 referred to in paragraph 128 above is underpinned by the expected population growth in a number of countries, for example, Australia (39 per cent), the United States (36 per cent) and Canada (34 per cent). On the contrary, almost all developed country EIT Parties expect their population to decrease over the same period, for example, Belarus (11 per cent), the Russian Federation (9 per cent) and Ukraine (17 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.

131. 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, the United States, Switzerland and Australia are the top ranking Parties on this indicator in 2009, followed by Canada, Iceland, 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 2009 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.

132. 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 and Monaco 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 23 per cent to 30 per cent during the period 1990–2020. These are somewhat lower than the reductions in per capita emissions of the EU for the high target (35 per cent) and Switzerland (32 and 40 per cent for the low and high targets, respectively), which expect lower population growth and are comparable to those of the EU for the low target (25 per cent) and for Japan (25 per cent), which expects its population to remain stable.

133. Among developed country EIT Parties, emissions per capita in 2020 are expected to remain at the 1990 levels for Belarus, Croatia and Ukraine and to reduce by 18 per cent and 16 per cent for the Russian Federation (for the high target) and Kazakhstan, respectively, as a result of the expected decline in emissions and 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 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

134. The comparison of mitigation efforts based on the per capita metrics suggests that 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

135. 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 reduction per unit of economic output. It can also provide a good indication of the potential for emission reductions, for example, through enhancing economic and energy production efficiency and to some extent 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, which are difficult to separate with the use of this metric.

136. The data used for this comparison are presented in tables 12 and 13 and figures 8–11 for two cases: for GDP values expressed in PPP and in market prices. The difference in GDP values expressed in PPP and in market prices is sizeable for developed country EIT Parties, and very small for the 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

137. The aggregate emission intensity of developed country Parties, measured by emissions, excluding and including LULUCF, relative to GDP, has already been reduced during the period 1990–2005 by around 31 per cent and 34 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 52 and 55 per cent lower by 2020 relative to 1990 levels. This means that developed country Parties are expecting to reduce collectively by half their emission intensity. The results in terms of overall trends in emission intensity of developed country Parties, as a group, do not show a major difference when calculated using GDP in PPP or in market prices.

Changes in emission intensity of individual Parties

138. 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 the most 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

139. 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 2009. 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 2011 submissions of emissions inventories to the UNFCCC secretariat

	<i>GHGs excluding LULUCF (Tg CO₂ eq)</i>					<i>GHGs including LULUCF (Tg CO₂ eq)</i>				
	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Emission change (per cent) 1990–2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Emission change (per cent) 1990–2009</i>
Australia	418.5	496.3	527.9	545.9	30.4%	461.6	482.7	572.7	599.8	29.9%
Austria	78.2	80.5	92.9	80.1	2.4%	64.4	63.0	75.2	62.5	–3.0%
Belarus	139.2	79.2	84.2	87.9	–36.9%	110.6	48.3	58.0	57.8	–47.7%
Belgium	143.4	145.5	142.8	124.5	–13.2%	141.9	144.3	141.2	123.0	–13.3%
Bulgaria	111.4	63.4	67.1	59.5	–46.6%	97.6	53.1	55.8	47.7	–51.1%
Canada	591.3	717.6	733.5	691.8	17.0%	523.8	655.5	787.0	679.7	29.8%
Croatia	31.4	26.0	30.3	28.9	–8.2%	24.5	18.8	22.2	20.2	–17.8%
Czech Republic	196.4	148.1	145.4	133.6	–32.0%	192.8	140.6	138.7	126.7	–34.3%
Denmark	69.4	69.3	65.1	62.3	–10.2%	72.5	72.2	68.7	61.2	–15.6%
Estonia	41.2	17.7	19.0	16.7	–59.6%	30.8	21.7	10.4	9.6	–68.8%
EU-27 ^a	5 588.8	5 085.8	5 148.8	4 614.5	–17.4%	5 244.2	4 716.1	4 768.2	4 182.4	–20.2%
Finland	70.4	69.2	68.5	66.3	–5.7%	55.3	48.2	40.8	25.8	–53.4%
France	566.0	570.9	573.8	522.4	–7.7%	526.3	521.9	508.9	458.5	–12.9%
Germany	1 247.9	1 042.1	999.8	919.7	–26.3%	1 216.7	1 009.7	1 015.5	937.3	–23.0%
Greece	104.6	126.2	134.6	122.7	17.4%	102.1	123.3	131.5	119.7	17.3%
Hungary	96.9	76.8	79.5	66.8	–31.1%	95.0	76.5	75.3	63.8	–32.9%
Iceland	3.4	3.8	3.8	4.6	35.1%	4.5	4.7	4.6	5.3	17.2%
Ireland	54.8	67.9	69.2	62.4	13.8%	54.3	67.1	67.9	60.2	11.0%
Italy	519.2	551.6	574.9	491.1	–5.4%	457.4	472.7	484.4	396.4	–13.3%
Japan	1 266.6	1 341.8	1 351.3	1 209.2	–4.5%	1 197.0	1 254.5	1 261.1	1 137.7	–5.0%
Kazakhstan ^b	376.5	193.2	256.3	289.8	–23.0%	369.6	181.7	245.1	278.4	–24.7%
Latvia	26.6	10.3	11.4	10.7	–59.7%	11.4	–4.0	–5.7	–9.7	–185.3%
Liechtenstein	0.2	0.3	0.3	0.2	7.8%	0.2	0.3	0.3	0.2	9.0%

	<i>GHGs excluding LULUCF (Tg CO₂ eq)</i>					<i>GHGs including LULUCF (Tg CO₂ eq)</i>				
	1990	2000	2005	2009	<i>Emission change (per cent)</i>	1990	2000	2005	2009	<i>Emission change (per cent)</i>
					1990–2009					1990–2009
Lithuania	49.7	19.5	23.2	20.4	–58.9%	45.3	15.4	19.9	16.7	–63.2%
Luxembourg	12.8	9.8	13.2	11.7	–8.9%	13.2	9.4	12.8	11.4	–13.6%
Malta ^c	2.1	2.6	2.9	2.9	38.8%	2.0	2.6	2.9	2.8	39.7%
Monaco	0.1	0.1	0.1	0.1	–15.7%	0.1	0.1	0.1	0.1	–15.8%
Netherlands	212.0	213.3	211.0	199.1	–6.1%	214.7	215.9	213.7	201.5	–6.1%
New Zealand	59.1	68.4	75.0	70.6	19.4%	35.7	41.7	49.5	43.9	23.1%
Norway	49.8	53.4	53.9	51.3	3.1%	41.2	34.9	24.3	26.0	–37.0%
Poland	453.5	390.3	389.6	383.2	–15.5%	433.3	377.6	363.4	346.0	–20.1%
Portugal	59.4	81.3	86.1	74.7	25.6%	50.1	67.7	79.8	60.6	20.9%
Romania	256.5	144.6	155.8	129.9	–49.4%	229.2	115.4	127.8	102.0	–55.5%
Russian Federation	3 369.3	2 054.6	2 135.5	2 127.4	–36.9%	3 449.6	1 593.3	1 598.0	1 477.8	–57.2%
Slovakia	74.1	49.3	50.1	43.4	–41.5%	71.2	46.2	48.7	39.9	–43.9%
Slovenia	18.5	18.8	20.3	19.4	5.2%	11.2	11.6	11.8	11.0	–2.0%
Spain	283.2	380.3	434.8	369.5	30.5%	264.1	357.1	410.2	340.9	29.1%
Sweden	72.5	69.0	67.7	60.1	–17.2%	27.8	28.0	31.4	18.4	–33.7%
Switzerland	53.1	52.0	54.2	52.0	–2.2%	50.4	53.4	53.8	52.0	3.3%
Turkey	187.0	297.0	329.9	369.6	97.6%	142.2	229.4	260.4	287.1	102.0%
Ukraine	933.3	400.4	430.8	374.1	–59.9%	863.4	351.6	394.6	354.9	–58.9%
United Kingdom	779.4	673.5	654.6	570.1	–26.9%	783.3	673.9	651.7	566.0	–27.7%
United States	6 166.8	7 076.3	7 185.0	6 608.2	7.2%	5 320.3	6 536.1	6 157.1	5 618.2	5.6%
Total	24 834.5	23 037.9	23 553.8	21 749.2	–12.4%	23 102.8	20 934.0	21 039.3	19 021.5	–17.7%

Note: The emission estimates in this table are based on the 2011 annual submissions made by the Parties, available at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.php.

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

^a The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 emission levels of developed country Parties, individual and aggregate, in relation to the quantitative economy-wide emission reduction targets

	<i>GHGs excluding LULUCF (Tg CO₂ eq)</i>				<i>GHGs including LULUCF (Tg CO₂ eq)</i>				<i>Targets in 2020 (per cent of reference year emissions)</i>		<i>GHGs excluding LULUCF (Tg CO₂ eq) for reference year or 2020</i>			<i>GHGs including LULUCF (Tg CO₂ eq) for reference year or 2020</i>			
	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Low</i>	<i>High</i>	<i>Reference year</i>	<i>Reference year level</i>	<i>Low target</i>	<i>High target</i>	<i>Reference year level</i>	<i>Low target</i>	<i>High target</i>
Australia ^d	418.5	496.3	527.9	545.9	550.0	554.9	595.9	575.9	5%	-25%	2000	496.3	471.4	372.2	554.9	527.1	416.2
Belarus	139.2	79.2	84.2	87.9	110.6	48.3	58.0	57.8	-5%	-10%	1990	139.2	132.2	125.3	110.6	105.1	99.5
Canada ^b	591.3	717.6	733.5	691.8	523.8	655.5	787.0	679.7	-17%	-17%	2005	733.5	608.8	608.8	733.5	608.8	608.8
Croatia ^c	31.4	26.0	30.3	28.9	24.5	18.8	22.2	20.2	-5%	-5%	1990	34.9	33.2	33.2	28.0	26.6	26.6
EU-27 ^d	5 588.8	5 085.8	5 148.8	4 614.5	5 244.2	4 716.1	4 768.2	4 182.4	-20%	-30%	1990	5 588.8	4 471.0	3 912.2	5 244.2	4,195.3	3 670.9
Iceland	3.4	3.8	3.8	4.6	4.5	4.7	4.6	5.3	-15%	-30%	1990	3.4	2.9	2.4	4.5	3.9	3.2
Japan	1 266.6	1 341.8	1 351.3	1 209.2	1 197.0	1 254.5	1 261.1	1 137.7	-25%	-25%	1990	1 266.6	949.9	949.9	1 197.0	897.7	897.7
Kazakhstan	376.5	193.2	256.3	289.8	369.6	181.7	245.1	278.4	-15%	-15%	1990	376.5	320.0	320.0	369.6	314.2	314.2
Liechtenstein	0.2	0.3	0.3	0.2	0.2	0.3	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	59.1	68.4	75.0	70.6	35.7	41.7	49.5	43.9	-10%	-20%	1990	59.1	53.2	47.3	35.7	32.1	28.5
Norway	49.8	53.4	53.9	51.3	41.2	34.9	24.3	26.0	-30%	-40%	1990	49.8	34.8	29.9	41.2	28.8	24.7
Russian Federation	3 369.3	2 054.6	2 135.5	2 127.4	3 449.6	1 593.3	1 598.0	1 477.8	-15%	-25%	1990	3 369.3	2 863.9	2 527.0	3 449.6	2 932.1	2 587.2
Switzerland	53.1	52.0	54.2	52.0	50.4	53.4	53.8	52.0	-20%	-30%	1990	53.1	42.5	37.2	50.4	40.3	35.3
Ukraine	933.3	400.4	430.8	374.1	863.4	351.6	394.6	354.9	-20%	-20%	1990	933.3	746.6	746.6	863.4	690.7	690.7
United States	6 166.8	7 076.3	7 185.0	6 608.2	5 320.3	6 536.1	6 157.1	5 618.2	-17%	-17%	2005	7 185.0	5 963.5	5 963.5	6 157.1	5 110.4	5 110.4
Total^e	19 047.4	17 649.2	18 070.7	16 756.4	17 785.0	16 045.7	16 019.6	14 510.5									
Total in per cent 1990 emissions		-7%	-5%	-12%		-10%	-10%	-18%					-12%	-18%		-13%	-18%
Total in per cent 2000 emissions			2%	-5%			0%	-10%					-5%	-11%		-3%	-10%
Total in per cent 2005 emissions				-7%				-9%					-8%	-13%		-3%	-9%

Note: The emission estimates in this table are based on the 2011 annual submissions made by the Parties, available at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/5888.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, 2009, 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 A decrease of 5 per cent in emissions relative to the base year for Croatia, calculated in accordance with decision 7/CP.12, is equivalent to an increase of 6 per cent in emissions excluding LULUCF by 2020 relative to 1990.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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.

^e The values of total emissions in this table differ from those in table 4 in the present 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
Emission reductions of developed country Parties in relation to their quantitative economy-wide emission reduction targets in 2020 excluding land use, land-use change and forestry

	<i>Emission reductions in 2020 relative to selected years (Tg CO₂ eq)</i>								<i>Emission reductions in 2020 relative to selected years (per cent of emissions in the selected years)</i>							
	<i>Low target</i>				<i>High target</i>				<i>Low target</i>				<i>High target</i>			
	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>
Australia	-53.0	24.8	56.4	74.4	46.3	124.1	155.7	173.7	-13%	5%	11%	14%	11%	25%	29%	32%
Belarus	7.0	-53.0	-48.0	-44.3	13.9	-46.1	-41.1	-37.4	5%	-67%	-57%	-50%	10%	-58%	-49%	-43%
Canada	-17.5	108.8	124.7	83.0	-17.5	108.8	124.7	83.0	-3%	15%	17%	12%	-3%	15%	17%	12%
Croatia ^a	1.7	-7.2	-2.9	-4.3	1.7	-7.2	-2.9	-4.3	5%	-28%	-10%	-15%	5%	-28%	-10%	-15%
EU-27 ^b	1 117.8	614.8	677.7	143.5	1 676.6	1 173.7	1 236.6	702.4	20%	12%	13%	3%	30%	23%	24%	15%
Iceland	0.5	0.9	0.8	1.7	1.0	1.4	1.3	2.2	15%	23%	22%	37%	30%	36%	36%	48%
Japan	316.6	391.9	401.4	259.3	316.6	391.9	401.4	259.3	25%	29%	30%	21%	25%	29%	30%	21%
Kazakhstan	56.5	-126.8	-63.7	30.2	56.5	-126.8	-63.7	30.2	15%	-66%	-25%	-10%	-15%	-66%	-25%	-10%
Liechtenstein	0.05	0.07	0.09	0.06	0.07	0.09	0.11	0.09	20%	28%	32%	26%	30%	37%	41%	35%
Monaco	0.03	0.04	0.03	0.02	0.03	0.04	0.03	0.02	30%	37%	28%	17%	30%	37%	28%	17%
New Zealand	5.9	15.2	21.8	17.4	11.8	21.1	27.8	23.3	10%	22%	29%	25%	20%	31%	37%	33%
Norway	14.9	18.5	19.1	16.5	19.9	23.5	24.0	21.4	30%	35%	35%	32%	40%	44%	45%	42%
Russian Federation	505.4	-809.3	-728.4	-736.5	842.3	-472.3	-391.5	-399.6	15%	-39%	-34%	-35%	25%	-23%	-18%	-19%
Switzerland	10.6	9.5	11.7	9.5	15.9	14.8	17.0	14.8	20%	18%	22%	18%	30%	28%	31%	28%
Ukraine	186.7	-346.2	-315.8	-372.5	186.7	-346.2	-315.8	-372.5	20%	-86%	-73%	-100%	20%	-86%	-73%	-100%
United States	203.3	1 112.8	1 221.4	644.7	203.3	1 112.8	1 221.4	644.7	3%	16%	17%	10%	3%	16%	17%	10%
Total	2 356.5	954.8	1 376.3	62.1	3 375.2	1 973.6	2 395.1	1 080.8	12%	5%	8%	0%	18%	11%	13%	6%

Note: The estimates of emission reductions represent the difference between emission levels in selected years (1990, 2000, 2005 and 2009) and emission levels in 2020 in relation to the targets. The estimates of emission reductions in per cent were calculated by dividing the emission reductions in the period between the selected years and 2020 by the emission levels in the selected year. Negative values represent emission increase and positive values represent emission decrease.

^a Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^b The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

Emission reductions of developed country Parties in relation to their quantitative economy-wide emission reduction targets in 2020 including land use, land-use change and forestry

	<i>Emission reductions in 2020 relative to selected years (Tg CO₂ eq)</i>								<i>Emission reductions in 2020 relative to selected years (per cent of emissions in the selected years)</i>							
	<i>Low target</i>				<i>High target</i>				<i>Low target</i>				<i>High target</i>			
	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>
Australia ^a	22.8	27.7	68.8	48.8	133.8	138.7	179.7	159.8	4%	5%	12%	8%	24%	25%	30%	28%
Belarus	5.5	-56.8	-47.1	-47.2	11.1	-51.3	-41.6	-41.7	5%	-118%	-81%	-82%	10%	-106%	-72%	-72%
Canada ^b	-85.0	46.7	178.2	70.9	-85.0	46.7	178.2	70.9	-16%	7%	23%	10%	-16%	7%	23%	10%
Croatia ^c	1.4	-7.8	-4.4	-6.5	1.4	-7.8	-4.4	-6.5	5%	-42%	-20%	-32%	5%	-42%	-20%	-32%
EU-27 ^d	1 048.8	520.7	572.9	-13.0	1 573.3	1 045.2	1 097.3	511.5	20%	11%	12%	0%	30%	22%	23%	12%
Iceland	0.7	0.9	0.7	1.5	1.4	1.5	1.4	2.1	15%	18%	15%	27%	30%	33%	30%	40%
Japan	299.2	356.8	363.3	240.0	299.2	356.8	363.3	240.0	25%	28%	29%	21%	25%	28%	29%	21%
Kazakhstan	55.4	-132.5	-69.1	-35.7	55.4	-132.5	-69.1	-35.7	15%	-73%	-28%	-13%	15%	-73%	-28%	-13%
Liechtenstein	0.04	0.07	0.09	0.06	0.07	0.10	0.11	0.09	20%	30%	33%	27%	30%	38%	42%	36%
Monaco	0.03	0.04	0.03	0.02	0.03	0.04	0.03	0.02	30%	37%	28%	17%	30%	37%	28%	17%
New Zealand	3.6	9.6	17.4	11.8	7.1	13.2	21.0	15.4	10%	23%	35%	27%	20%	32%	42%	35%
Norway	12.4	6.0	-4.6	-2.9	16.5	10.1	-0.4	1.2	30%	17%	-19%	-11%	40%	29%	-2%	5%
Russian Federation	517.4	-1 338.8	-1 334.2	-1 454.4	862.4	-993.9	-989.2	-1 109.4	15%	-84%	-83%	-98%	25%	-62%	-62%	-75%
Switzerland	10.1	13.1	13.5	11.7	15.1	18.1	18.5	16.8	20%	24%	25%	23%	30%	34%	34%	32%
Ukraine	172.7	-339.1	-296.1	-335.8	172.7	-339.1	-296.1	-335.8	20%	-96%	-75%	-95%	20%	-96%	-75%	-95%
United States	209.9	1 425.7	1 046.7	507.8	209.9	1 425.7	1 046.7	507.8	4%	22%	17%	9%	4%	22%	17v	9%
Total	2 275.0	532.3	506.1	-1 002.9	3 274.4	1 531.6	1 505.5	-3.6	13%	3%	3%	-7%	18%	10%	9%	0%

Note: The estimates of emission reductions represent the difference between emission levels in selected years (1990, 2000, 2005 and 2009) and emission levels in 2020 in relation to the targets. The estimates of emission reductions in per cent were calculated by dividing the emission reductions in the period between the selected years and 2020 by the emission levels in the selected year. Negative values represent emission increase and positive values represent emission decrease.

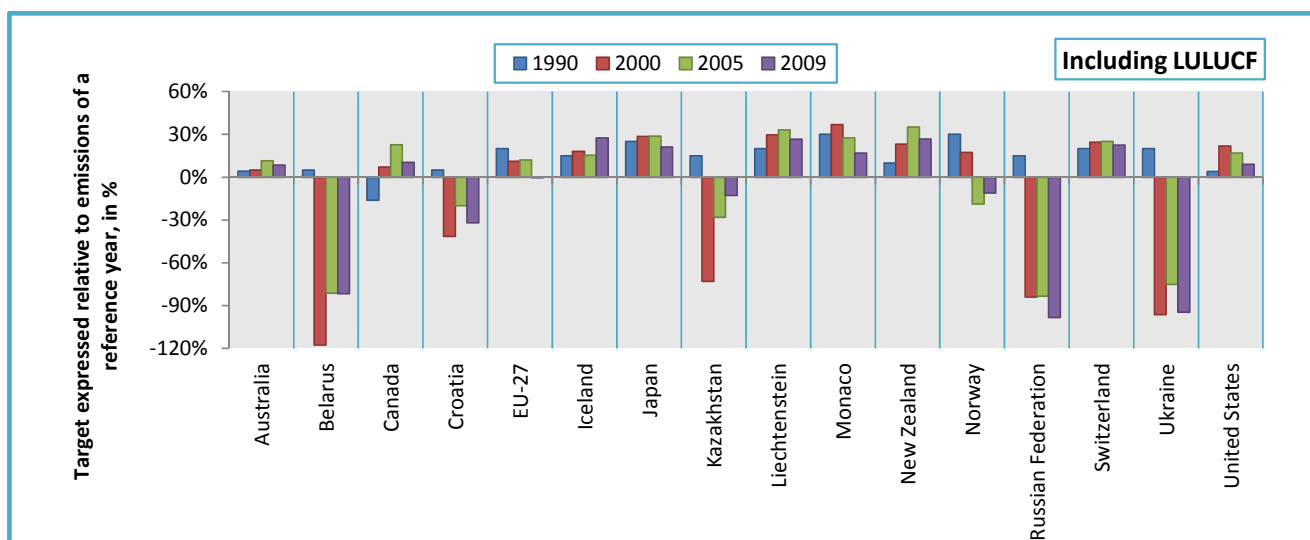
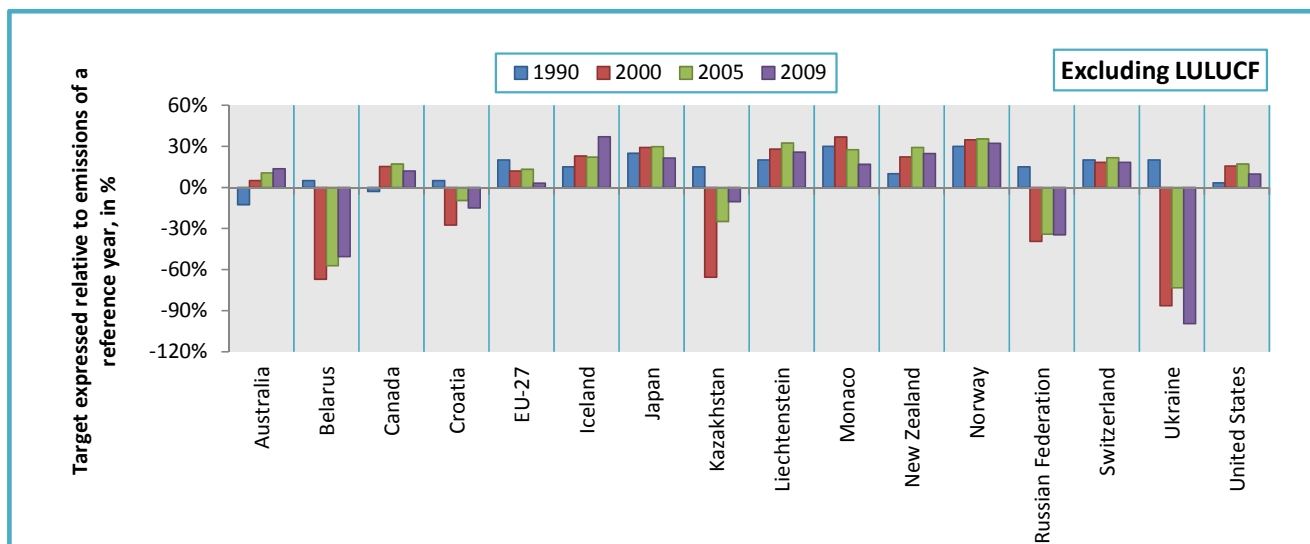
^a In accordance with the definition of Australia's target for 2020, the net emission levels for the selected years and for 2020 include emissions and removals from the sector and source categories included in Annex A to the Kyoto Protocol as well as from afforestation, reforestation and deforestation 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 Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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.

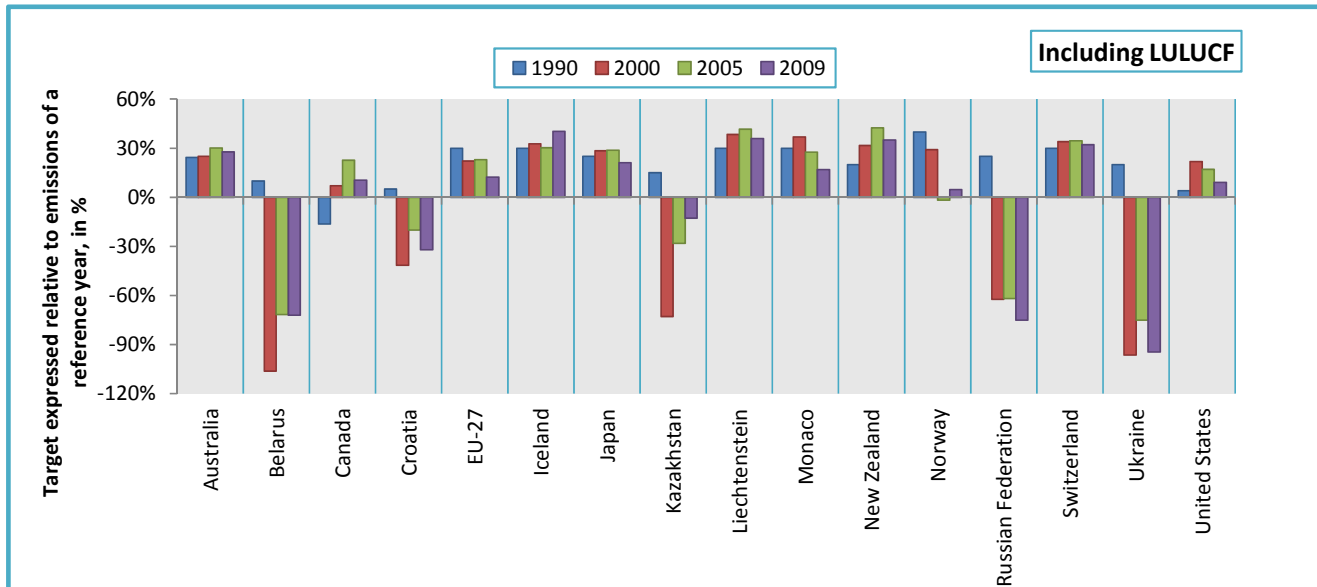
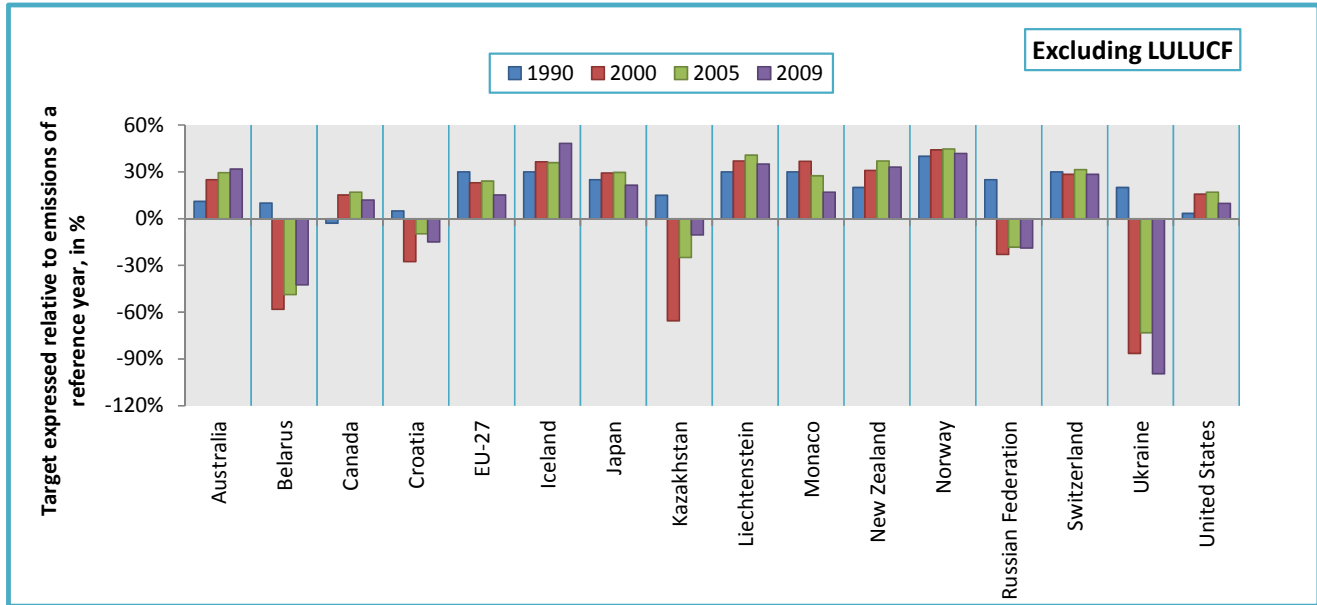
Figure 1
Reduction of total greenhouse gas emissions, excluding and including land use, land-use change and forestry, by 2020 relative to emission levels in a selected year (1990, 2000, 2005 or 2009) for low targets submitted by developed country Parties, expressed as per cent of emissions in the selected year



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

Reduction of total greenhouse gas emissions, excluding and including land use, land-use change and forestry, by 2020 relative to emission levels in a selected year (1990, 2000, 2005 or 2009) for high targets submitted by developed country Parties, expressed as per cent of emissions in the selected year



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 reductions of developed country Parties between 1990 and 2009 and between 2009 and 2020 in relation to their quantitative economy-wide emission reduction targets

	<i>Total GHGs excluding LULUCF (per cent of emissions in 1990 or 2009)</i>			<i>Total GHGs including LULUCF (per cent of emissions in 1990 or 2009)</i>		
	<i>1990–2009</i>	<i>2009–2020</i>		<i>1990–2009</i>	<i>2009–2020</i>	
		<i>Low target</i>	<i>High target</i>		<i>Low target</i>	<i>High target</i>
Australia ^a	–30%	14%	32%	–5%	8%	28%
Belarus	37%	–50%	–43%	48%	–82%	–72%
Canada ^b	–17%	12%	12%	–30%	10%	10%
Croatia ^c	17%	–15%	–15%	28%	–32%	–32%
EU-27 ^d	17%	3%	15%	20%	0%	12%
Iceland	–35%	37%	48%	–17%	27%	40%
Japan	5%	21%	21%	5%	21%	21%
Kazakhstan	23%	–10%	–10%	25%	–13%	–13%
Liechtenstein	–8%	26%	35%	–9%	27%	36%
Monaco	16%	17%	17%	16%	17%	17%
New Zealand	–19%	25%	33%	–23%	27%	35%
Norway	–3%	32%	42%	37%	–11%	5%
Russian Federation	37%	–35%	–19%	57%	–98%	–75%
Switzerland	2%	18%	28%	–3%	23%	32%
Ukraine	60%	–100%	–100%	59%	–95%	–95%
United States	–7%	10%	10%	–6%	9%	9%
Total	12%	0%	6%	18%	–7%	0%

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

Note: The estimates of emission reductions represent the difference between emission levels in 1990 and 2009 and between 2009 and 2020 in relation to the targets. The estimates of emission reductions in per cent were calculated by dividing the emission reductions between 1990 and 2009 by emission levels in 1990, and by dividing the target emission reductions between 2009 and 2020 by emission levels in 2009. Negative values represent emission increase and positive values represent emission decrease.

^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, 2009 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.

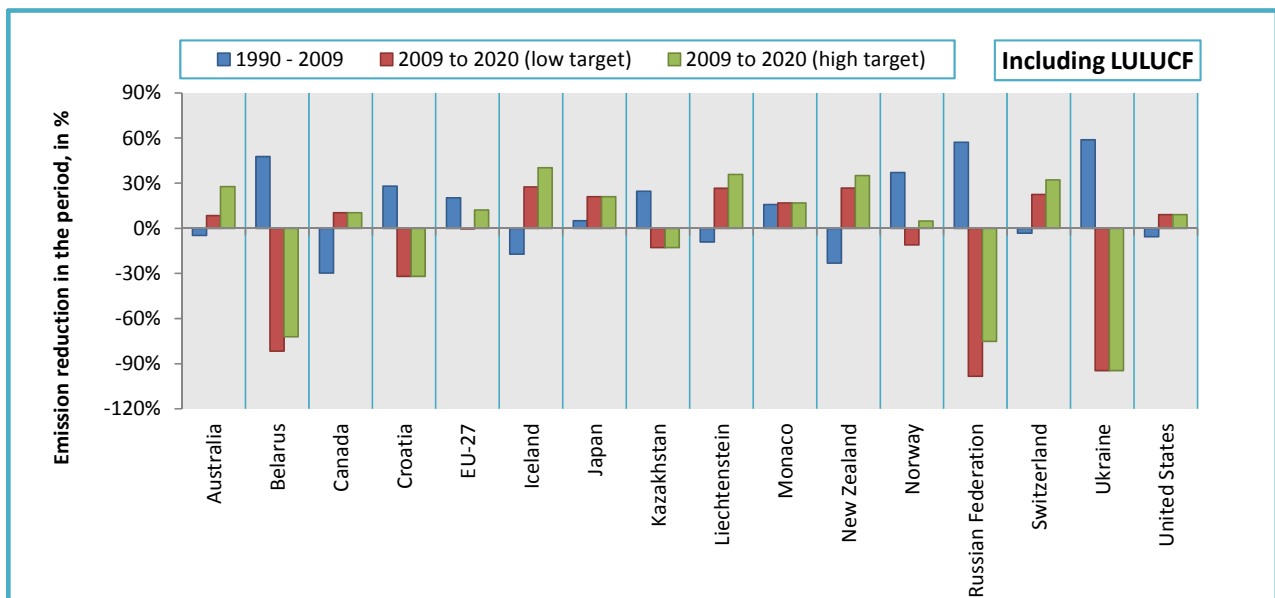
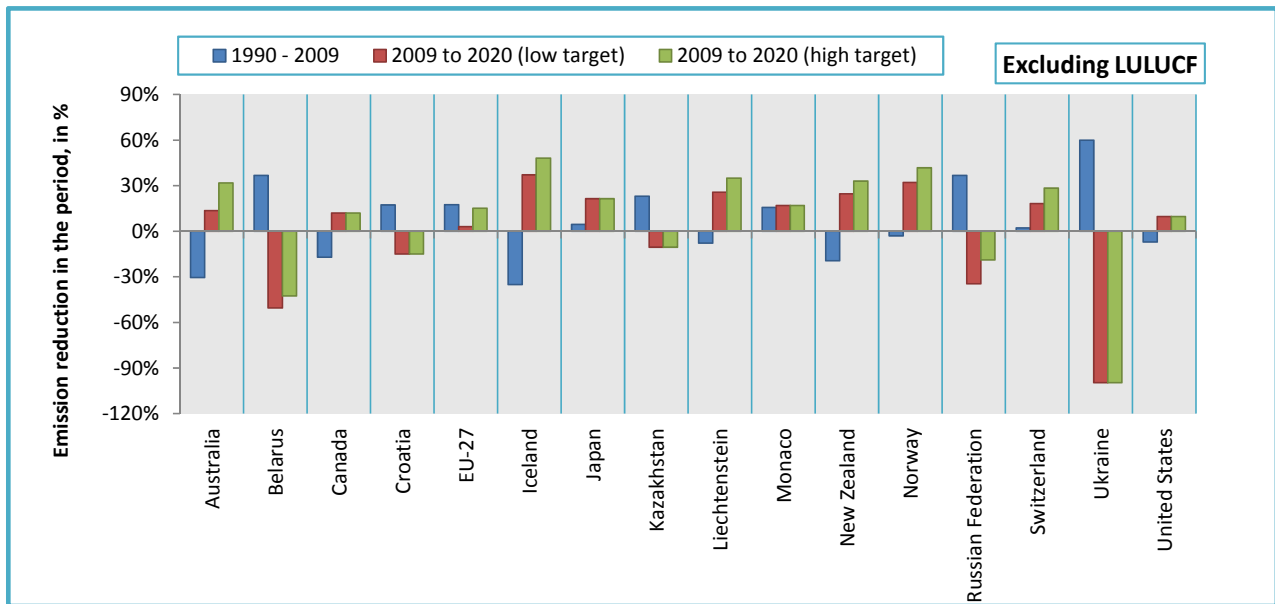
^b The emission levels for 2005 that were used to calculate the target for Canada using total GHG emissions including LULUCF do not include LULUCF.

^c Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

Reduction of total greenhouse gas emissions excluding and including land use, land-use change and forestry between 1990 and 2009 and between 2009 and 2020 for the low and high targets submitted by developed country Parties, expressed as per cent of emission reductions relative to the initial year of the period



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 (gross domestic product is presented in constant 2005 United States dollars expressed in purchasing power parity)

	Population (millions)					Gross domestic product (billions of 2005 USD)					Gross domestic product per capita (thousands of USD per inhabitant)				
	1990	2000	2005	2009	2020	1990	2000	2005	2009	2020	1990	2000	2005	2009	2020
Australia	17.1	19.2	20.4	21.3	23.7	409.2	570.1	666.9	749.7	1 057.2	23.9	29.7	32.7	35.2	44.7
Belarus	10.3	10.1	9.8	9.6	9.1	66.5	59.0	83.5	113.0	196.7	6.5	5.9	8.5	11.7	21.6
Canada	27.7	30.7	32.3	33.6	37.1	748.7	998.4	1 132.0	1 166.3	1 519.2	27.0	32.5	35.0	34.7	40.9
Croatia	4.5	4.5	4.4	4.4	4.3	64.0	54.7	68.1	72.4	85.1	14.2	12.2	15.3	16.4	19.7
EU-27 ^a	473.7	483.7	492.7	499.1	508.7	9 700.1	12 000.7	13 221.4	14 226.9	17 028.9	20.5	24.8	26.8	28.5	33.5
Iceland	0.3	0.3	0.3	0.3	0.4	6.5	8.4	10.4	10.8	13.2	25.6	29.9	35.0	33.5	35.8
Japan	123.2	126.7	127.4	127.1	123.7	3 227.9	3 630.1	3 872.8	3 745.3	4 590.1	26.2	28.6	30.4	29.5	37.1
Kazakhstan	16.5	15.0	15.2	15.6	16.7	115.9	80.5	131.8	166.0	320.9	7.0	5.4	8.7	10.6	19.2
Liechtenstein	0.03	0.03	0.04	0.04	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Monaco	0.03	0.03	0.03	0.03	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
New Zealand	3.4	3.9	4.1	4.3	4.7	65.1	86.4	104.6	104.9	135.1	19.2	22.3	25.4	24.6	28.9
Norway	4.2	4.5	4.6	4.8	5.2	136.2	196.0	218.7	230.6	287.8	32.1	43.7	47.2	47.9	55.3
Russian Federation	148.1	146.7	143.2	140.9	135.4	1 872.3	1 260.1	1 696.7	1 932.6	2 885.3	12.6	8.6	11.9	13.7	21.3
Switzerland	6.7	7.2	7.4	7.6	7.9	224.3	249.4	266.1	285.7	354.8	33.4	34.7	35.8	37.8	45.0
Ukraine	51.6	48.9	46.9	45.7	42.9	418.4	181.8	263.0	264.8	384.8	8.1	3.7	5.6	5.8	9.0
United States	253.4	286.3	300.0	314.7	350.7	7 969.5	11 167.7	12 579.7	12 820.8	17 298.7	31.4	39.0	41.9	40.7	49.3
Total	1 140.7	1 187.5	1 208.9	1 229.1	1 270.5	25 024.6	30 543.1	34 315.7	35 889.8	46 157.9	21.9	25.7	28.4	29.2	36.3

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not available.

Note: Population numbers and population projections to 2020 are from the United Nations World Population Prospects, 2010 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 2005 United States dollars at purchasing power parity values. GDP values for the period 1990–2009 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 2010–2016. An average growth rate calculated based on the projected GDP data for the period 2010–2016 was applied for each country for the period 2017–2020.

^a The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 (gross domestic product is presented in constant 2000 United States dollars at market prices)

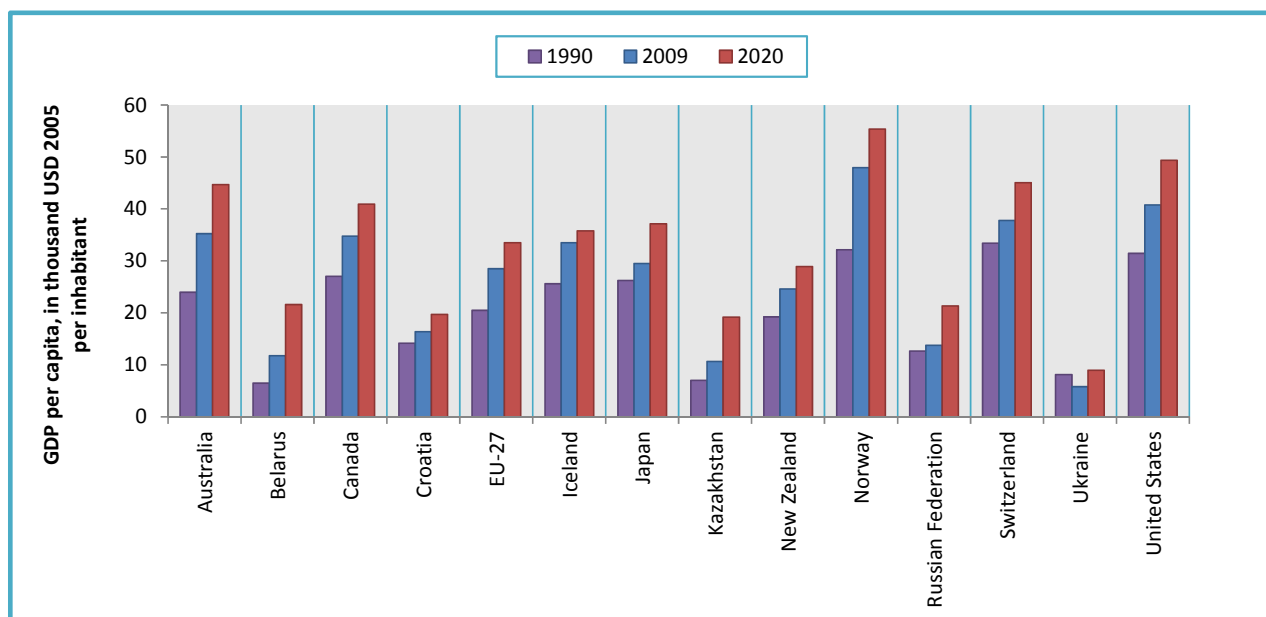
	Population (millions)					Gross domestic product (billions of constant 2000 USD)					Gross domestic product per capita (thousands of USD per inhabitant)				
	1990	2000	2005	2009	2020	1990	2000	2005	2009	2020	1990	2000	2005	2009	2020
Australia	17.1	19.2	20.4	21.3	23.7	299.3	416.9	487.7	548.1	777.9	17.5	21.7	23.9	25.7	32.9
Belarus	10.3	10.1	9.8	9.6	9.1	14.4	12.7	18.0	24.7	44.4	1.4	1.3	1.8	2.6	4.9
Canada	27.7	30.7	32.3	33.6	37.1	543.6	724.9	821.9	846.8	1 107.2	19.6	23.6	25.4	25.2	29.8
Croatia	4.5	4.5	4.4	4.4	4.3	25.1	21.3	26.6	28.3	35.4	5.6	4.7	6.0	6.4	8.2
EU-27 ^a	473.7	483.7	492.7	499.1	508.7	6 814.3	8 493.5	9 290.3	9 492.7	10 812.1	14.4	17.6	18.9	19.0	21.3
Iceland	0.3	0.3	0.3	0.3	0.4	6.8	8.7	10.7	11.2	14.2	26.5	31.0	36.3	34.8	38.3
Japan	123.2	126.7	127.4	127.1	123.7	4 150.3	4 667.4	4 979.5	4 869.9	5 827.3	33.7	36.8	39.1	38.3	47.1
Kazakhstan	16.5	15.0	15.2	15.6	16.7	6.2	9.3	10.9	37.8	71.8	0.4	0.6	0.7	2.4	4.3
Liechtenstein	0.03	0.03	0.04	0.04	0.04	1.4	2.5	2.6	3.0	4.9	48.9	75.3	73.9	83.8	124.7
Monaco	0.03	0.03	0.03	0.03	0.03	2.2	2.6	2.9	4.0	6.0	75.1	82.8	90.2	122.0	177.6
New Zealand	3.4	3.9	4.1	4.3	4.7	38.8	51.4	62.3	64.0	82.1	11.4	13.3	15.2	15.0	17.6
Norway	4.2	4.5	4.6	4.8	5.2	117.0	168.3	187.8	197.6	249.1	27.6	37.5	40.5	41.1	47.9
Russian Federation	148.1	146.7	143.2	140.9	135.4	385.9	259.7	349.7	397.9	609.0	2.6	1.8	2.4	2.8	4.5
Switzerland	6.7	7.2	7.4	7.6	7.9	224.8	249.9	266.7	286.3	352.9	33.5	34.8	35.8	37.8	44.8
Ukraine	51.6	48.9	46.9	45.7	42.9	72.0	31.3	45.2	45.4	68.2	1.4	0.6	1.0	1.0	1.6
United States	253.4	286.3	300.0	314.7	350.7	7 105.0	9 959.8	11 214.8	11 421.5	15 264.7	28.0	34.8	37.4	36.3	43.5
Total	1 140.7	1 187.5	1 208.9	1 229.1	1 270.5	19 806.8	25 080.5	27 777.8	28 279.4	35 327.2	17.4	21.1	23.0	23.0	27.8

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

Note: Population numbers and population projections to 2020 are from the United Nations World Population Prospects, 2010 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 2000 United States dollars at market prices. GDP values for the period 1990–2009 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 2010–2016. An average growth rate calculated based on the projected GDP data for the period 2010–2016 was applied for each country for the period 2017–2020.

^a The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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.

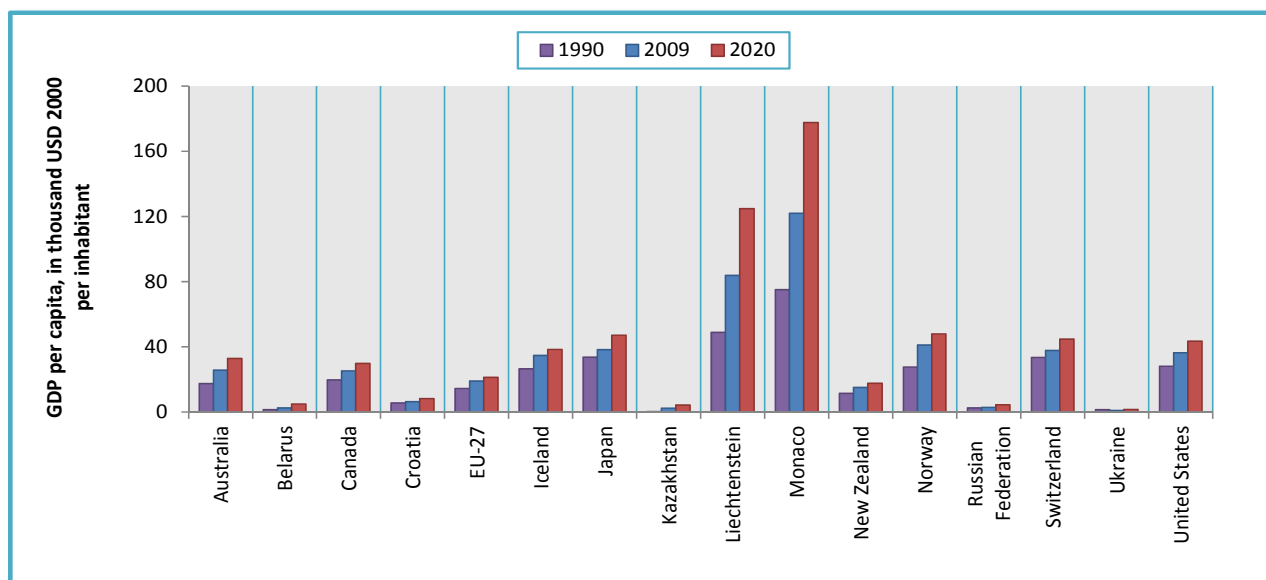
Figure 4
Gross domestic product per capita for developed country Parties, expressed in thousands of constant 2005 United States dollars in purchasing power parity per inhabitant



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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.

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

Figure 5
Gross domestic product per capita for developed country Parties, expressed in thousands of constant 2000 United States dollars at market prices per inhabitant



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 in 1990, 2000, 2005, 2009 and 2020 in relation to the quantitative economy-wide emission reduction targets for 2020

	<i>Emissions per capita (Gg CO₂ eq/1000 inhabitants)</i>											<i>Emissions per capita (change relative to 1990 in per cent)</i>										
	<i>Excluding LULUCF</i>						<i>Including LULUCF</i>					<i>Excluding LULUCF</i>					<i>Including LULUCF</i>					
	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Low target</i>	<i>High target</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Low target</i>	<i>High target</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Low target</i>	<i>High target</i>	<i>2000</i>	<i>2005</i>	<i>2009</i>	<i>Low target</i>	<i>High target</i>
Australia ^a	24.5	25.9	25.9	25.6	19.9	15.7	32.2	28.9	29.2	27.1	22.3	17.6	-6%	-6%	-5%	19%	36%	10%	9%	16%	31%	45%
Belarus	13.6	7.9	8.6	9.1	14.5	13.7	10.8	4.8	5.9	6.0	11.5	10.9	42%	37%	33%	-7%	-1%	55%	45%	44%	-7%	-1%
Canada ^b	21.3	23.4	22.7	20.6	16.4	16.4	18.9	21.4	24.4	20.2	16.4	16.4	-10%	-6%	3%	23%	23%	-13%	-29%	-7%	13%	13%
Croatia ^c	7.7	5.8	6.8	6.5	7.7	7.7	6.2	4.2	5.0	4.6	6.2	6.2	25%	12%	16%	1%	1%	33%	20%	26%	1%	1%
EU-27 ^d	11.8	10.5	10.5	9.2	8.8	7.7	11.1	9.7	9.7	8.4	8.2	7.2	11%	11%	22%	25%	35%	12%	13%	24%	25%	35%
Iceland	13.5	13.5	12.7	14.4	7.9	6.5	17.8	16.8	15.4	16.5	10.4	8.6	0%	6%	-7%	41%	52%	6%	14%	7%	41%	52%
Japan	10.3	10.6	10.6	9.5	7.7	7.7	9.7	9.9	9.9	9.0	7.3	7.3	-3%	-3%	7%	25%	25%	-2%	-2%	8%	25%	25%
Kazakhstan	22.8	12.9	16.9	18.5	19.1	19.1	22.4	12.1	16.1	17.8	18.8	18.8	43%	26%	19%	16%	16%	46%	28%	20%	16%	16%
Liechtenstein	7.9	7.7	7.8	6.9	4.7	4.1	7.6	7.6	7.6	6.7	4.5	4.0	2%	2%	13%	41%	48%	0%	1%	12%	41%	48%
Monaco	3.7	3.7	3.3	2.8	2.2	2.2	3.7	3.7	3.3	2.8	2.2	2.2	0%	12%	26%	40%	40%	0%	12%	26%	40%	40%
New Zealand	17.5	17.7	18.3	16.5	11.4	10.1	10.5	10.8	12.0	10.3	6.9	6.1	-1%	-5%	5%	35%	42%	-2%	-14%	2%	35%	42%
Norway	11.7	11.9	11.6	10.7	6.7	5.7	9.7	7.8	5.2	5.4	5.5	4.8	-1%	1%	9%	43%	51%	20%	46%	44%	43%	51%
Russian Federation	22.8	14.0	14.9	15.1	21.2	18.7	23.3	10.9	11.2	10.5	21.7	19.1	38%	34%	34%	7%	18%	53%	52%	55%	7%	18%
Switzerland	7.9	7.2	7.3	6.9	5.4	4.7	7.5	7.4	7.2	6.9	5.1	4.5	9%	8%	13%	32%	40%	1%	4%	8%	32%	40%
Ukraine	18.1	8.2	9.2	8.2	17.4	17.4	16.7	7.2	8.4	7.8	16.1	16.1	55%	49%	55%	4%	4%	57%	50%	54%	4%	4%
United States	24.3	24.7	23.9	21.0	17.0	17.0	21.0	22.8	20.5	17.9	14.6	14.6	-2%	2%	14%	30%	30%	-9%	2%	15%	31%	31%
Total	16.7	14.9	14.9	13.6	13.1	12.3	15.6	13.5	13.3	11.8	12.2	11.4	11%	10%	18%	21%	26%	13%	15%	24%	22%	27%

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

Note: Emissions per capita were calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2009 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, 2010 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 the present document. Negative percentages represent increase in emissions per capita.

^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, 2009 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.

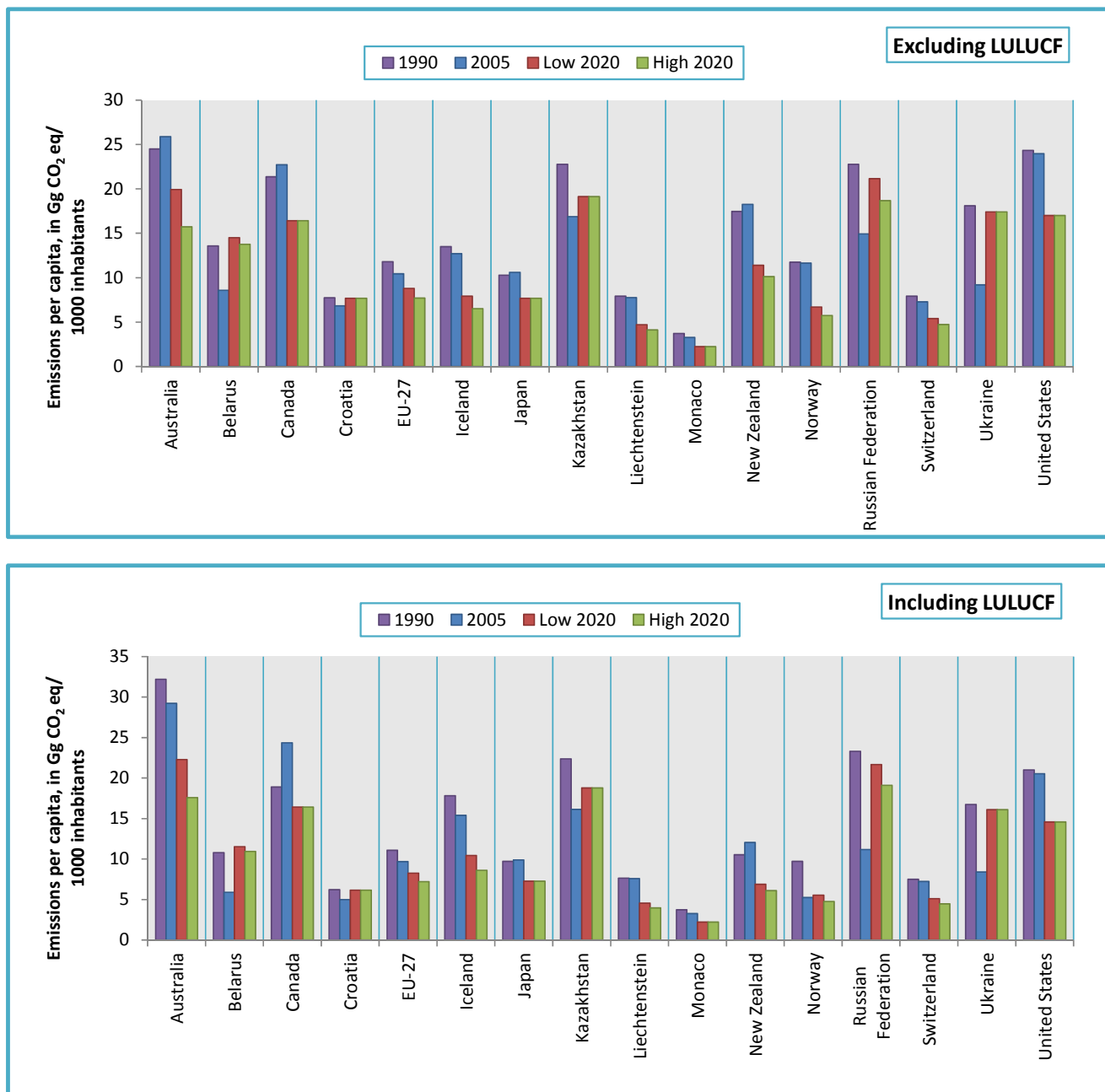
^b The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including LULUCF do not include LULUCF.

^c Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

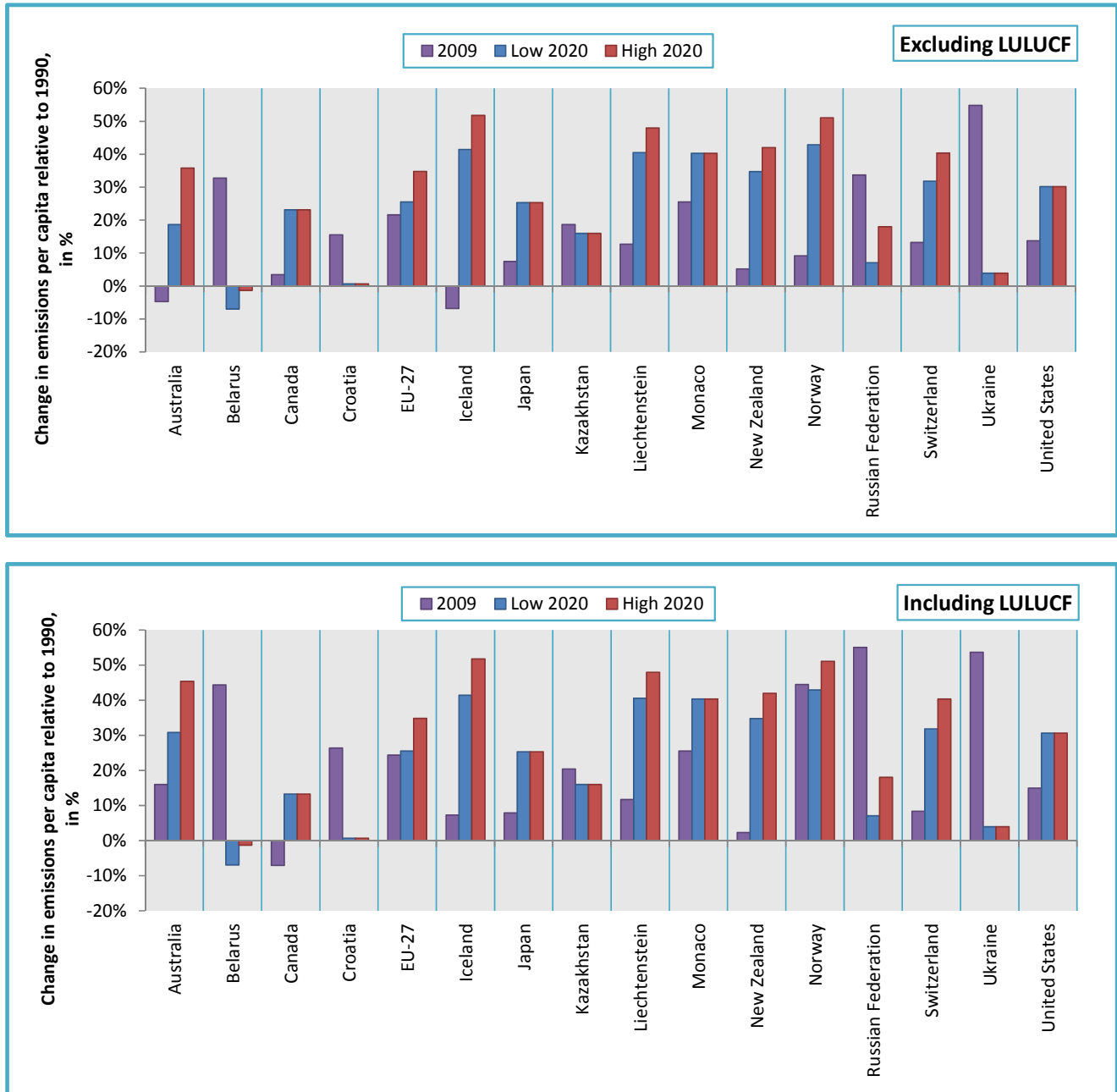
Per capita greenhouse gas emissions, excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed country Parties, expressed as Gg CO₂ eq per thousand inhabitants



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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, excluding and including land use, land-use change and forestry, in 2009 relative to per capita emissions in 1990 for the low and high targets submitted by developed country Parties



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 1990, 2000, 2005, 2009 and 2020 in relation to the quantitative economy-wide emission reduction targets for 2020 (calculated using gross domestic product presented in constant 2005 United States dollars expressed in purchasing power parity)

	Emission intensity (Gg CO ₂ eq/million 2005 USD)												Change in emission intensity (reduction from 1990 in per cent)									
	Excluding LULUCF						Including LULUCF						Excluding LULUCF				Including LULUCF					
	1990	2000	2005	2009	Low target	High target	1990	2000	2005	2009	Low target	High target	2000	2005	2009	Low target	High target	2000	2005	2009	Low target	High target
Australia ^d	1.02	0.87	0.79	0.73	0.45	0.35	1.34	0.97	0.89	0.77	0.50	0.39	15%	23%	29%	56%	66%	28%	34%	43%	63%	71%
Belarus	2.09	1.34	1.01	0.78	0.67	0.64	1.66	0.82	0.69	0.51	0.53	0.51	36%	52%	63%	68%	70%	51%	58%	69%	68%	70%
Canada ^b	0.79	0.72	0.65	0.59	0.40	0.40	0.70	0.66	0.70	0.58	0.40	0.40	9%	18%	25%	49%	49%	6%	1%	17%	43%	43%
Croatia ^c	0.55	0.48	0.44	0.40	0.39	0.39	0.44	0.34	0.33	0.28	0.31	0.31	13%	19%	27%	29%	29%	22%	26%	36%	29%	29%
EU-27 ^d	0.58	0.42	0.39	0.32	0.26	0.23	0.54	0.39	0.36	0.29	0.25	0.22	26%	32%	44%	54%	60%	27%	33%	46%	54%	60%
Iceland	0.53	0.45	0.36	0.43	0.22	0.18	0.70	0.56	0.44	0.49	0.29	0.24	14%	31%	18%	58%	65%	19%	37%	29%	58%	65%
Japan	0.39	0.37	0.35	0.32	0.21	0.21	0.37	0.35	0.33	0.30	0.20	0.20	6%	11%	18%	47%	47%	7%	12%	18%	47%	47%
Kazakhstan	3.25	2.40	1.94	1.75	1.00	1.00	3.19	2.26	1.86	1.68	0.98	0.98	26%	40%	46%	69%	69%	29%	42%	47%	69%	69%
New Zealand	0.91	0.79	0.72	0.67	0.39	0.35	0.55	0.48	0.47	0.42	0.24	0.21	13%	21%	26%	57%	61%	12%	14%	24%	57%	61%
Norway	0.37	0.27	0.25	0.22	0.12	0.10	0.30	0.18	0.11	0.11	0.10	0.09	25%	33%	39%	67%	72%	41%	63%	63%	67%	72%
Russian Federation	1.80	1.63	1.26	1.10	0.99	0.88	1.84	1.26	0.94	0.76	1.02	0.90	9%	30%	39%	45%	51%	31%	49%	58%	45%	51%
Switzerland	0.24	0.21	0.20	0.18	0.12	0.10	0.22	0.21	0.20	0.18	0.11	0.10	12%	14%	23%	49%	56%	5%	10%	19%	49%	56%
Ukraine	2.23	2.20	1.64	1.41	1.94	1.94	2.06	1.93	1.50	1.34	1.79	1.79	1%	27%	37%	13%	13%	6%	27%	35%	13%	13%
United States	0.77	0.63	0.57	0.52	0.34	0.34	0.67	0.59	0.49	0.44	0.30	0.30	18%	26%	33%	55%	55%	12%	27%	34%	56%	56%
Total	0.76	0.58	0.53	0.47	0.36	0.34	0.71	0.53	0.47	0.40	0.34	0.31	24%	31%	39%	52%	55%	26%	34%	43%	53%	56%

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

Note: Emission intensity was calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2009 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 1990–2009 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 2010–2016. 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 2010–2016 was applied for each country for the period 2017–2020. Information on emissions 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 the present document.

^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, 2008 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 Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 1990, 2000, 2005, 2009 and 2020 in relation to the quantitative economy-wide emission reduction targets for 2020 (calculated using gross domestic product presented in constant 2000 United States dollars at market prices)

	Emission intensity (Gg CO ₂ eq/million 2000 USD)												Change in emission intensity (reduction from 1990 in per cent)									
	Excluding LULUCF						Including LULUCF						Excluding LULUCF					Including LULUCF				
	1990	2000	2005	2009	Low target	High target	1990	2000	2005	2009	Low target	High target	2000	2005	2009	Low target	High target	2000	2005	2009	Low target	High target
Australia ^a	1.40	1.19	1.08	1.00	0.61	0.48	1.84	1.33	1.22	1.05	0.68	0.53	15%	23%	29%	57%	66%	28%	34%	43%	63%	71%
Belarus	9.69	6.22	4.67	3.56	2.98	2.82	7.70	3.79	3.22	2.34	2.36	2.24	36%	52%	63%	69%	71%	51%	58%	70%	69%	71%
Canada ^b	1.09	0.99	0.89	0.82	0.55	0.55	0.96	0.90	0.96	0.80	0.55	0.55	9%	18%	25%	49%	49%	6%	1%	17%	43%	43%
Croatia ^c	1.25	1.22	1.14	1.02	0.94	0.94	0.98	0.88	0.83	0.71	0.75	0.75	2%	9%	19%	25%	25%	10%	15%	27%	23%	23%
EU-27 ^d	0.82	0.60	0.55	0.49	0.41	0.36	0.77	0.56	0.51	0.44	0.39	0.34	27%	32%	41%	50%	56%	28%	33%	43%	50%	56%
Iceland	0.51	0.44	0.35	0.41	0.21	0.17	0.67	0.54	0.43	0.47	0.27	0.22	14%	31%	19%	59%	67%	19%	37%	29%	59%	67%
Japan	0.31	0.29	0.27	0.25	0.16	0.16	0.29	0.27	0.25	0.23	0.15	0.15	6%	11%	19%	47%	47%	7%	12%	19%	47%	47%
Kazakhstan	60.76	20.74	23.47	7.68	4.45	4.45	59.65	19.50	22.45	7.37	4.37	4.37	66%	61%	87%	93%	93%	67%	62%	88%	93%	93%
New Zealand	1.53	1.33	1.20	1.10	0.65	0.58	0.92	0.81	0.79	0.69	0.39	0.35	13%	21%	28%	57%	62%	12%	14%	25%	57%	62%
Norway	0.43	0.32	0.29	0.26	0.14	0.12	0.35	0.21	0.13	0.13	0.12	0.10	25%	33%	39%	67%	72%	41%	63%	63%	67%	72%
Russian Federation	8.73	7.91	6.11	5.35	4.70	4.15	8.94	6.14	4.57	3.71	4.81	4.25	9%	30%	39%	46%	52%	31%	49%	58%	46%	52%
Switzerland	0.24	0.21	0.20	0.18	0.12	0.11	0.22	0.21	0.20	0.18	0.11	0.10	12%	14%	23%	49%	55%	5%	10%	19%	49%	55%
Ukraine	12.97	12.81	9.52	8.24	10.95	10.95	12.00	11.25	8.72	7.82	10.13	10.13	1%	27%	36%	16%	16%	6%	27%	35%	16%	16%
United States	0.87	0.71	0.64	0.58	0.39	0.39	0.75	0.66	0.55	0.49	0.33	0.33	18%	26%	33%	55%	55%	12%	27%	34%	55%	55%
Total	0.96	0.70	0.65	0.59	0.47	0.44	0.90	0.64	0.58	0.51	0.44	0.41	27%	32%	38%	51%	54%	29%	36%	43%	51%	54%

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

Note: Emission intensity was calculated by dividing total greenhouse gas emissions in 1990, 2000, 2005, 2009 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 2000 market prices. GDP values for the period 1990–2009 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 2010–2016. 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 2010–2016 was applied for each country for the period 2017–2020. 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 the present document.

^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, 2008 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.

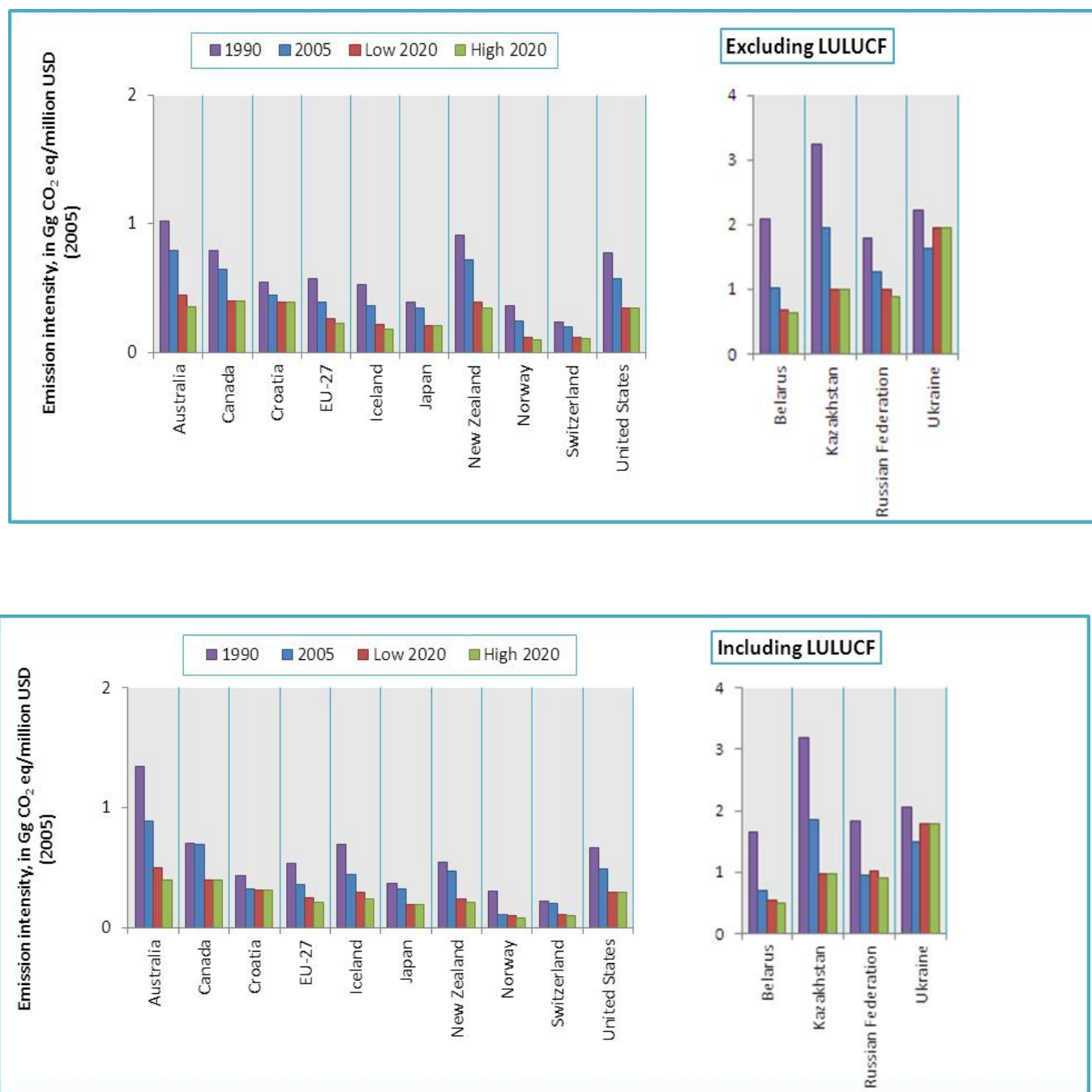
^b The emission levels for 2005 that were used to calculate the target for Canada using total greenhouse gas emissions including LULUCF do not include LULUCF.

^c Emissions for Croatia in the base year (1990) were calculated in accordance with decision 7/CP.12.

^d The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

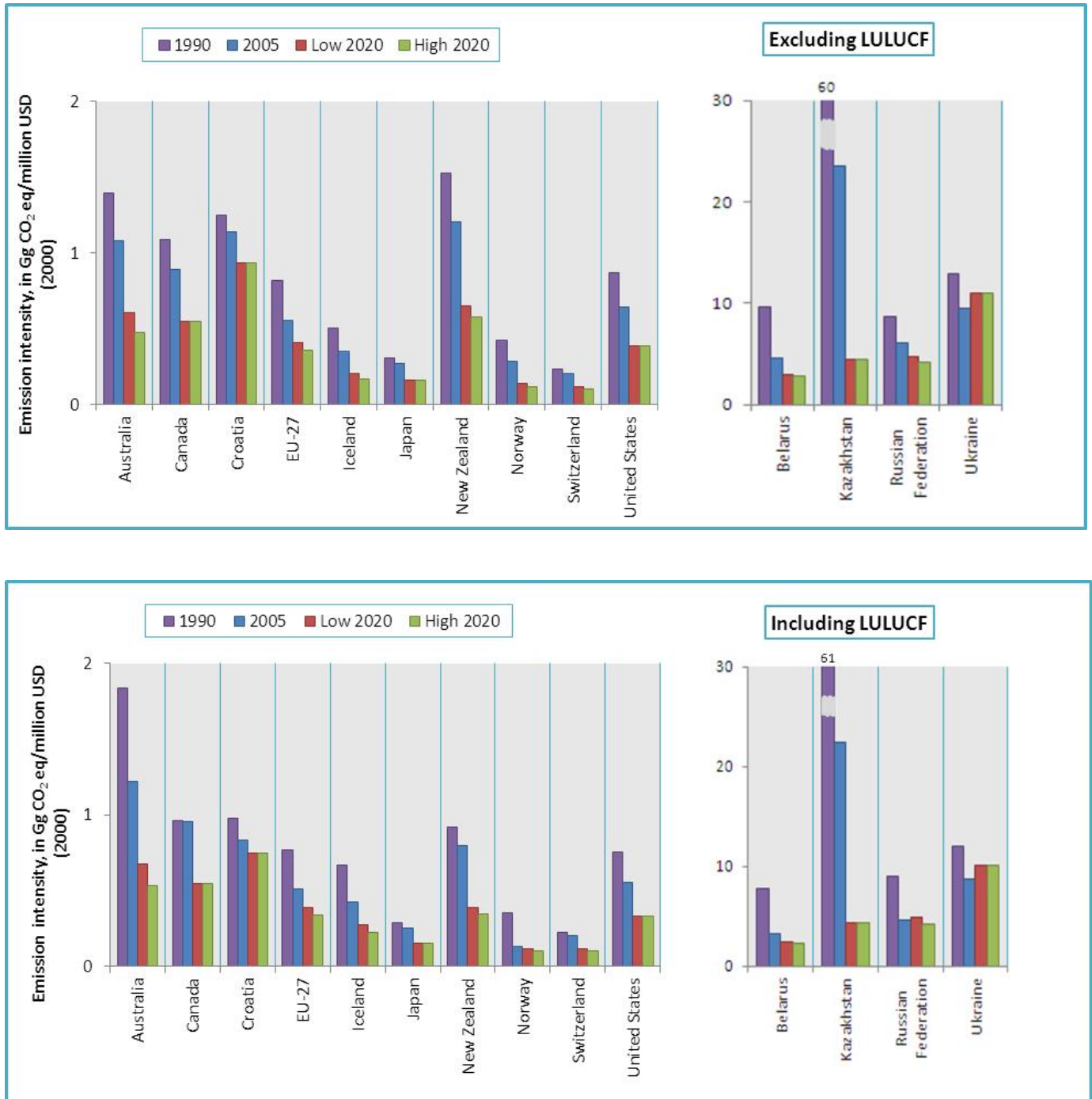
Emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2005 United States dollars in purchasing power parity), excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed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



Abbreviations: EU-27: The European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

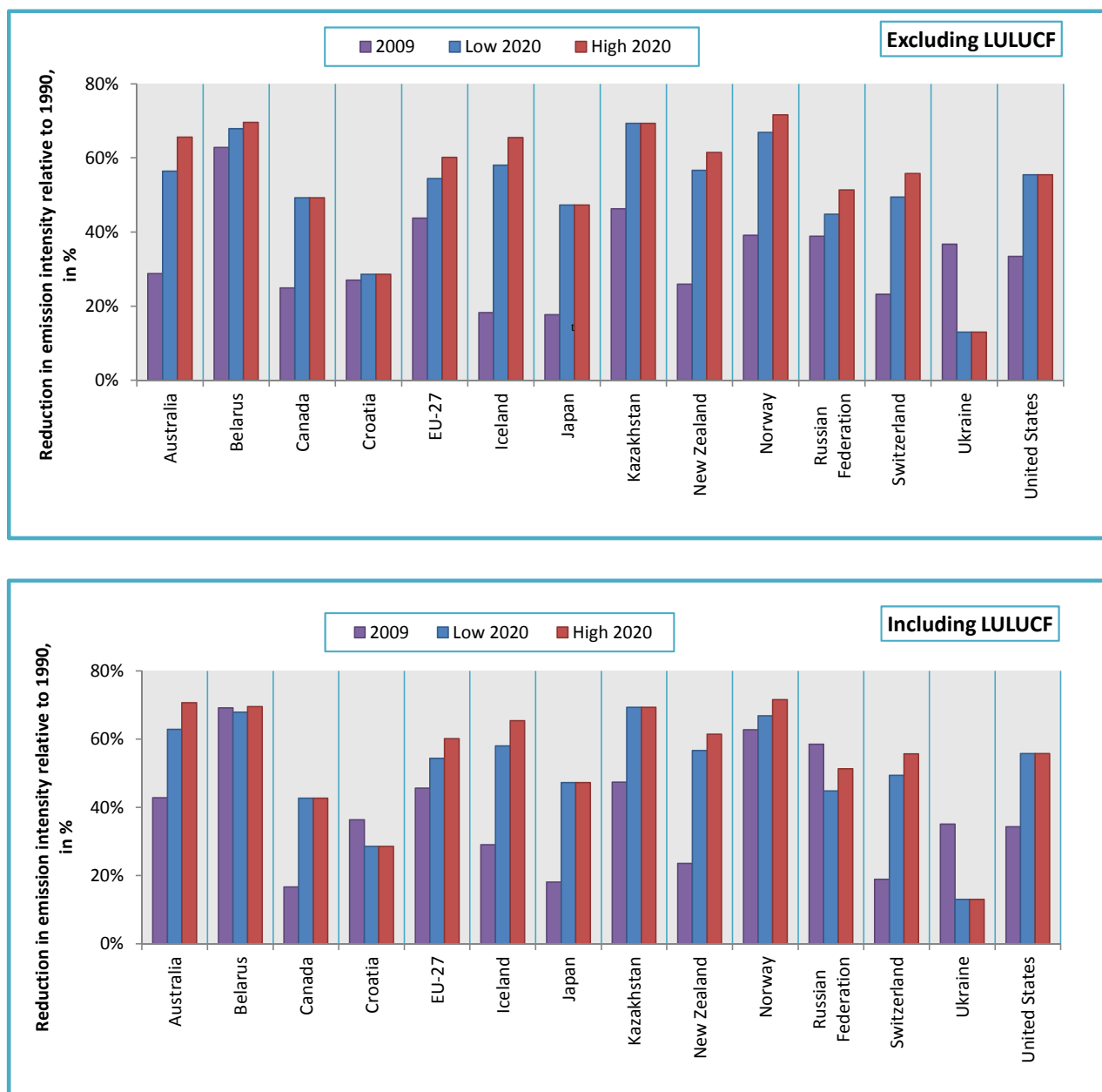
Emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2000 United States dollars at market prices), excluding and including land use, land-use change and forestry, in 1990, 2005 and 2020 for the low and high targets submitted by developed country Parties



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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

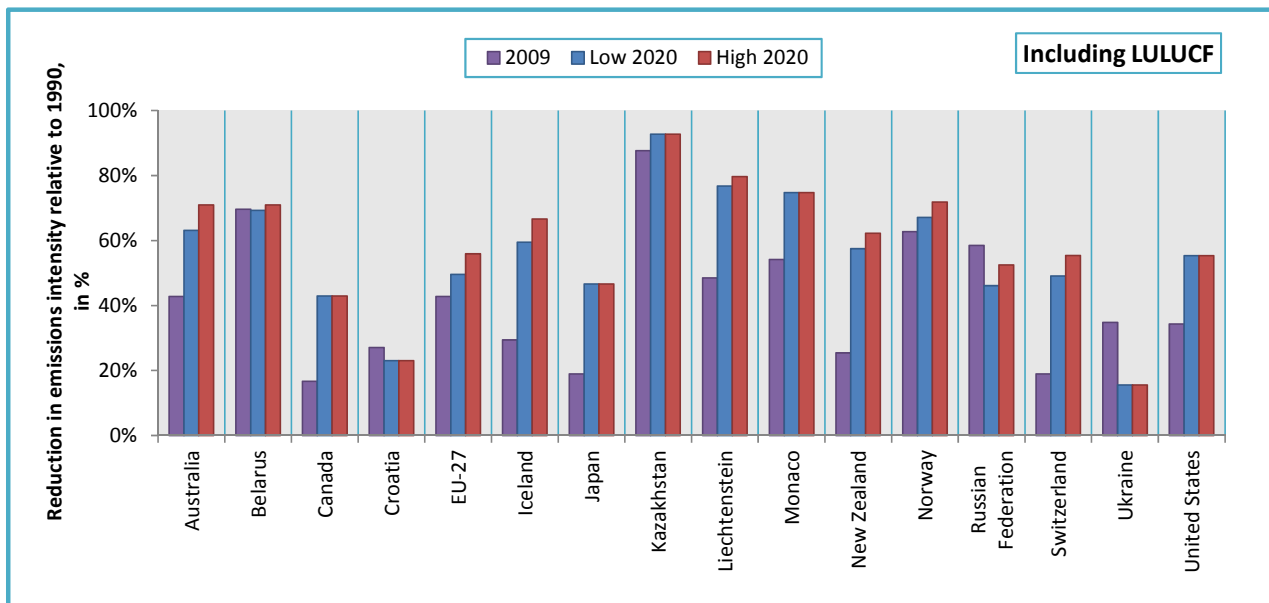
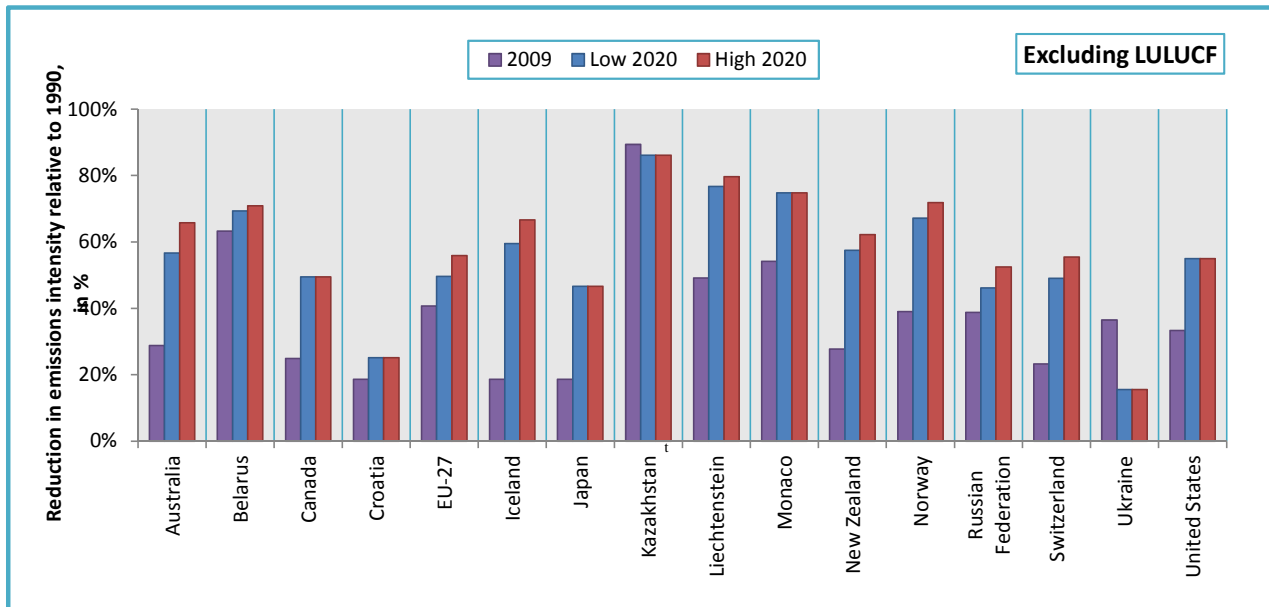
Change in emission intensity (total greenhouse gas emissions per unit of gross domestic product presented in constant 2005 United States dollars in purchasing power parity), excluding and including land use, land-use change and forestry, relative to the emission intensity in 1990 for the low and high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



Abbreviations: EU-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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 2000 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-27: the European Union and its 27 member States: Austria, Belgium, Bulgaria, 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.