CLIMATE ANALYTICS

Info sheet:

Timetables for Zero Emissions and 2050 Emissions Reductions: State of the Science for the ADP Agreement

February 2015 – Authors: Joeri Rogelj, Michiel Schaeffer, Bill Hare

Holding warming below 2°C and returning warming below 1.5°C by 2100 are two warming limits being called for in the new climate agreement that is currently being prepared for adoption in Paris at the end of 2015[i]. Many countries and stakeholders have proposed that global emission reduction goals for 2050 and a timetable for the achievement of zero emissions, consistent with achieving these temperature limits, be included in the agreement. This new analysis reviews the state-of-the-art science, including the Fifth Assessment Report of the Intergovernmental Panel on Climate Change[ii] (IPCC AR5) and the 2014 UNEP Emissions Gap Report[iii], to provide recommended numbers for reflecting these long-term global emission goals within the text of the agreement.

Recommended Quantitative Elements for the ADP Agreement

1.5°C	2°C
returning warming to below 1.5°C by 2100 with a more than 50% chance	*limiting warming to below 2°C by 2100 with a more than 66% chance*
global greenhouse gas (GHG) emissions	
- 70 to 95% reduction from 2010 levels **by 2050** *or* 65 to 90% from 1990 levels - reach zero global GHG emissions by 2060-2080	- 40 to 70% reduction from 2010 levels **by 2050** *or* 35 to 55% from 1990 levels - reach zero global GHG emissions by 2080-2100
global energy & industry CO_2 emissions	
- 95 to 120% reduction from 2010 levels **by 2050** *or* 95 to 125% from 1990 levels - reach zero energy & industry CO_2 emissions around 2050 (range 2045-2055)	- 35 to 80% reduction from 2010 levels **by 2050** *or* 10 to 70% from 1990 levels - reach zero energy & industry CO_2 emissions by 2060-2075

These ***Recommended Quantitative Elements*** are based on a detailed analysis of low-emission scenarios from the IPCC AR5, the 2014 UNEP Emissions Gap Report and the recent scenario literature . The underlying analysis quantifies global emission benchmarks for near-term policy variations (higher or lower 2020 emissions), various GHG baskets (CO_2 only or all GHGs), additional indicators (year of emissions reaching zero), and other temperature targets.

The 1.5°C scenarios underlying the emission numbers here can also be seen as high probability below 2°C pathways (around 85% chance to hold warming below 2°C), compared to the likely (>66%) 2°C pathways. For the return below 1.5°C/ high probability below 2°C pathways full decarbonisation of the energy sector is needed by 2050 (2045-2055).

A detailed briefing note is available at:
http://www.climateanalytics.org/publications/timetables-zero-emissions-and-2015-emissions-reductions-state-science-adp-agreement

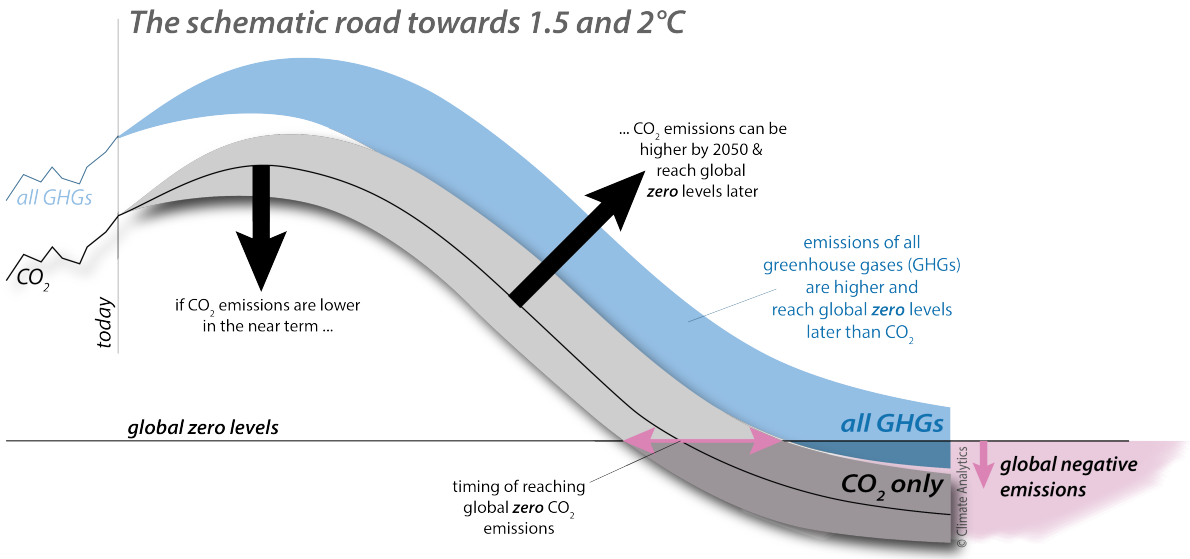
Climate Analytics gGmbH
Supporting science based policy to prevent dangerous climate change enabling sustainable development

Friedrichstraße 231 / Haus B
10969 Berlin / Germany

T / +49 (0)30 259 22 95 20
W / www.climateanalytics.org

Temperature stabilisation implies zero CO_2 emissions

Holding warming below 2°C, or more stringently, returning global warming to below 1.5 °C by 2100 implies a limit on the total amount of carbon-dioxide (CO_2) emissions that can ever be emitted into the atmosphere. Because of this limited carbon budget and historical emissions, global CO_2 emissions have to become zero at some point.



Zero carbon emissions are defined as zero global anthropogenic CO_2 emissions. Global zero carbon emissions does not mean that carbon emissions have to be zero everywhere, but means that any remaining anthropogenic CO_2 emissions in one region, or sector, are compensated by the same amount of 'negative' anthropogenic CO_2 emissions elsewhere. Negative CO_2 emissions are a result of a process such as the use of Carbon Dioxide Removal (CDR) technologies that permanently removes CO_2 from the Earth's atmosphere, storing it in a geological reservoir on a timescale of thousands of years. In addition, scenarios also assume anthropogenically enhanced uptake of CO_2 by the terrestrial biosphere, for example, through afforestation, resulting in increased storage of carbon. The net input of CO_2 to the atmosphere due to human activities globally thus remains zero. If the global amount of CO_2 storage is larger than the global CO_2 emissions then *global negative emissions* are achieved.

From a geophysical point of view, there are no restrictions on how the CO_2 budget can be spread out over time, but higher emissions in the near term have to be compensated by lower emissions in the longer term. However, factors like costs and availability of mitigation technologies and political barriers restrict how fast and how deep emissions can be reduced in the real world. These limitations are taken into account in the assessments of detailed future scenarios of the IPCC AR5 and the 2014 UNEP Emissions Gap Report. Other greenhouse gases (GHGs), like methane, also contribute to global warming and also typically decline in low-emission scenarios. Because it is much more difficult to entirely eliminate non-CO_2 emissions, for example from the agricultural sector, the overall path of emissions of all GHGs is higher than the path of CO_2 only. Consequently, the timing of all GHGs reaching global zero levels is later than the timing of the corresponding zero CO_2 emissions.

---

[i] The anticipated outcome of the Ad-hoc Working Group on the Durban Platform (ADP) under the UNFCCC.

[ii] Available at: www.ipcc.ch

[iii] Available at: http://www.unep.org/publications/ebooks/emissionsgapreport2014/