Key results for the Global Carbon Budget 2016

EMBARGO:
00.01 GMT (London time) on MONDAY 14 NOVEMBER 2016
00.01 WET (West European time – Marrakesh) on MONDAY 14 NOVEMBER 2016
19.01 US EST on SUNDAY 13 NOVEMBER 2016

1. Global carbon emissions are nearly flat for third year in a row.
   - CO_2 emissions from fossil fuels and industry did not grow in 2015, at 36.3 $GtCO_2$, and are projected to rise only slightly in 2016 by 0.2% (range of -1.0 to + 1.8%), with world-average emissions per person at 4.8 tCO_2 for 2016 (see further statistics in Table 1 below).
   - This is the third year in a row with global emissions below 1% growth while global GDP exceeds 3% growth. It marks a clear and unpredicted break with the rapid emissions growth of 2.3% per year of the previous decade (2004-2013), and 0.7% growth in 2014.
   - In 2015 and 2016, the key changes are
     - China's decreased coal use again largely accounts for the break in global emissions growth, with Chinese emissions decreasing -0.7% in 2015. Emissions in China are projected to decrease for a second year, by -0.5% in 2016 (range of -3.8 to +1.3%). In comparison, China's emission grew by 5.3% per year during 2005-2014. Considerable uncertainty is associated with 2016 estimates of China's national emissions, due to uncertain data on stocks of coal and oil, and in reporting of emissions particularly by small coal mines. Emissions for China reported here are based on the most recent data revisions.
     - US emissions decreased, by -2.6% in 2015, with coal decreasing and oil and gas increasing. US emissions are projected to decrease by -1.7 in 2016 (range of -4.0 to + 0.6).
     - Indian emissions increased +5.2% in 2015 (no projection for 2016). This growth is similar to the average growth of 6.4% per year on average during 2005-2014.
   - Emissions from deforestation and other land-use change were estimated at 4.8 $GtCO_2$ in 2015 (range of 3.0-6.6). This is 1.0 $GtCO_2$ above the average of the previous decade because of fires in Indonesia related to land-use change and exacerbated by El Niño conditions, as detected from satellite. (Details available at http://www.globalfiredata.org/updates.html).
   - We do not yet have land-use change emissions for 2016, but fire activity related to land management so far (January to August) suggest a return to average or below average conditions.

2. With three years of reduced growth in emissions it is possible that the trajectory of global emissions has permanently deviated from the long-term rapid growth trend.
   - The three years of reduced growth in global emissions primarily relates to a marked slowdown in coal consumption in China. Emissions growth in the next few years will depend on whether energy and climate policies can lock in the slowdown in emissions growth, and

importantly, raise the ambition of emission pledges to be more consistent with the temperature goals of the Paris Agreement.

- The marked 3-year break in the rise in global emissions is aligned with the country pledges (NDCs) but not with the climate objectives of the Paris Agreement.
    - The lower growth in emissions is consistent with the collective NDCs emission pledges with projected emissions from fossil fuels and industry in the range 37-43 $GtCO_2$ per year in 2030, or 0.7% per year growth to 2030 for the conditional pledges (range 0.1 to 0.9% per year) and 1.0% per year growth for the unconditional pledges (range 0.5 to 1.3% per year).
    - The lower growth in emissions is not aligned with the pathways that limit climate change below two degrees Celsius, which require emissions to decrease by -0.9% per year (range -2.4 to -0.6 % per year) to 2030.

3. Record growth in atmospheric CO_2 in spite of flat emissions due to weak carbon sinks
    - In spite of a nearly flat growth in emissions, the growth in atmospheric CO_2 concentration was a record-high in 2015 and could be a record high again in 2016, at 23 and 25 $GtCO_2$ respectively, compared to 16 $GtCO_2$ per year in the previous decade. The high growth in atmospheric CO_2 was caused by smaller sinks of carbon in the terrestrial biosphere in response to warm and dry conditions over tropical land caused by the recent El Niño event that lasted from May 2015 to June 2016.
    - In 2015, the ocean sink was near or slightly above its decadal average at 11 [9 to 13] $GtCO_2$. The land sink was smaller than usual at 7 [4 to 10] $GtCO_2$, only 60% of its intensity for the previous decade.
    - Atmospheric CO_2 levels have exceeded 400 parts per million (ppm) in 2015, 44% above pre-industrial levels [data NOAA/ESRL]. This is the highest level in at least the last 800,000 years.
    - Verification of reported emissions cannot yet be done with independent data because of uncertainties in our capacity to account for carbon fluxes in the natural environment. This uncertainty is about 5 $GtCO_2$ per year over a period of 5 years. The implication is that, at the moment, it could take 5-10 years before a peak in global CO_2 emissions is confirmed with independent data.

4. The remaining carbon quota that we can emit to limit climate change below two degrees Celsius has shrunk further
    - Global emissions need to decrease to near zero to stop the rise in atmospheric CO_2 and achieve climate stabilisation (at any level). This implies that there is a fixed cumulative carbon quota available to keep global average temperature below a desired stabilisation level.
    - Cumulative emissions from year 1870 to year 2016 are 2075 [1870 to 2280] $GtCO_2$ including emissions from fossil fuels, industry, and land use change.
    - The remaining carbon quota to stay well below two degree Celsius has shrunk another 40 $GtCO_2$ in 2016 due to ongoing emissions. We have already used more than two thirds of the emissions quota to keep climate change well below two degrees. The remaining quota

would be used up in less than 30 years at the current emission level, and even less to keep the warming to 1.5 degree Celsius.

5. Access to Data and Forums
    - Data pertaining to the Global Carbon Budget 2016 can be accessed from http://www.globalcarbonproject.org/carbonbudget and http://dx.doi.org/10.3334/CDIAC/GCP_2016
    - Global and national data on carbon emissions from fossil fuels and industry to year 2015 can also be obtained from the Global Carbon Atlas, an online interactive tool to explore, plot and download data http://globalcarbonatlas.org
    - Full publication including methods http://www.earth-syst-sci-data.net/8/605/2016/
    - Social Media:
        - https://www.facebook.com/globalcarbonproject
        - https://twitter.com/gcarbonproject
            - #carbonbudget
            - Global Carbon Budget, @gcarbonproject
            - Glen Peters, @Peters_Glen
            - Pep Canadell, @pepcanadell
            - Tyndall Centre for Climate Change Research, @TyndallCentre
            - Future Earth, @futureearth
            - Corinne Le Quéré, @clequere
            - Benjamin Poulter, @poulterlab

Table 1. 2015 fossil fuel emissions from top 20 countries including the EU (together and separate) in billion tonnes CO_2/yr.

	2015 fossil fuel emissions (billion tonnes CO_2/yr)	2015 percent of total (excluding bunker)	2015 emissions per capita (tonnes CO_2/person/yr)	Growth rate 2014-2015 (percent)
China	10.4	29%	7.5	-0.7
USA	5.4	15%	16.8	-2.6
EU28	3.5	10%	7.0	1.4
India	2.3	6%	1.7	5.2
Russia	1.6	4%	11.3	-3.3
Japan	1.2	3%	9.8	-2.2
Bunkers	1.1	3%		
Germany	0.80	2%	9.9	0.7
Iran	0.65	2%	8.2	1.5
Saudi Arabia	0.60	2%	19.0	5.5
South Korea	0.59	2%	11.8	0.2
Indonesia	0.54	1%	2.1	3.5

Brazil	0.51	1%	2.5	-2.3
Mexico	0.47	1%	3.7	-1.8
Canada	0.46	1%	12.9	-3.0
South Africa	0.46	1%	8.5	-3.8
United Kingdom	0.42	1%	6.4	-4.1
Australia	0.40	1%	16.7	1.7
Turkey	0.39	1%	4.9	1.1
Italy	0.36	1%	6.0	5.4
France	0.34	1%	5.3	1.4
Global total (inc bunkers)	36.3		4.9	0.06

Results presented here will be published on November 14, 12.01 GMT, in:

Le Quéré, C., Andrew, R. M., Canadell, J. G., Sitch, S., Korsbakken, J. I., Peters, G. P., Manning, A. C., Boden, T. A., Tans, P. P., Houghton, R. A., Keeling, R. F., Alin, S., Andrews, O. D., Anthoni, P., Barbero, L., Bopp, L., Chevallier, F., Chini, L. P., Ciais, P., Currie, K., Delire, C., Doney, S. C., Friedlingstein, P., Gkritzalis, T., Harris, I., Hauck, J., Haverd, V., Hoppema, M., Klein Goldewijk, K., Jain, A. K., Kato, E., Körtzinger, A., Landschützer, P., Lefèvre, N., Lenton, A., Lienert, S., Lombardozzi, D., Melton, J. R., Metzl, N., Millero, F., Monteiro, P. M. S., Munro, D. R., Nabel, J. E. M. S., Nakaoka, S., O'Brien, K., Olsen, A., Omar, A. M., Ono, T., Pierrot, D., Poulter, B., Rödenbeck, C., Salisbury, J., Schuster, U., Schwinger, J., Séférian, R., Skjelvan, I., Stocker, B. D., Sutton, A. J., Takahashi, T., Tian, H., Tilbrook, B., van der Laan-Luijkx, I. T., van der Werf, G. R., Viovy, N., Walker, A. P., Wiltshire, A. J., and Zaehle, S.: Global Carbon Budget 2016, Earth Syst. Sci. Data, 8, 605-649, doi:10.5194/essd-8-605-2016, 2016. http://www.earth-syst-sci-data.net/8/605/2016/

This media release is part of the Global Carbon Budget 2016, the annual update by the Global Carbon Project. It is based on the analyses published here:

- Le Quéré et al. (2016) Global Carbon Budget 2016. *Earth System Science Data* http://www.earth-syst-sci-data.net/8/605/2016/

Access:

- Data and figures: http://www.globalcarbonproject.org/carbonbudget
- Data interface for exploring data: http://www.globalcarbonatlas.org
- Prior to embargo: ESSD paper and Infographics can be requested for media purposes to press@uea.ac.uk
- After embargo: ESSD paper is open access available at link above

Social media:

- Facebook https://www.facebook.com/globalcarbonproject
- Twitter: @gcarbonproject
- infographic address: http://www.globalcarbonbudget2016.org/

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- The Global Carbon Atlas that provides easy access to the emissions data is funded by the BNP Paribas Foundation
- A full list of funders is provided in Table B1 of the ESSD paper