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CARBON BUDGET AND INDCs

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What is the carbon budget?

In its fifth assessment report, the Intergovernmental Panel on Climate Change (IPCC) has published an emission budget which tells us how much CO₂ the world can emit to stay below 2°C global warming.

This estimate is put at 2,900 billion tonne (giga-tonne or Gt) of carbon dioxide from all sources from the dawn of industrial revolution till the year 2100.

By 2011, the world had already emitted 1,900 Gt of CO₂. This means that only 1,000 Gt remains to be used between now and 2100.

What are INDCs?

Kyoto Protocol is coming to an end in 2020. United Nations Framework Convention on Climate Change (UNFCCC) has therefore urged countries to come up with **Intended Nationally Determined Contributions** (INDCs) by the time of COP21 so as to negotiate and come up with a legally binding document to cut down emissions. So far, more than 150 countries have submitted their INDCs on the UNFCCC website;¹ all the countries of North America, almost all of Europe, around 90 per cent of Africa, two-thirds of Asia, 60 per cent of Latin America and one-third of the Middle East. Put together, these countries account for around 90 per cent of the current global fossil fuel demand and almost 80 per cent of the production.

The INDCs combine the top-down system of a United Nations climate agreement with bottom-up elements through which countries put forward their contributions in the context of their own national circumstances, capabilities and priorities. The ambition is to reduce global greenhouse gas (GHG) emission enough to keep global rise in temperature rise to 2°C.

The content of climate pledges varies in many respects, making their interpretation and evaluation challenging. Forms of pledges put forward in the INDCs include absolute GHG emission targets, deviation from **business-as-usual** (BAU) emission trajectories, emission intensity targets (i.e., GHG emission per unit of economic output), reductions or limitations in per-capita emission, or statements regarding policies and measures to be implemented. A number of pledges are conditional, at least partially, on financial support or other factors.

How do countries compare on emissions till date?

Between 1850 and 2011, the US has emitted 411 billion tonne of carbon dioxide (including emissions and sinks from land use, land-use changes and forestry (LULUCF)). This means that the US, with roughly five per cent of the world's population, has emitted 21 per cent of world's total carbon dioxide till 2011. The 28-member European Union (EU-28) has emitted 18.4 per cent. As a matter of fact, US, EU-28, Russia and Canada together have emitted 50 per cent of the world's carbon dioxide during this period. In comparison, China has emitted 10.7 per cent and India, 2.8 per cent.

How is the remaining carbon budget being claimed in INDCs?

An analysis of INDCs of 42 countries (including EU-28's submission as one INDC) which comprise around 70 per cent of world's population as well as its emissions shows that put together they will emit around 650 billion tonnes between 2012 and 2030 and around 1,400 billion tonnes by 2070 and reach net zero in 2070.

Table 1: The carbon budget

Unit Gt CO ₂	>33 per cent probability of staying within 2°C	>50 per cent probability of staying within 2°C	>66 per cent probability of staying within 2°C
Total anthropogenic CO ₂ budget: 1861-1880 to 2100	5,762	4,441	3,670
Total anthropogenic CO ₂ budget remaining after excluding non-CO ₂ forcing: 1861-1880 to 2100	3,303	3,009	2,899
Total anthropogenic CO ₂ emitted: 1861-1880 to 2100	1,890	1,890	1,890
Total anthropogenic CO ₂ budget remaining: 2012 to 2100	1,413	1,119	1,009

Source: IPCC, AR5

If the remaining countries were to follow, on an average, a similar level of ambition in their INDCs, the world will end up emitting around 2,000 billion tonnes post 2012.

Relationship between temperature and carbon dioxide

Representative Concentration Pathways (RCPs) are scenarios that describe alternative trajectories for carbon dioxide emission and the resulting atmospheric concentration from 2000 to 2100. There are four different scenarios based on differing assumptions about population, economic growth, energy consumption and sources, and land use over this century. Scientists project that by 2100, global mean temperature will increase by approximately 1.5°C for the lowest emissions scenario (RCP 2.6) and 4.9°C for the highest 8.5 emissions scenario (RCP 8.5).² Low emissions scenarios assume that humans will aggressively reduce emissions so that by 2100 the temperature has risen upto only 2°C from pre-industrial levels. Many scientists, including those at IPCC, consider 2°C a critical number.

Table 2 shows us that the carbon budget of around 2,000 GtCO₂ that the world is likely to use up based on current commitments and pledges will put the world on a pathway of between 3–4°C increase in temperature.

What carbon space will India use?

So far, India has emitted about 53 billion tonne of carbon dioxide, which is 2.8 per cent of the world's total emissions between 1850 and 2011.

With the pledges made in its INDC, India will be

reducing emission intensity of its GDP by 33 to 35 per cent by 2030 from the 2005 level, which comes to around 5.7 billion tonne of carbon dioxide in 2030.

India is likely to use up around 83 billion tonnes between 2012 and 2030, which is around 8 per cent of the remaining carbon budget.

The per capita emission of India in 2030 will be 3.7 tonne compared to around 12 tonne of China and US.

What carbon space will Africa use?

From 1850–2011, the entire continent of Africa emitted 50 billion tonne of carbon dioxide, which is 2.7 per cent of world's total emissions.

From now to 2030, based on a BAU scenario, the continent will emit an additional 50 billion tonne of carbon dioxide, which will be 5.5 per cent of the remaining budget.

Examples of some of the African pledges (INDCs):

- Gambia has agreed to a 44 and 45 per cent emissions cut by 2025 and 2030 respectively from BAU projections. A majority of these pledges are conditional on international financial support and

Table 2: Scenarios assessed by IPCC³

	CO ₂ concentration (ppm)	Approx cumulative emissions from 2012 to 2100 (GtCO ₂) ⁴	Temperature anomaly (°C)
RCP 2.6	490	1,445	1.5
RCP 4.5	650	1,590	2.4
RCP 6.0	850	1,793	3.0
RCP 8.5	1,370	2,449	4.9

Source: Estimations from IPCC AR5 Synthesis report, 2014

Figure 1: Per capita emissions: Present and future



Source: Historical data from Greenhouse Development Rights, 2014 and projected data from INDC submission portal: <http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx>

Table 3: Carbon budget estimation as per INDCs

Country	Emission reduction pledge	Type of reduction: net emissions/ emission intensity/BAU scenario	Cumulative CO ₂ emissions (GtCO ₂)					
			1850–1949	1950–89	1990–2011	Projected 2012–30 as per INDC	1850–2011	1850–2030
EU (28 countries)	40 per cent over 1990 by 2030	Net emissions	120.5	149.2	91.3	62.1	360.9	423.0
Russia	25–30 per cent over 1990 by 2030	Net emissions	22.3	72.9	37.7	33.2	132.9	166.2
Switzerland	50 per cent over 1990 by 2030	Net emissions	0.6	1.3	1.0	0.6	2.8	3.5
Australia	26–28 per cent over 2005 by 2030	Net emissions	4.5	9.3	7.9	6.4	21.7	28.2
Brazil	37–43 per cent over 2005 by 2030	Net emissions	13.7	36.9	33.8	11.3	84.4	95.7
Canada	30 per cent over 2005 by 2030	Net emissions	14.1	16.7	13.1	13.3	43.9	57.2
China ⁵	60–65 per cent over 2005 by 2030	Emission intensity reduction (emission per unit of GDP)	47.3	72.7	99.6	244.2	219.6	463.8
India ⁶	33–35 per cent over 2005 by 2030	Emission intensity reduction (emission per unit of GDP)	9.7	14.5	26.2	83.6	50.3	133.9
USA	26–28 per cent over 2005 by 2025	Net emissions	158.8	148.5	123.0	115.3	430.3	545.5
Japan	26 per cent over 2013 by 2030	Net emissions	2.5	27.6	26.9	20.3	57.0	77.3
Indonesia	29–41 per cent by 2030	Compared to BAU growth	17.8	30.6	28.1	25.0	76.5	101.5
Kenya	30 per cent by 2030	Compared to BAU growth	0.4	0.4	0.4	1.5	1.1	2.6
Mexico	25–40 per cent by 2030	Compared to BAU growth	5.8	9.2	10.5	13.9	25.5	39.4
South Africa	Emissions during 2025–30 will be in the range 398–614 million tonnes of CO ₂ e		1.5	6.4	8.3	9.2	16.3	25.5
Turkey	21 per cent by 2030	Compared to BAU growth	3.6	4.9	5.0	12.8	13.5	26.3

Source: INDC submissions: <http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx>
 Historic Data Source: Greenhouse Development Rights, 2014

- technology transfer.
- Ethiopia's goal is to limit GHG emission to 145 MtCO₂e by 2030. This represents a reduction of at least 64 per cent from a BAU scenario by 2030, where net emissions are projected to reach 400 MtCO₂e. The corresponding GHG emission target for 2030, excluding LULUCF, is 40 per cent below BAU, or 185 MtCO₂e, which is the level used to rate the emission reduction target. The INDC implementation is conditional to support in terms of finance, technology transfer and capacity building.
- Kenya proposes reduction of 30 per cent in its emissions by 2030 relative to a BAU scenario of 143 MtCO₂e. This is subject to financial and technological international support.



References

1. INDCs submitted by parties on UNFCCC INDC submission portal.
2. Source: 5th IPCC report and CDIAC.
3. Climate Change 2014 Synthesis Report .
4. Estimated values.
5. The target for a reduction in the economy's carbon intensity by 60–65 per cent below 2005 levels by 2030 leads to absolute emission levels of 15–16.9 GtCO₂e in 2030 excluding LULUCF, with the assumed GDP growth rates. <http://climateactiontracker.org/countries/china.html>
6. Under the assumption of a 6.4 per cent annual GDP growth (IEA, 2014a), the emissions level resulting from this target would be 5.6–5.7 GtCO₂e (excluding LULUCF) by 2030. <http://climateactiontracker.org/countries/india.html>