Implications for non-Annex 1 countries of various scenarios of global emissions peaking and Annex 1 reduction efforts

Doreen Stabinsky

CCDA-II

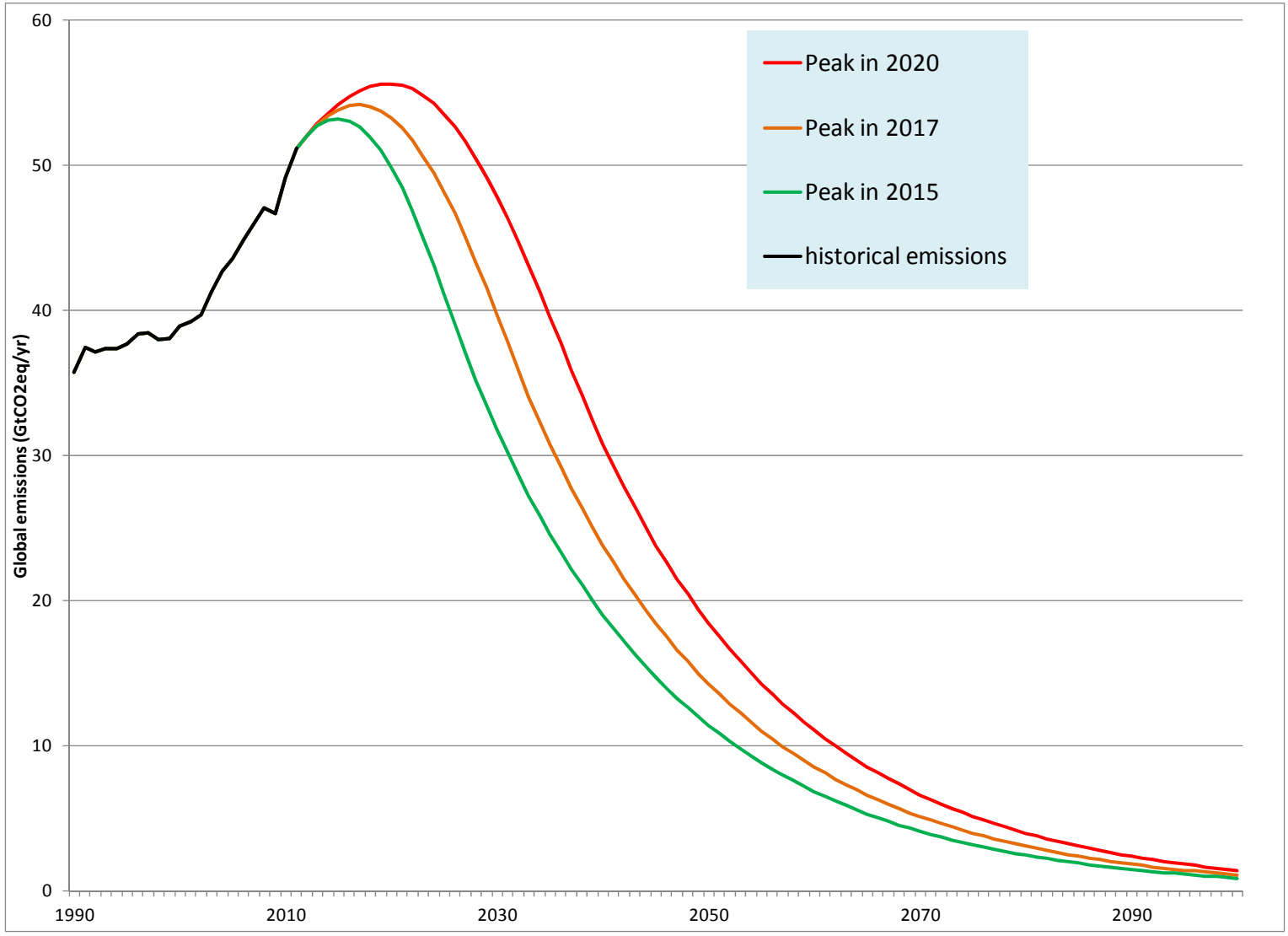
Addis Ababa, Ethiopia

19-20 October 2012

Purpose

Analysis of what the possible peaking year and mitigation burden implications would be for developing countries – e.g. the range of years in which they would need to peak and what the % reduction below various BAU scenarios, would be for developing countries – if a specific global peaking year such as 2015, 2017, 2020, were to be adopted.

Three global paths



Three global paths (details)

	Peak in 2015	Peak in 2017	Peak in 2020
2020 emissions (GtCO2eq)	50	53	56
Budget (2000-2050) (GtCO2eq)	1,790	1,960	2,170
Budget (2011-2050) (GtCO2eq)	1,310	1,490	1,690
% reduction by 2050 vs 1990	-68%	-60%	-48%
Chance of exceeding 2C	39%	49%	61%
(Range of probabilities)	(20% - 57%)	(28% - 68%)	(39% - 79%)

- The most ambitious path peaks in 2015, and has a 61% chance of keeping warming below 2°C.

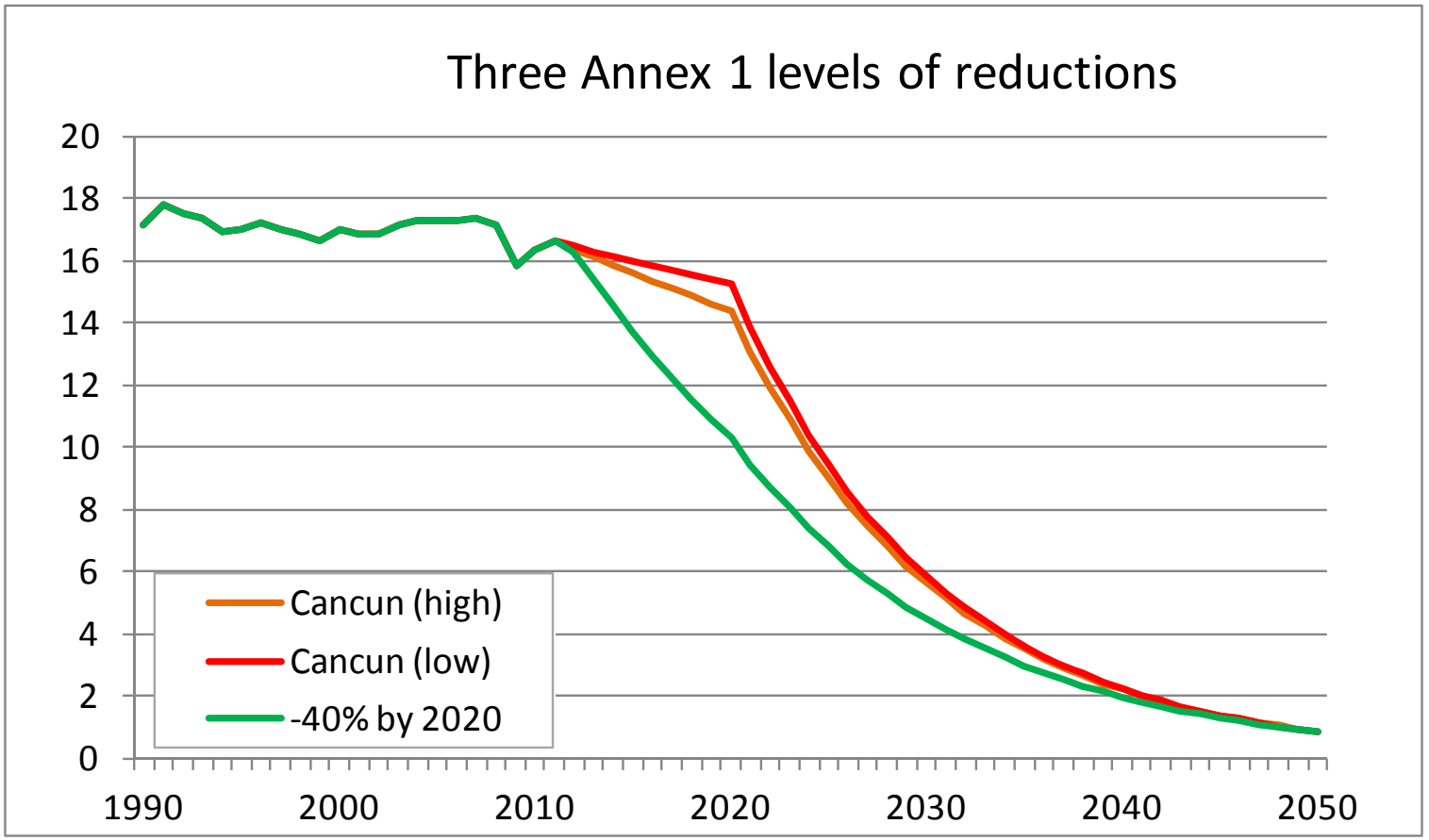
(According to IPCC, it is "likely" but not "very likely" to keep warming below 2°C.)

- The least ambitious path peaks in 2020, and has less than 40% chance of keeping warming below 2°C.

(It also has a significant chance of warming exceeding 3°C.)

2 °C risk figures based on analysis from Meinshausen et al, 2009, *Nature*.

Annex 1 reductions: three levels of ambition



Annex 1 reductions: description

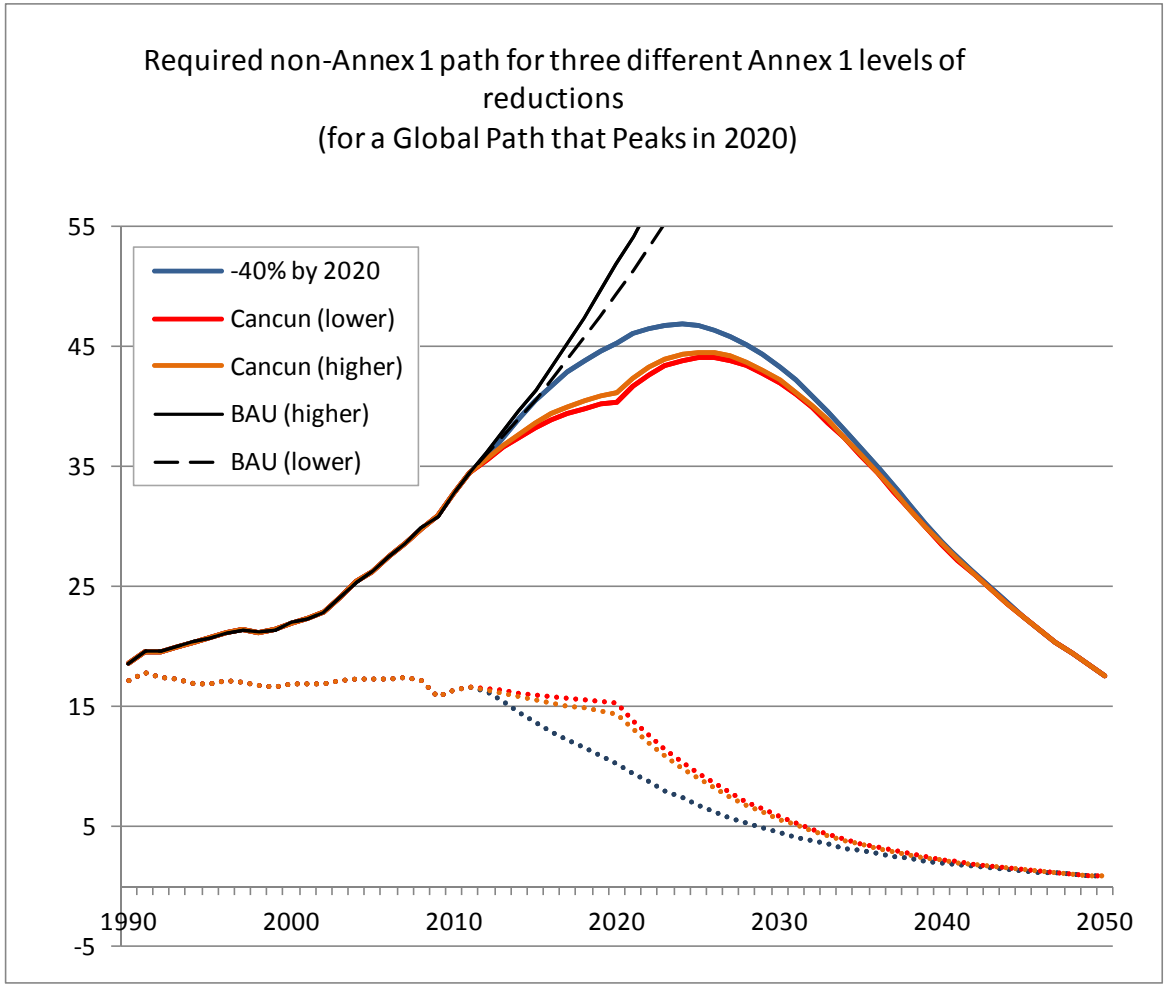
	Cancun (lower)	Cancun (higher	-40% by 2020
Annex 1 2020 (vs 1990)	-11%	-16%	-40%
Annex 1 2020	15.2	14.4	10.3
cumulative emissions (2012-2050)	285	275	227

- Cancun(lower) reflects the lower (unconditional) pledges of Annex 1 countries, which in aggregate would yield a 11% reduction relative to 1990
- Cancun(higher) reflects the higher (conditional) pledges of Annex 1 countries, which in aggregate would yield a 11% reduction relative to 1990
- "-40% by 2020" reflects the G77 demand
- All paths assumed to reduce 95% by 2050 (relative to 1990).
- Note: none of these paths reflect loopholes, which could seriously undermine the pledged reduction levels.
- Nor do these paths reflect CDM or other market mechanisms, which would also reduce domestic Annex 1 reductions.

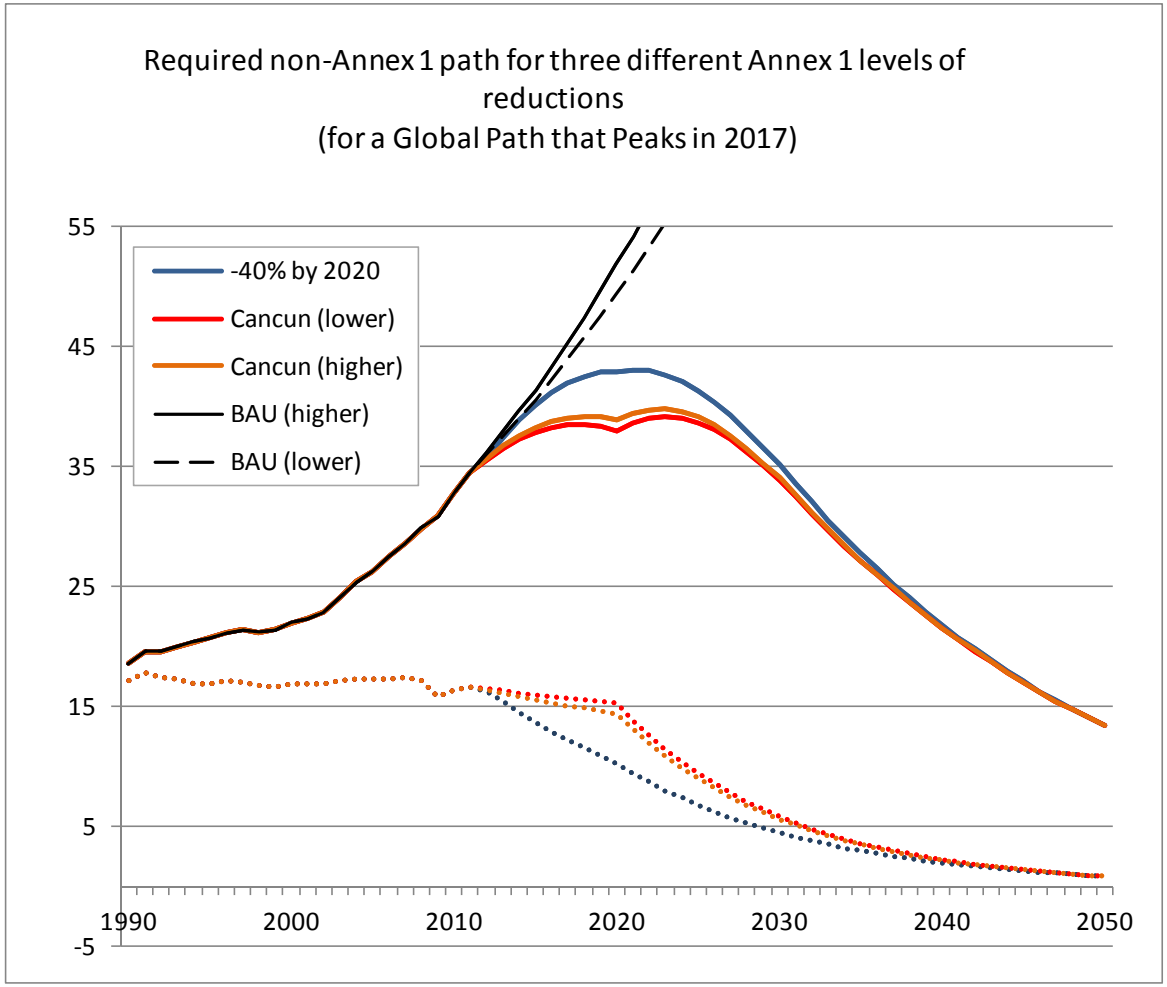
Implications for non-Annex 1

- The following three graphs are, in order, for the global path peaking in 2020, 2017, and 2015.
- Each graph shows three Annex 1 paths (according to the three previously described reduction paths)
- For each Annex 1 path, there is a corresponding non-Annex 1 path, “the residual emission space”.
- The amount of mitigation these paths imply for non-Annex 1 depends on the BAU.
- Two example non-Annex 1 BAU paths are shown (“BAU lower” and “BAU higher”)

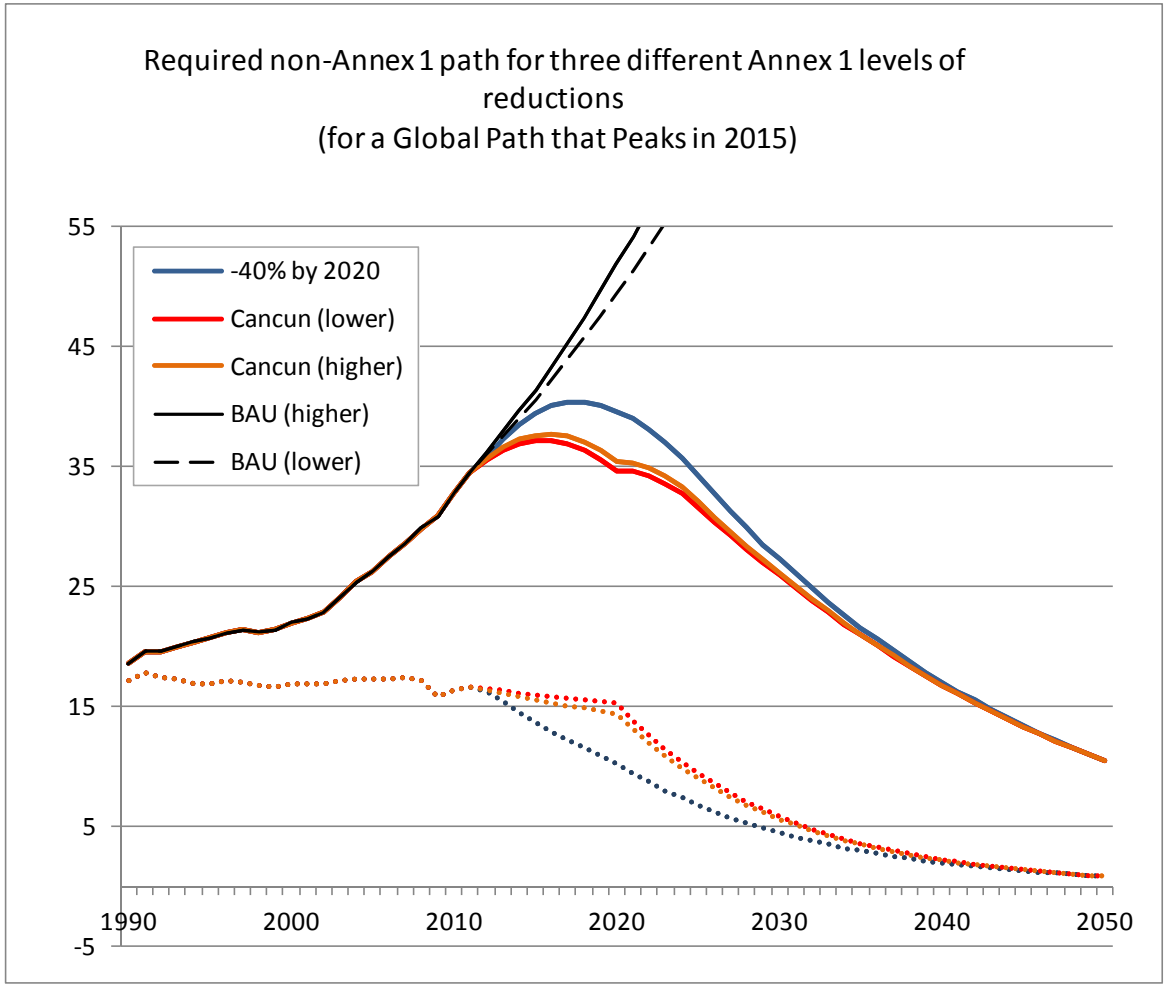
non-Annex 1 paths for three Annex 1 reduction levels (for 2020 global peak)



non-Annex 1 paths for three Annex 1 reduction levels (for 2017 global peak)



non-Annex 1 paths for three Annex 1 reduction levels (for 2015 global peak)



Observations

- As can be expected, the required mitigation in non-Annex1 a countries is greater:
  - if the global path peaks earlier.
  - If Annex 1 reductions are less ambitious.

Non-Annex 1 example BAU: lower and higher variants

	lower BAU	higher BAU
2020 emission level	49.4	51.9
Cumulative emissions (2011-2050)	3096	3637
Growth rate, 2011 to 2020	4.2% to 3.9%	4.7% to 4.5%
Average compound growth rate (2011-2020)	4.1%	4.6%

- Note, the annual non-Annex 1 emission growth rate for the past 10 years is 4.5%

Implications for mitigation in non-Annex 1 countries

- The following three tables are, in order, for the global path peaking in 2020, 2017, and 2015.
- Each table shows three Annex 1 paths (according to the three previously described reduction paths) in the three columns labeled "Cancun (lower), Cancun (higher), and "-40% by 2020"
- The following two sections of the tables show the mitigation amounts (in GtCO2eq) and costs (in $billion) for the lower and higher BAU examples.
- Costs of mitigation are shown for three different examples of average costs of mitigation ($20, $50, and $100/tCO2eq)

Peaking year, and mitigation cost examples (for global 2020 peak, and three Annex 1 reduction levels)

For a global path that Peaks in 2020:			
Annex 1 reduction level	Cancun (lower)	Cancun (higher	-40% by 2020
non-Annex 1 peaking year	2025	2025	2024
non-Annex 1 peaking level	44	45	47
Assuming lower BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	9.1	8.2	4.1
cumulative mitigation required (2012-2020) (GtCO2eq)	35.5	31.0	10.7
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$181	$164	$82
$50	$453	$410	$204
$100	$905	$820	$409
Assuming higher BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	11.5	10.6	6.5
cumulative mitigation required (2012-2020) (GtCO2eq)	46.0	41.6	21.3
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$229	$212	$130
$50	$574	$531	$325
$100	$1,147	$1,062	$651

Peaking year, and mitigation cost examples (for global 2017 peak, and three Annex 1 reduction levels)

For a global path that Peaks in 2017:			
Annex 1 reduction level	Cancun (lower)	Cancun (higher	-40% by 2020
non-Annex 1 peaking year	2023	2023	2021
non-Annex 1 peaking level	39	40	43
Assuming lower BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	11.4	10.6	6.5
cumulative mitigation required (2012-2020) (GtCO2eq)	43.3	38.9	18.5
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$229	$212	$129
$50	$572	$529	$324
$100	$1,144	$1,058	$647
Assuming higher BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	13.9	13.0	8.9
cumulative mitigation required (2012-2020) (GtCO2eq)	53.8	49.4	29.1
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$277	$260	$178
$50	$693	$650	$445
$100	$1,386	$1,301	$890

Peaking year, and mitigation cost examples (for global 2015 peak, and three Annex 1 reduction levels)

For a global path that Peaks in 2015:			
Annex 1 reduction level	Cancun (lower)	Cancun (higher	-40% by 2020
non-Annex 1 peaking year	2015	2016	2018
non-Annex 1 peaking level	37	38	40
Assuming lower BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	14.8	14.0	9.9
cumulative mitigation required (2012-2020) (GtCO2eq)	55.1	50.7	30.4
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$297	$280	$197
$50	$742	$699	$494
$100	$1,484	$1,398	$987
Assuming higher BAU			
non-Annex 1 mitigation required in 2020 (GtCO2eq)	17.3	16.4	12.3
cumulative mitigation required (2012-2020) (GtCO2eq)	65.7	61.2	40.9
If mitigation cost per tCO2e in 2020 is:	**then mitigation cost ($billion) in 2020 is:**		
$20	$345	$328	$246
$50	$863	$820	$615
$100	$1,726	$1,640	$1,229

Observations

- In all cases, peaking year for non-Annex 1 is less than ~5 years of the global peaking.
- Mitigation cost is higher for earlier peaking and for weaker Annex 1 mitigation effort.
- This simple calculation of the mitigation cost in non-Annex 1 countries in 2020 varies from:

$82 billion (global peak in 2020, ambitious Annex 1 mitigation, average cost $20/tCO2eq)

to

$1,726 billion (global peak 2015, weak Annex 1 mitigation, average cost $100/tCO2)

Conclusions

- Maintaining a reasonable chance of keeping warming below 2°C requires rapid global reductions.
- If peaking is not well before 2020, warming will not be "likely" to remain below 2°C.
- Weak mitigation in Annex 1 countries will imply dramatic reductions in non-Annex 1 countries, for any of these global pathways.
- Ambitious mitigation in Annex 1 countries (i.e., -40% by 2020) will also imply less dramatic reductions from business as usual (by ~5 GtCO2eq in 2020).