The Emissions Gap Report

Are the Copenhagen Accord pledges sufficient to limit global warming to 2° C or 1.5° C?

Appendix 3:

Detailed information about the studies reviewed and modelling approach

28 January 2011

Appendix 3: detailed information about the studies reviewed and modelling approach

This is an appendix to The Emissions Gap Report; a joint publication of the United Nations Environment Programme (UNEP), the European Climate Foundation (ECF) and the National Institute of Ecology, Mexico (INE) authored by a team of scientists and analysts from 25 organisations worldwide. This appendix provides further information about the modelling approach behind the assessment of the various studies that analysed the impact of the Copenhagen Accord pledges on global emissions in 2020. It is intended to be a useful document for analysts and researchers wanting to gain a better understanding of the analysis performed.

The ECF supported the author teams with this analysis and hence this document is published on the ECF website.

This document is split into four sections

1. Studies reviewed
2. Adjustments made to make studies comparable
3. Construction of the four pledge cases
4. Detailed results

Further information

Should you have further questions regarding the analysis, please contact Nikola Franke (nikola.franke@europeanclimate.org) at the European Climate Foundation who will endeavour to help you.

1. STUDIES REVIEWED

The Emissions Gap Report included an assessment of 13 different studies analysing the mitigation pledges made in Copenhagen and their impact on emission levels in 2020. The organizations and studies reviewed are shown in Table 1 below.

Table 1: Overview of studies assessed

Organisation	Publication	Date of report	Coverage		Website
			Annex I	Non-Annex I	
AVOID programme, (UK Met Office, project lead)	*Are the emission pledges in the Copenhagen Accord compatible with a global aspiration to avoid more than 2°C of global warming?*	Mar 2010	Yes	Yes	http://ensembles-eu.metoffice.com/avoid/
Climate Action Tracker (Ecofys, Climate Analytics, & PIK)	Climate Action Tracker website	Aug 2010	Yes	Yes	www.climateactiontracker.org
Climate Interactive (C-ROADS)	Climate Scoreboard website	Aug 2010	Yes	Yes	www.climateinteractive.org/scoreboard
Climate Strategies	*Analytic Support for Target-based Negotiations (paper 5)*	May 2010	Yes	China & India	http://www.climatestrategies.org/our-reports/category/59.html
Fondazione Eni Enrico Mattei (FEEM)	*Beyond the Copenhagen Pledges: Realistic Climate Policy in a Fragmented World*	Oct 2010	Yes	Yes	http://www.feem.it/
IIASA (GAINS model)	*Analysis of the proposals for GHG reductions in 2020 made by UNFCCC Annex I Parties: Implications of the economic crisis*	Nov 2009 (data as at Apr 2010)	Yes	No	http://gains.iiasa.ac.at/index.php/gains-annex-1
Grantham Research Institute, London School of Economics & UNEP	*What do the Appendices to the Copenhagen Accord tell us about global greenhouse gas emissions and the prospects for avoiding a rise in global average temperature of more than 2°C?*	Mar 2010	Yes	Yes	http://www2.lse.ac.uk/GranthamInstitute/publications/Policy/docs/PPCOPAccordSternTaylorMarch10.pdf
OECD	*Costs and effectiveness of the Copenhagen pledges: Assessing global greenhouse gas emissions targets and actions for 2020*	Jun 2010	Yes	Yes	www.oecd.org/env/cc/econ
PBL Netherlands Environmental Assessment Agency	*Evaluation of the Copenhagen Accord: Chances and risks for the 2°C climate goal*	May 2010	Yes	Yes	http://www.pbl.nl/en/
Peterson Institute for International Economics	*Evaluating Copenhagen: Does the Accord Meet the Challenge?*	Feb 2010	Yes	Yes	http://www.piie.com/publications/interstitial.cfm?ResearchID=1508
Project Catalyst (Climate Works Foundation)	*Taking Stock: the emissions levels implied by the pledges to the Copenhagen Accord*	Feb 2010 (data as at Sept 2010)	Yes	Yes	www.project-catalyst.info
UNEP Risoe centre	Climate Pledges website	Data as at Sept 2010	Yes	Yes	http://www.unep.org/climatepledges/
WRI	*Comparability of Annex I Emission Reduction Pledges*	Feb 2010	Yes	No	http://www.wri.org/publication/comparability-of-annexi-emission-reduction-pledges

The Emissions Gap Report included authors from 12 of the 13 groups listed above. The author from the remaining organisation was involved as a reviewer and was consulted on the analysis.

Other studies have also been published on this topic. These include the EU Expert Group on Science Information Document, *Scientific Perspectives after Copenhagen,* (October 2010), an analysis by Stockholm Environment Institute (SEI) and Third World Network, presented at the UNFCCC meeting in Bonn (August 2010), and a World Wildlife Fund (WWF) report, *Plugging the Gap: an easy guide to a safe climate future,* (August 2010). The EU paper also reviews studies that have looked at the Copenhagen Accord pledges. Its findings are broadly similar to those of this report. The SEI analysis assessed the pledges of Annex I countries and how their emissions impact can be affected by various accounting rules. Many of the same studies reviewed in that analysis have been reviewed in The Emissions Gap Report. The WWF paper reviews findings from Rogelj et al. (2010), which uses a similar dataset to the Climate Action Tracker (which is included in The Emissions Gap Report set), and assess uncertainties which could increase or decrease the size of the 'gap' in 2020.

2. ADJUSTMENTS MADE TO MAKE STUDIES COMPARABLE

As explained in Chapter 3, differences across the modelling groups' approaches to calculating the impact of the pledges means that a straightforward comparison of groups' findings is not possible. Three important adjustments were made to modelling groups' findings to ensure a consistent comparison across groups.

i) Applied consistent classification of country pledges

ii) Completed data sets with missing country/sector emissions

iii) Harmonised emissions data

i) Applied consistent classification of country pledges

The classification of particular country pledges as either 'low' or 'high' ambition was not consistent across the 13 studies. For example, some groups classified Brazil's pledge to reduce emissions by approximately 36 to 39% below business-as-usual by 2020 as a 'low ambition' pledge of a 36% reduction and another 'high ambition' pledge of 39% reduction, whilst others assumed the 36-39% to be an uncertainty range on a 'low ambition' or 'unconditional' pledge. Another prominent example is that of the United States where some groups modelled the 17% on 2005 pledge as a 'low ambition' pledge, whilst others modelled it as a 'high ambition' pledge with a business-as-usual emissions trajectory assumed for the low case. This makes simple comparisons across studies' 'low' and 'high' estimates confusing and uninformative. Such comparisons also blur the part of the range in results that reflects deliberate policy-choices of countries and that which reflects different modelling assumptions (e.g., on business-as-usual trajectories).

To overcome this problem we have applied consistent assumptions about whether a pledge is deemed to be 'unconditional' (i.e. one that countries will do regardless of the actions of others) or 'conditional' on the actions of others. Pledges can be conditional on, inter alia, the requirement of ambitious action from other countries, the finalisation of a global agreement to tackle climate change, the provision of finance (or other types of support), or, in the case of the United States, the passing of domestic legislation. By applying consistent assumptions on the conditionality of pledges we intend to clearly separate out the range that is driven by policy-choice (captured in the four different pledge cases presented in Chapter 3) from the range driven by different modelling assumptions of groups (captured in the range of findings within each pledge case).

Tables 2 and 3 show how we have classified the different pledges analysed by the 13 studies. Countries not included in Tables 2 and 3 were assumed by modelling groups to follow their business-as-usual trajectories.

It should be noted that it is not always clear from country submissions or announcements whether a pledge is conditional or not. This makes the classification of pledges difficult. The author team has therefore sometimes had to make judgements, based on discussions with in-country analysts, as to whether certain pledges should be classified as conditional or not. We would welcome further information from countries to help clarify this.

Table 2: Classification of Annex I country pledges (unconditional vs. conditional) as used in The Emissions Gap Report analysis

Country	Unconditional pledge	Conditional pledge
Australia[1]	Reduce emissions by 5% below 2000 level by 2020	Reduce emissions by 25% below 2000 level by 2020
Belarus	Reduce emissions by 5% below 1990 level by 2020	Reduce emissions by 10% below 1990 level by 2020
Canada	No unconditional pledge, business-as-usual emissions growth assumed	Reduce emissions by 17% below 2005 level by 2020
Croatia	Reduce emissions by 5% below 1990 level by 2020	No additional conditional pledge
EU27	Reduce emissions by 20% below 1990 level by 2020	Reduce emissions by 30% below 1990 level by 2020 while allowing for LULUCF accounting
Iceland	Reduce emissions by 15% below 1990 level by 2020	Reduce emissions by 30% below 1990 level by 2020
Japan	No unconditional pledge, business-as-usual emissions growth assumed	Reduce emissions by 25% below 1990 level by 2020
Kazakhstan	Reduce emissions by 15% below 1992 level by 2020	No additional conditional pledge
Liechtenstein	Mirrors the EU pledge	Mirrors the EU pledge
Monaco	Mirrors the EU pledge	Mirrors the EU pledge
New Zealand	Reduce emissions by 10% below 1990 level by 2020	Reduce emissions by 20% below 1990 level by 2020
Norway	Reduce emissions by 30% below 1990 level by 2020	Reduce emissions by 40% below 1990 level by 2020
Russian Federation	Reduce emissions by 15% below 1990 level by 2020	Reduce emissions by 25% below 1990 level by 2020
Switzerland	Mirrors the EU pledge	Mirrors the EU pledge
Turkey	Business-as-usual emissions growth assumed	No additional conditional pledge
Ukraine	Reduce emissions by 20% below 1990 level by 2020	No additional conditional pledge
United States of America[2]	No unconditional pledge, business-as-usual emissions growth assumed	Reduce emissions by 17% below 2005 level by 2020

1 – Note that some modelling groups included deforestation emissions in the base year for Australia, in accordance with article 3.7 (second sentence).

2 – One modelling group (Project Catalyst) has modelled the impacts of domestic regulation in the US (e.g., EPA regulation) and that is included as the unilateral pledge for that modelling group.

Table 3: Classification of non-Annex I country pledges (unconditional vs. conditional) as used in The Emissions Gap Report analysis

Country	Unconditional pledge	Conditional pledge
Brazil	Reduce emissions by 36% to 39% below business-as-usual by 2020	No additional conditional pledge
China	Lower carbon dioxide emissions per unit of GDP by 40-45% by 2020 compared to the 2005 level; increase share of non-fossil fuels in primary energy consumption to around 15% by 2020; increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from 2005 levels	No additional conditional pledge
India	Reduce emission intensity of GDP by 20 to 25% by 2020 in comparison to the 2005 level	No additional conditional pledge
Indonesia[1]	Reduce emissions by 26% on business-as-usual by 2020	Reduce emissions by 41% on business-as-usual by 2020, based on pre-Copenhagen announcements
Mexico	Emissions reductions through to 2012 in line with Special Climate Change Program. Estimated to deliver 51MtCO_2e reduction on business-as-usual in 2020	Reduce emissions by 30% below business-as-usual in 2020
South Africa	None, assumed to follow business-as-usual trajectory	Reduce emissions by 34% below business-as-usual by 2020
Korea (South)	Reduce emissions by 30% below business-as-usual in 2020	No additional conditional pledge
Costa Rica[2]	None, assumed to follow business-as-usual trajectory	Reduce net emissions to zero by 2020
Israel[2]	Reduce emissions by 20% on business-as-usual by 2020	No additional conditional pledge
Macedonia[2]	Reduction of 20% below business-as-usual by 2020	Reduction of 30% below business-as-usual by 2020
Maldives[2]	None, assumed to follow business-as-usual trajectory	Reduce net emissions to zero by 2020
Marshall Islands[2]	Reduce emissions by 40% below 2009 levels by 2020	No additional conditional pledge
Moldova[2]	Reduce emissions by 25% below 1990 by 2020	No additional conditional pledge
Montenegro[2]	Reduce emissions by 20% below 1990 by 2020	No additional conditional pledge
Papua New Guinea[2]	Reduce emissions by 50% below business-as-usual by 2030	No additional conditional pledge
Peru[2]	Reduce emissions by 50% below business-as-usual by 2020	No additional conditional pledge
Singapore[2]	None, assumed to follow business-as-usual trajectory	Reduce emissions by 16% below business-as-usual by 2020
Other countries	Other countries were not specifically modelled by the modelling groups	

1 – Note that the official pledge for Indonesia is for a 26% emissions reduction on business-as-usual by 2020. However, almost all of the modelling groups had also modelled a 41% reduction, based on earlier announcements by the President of that country. As a result it was included in this assessment.

2 – Not all modelling groups specifically modelled these countries' pledges. In the case that they were not modelled, studies assumed business-as-usual emissions growth for those countries.

ii) Completed data sets with missing country/sector emissions

Not all of the 13 studies attempted to estimate a global emissions to compare with emissions pathways consistent with particular temperature increases (as analysed in Chapter 2 of The Emissions Gap Report). Some, for example, only looked at the mitigation pledges of the Annex I countries, whilst others looked at both Annex I and non-Annex I countries but did not include emissions from international transport emissions. A number of adjustments were therefore made to ensure a consistent comparison across studies.

For those studies that only looked at Annex I emissions it was found that, in some instances, studies focused only on the largest countries and did not report emissions for smaller countries. To ensure a consistent comparison across studies we have therefore added the median estimate of the other modelling groups' findings for any missing countries[1].

For the studies that estimated global emissions but did not include estimates for international transport emissions, we have added the median estimate of other modelling groups for those emissions (2020 emissions of 1,308 $MtCO_2e$)[2]. It should be noted that some modelling groups included international transport emissions in the individual country emissions data, rather than splitting them out separately. This can explain part of the range in emission estimates.

It must also be noted that one study (OECD) did not include LULUCF emissions in its analysis. Its findings are therefore included in the Annex I analysis (which focuses on emissions excluding the LULUCF sector) and at a country-specific level (presented in Appendix 2), but do not inform the global analysis that is the focus of The Emissions Gap Report.

iii) Harmonised emissions data

In order to ensure a consistent comparison between the results of the emission pathway analysis (findings of Chapter 2) regarding what emission levels are consistent with particular temperature increases, the emissions data from the pledge analysis need to be harmonised.

The emission pathway analysis involved the collection of 223 emission pathways prepared by different modelling groups. These pathways were harmonised to consistent emission levels in 2005 (of 45 $GtCO_2e$) to allow a comparison across those pathways.

For the pledge analysis, therefore, we have also harmonised the emissions data used in the 13 studies around consistent 2005 levels of 45 $GtCO_2e$. The harmonisation included an absolute adjustment for each study's data set (equal to that required to bring 2005 emissions into line) that remained the same for all years. An absolute adjustment was made since it was thought that some studies may have consistently missed or double-counted emissions equal to the size of that adjustment[3].

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[1] This was particularly relevant for Climate Strategies (2020 business as usual adjustment of 1,598 $MtCO_2e$), IIASA (289 $MtCO_2e$) and WRI (843 $MtCO_2e$) which had not analysed the emissions of all Annex I countries.

[2] This was relevant for Climate Interactive and Peterson Institute for International Economics (with respect to 2020 emission estimates).

[3] A sensitivity analysis was performed to see how harmonising the data using a common *scale factor* over time would affect the results (rather than absolute adjustment). There was not found to be a significant difference between the two approaches

The results of the harmonisation led to changes of between –0.3 $GtCO_2e$ and +1.0 $GtCO_2e$ in the median estimates of the 2020 emission levels reported in the business-as-usual and four pledge cases. However, the results for individual groups saw a larger range of adjustments (ranging from –2.8 $GtCO_2e$ to +1.5 $GtCO_2e$).

3. CONSTRUCTION OF THE FOUR PLEDGE CASES

Chapter 3 of The Emissions Gap Report presents four different pledge cases, which aim to reflect a range of possible outcomes in 2020 as a result of the climate change negotiations. The four pledge cases are combinations of the following two interdependent factors.

Unconditional versus conditional pledges: As explained in Section 2 above we have made common assumptions as to whether a country's pledge is deemed conditional or not and applied that to all modelling groups' estimates. We have then summed the estimates to create a global total, which also includes international transport emissions. Note that where a country does not have an unconditional pledge (e.g. Canada, Japan, US and South Africa) the business-as-usual estimate for that country is assumed for the unconditional case.

"Lenient" versus "strict" rules: LULUCF accounting and the rules surrounding the use of surplus emissions units are two unresolved issues in the negotiations that can have a significant impact on the emission levels resulting from the pledges. These issues have the potential to displace mitigation action in other sectors and thus lead to higher global emissions in 2020. The two "strict" rules pledge cases include no adjustment for these – i.e. they assume their net impact is zero on the level of emissions. The two "lenient" rules pledge cases do include an adjustment for these accounting rules, which aim to reflect their maximum potential impact on emissions. The adjustments made are based on a review of existing literature.

Specifically, for LULUCF accounting we have applied a maximum expected impact of 4.2 per cent of 1990 Annex I emissions annually in 2020 (approximately 0.8 $GtCO_2e$). We assumed that credits of this magnitude would be given for carbon removals from existing forests or other sinks that would have occurred without further policy interventions.

For surplus emissions units, we have made two adjustments: the first for the expected impact of surplus emissions units "carried over" or "banked" from the first commitment period and used in the next. We have applied the maximum expected impact of 1.3 $GtCO_2e$ on 2020 emissions. The second adjustment is to account for any new surplus units that are expected to be generated in the next commitment period as a result of the pledges from Russia, Ukraine and Belarus when groups assess that these goals remaining above business-as-usual and hence creating a further surplus. The expected impact of these depends on the modelling assumptions of each group and ranges up to 1 $GtCO_2e$ in 2020.

Note that for the "unconditional pledge, lenient rules" case we have, for some studies, had to constrain emissions from Annex I countries to their business-as-usual levels. This is because, in this pledge case, we assume that a maximum amount of "lenient LULUCF credits"[4] and surplus emission units are available and this exceeds the demand for credits to reduce emissions below business-as-usual in the unconditional pledge case. Since in this case LULUCF credits and surplus emission units are displacing all mitigation in Annex I countries there is no plausible demand for further credits.

[4] Credits given for carbon removals from existing forests or other sinks that would have occurred without policy intervention.

4. DETAILED RESULTS

Tables 4, 5 and 6 on the following pages give an overview of the different studies‘ results, at a global, Annex I and Non-Annex I level respectively.

The tables include the historic emissions levels and 2020 projections (for business-as-usual and the four pledge cases) for the various groups, after having been adjusted in line with Sections 2 and 3 above. Note that only the global results were harmonised to consistent 2005 emission levels (as explained in Section 2iii) since these results are the only ones compared directly with the emission pathways from Chapter 2. The Annex I and non-Annex I specific results remain unharmonised.

The final two columns of the tables show the original results of the studies for the “low” and the “high” ambition cases that were reported in the original studies. This is provided for comparison purposes.

Table 4: Global harmonised results, by modelling group, $GtCO_2e$, including LULUCF emissions (unless stated)

$GtCO_2e$	Historic emissions		2020 emissions projections					Original results	
	1990 [1]	2005	Business-as-usual	(1) Unconditional pledge, Lenient rules	(2) Unconditional pledge, Strict rules	(3) Conditional pledge, Lenient rules	(4) Conditional pledge, Strict rules	"Low ambition" case	"High ambition" case
AVOID	37.7	45.0	59.6	55.5	53.5	51.7	49.6	49.5	48.1
Climate Action Tracker	-	45.0	61.6	60.4	59.4	57.2	54.9	56.0	52.0 [2]
Climate Interactive	37.9	45.0	60.4	59.7	57.5	53.6	51.4	55.6	52.6
FEEM	37.7	45.0	53.2	51.4	49.7	47.7	45.2	47.8	46.2
Grantham	-	45.0	55.0	51.7	50.3	48.7	46.6	49.2	48.2
PBL	-	45.0	55.5	52.8	51.6	50.8	48.1	50.1	48.7
Peterson Institute	33.7	45.0	56.0	53.7	53.1	52.7	50.5	51.5	49.7
Project Catalyst	-	45.0	55.1	53.0	51.9	51.4	49.0	50.7	47.8 [2]
UNEP Risoe	-	45.0	52.8	51.8	50.2	48.9	46.8	49.3	48.4
OECD	-	-	-	-	-	-	-	46.2 [3]	44.2 [3]
Global statistics									
n	*4*	*9*	*9*	*9*	*9*	*9*	*9*	*10*	*10*
High	37.9	45.0	61.6	60.4	59.4	57.2	54.9	-	-
80th	37.8	45.0	59.9	57.1	55.1	53.0	50.9	-	-
Median	37.7	45.0	55.5	53.0	51.9	51.4	49.0	-	-
20th	36.1	45.0	54.3	51.8	50.3	48.8	46.7	-	-
Low	33.7	45.0	52.8	51.4	49.7	47.7	45.2	-	-

All emissions data refer to $GtCO_2e$ (gigatonnes or billion tonnes of carbon dioxide equivalent). This is the global warming potential-weighted sum of the six Kyoto greenhouse gas emissions -- CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, including LULUCF CO_2 emissions.

n = number of studies; High = maximum of full range; Low = minimum of full range; 20th-80th = 20th and 80th percentile values of the range

The historic emissions data and 2020 emissions projections have been adjusted as explained in Sections 2 and 3 of this appendix. Hence the emissions data reported here will not exactly match that reported in the original studies of those groups. The original data from the studies are reported in the final two (yellow) columns for comparison.

Note that, in the case that an uncertainty range was calculated for any pledge case, we have presented the mid-point of that range in this table.

1 – 1990 emissions were only collected from 4 of the modelling groups, due to time constraints

2 – The original high ambition cases from the Climate Action Tracker and Project Catalyst publications include the effect of ambitious national plans of China and India which have been excluded from the four pledge cases. This explains some of the difference between the results for pledge case 4 and the original 'high ambition' case.

3 – Data from OECD excludes LULUCF emissions and is therefore treated separately from the other studies

Table 5: Annex I results, by modelling group, $GtCO_2e$, excluding LULUCF emissions (unless stated)

Annex I emissions

$GtCO_2e$	Historic emissions		2020 emissions projections					Original results	
	1990	2005	Business-as-usual	(1) Unconditional pledge, Lenient rules	(2) Unconditional pledge, Strict rules	(3) Conditional pledge, Lenient rules	(4) Conditional pledge, Strict rules	"Low ambition" case	"High ambition" case
AVOID	18,7	17,9	22,7	21,4	19,3	17,8	15,7	16,1	15,6
Climate Action Tracker	19,0	18,2	20,3	20,3	19,2	18,5	16,1	17,4	16,4
Climate Interactive	20,6	20,5	25,6	25,1	22,9	19,6	17,4	19,4	17,4
Climate Strategies	19,0	18,6	- [1]	- [1]	- [1]	18,1	16,0	n/a [2]	n/a [2]
FEEM	19,1	18,2	21,2	21,2	19,4	18,1	15,6	17.1 [3]	16.0 [3]
GAINS	19,0	18,3	18,2	18,2	17,7	18,1	15,6	16,7	15,7
Grantham	18,7	17,9	20,9	20,9	19,5	19,1	17,0	16,7	15,7
OECD	19,7	18,9	20,2	20,2	19,0	18,4	16,3	17,0	16,4
PBL	19,0	18,2	19,3	19,3	18,1	18,0	15,3	16,5	15,5
Peterson Institute	20,6	19,9	19,7	19,7	19,1	19,1	16,9	17.9 [3]	17.1 [3]
Project Catalyst	17,2	16,9	18,3	18,3	17,2	17,6	15,3	17,0	15,3
UNEP Risoe	19,2	-	20,4	20,4	18,8	18,2	16,1	16,8	15,8
WRI	19,0	18,4	- [1]	- [1]	- [1]	18,1	16,0	16,1	15,1
Annex I statistics									
n	*13*	*12*	*11*	*11*	*11*	*13*	*13*	*12*	*12*
High	20,6	20,5	25,6	25,1	22,9	19,6	17,4	-	-
80th	19,5	18,8	21,2	21,2	19,4	18,8	16,7	-	-
Median	19,0	18,3	20,3	20,3	19,1	18,1	16,0	-	-
20th	18,8	18,0	19,3	19,3	18,1	18,0	15,6	-	-
Low	17,2	16,9	18,2	18,2	17,2	17,6	15,3	-	-

All emissions data refer to G tCO_2e (gigatonnes or billion tonnes of carbon dioxide equivalent). This is the global warming potential-weighted sum of the six Kyoto greenhouse gas emissions -- CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, including LULUCF CO_2 emissions.

n = number of studies; High = maximum of full range; Low = minimum of full range; 20th-80th = 20th and 80th percentile values of the range

Note that the emissions data in this table have been adjusted as explained in Sections 2i and 2ii above, but have not been harmonized to consistent historic emission levels (as explained in section 2iii) as this was only required at a global level. The original data from the studies are reported in the final two (yellow) columns for comparison.

Note that, in the case that an uncertainty range was calculated for any pledge case, we have presented the mid-point of that range in this table.

1 – No results are provided for the business-as-usual and pledge cases (1) and (2) for Climate Strategies and WRI as these entries require the use of business-as-usual projections, which were not calculated in those groups' studies.

2 – The Climate Strategies study looked only at the major emitting countries and did not report results for total Annex I emissions. The data used in the Emissions Gap report for historic emissions and 2020 projections have been adjusted to correct for the missing Annex I countries, as explained in Section 2.

3 – Note that the original data reported by FEEM and the Peterson Institute for total Annex I emissions include emissions from LULUCF.

Table 6: Non-Annex I results, by modelling group, $GtCO_2e$, including LULUCF emissions (unless stated)

$GtCO_2e$	Historic emissions		2020 emissions projections					Original results	
	1990	2005	Business-as-usual	(1) Unconditional pledge, Lenient rules	(2) Unconditional pledge, Strict rules	(3) Conditional pledge, Lenient rules	(4) Conditional pledge, Strict rules	"Low ambition" case	"High ambition" case
AVOID	16.2	24.0	34.1	n/a	31.4	n/a	31.2	31.3	30.6
Climate Action Tracker	-	22.5	37.7	n/a	35.1	n/a	34.2	36.0	34.2
FEEM	18.4	26.3	31.1	n/a	29.4	n/a	28.8	29.3	28.7
Grantham	-	-	33.9	n/a	30.5	n/a	29.6	30.6	30.6
PBL	-	22.2	35.9	n/a	33.2	n/a	32.6	33.3	32.6
Peterson Institute	13.4	24.7	35.7	n/a	33.4	n/a	33.0	33.6	32.6
Project Catalyst	-	-	36.7	n/a	34.5	n/a	33.8	32.6	31.4 [1]
UNEP Risoe	-	-	33.5	n/a	31.2	n/a	30.5	31.7	31.6
Climate Interactive[2]	13.4	20.8	31.4	n/a	31.5	n/a	31.0	31.6	30.9
OECD [2]	-	20.3	31.4	n/a	28.5	n/a	28.5	29.1	27.8
Non-Annex I statistics[3]									
n	*3*	*5*	*8*	*n/a*	*8*	*n/a*	*8*	*10*	*10*
High	18.4	26.3	37.7	n/a	35.1	n/a	34.2	-	-
80th	17.5	25.0	36.4	n/a	34.1	n/a	33.5	-	-
Median	16.2	24.0	34.9	n/a	32.3	n/a	31.9	-	-
20th	14.5	22.4	33.7	n/a	30.8	n/a	30.0	-	-
Low	13.4	22.2	31.1	n/a	29.4	n/a	28.8	-	-

All emissions data refer to $GtCO_2e$ (gigatonnes or billion tonnes of carbon dioxide equivalent). This is the global warming potential-weighted sum of the six Kyoto greenhouse gas emissions -- CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, including LULUCF CO_2 emissions.

n = number of studies; High = maximum of full range; Low = minimum of full range; 20th-80th = 20th and 80th percentile values of the range

Note that the emissions data in this table have been adjusted as explained in Sections 2i and 2ii above, but have not been harmonized to consistent historic emission levels (as explained in section 2iii) as this was only required at a global level. The original data from the studies are reported in the final two (yellow) columns for comparison.

Note that, in the case that an uncertainty range was calculated for any pledge case, we have presented the mid-point of that range in this table.

1 – The original high ambition case from Project Catalyst includes the effect of ambitious national plans of China and India which have been excluded from the four pledge cases. This explains some of the difference between the results for pledge case 4 and the original 'high ambition' case.

2 – Note that non-Annex I data from Climate Interactive and OECD are excluding LULUCF emissions and so are reported separately here.

3 – Statistics in the bottom half of the table relate to the 8 studies that included LULUCF emissions in their analysis.