

Copenhagen Accord By-the-Numbers

In our previous paper, [Copenhagen Accord and Discord: COP-15 and the Many Roads to Mexico](#), we laid out some of the policy and process issues surrounding the [Copenhagen Accord](#). In this paper, we take a look at what impact the Accord could have on global emissions of greenhouse gases (GHGs).

While not formally adopted by the Framework Convention on Climate Change (UNFCCC), the Accord was cast as an “operational” document. Parties to the UNFCCC were encouraged to “associate” themselves with the Accord and to pledge, at the highest political level, GHG emission reductions or actions that could lead to reductions. The document contains two appendices for countries to detail these pledges: one for Annex I Parties to record their quantified emissions reduction targets for 2020 and base years and another for Non-Annex I Parties to record nationally appropriate mitigation actions (NAMAs). Parties also were given the option to associate themselves with the Accord without signing up for action in the appendices.

The deadline for countries to submit to the UNFCCC secretariat actions for listing in the appendices was January 31, 2010. To date, almost all Annex I Parties¹ and 29 Non-

¹ The European Union submitted a collective goal on behalf of its individual Member States. Switzerland,

Annex I Parties have filed pledges of some sort, and these have been posted on the UNFCCC website (see here for [Annex I Parties](#) and here for [Non-Annex I Parties](#)).² Thirty-six countries also have provided “[additional information](#)” concerning the Accord.

This brief analysis provides a look at the emission reductions that could be expected from the pledges registered thus far provided they are implemented. This kind of analysis would be tricky under any circumstances, but because the Accord is binding politically, but not legally, the task is trickier still. Nevertheless, employing some basic assumptions we can draw some broad conclusions about the impact the Accord could have on global emissions out to 2020. A discussion of the assumptions we used and other data issues can be found in the Appendix to this paper.

Pledges

A list of pledges is provided in table 1. Most quantitative pledges are in terms of a percent reduction, either in terms of

Turkey, and the Ukraine have announced goals but have not submitted them to the Accord.

² Annex I Parties include Organization for Economic Co-operation and Development members in 1992, Malta, and countries with “economies in transition” (i.e., Russia and the Baltic, Central, and Eastern Europe states). All other Parties—almost all developing countries—are considered Non-Annex I.

emissions or emissions intensity,³ from a specified base year using either historic data (1990, 1992, 2000, 2005) or a 2020 “business as usual” (BAU) projection.

Many developed countries along with China and India also have provided a range of targets. For developed countries, the more ambitious goals typically are contingent on a binding international agreement that has comparable targets for other developed countries.⁴ In many cases, the target range is very broad. Therefore, we used these ranges to calculate minimum and maximum emission reduction figures.

We should also note here that during the run-up to the Copenhagen talks, some Annex I Parties announced domestic emission reduction goals but have yet to submit these goals to the Copenhagen Accord’s appendix.⁵ It is likely, however, that at some point these countries will submit these, so we have included them in our analysis.

Whereas most Annex I countries put their goals in terms of a historical base year for which data are readily available, most Non-Annex I major economies set their goals in terms of a reduction in emissions below a 2020 BAU baseline. The exceptions were China and India, both of which were clear in setting out emissions intensity goals with a 2005 baseline. In many other cases, it is difficult to discern exactly what the pledges mean, with few countries providing much in the way of specifics.

³ Emissions intensity is a measure of the amount of emissions per unit of economic output.

⁴ Australia and the European Union, for example.

⁵ These countries are Switzerland, Turkey, and the Ukraine.

We have assumed that the pledges for Brazil, Indonesia, Korea, Mexico, and South Africa represent actual reductions in emissions, not emissions intensity, below a 2020 BAU baseline. In some cases, such as Brazil, we were able to find a fair amount of detailed information on estimated emissions reductions by sector and BAU projections, but in most cases, such detail was lacking.

The pledges also are largely silent on the issue of emissions from Land Use, Land Use Change and Forestry (LULUCF), which can be quite large.⁶ Therefore, we calculated two sets of emissions reductions estimates and baselines: “gross” GHG emissions we define as excluding emissions from LULUCF; “net” GHG emissions we define as including emissions from LULUCF.

Results

Results of the analysis are provided in tables 2, 3, and 4. Tables 2 and 3 provide historical data for 1990 and 2005, estimated 2020 emissions based on minimum and maximum emissions reduction pledges, and 2020 BAU estimates for different groupings of Annex I and Non-Annex I countries. The data in table 2 represent gross emissions, while the data in table 3 represent net emissions. Table 4 provides data on the minimum and maximum percent change in emissions in 2020 compared to 1990, 2005, and 2020 BAU baselines.

The following discussion focuses on emissions from: (1) from Annex I countries

⁶ The Intergovernmental Panel on Climate Change’s 4th Assessment Report reported that emissions from LULLUCF account for about 17% of total anthropogenic GHG emissions in 2004.

associating themselves with the Accord; (2) Non-Annex I major economies associating themselves with the Accord;⁷ (3) Major Economies Forum on Energy and Climate (MEF) countries;⁸ and (4) all countries. The tables also provide the results for other country groupings.

Annex I Countries Associated with the Copenhagen Accord: If Annex I Parties that have associated themselves with the Accord are able to meet their pledges, gross GHG emissions for this group would be at a minimum 12% lower and net emissions 13% lower than in 1990. Many Annex I countries have offered to go further provided there is an international agreement that includes comparable emissions reduction targets from other Annex I Parties. Under this scenario, total gross and net GHG emissions could be lower by as much as 18% and 19%, respectively. (The addition of the other Annex I Parties would lower the expected emissions reductions by about a percentage point at the minimum and maximum ends of the range.)

By 2020, gross GHG emissions from Annex I countries would fall to between 14.4 and 15.4 gigatons⁹ in 2020, while net emissions would fall to between 13.2 and 14.1 gigatons in 2020. (The addition of other Annex I Parties, particularly Turkey and the Ukraine, would push each of these 2020 emission figures higher by well over 1 gigaton.)

⁷ Brazil, China, India, Indonesia, Korea, Mexico, and South Africa.

⁸ Australia, Brazil, Canada, China, EU, India, Indonesia, Japan, Korea, Mexico, Russia, South Africa, and U.S.

⁹ A gigaton equals one billion metric tons.

Of note, Russia is the only Annex I country whose emissions would rise even if it reached its targets. Shortly after the collapse of the Soviet Union, Russian emissions of GHGs also collapsed as inefficient factories and plants were shuttered. Russia's gross emissions in 2005 were roughly one-third below their 1990 level. Therefore, its 2020 goal actually results in an *increase* in gross emissions of 18% to 33% above the 2005 level.¹⁰ Indeed, we estimate that Russia's most ambitious goal would still lead to GHG emissions *above* the estimated 2020 BAU level.

Achieving the Annex I pledges implies collective emission reductions and avoidances¹¹ from 2007, the most recent year for which we have complete Annex I data, to 2020 of about 2.8 to 3.8 gigatons CO₂ eq. excluding LULUCF and 2.2 gigatons to 3.2 gigatons including LULUCF.

However, as noted above, the Russian goal actually results in a not inconsequential increase in its emissions from 2005 to 2020, and this acts to offset the actual amount of emissions reductions needed from the other associated Annex I countries to meet their goals.

When Russian emissions are not included, emission reductions and avoidances from

¹⁰ Russia's *net* emissions (including LULUCF) in 2005 were about 45% below their 1990 level. Therefore, its 2020 goal represents an increase in net emissions of 26% to 43% above the 2005 level.

¹¹ Avoidances are reductions achieved against an expected rise in emissions. Many Annex I countries—Australia, Canada, and the U.S., for example—anticipate that absent additional new policies GHG emissions will increase between now and 2020, and these have to be taken into account when calculating the quantity of reductions that might be needed to achieve a specific goal.

Annex I countries associating themselves with the Accord would have to amount to on the order of 3.2 to 3.9 gigatons CO₂ eq. excluding LULUCF and 3.0 to 3.6 gigatons including LULUCF. These amounts are quite large, equivalent to between 60% and 80% of total EU GHG emissions in 2007. The global financial crisis and economic recession have resulted in lower emissions since 2007, so the reductions and avoidances needed from 2010 to 2020 would be somewhat less than the figures provided here, but they would be large nevertheless.

Non-Annex I Major Economies Associated with Accord: Even if all Non-Annex I major economies make good on their pledges, emissions from this group would continue to rise rapidly, albeit at a somewhat slower pace, out to 2020.

In the case of India, it is not clear that its pledge even constitutes a relative reduction. Our analysis suggests that India's 20% to 25% intensity improvement goal results in an emissions trajectory out to 2020 that is above, not below, its BAU baseline, but this could be explained by drastically different expectations of future emissions and economic growth from India and the IEA (which is the primary data source we used for our estimate). And while China's 40% to 45% intensity improvement goal appears to be a clear deviation below its BAU baseline intensity in 2020, it does not appear to be all that much different from what it achieved over the previous 15 years, from 1990 to 2005.

While reducing emissions from the energy sector is the focus of many NAMAs, reducing emissions from deforestation and forest degradation—REDD—is a key

component of the national plans proffered by Brazil and Indonesia. Both countries are large sources of carbon dioxide emissions from LULUCF, chiefly from deforestation. REDD also contributes significantly to China's national plan, as well.

Based on the pledges submitted, we estimate that gross GHG emissions from Non-Annex I major economies would increase from 14.4 gigatons CO₂ eq. in 2005 to a range of roughly 20.2 to 21.5 gigatons in 2020. When LULUCF is taken into account, net emissions in 2020 reach 21.3 to 22.8 gigatons CO₂ eq.

In both cases, emissions in 2020 are roughly 130% to 150% higher than in 1990, but about 6% to 17% lower than they would be expected to be in 2020 if the reductions described in their submissions were not achieved. This would result in avoided gross emissions of 1.3 to 2.6 gigatons CO₂ eq. and avoided net emissions of 2.7 to 4.2 gigatons.

Major Economies Forum Countries: In 2005, the countries that make up the MEF accounted for two-thirds to three-quarters of global net and gross GHG emissions, respectively. In 1990, these same countries accounted for about the same portion of global emissions. The major difference is that since 1990 the portion of global emissions attributed to developing countries has grown (from about 25% to 35% for both gross and net emissions) while the portion attributed to developed countries has shrunk (from about 50% to 40% for gross and 42% to 31% for net emissions). This trend is expected to continue into the future.

In light of the pledges made by MEF countries, we estimate that overall emissions from this group would climb about 34% to 46% above its 1990 level—to anywhere from 34.3 to 36.8 gigatons CO₂ eq.—with large increases from developing countries more than offsetting decreases from developed countries. Total major economy emissions also would be higher than in 2005, but compared to a 2020 BAU estimate, they would be roughly 10% to 18% lower.

Overall, pledged actions would lead to a small (about a 5 percentage point) decline in the share of total global emissions from this group in 2020. Developing country emissions would account for about 40% of the global total and developed country emissions about 20% to 30%.

Global Emissions: The story for global emissions is similar in outline to the story for MEF emissions. Even if all quantitative pledges are met, GHG emissions from developing countries would continue to climb rapidly and more than offset emissions cuts from developed countries. By 2020, we estimate that global gross GHG emissions would be between 49.7 and 52.0 gigatons CO₂ eq. and net emissions between 54.5 and 57.0 gigatons. At these levels, global GHG emissions would be somewhere in the region of 44% to 51% higher than they were in 1990.

Realization of the pledges, however, would reduce the rate emissions will increase such that by 2020, both global gross and net GHG emissions would be about 7% to 12% below where we estimate they would be in the absence of these pledges.

Conclusions

The Copenhagen Accord has prompted pledges from countries that together comprise a large portion of global GHG emissions. Many pledges are conditional, and these conditions go to some of the most contentious issues in the international negotiations. If the country submissions are any guide, these issues continue to occupy the minds of many countries, especially developing countries.¹² So even as we assess the impact the pledges on emissions, we recognize that these caveats could impact significantly how countries follow through on their pledges.

Setting aside these concerns, we expect that the submissions made by Annex I countries would lead to a 12% to 19% cut in emissions below the 1990 level over the next 10 years.

Based on the list of quantifiable NAMAs submitted—whose details often are difficult to discern—our analysis suggests that the growth in Non-Annex I country emissions would continue to rise, but at a slower pace. We estimate that in 2020, emissions from this group would fall roughly from 6% to 17% below a 2020 BAU baseline.

With most future emissions coming from developing countries, it is not surprising that global emissions also would continue to grow, but again at a slower rate than expected in the absence of these pledges. We estimate that by 2020, global emissions still would be considerably above the 1990 level, perhaps by as much as 50%.

¹² For more on these issues, see our report [The Prospects for Copenhagen](#).

Table 1. Annex I and Non-Annex I Quantified Emissions Reduction Pledges for 2020

Country/Region	2020 Target	Base Year
Annex I:		
Associated with Copenhagen Accord		
Australia	-5% up to -15% or -25%	2000
Belarus	-5% to -10%	1990
Canada	-17%	2005
Croatia	-5%	1990
European Union	-20% to -30%	1990
Iceland	-15% to -30%	1990
Japan	-25%	1990
Liechtenstein	-20%	1990
Monaco	-30%	1990
New Zealand	-10% to -20%	1990
Norway	-30% to -40%	1990
Russian Federation	-15% to -25%	1990
USA	-17%	2005
Not Associated with Copenhagen Accord		
Switzerland	-20% to -30%	1990
Turkey	-7% energy-related CO ₂	2020 BAU
Ukraine	-20%	1990
Non-Annex I:		
Major Economies Associated with Copenhagen Accord		
Brazil	-36.1% to -38.9%	2020 BAU
China	-40% to -45% emissions intensity	2005
India	-20% to -25% emissions intensity (excluding agriculture)	2005
Indonesia	-26% to -41%	2020 BAU
Korea, Republic of	-4%*	2005
Mexico	-30%	2020 BAU
South Africa	-34%	2020 BAU
Other Non-Annex I Associated with Copenhagen Accord		
Israel	-20%	2020 BAU
Kazakhstan	-15%	1992
Macedonia	Goal not quantified**	2020 BAU
Moldova	-25%	1990
Singapore	-16%	2020 BAU

* This goal was also characterized as 30% below 2020 BAU.

** We assumed that Macedonia will achieve emission reductions equal to its first or second mitigation scenarios, which are found in Macedonia's Climate Change Mitigation plan attached to its Copenhagen Accord [submission](#).

Table 2. Estimated Gross GHG Emissions in 2020, Historical Emissions, and Projected Business As Usual Emissions in 2020 (Excluding LULUCF)
(million metric tons CO₂ eq.)

Country/Region	2020 Emissions with:		1990 Baseline	2005 Baseline	2020 BAU Baseline
	Minimum Reduction	Maximum Reduction			
Annex I Associated					
Australia	470	371	416	525	727
Belarus	123	116	129	77	85
Canada	607	607	592	731	937
Croatia	30	30	31	30	34
European Union*	4,451	3,895	5,564	5,108	5,210
Iceland	3	2	4	3	3
Japan	952	952	1,270	1,358	1,170
Liechtenstein**	0	0	0	0	0
Monaco**	0	0	0	0	0
New Zealand	56	49	62	77	87
Norway	35	30	50	54	52
Russian Federation	2,821	2,489	3,319	2,118	2,410
USA	5,878	5,878	6,084	7,082	7,492
Annex I Associated Total	15,426	14,420	17,521	17,164	18,208
Annex I Not Associated					
Switzerland	42	37	53	54	48
Turkey	512	512	170	312	539
Ukraine	741	741	926	418	463
Annex I Total*	16,721	15,710	18,670	17,947	19,258
Non-Annex I Major Economies					
Brazil	2,180	2,100	1,200	1,860	2,480
China	12,450	11,590	3,910	7,530	12,880
India	4,290	4,080	1,580	2,390	3,650
Indonesia	860	680	620	860	1,320
Korea, Republic of	570	640	290	594	813
Mexico	575	575	515	695	820
South Africa	540	540	350	435	820
Major Economy Total	21,465	20,205	8,465	14,364	22,783
Other Non-Annex I					
Israel	87	87	40	70	109
Kazakhstan	190	190	230	210	220
Macedonia	17	15	12	10	21
Moldova	23	23	17	12	11
Singapore	76	76	31	55	90
Non-Annex I Making Pledges	21,858	20,596	8,795	14,722	23,234
Rest of World	13,400	13,400	6,900	10,200	13,400
World Total	51,979	49,706	34,365	42,869	55,892
All Major Economies	36,645	34,397	25,710	31,285	40,729

* Excludes emissions from Cyprus and Malta.

** Emissions for these countries are very small and so appear as "0" on this table.

Table 3. Estimated Net GHG Emissions in 2020, Historical Emissions, and Projected Business As Usual Emissions in 2020 (Including LULUCF)
(million metric tons CO₂ eq.)

Country/Region	2020 Emissions with:		1990 Baseline	2005 Baseline	2020 BAU Baseline
	Minimum Reduction	Maximum Reduction			
Annex I Associated					
Australia	384	303	454	596	775
Belarus	102	96	107	52	60
Canada	641	641	540	772	965
Croatia	26	26	27	23	27
European Union*	4,184	3,661	5,230	4,669	4,782
Iceland	4	3	5	5	5
Japan	897	897	1,195	1,272	1,080
Liechtenstein**	0	0	0	0	0
Monaco**	0	0	0	0	0
New Zealand	39	35	44	52	84
Norway	26	22	37	26	28
Russian Federation	2,856	2,520	3,360	1,998	2,040
USA	4,968	4,968	5,257	5,986	6,487
Annex I Associated Total	14,127	13,173	16,257	15,451	16,333
Annex I Not Associated					
Switzerland	40	35	50	55	48
Turkey	446	446	125	243	468
Ukraine	682	682	853	383	422
Annex I Total*	15,296	14,336	17,285	16,131	17,271
Non-Annex I Major Economies					
Brazil	2,590	2,520	2,010	2,810	3,570
China	12,050	11,190	3,500	7,530	12,880
India	4,290	4,080	1,580	2,390	3,650
Indonesia	2,230	1,780	780	2,300	3,010
Korea, Republic of	570	640	265	594	813
Mexico	575	575	655	735	820
South Africa	540	540	330	435	820
Major Economy Total	22,845	21,325	9,120	16,794	25,563
Other Non-Annex I					
Israel	87	87	40	70	109
Kazakhstan	190	190	230	210	220
Macedonia	17	15	12	10	21
Moldova	10	10	17	12	11
Singapore	76	76	31	55	90
Non-Annex I Making Pledges	23,225	21,703	9,450	17,152	26,014
Rest of World	18,500	18,500	11,100	15,100	18,500
World Total	57,021	54,539	37,835	48,383	61,785
All Major Economies	36,774	34,315	25,156	32,088	41,692

* Excludes emissions from Cyprus and Malta.

** Emissions for these countries are very small and so appear as "0" on this table.

**Table 4. Estimated Changes in Greenhouse Gas Emissions in 2020
for Minimum and Maximum Reduction Goals Compared to 1990, 2005 & 2020 BAU Baselines
(Percent)**

Country Grouping	Excluding LULUCF			Including LULUCF		
	1990	2005	2020 BAU	1990	2005	2020 BAU
Annex I Associated	-12 to -18	-10 to -16	-15 to -21	-13 to -19	-9 to -15	-14 to -19
Annex I Total	-10 to -16	-7 to -12	-13 to -18	-12 to -17	-5 to -11	-11 to -17
Non-Annex I Major Economies	154 to 139	49 to 41	-6 to -11	150 to 134	36 to 27	-11 to -17
Non-Annex I Making Pledges Total	134 to 149	40 to 48	-6 to -11	146 to 130	35 to 27	-11 to -17
Rest of World	94	31	0	67	23	0
World Total	51 to 45	21 to 16	-7 to -11	51 to 44	18 to 13	-8 to -12
All Major Economies	43 to 34	17 to 10	-10 to -16	46 to 36	15 to 7	-12 to -18

Appendix: Assumptions & Data Issues

Our analysis began with a few assumptions. First, we assumed that all countries that have provided *quantifiable* goals will achieve those goals, though many are conditional on an international agreement being reached or some other criteria. The U.S., for example, has hedged its target to ensure its conformity with the anticipated enactment of domestic legislation. Developing countries, especially, conditioned their actions and goals on financial and technological support¹³ and characterized their actions and goals as voluntary. Despite these caveats—which are, it must be said, significant impediments to action—we assumed all of the goals would be met. Although many developing countries recorded NAMAs, we only considered those that contained some sort of quantifiable goal.

Second, we assumed that all of the emissions reductions proposed would be additional; that is, there is no double counting. Many developing countries that set quantitative goals have said that reductions from international credit mechanisms, such as the Kyoto Protocol's Clean Development Mechanism, would be counted towards achieving their goal.¹⁴ We assumed here that all emissions reductions or avoidances from developing countries are in addition to these credits.

¹³ Many developing country Parties cited UNFCCC Article 4.7, which states effective implementation of the developing countries' commitments under the Convention will depend on developed countries fulfilling their commitments to provide financial resources and technology transfer.

¹⁴ See [Brazil's](#) submission, for example.

Further, we assumed that all emission reductions that might come about through LULUCF activities would be in addition to emission reductions that might already be coming from this sector.

Third, because the pledges, for the most part, do not specify what GHGs are covered, we assumed that they cover all six GHGs¹⁵ recognized by the UNFCCC unless specified otherwise.¹⁶ Emissions from bunker fuels and international aviation were not included in our analysis.

While the pledges all have 2020 as the end point, they contain a variety of base years against which to measure progress. Based on the pledges, we calculated a 2020 emissions figure and compared that against historical data for 1990 and 2005 and a business-as-usual estimate for 2020.¹⁷

Data for this analysis were drawn primarily from four main sources. Historical data for 1990 and 2005 for Annex I Parties were derived from national reports filed with the UNFCCC in the [common reporting format](#).¹⁸ Historical data for Non-Annex I were derived from the International Energy Agency (IEA) Data Services branch, which

¹⁵ These include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Emissions amounts are presented in "carbon dioxide equivalents."

¹⁶ Turkey, for example, pledges to reduce energy-related carbon dioxide emissions 7% from a 2020 business-as-usual baseline.

¹⁷ In providing a comparison of the pledges against a 2020 baseline estimate, our intention is to provide an indication of how these pledges would cause global emissions to deviate from BAU. As with any look into the future, BAU estimates of future emissions should be taken with a pinch of salt.

¹⁸ As opposed to the format used for reporting under the Kyoto Protocol.

periodically issues global estimates of GHG emissions by country and region. This database does not include emissions from LULUCF.

For BAU projections to 2020, we relied on national and IEA data. Some countries¹⁹ have undertaken modeling efforts projecting BAU emissions out to 2020, and we availed ourselves of these data, some of which include emissions from LULUCF.

For other countries, we developed our own projections. In general, BAU estimates for gross emissions in 2020 for the countries in our analysis were calculated by adding together two figures: (1) an estimate of carbon dioxide emissions from fossil fuels *either* taken directly from IEA's [World Energy Outlook 2009](#) (IEA WEO 2009) *or* calculated using the WEO 2009 regional growth rates out to 2020 and applying these as appropriate to the data on carbon dioxide emissions from fossil fuels in the IEA country emissions database; and (2) the historical growth rate for all other gasses for 1990 to 2005 based on the IEA database.

Emissions from LULUCF can display wide swings from years to year. Moreover, they can move from positive to negative, that is, from an emissions source to an emissions sink. This makes them difficult to project.

When estimating BAU net emissions for Annex I countries in 2020, we assumed that emissions from LULUCF in 2020 would equal their average over the period from 2000 through 2007. This figure was then simply added to the 2020 gross estimate we calculated earlier.²⁰ For Non-Annex I countries submitting pledges, unless we had firm information on emissions, either positive or negative, from LULUCF, we assumed net emissions equaled gross emissions.

For the world as a whole in 2020, we estimated emissions from LULUCF at about 8 gigatons CO₂ equivalent and sinks from LULUCF at about 1.9 gigatons. For the 1990 and 2005 estimates of LULUCF emissions, we relied on estimates provided in the [Intergovernmental Panel on Climate Change 4th Assessment Report Working Group III Reports on Mitigation Summary for Policymakers](#) (IPCC WGIII).

¹⁹ For example, Australia, Brazil, Canada, the EU, New Zealand, Korea, South Africa, and the U.S.

²⁰ For most Annex I countries, LULUCF emissions are negative, that is, LULUCF on net acts as an emissions sink, not a source.