China, US and EU post-2020 plans reduce projected warming

Climate Action Tracker policy brief

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08 December 2014

Summary and Overview

For the first time since 2009 the Climate Action Tracker calculates a discernibly lower temperature increase than previously estimated because of new proposed post-2020 actions.

Recent announcements by China, the United States and European Union, who comprise approximately 53% of global emissions, indicate a rising level of ambition, which are reflected in the slightly improved outlook for global warming by the Climate Action Tracker, should these and other governments fully implement their pledges.

These new, post-2020 announcements by the EU, USA, and China are more ambitious than their previous (2020) commitments. The effect of these new announcements is between 0.2 and 0.4 degrees lower warming than in earlier assessments of global ambition, reducing the projected warming to 2.9-3.1°C. However, there is substantial uncertainty from unknown long-term developments in China.

The EU and US have announced 2030 and 2025 emissions reduction plans that we find are broadly consistent with their 2050 targets, but do not yet fully take into account equity and fairness considerations. As a result, the emissions pathway for the OECD region changes little when including these new plans. We interpret these new developments as indicating an increasing political will to meet the long-term goals, and it is encouraging that the EU and US are putting their pledges closer to a direct path to their 2050 goals, rather than relying on delayed, rapid action post-2030.

China announced in November 2014 its intent to peak CO_2 emissions at the latest by 2030 and increase the share of non-fossil energy carriers of the total primary energy supply to at least 20% by then. This extends its pledge to reduce CO_2 emissions per unit of GDP by 40-45% as compared to the 2005 level and a share of non-fossil energy of 15% all by 2020. We estimate total CO_2 emissions could peak around 11.7 $GtCO_2$ or about 27% above 1990 levels. China is implementing significant policies, most recently a cap on coal consumption from 2020. We estimate that it will likely achieve its 2020 pledge and the objectives stated for 2030, reaching 20% share of non-fossil fuels in a manner that is consistent with peaking CO_2 emissions by 2030. Yet the resulting emission level is uncertain.

The US has announced a target to reduce emissions by 26-28% below 2005 in 2025 (equivalent to 14 - 16% below 1990). This adds to the pledge to reduce GHG emissions by 17% below 2005 levels by 2020 (equivalent to -3% below 1990 levels). In relation to the 2020 pledge, with presently implemented policies we estimate reductions of about 6% below 2005 levels, about 780 $MtCO_2e$ short of the goal. Additional planned policies announced, if successfully implemented, would lead to further reductions enabling the

USA to reach about 18% below 2005 levels by 2020, hence meeting its 2020 pledge. To reach the 2025 goal, according to our analysis, the US will need to implement additional policies, building upon and accelerating the implementation for the already planned policies (e.g. the targets in the Climate Action Plan).

In October 2014, the European Council adopted a new set of climate and energy targets for 2030. Among those, the EU put forward a binding target of at least 40% aggregate domestic emissions reductions below 1990 levels by 2030. Currently implemented policies do not - yet - put the EU on a trajectory towards meeting either its 2030 or 2050 targets. The EU's Copenhagen target for 2020 is to reduce emissions by 20% below 1990. Currently implemented policies put the EU on a good trajectory towards meeting this target and projections indicate that no additional policies between now and 2020 are needed. However, with current policies the EU is not on track to meet its more ambitious conditional target of 30% emissions reduction below 1990 levels by 2020 and its 40% target for 2030.

The Climate Action Tracker assesses government pledges and actions against those needed to limit warming below a 2°C increase above preindustrial levels, and against the goal of bringing warming below 1.5°C by 2100. In this update, the Climate Action Tracker has assessed multiple countries and we have made them available on our website.

While the pledges and/or policy proposals are still not sufficient, taken together, these countries are proposing additional action that, if implemented, would reduce the projected warming to around 3.1°C.[1] This is still substantially above the almost universally-agreed goal of holding warming below a 2°C increase above pre-industrial. In the context of increasing momentum towards a global agreement to be adopted in Paris in 2015, these developments represent a very important first step towards what is needed and opens the way to further improvements in 2015.

Tempering this optimism is our projection that current policies, policies that have been implemented, remain insufficient and global efforts to limit warming put us on track to reach 3.9°C by 2100.

Emissions pathway	Global Temperature increase above pre-industrial 2100 (°C)
Current policy projections	3.9[2]
Unconditional Pledges[3]	3.1[4]
Conditional Pledges	2.9[5]

Table 1 Projected temperatures in 2100 under CAT scenarios.

There is only a limited carbon budget that can be emitted to limit warming below 2°C. To keep warming below 2°C, total CO_2 emissions through 2050 need to stay below 1,100 $GtCO_2$. Under the current policy pathway 800 $GtCO_2$ more than this would be emitted by then – totalling 1,900 $GtCO_2$.

Present pledges bring this down to 1600 $GtCO_2$, still 500 $GtCO_2$ higher than the budget. To have a 50% chance of limiting warming below 1.5°C by 2100, only 800 $GtCO_2$ can be emitted, indicating that pledges need to go much deeper.

In our pathway for the pledge scenario (unconditional pledges), emissions stabilise below 60 $GtCO_2e$/year between 2030 and 2090. When conditional pledges are included, global emissions in the representative pathway peak in the late 2030s, but remain above 49 $GtCO_2e$/year, at about present (2010) levels until

[1] Excluding all 2050 pledges increases the estimated temperature by a further 0.2°C to 3.3°C. The 2050 pledge case is still far above the emissions consistent with the 2°C limit.

[2] Average temperature resulting from emissions pathways with high and low evaluations of current policy projections. A high pathway gives a warming of 4.2°C in 2100 and a low pathway leads to 3.6°C in 2100. Corresponding uncertainty ranges resulting from the simulated carbon-cycle and climate modeling are 3.3-5.2°C and 2.9-4.5°C for the higher and lower cases respectively.

[3] Estimates include 2050 goals of countries. Excluding these would add about 0.2°C to the median estimates of warming.

[4] The uncertainty range from carbon-cycle and climate modelling is 2.5-3.8°C.

[5] The uncertainty range from carbon-cycle and climate modelling is 2.4-3.6°C.

the end of the century. These emissions levels are far above those required to hold warming below 2°C global emissions need to reduce to about 23-25 $GtCO_2e$ by 2050, and for 1.5°C global emissions to about 15 $GtCO_2e$ by 2050.

Over the last year, the gap between the pledges governments have made and emissions levels required to limit warming below 2°C (or back to below 1.5°C by 2100) has not been closed. There is still a gap between actions and the pledges themselves. While countries are close to meeting their aggregated pledges for 2020, implementation towards the long-term targets of mainly developed countries falls short, leaving an increasing gap between actions and pledges for 2025 and 2030.

Of the 22 countries the Climate Action Tracker analysed, only five are projected to meet their 2020 pledges, with 13 exceeding (an assessment of the remainder has not been possible). Very few of the pledges are consistent with limiting warming below 2°C. The overview below shows, for the first time, an emergence of a decline in emissions (if pledges to 2050 were fully implemented) compared to the previous continuous increase in a pathway based on current policy projections. This decline, however, is still small.

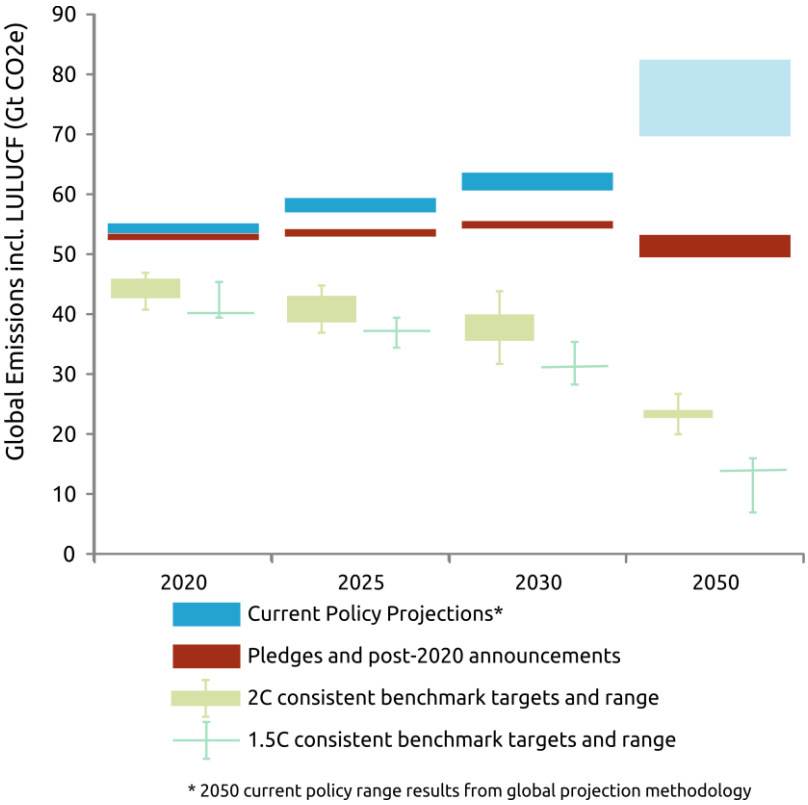


Figure 1 Emissions level ranges under current policies projections, pledges, and in line with 1.5°C and 2°C limits

Outlook for 2015

The UNFCCC has requested governments to, in the first quarter of 2015, submit their proposals for intended nationally determined contributions (INDC's) for the post 2020 ADP agreement to be adopted in Paris.

The update of pledge pathways here indicates some progress toward increased action on climate change, while the gap between 2020 pledges and action remains.

Governments need to improve action before 2020 to close the gap between where emissions are headed and what is needed to get emissions levels down to limit warming below 2°C in 2020.

- In addition to the proposals made by the EU, China and the United States of America, further improvements need to be made by many others.

- Recent discussions indicate that India could be considering putting forward a peak year for emissions between 2035 and 2050 which, depending upon the level at which this peak occurred, could be consistent with a 2°C pathway.
- China's peak by 2030 falls somewhat short of a 2°C pathway. However, if emissions peak just five years earlier, this could make a very big difference and move the country very close to 2°C emission benchmark.
- Both the European Union and the USA need to increase their level of action in order to meet their 2020-2025 and 2030 pledges and goals.

Introduction

The Climate Action Tracker assesses countries pledges and actions against those needed to limit warming below 2°C increase above preindustrial, and against the goal of bringing warming below 1.5°C by 2100. In this update, we have assessed multiple countries and placed these new analyses on our website.

We assessed multiple different scenarios to understand where different pledge and policy scenarios will take us. We also assess the uncertainty associated with the implementation of policies, and the differences between conditional and unconditional pledges.

Pledges, policies and limiting warming below 2°C and 1.5°C by 2100

Limiting warming below a 2°C increase above pre-industrial in the 21st century means the emissions of greenhouse gases need to be reduced rapidly in the coming years and decades, and ultimately brought to zero shortly after mid-century. We have evaluated and quantified the aggregate effect of the pledges (promises) and proposed policies put forward by countries, and compared them against the emissions levels consistent over time with these limits.

Current policies place the world on a path towards 4°C warming above pre-industrial or more, whereas the unconditional pledges or promises governments have made would limit warming to 3.1°C. In other words, there is still a substantial gap between what governments have promised to do and the total level of actions they have undertaken to date.

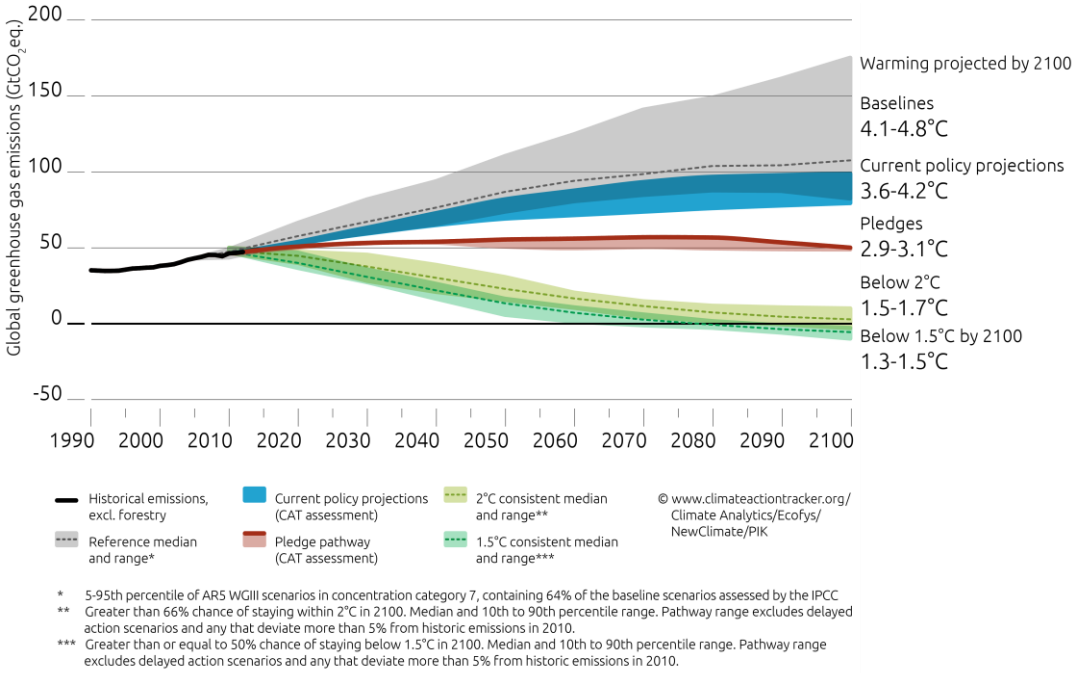


Figure 2 CAT global pathway scenarios.

In addition to the global temperature outcomes of policies and pledges, we have assessed the expected absolute emissions in 2020, 2025, and 2030 and compared these with benchmark emissions consistent with limiting warming below 2°C and 1.5°C for these years. Results are plotted in Figure 1 above, and tabulated in Table 2 below.

Emissions gap and pledges

Compared with a 2°C consistent emissions level in 2020, current policy projections and pledges will exceed the 2°C range in 2020 by 8-12 $GtCO_2e$ and 6-10 $GtCO_2e$ respectively. The gap between the 2°C pathway

and pledges increases over the decade to 10-15 $GtCO_2e$ by 2025, and to 14-20 $GtCO_2e$ by 2030. For current policy projections, the gap to 2°C grows even more by 2030 to 21-28 $GtCO_2e$ (Figure 1). The ranges stated here result from a combination of the range of pledge or policy estimates and assumptions regarding the availability of negative emissions technology in the calculation of the 2°C benchmark (see Table 2).

Relative to current policy projections, emissions decreases required to stay consistent with limiting warming to 1.5°C are even larger; 13-14 $GtCO_2e$ per year in 2020, 19-21 $GtCO_2e$ in 2025, and 29-32 $GtCO_2e$ in 2030.

Under current policy projections emissions in 2020 are estimated be 54-55 $GtCO_2e$,[6] about 1-3 $GtCO_2e$ higher than the 2020 pledges, which are estimated to be 52-53 $GtCO_2e$.[7] Our pledge projections beyond 2020 are lower than those in the UNEP Emissions Gap Report[8] because we have included recent EU, USA, and China announcements, and also included the long-term 2050 goals countries have put forward. For 2025, current policy projections are 57-59 $GtCO_2e$ and pledges 53-54 $GtCO_2e$, and a policy gap of 3-6 $GtCO_2e$, which grows to 5-10 $GtCO_2e$ in 2030. For the latter year, we estimate that meeting all current pledges would results in emissions of 54 - 56 $GtCO_2e$.

Emissions in Policy Case ($GtCO_2e$)	2020	2025	2030	2050
Current Policy Projections[9]	54-55	57-59	61-64	
Unconditional Pledges	53	54	56	53
Conditional Pledges	52	53	54	50
Below 2°C compatible pathway[10]	43-46[11] (41-47)[12]	39-43[11] (37-45)[12]	36-40[11] (32-44)[12]	23-24[11] (20-27)[12]
Below 1.5°C by 2100 compatible pathway[13]	41 (40-46)[14]	38 (35-40)[14]	32 (29-36)[14]	15 (8-17)[14]

Table 2 Global emission benchmark 2020-2050.

[6] For comparison, the Emissions Gap report estimate is 55 $GtCO_2e$.

[7] This is within the range of UNEP's 2014 Emissions Gap report estimate (52-54 $GtCO_2e$), which is wider, inter alia, because it considers a broader range of interpretations of stringency under the Kyoto Protocol.

[8] UNEP 2014 Emissions Gap estimate of 2030 emissions under current policies is 56-59 $GtCO_2e$.

[9] Range results from different projection scenarios, uncertainties in policy effectiveness, and assumptions regarding the completeness of policy implementation in the underlying country analyses.

[10] 2020 "Pledge Gap" closed - least cost-action from 2010 that leads to 2oC compatible emissions in 2020.

[11] Low end of range assumes that negative emission technology is not available in the 21st century and high end assumes availability of this technology.

[12] 20th to 80th percentile range of scenarios. Low end represents low end of scenarios that assume negative emission technology is not available in the 21st century and high end represents high end of scenarios that assume it is.

[13] 2020 "Pledge Gap" closed - least cost-action from 2010 that leads to 1.5oC compatible emissions in 2020 - limits warming below 2oC in the 21st century and has at least a 50% chance of returning warming to below 1.5°C by 2100. Assumes negative emissions technology is available.

[14] 20th to 80th percentile range of scenarios. As higher emissions in the near term have to be compensated by deeper reductions later, following 80th percentile benchmarks over the near term would need to be followed by 20th percentile benchmarks in the second half of the century.

Who is meeting their pledge, who is not and by how much?

One of the objectives of our analysis is to list and quantify governments' emissions reduction pledges and estimate whether currently implemented domestic policies will be sufficient to meet the pledged reductions.

We find that China, the EU and Brazil's currently implemented policies will be sufficient to meet their pledge. Japan, Russia and Ukraine are also achieving their pledge, but this is primarily due to the lack of ambition in their targets.

At the other end of the scale, Australia, New Zealand and Norway are far away from achieving their pledge. Most other countries also still have to implement additional policies or purchase international emission units to achieve their pledges. See Annex 1 for details.

Box 1 - Methodology Changes and Uncertainties

In this update, we present results using a new methodology that is based on the set of long-term emissions scenarios of the IPCC AR5 report (IPCC 2014a), a methodology that incorporates the latest science. For each CAT pathway, we identify a set of long-term (to 2100) scenarios that most closely match our short-term scenarios. From these scenarios, a representative pathway is chosen for calculation of the resulting global temperature change.

In last year's CAT assessment (November 2013), our analysis of current policy projections took us on a trajectory to 3.7°C warming. This year's result of 3.9°C differs for three reasons. We now give the main result as the average of the range of current policy pathway temperatures rather than just the upper estimate because this better reflects the underlying analysis. The new upper estimate of current policy projections that is directly comparable with last year's assessment yields a temperature of 4.2°C. Changes in the projection methodology caused an increase in temperature of around 0.6°C, and a decrease in the assessed aggregate emissions under current policies (1-2 $GtCO_2e$) result in a slight lowering (of around 0.1°C) of the assessed temperature.

Current policy estimates for the 2020s are ~1.2 $GtCO_2e$ lower than in our earlier assessments due to improvements in policy settings and methodologies. Beyond 2030 an improved method for longer-term projections of the effects of policies leads to significantly higher emissions in the latter half of the century. The new methodology provides a better assessment of longer-term emissions taking into account current policies and updated socio-economic assumptions. The new methodology has a smaller impact on the pledge case because the extended pledge pathway has a similar long-term trajectory closer to the single long-term growth pathway used in our previous methodology.

Estimating long-term warming from near-term emission trajectories is associated with considerable uncertainty. In the methodology described above, near-term CAT trajectories are mapped on long-term emission pathways from the IPCC Fifth Assessment report's scenarios database. The IPCC Fifth Assessment report itself also compared near-term "Cancún" pledge cases for 2020 with emissions of long-term scenarios, but did not provide an uncertainty estimate (IPCC 2014a). The UNEP emissions gap report (2013) mapped 2020 pledges on envelopes of long-term emission scenarios and concluded that "the 2020 emissions under the four pledge cases … will be on a trajectory with a 'likely' chance of limiting warming to 3-4°C." The results presented in that report, however, suggest the pledge levels also substantially overlap with a larger range of 2.5-5°C. This leads to an assessment that scenario uncertainty is ±0.5 to ±1°C. This uncertainty arises from assumptions regarding technology portfolio, socio-economic development, energy resources, substitution rates between energy sources, etc. as reflected by – and limited by – the scenario database underlying these studies.

Closer research on this aspect is underway for the CAT pathways, but in contrast to the methods described above the CAT methodology allows a preliminary statistical analysis that shows there is a larger scenario uncertainty associated with higher emission trajectories, of roughly ±0.6°C for the Current Policy projections (3.9°C by 2100), and smaller for lower trajectories, of roughly ±0.3°C for the 2020-2050 pledge pathways (3.1°C by 2100).

For further details please see our website.

China

In November 2014 China announced its intent to peak CO_2 emissions by 2030 at the latest, and increase the share of non-fossil energy carriers of the total primary energy supply to at least 20% by then. This extends China's pledge to reduce CO_2 emissions per unit of GDP by 40-45% on 2005 levels and a share of non-fossil energy of 15% - all by 2020. We estimate total CO_2 emissions could peak around 11.7 $GtCO_2$ or about 27% above 1990 levels between 2025 and 2030.

China is implementing significant policies, most recently a cap on coal consumption from 2020. We estimate that it will likely achieve its 2020 pledge and the objectives stated for 2030, reaching 20% share of non-fossil fuels in a manner that is consistent with peaking CO_2 emissions by 2030. Yet the resulting total emissions level is uncertain and not possible to uniquely quantify. This is an important issue in the context of the need for transparency in quantifying the total emissions consequences of a countries proposed policies and actions for the post 2020 period, in particular in relation to the submissions due in 2015 of iNDCs by governments.

The announcement of China's intent to peak its CO_2 emissions will have a major impact for the period after 2030 as, until now, many projections foresee increasing emissions beyond this time. As the announced measures consist of changes in the energy mix, further measures reducing the absolute energy use - increasing energy efficiency further - would decrease emissions even further.

China has significant and growing non-CO_2 GHG emissions (approximately 20% of total GHG emissions in 2010) which, on present estimates, would still be growing by 2030, and would need further policy measures to address and ultimately reduce.

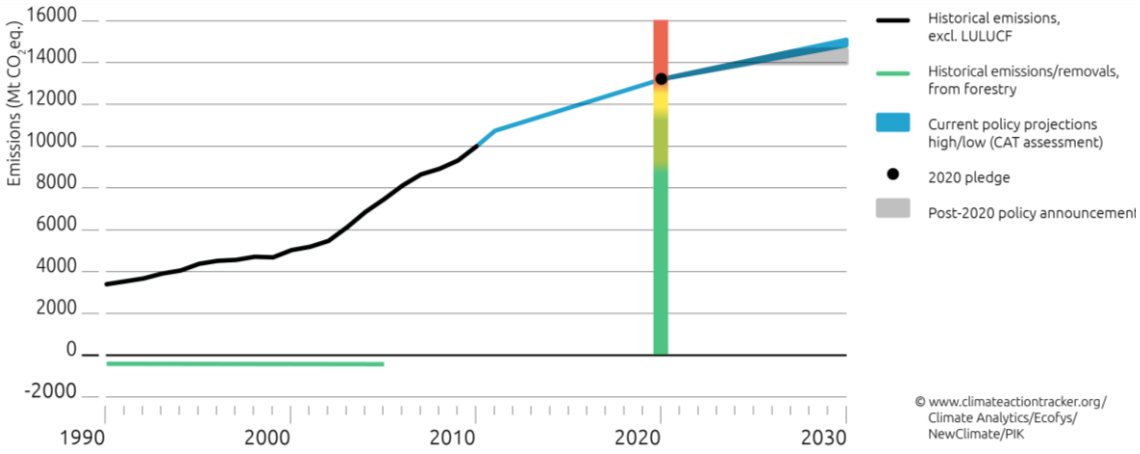


Figure 3 Emission trajectories for China

According to our assessment, for 2020, the absolute emissions level resulting from China's pledge is at 13.2 $GtCO_2e/a$. With currently implemented policies, China will likely reach an emissions level of about 13.2 $GtCO_2e$[15] in 2020 and 14.8 – 15.1 $GtCO_2e$ in 2030. The CAT estimates that the announced goal and policies, if achieved, would result in an absolute emissions level in 2030 of 13.8 – 14.8 $GtCO_2e$ depending on the actual year of peaking (Box 2). This means, that according to our assessment, China likely meets its 2020 pledge, but needs further policy measures to successfully peak emissions by 2030.

[15] Compared to previous CAT analysis, it is somewhat lower due to additional measures in the energy sector and a change in assumptions on non-energy related emissions.

China has a range of implemented policies in most sectors. Most significant is the commitment to a strong increase of renewable and low carbon energy. Since the Medium and Long Term Development Plan for Renewable Energy from 2007, China has increased its renewable energy capacity plans multiple times.

In its latest update of the 12th Five Year Plan, China decided to aim for a new target of 700 GW of renewable energy capacity in 2020. This target was confirmed in the National Action Plan on Climate Change released in September 2014, which defines a number of actions and targets for 2020 (The People's Republic of China, 2014).

Bloomberg New Energy Finance projects an increase of RE capacity of 809 GW between 2010 and 2030 (Bloomberg New Energy Finance, 2013), which would add up to more than 1,100 GW in 2030. While the emissions per kWh of electricity produced in China was roughly stable from 1990 to 2004, and is still above world average, the country has turned towards a trend of decarbonisation of their energy supply in recent years (IEA 2014b).

The Climate Change Action Plan further includes actions on increasing the share of gas of total primary energy supply to 10% in 2020 and limiting coal to a maximum of 4.2 billion tonnes of coal from 2020 onwards. Both actions go beyond the IEA WEO 2014 current policies projections and lead to significant emission reductions in the CAT current policies projections. The cap on coal specifically has an important impact on emissions post 2020 and we expect this policy to be one of the main drivers on a pathway towards peaking emissions in China by 2030.

Policies to reduce energy consumption support the energy intensity targets in the Five Year Plan. In the industrial sector, the TOP 1000 enterprises programme has proven effective in the past and has been extended to 10,000 installations. There is also an increasing number of efficiency standards for appliances, buildings and cars.

In 2013, China published the Air Pollution Control Action Plan (Government of China, 2013) that, along with other measures, bans the construction of new coal-fired power plants in various coastal provinces in order to decrease local air pollution. The effect on emissions are likely to be small, as the regions with major extension plans for coal-fired power plants are not touched by the regulation (Ailun Yang and Ryna Yiyun, 2013). Eventually, the impact on emissions will be dependent on the energy source used to replace the planned plants affected by the regulation.

Box 2 – Approach to quantifying China's emissions level in the peaking year

The Climate Action Tracker estimate of the post-2020 contribution reflects China's announcement to peak CO2 emissions no later than 2030 and to aim at a share of non-fossil fuels of 20% in 2030. China does not provide an absolute emissions level connected to this contribution.

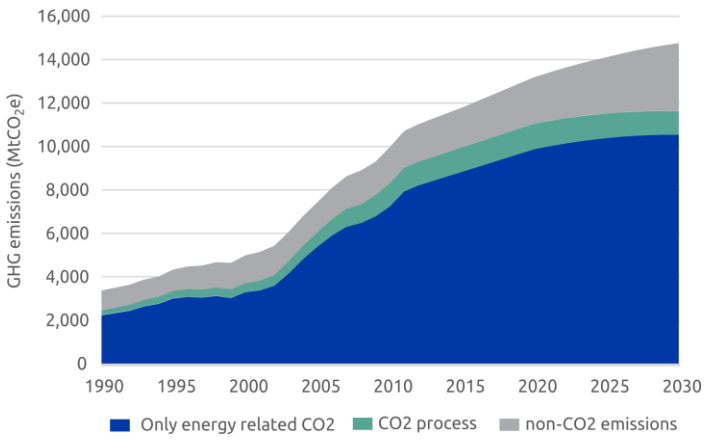
To quantify potential emissions trajectories we considered three options and chose the one that results in the lowest emissions:

- Only the share of non-fossil fuels
- Peak emissions in 2030
- Peak emissions in 2025

To quantify the emissions level resulting from the non-fossil target, we started from the WEO 2014 current policies scenario, and added the effect of recently adopted policies including the cap on coal and the target for gas of at least 10% and a share of 20% non-fossil fuels (excl. biomass).

To illustrate potential peaking scenarios, we assume that the growth rate of energy-related CO_2 emissions linearly approaches zero from today to the respective year. For peaking in 2030, this results in higher emissions than from the non-fossil target, so does not add to the reduction. If emissions were to peak in 2025 (reflecting the provision of "no later than 2030"), this would add 1 GtCO2e of reduction over the non-fossil target in 2030.

We estimate that CO_2 process emissions already peak before 2020 and, we assume, no further mitigation measures for non-CO_2 emissions, which results in an increase of total GHG emissions after 2030.



CO_2 and other greenhouse gases in the CAT assessment in the scenario of peaking CO_2 emissions by 2030

The United States

The US has announced its plan to reduce emissions by 26-28% below 2005 in 2025 (equivalent to 14 - 16% below 1990). This adds to the pledge to reduce GHG emissions by 17% below 2005 levels by 2020 (equivalent to 3% below 1990 levels).

In relation to the US 2020 pledge, we estimate presently implemented policies will achieve reductions of about 6% below 2005 levels, about 780 $MtCO_2e$ short of the goal. Additional announced policies, if successfully implemented, would lead to further reductions, enabling the US to reach about 18% below 2005 levels by 2020, hence meeting its 2020 pledge.

According to our analysis, to reach the 2025 goal, the US will need to implement additional policies, and build on and accelerate the implementation for its already planned policies (e.g. the targets in the Climate Action Plan).

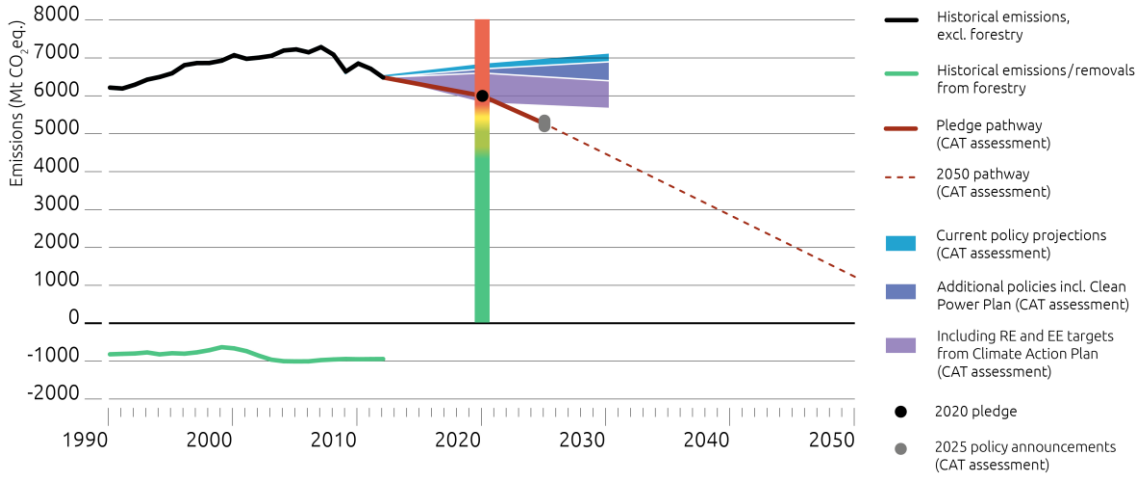


Figure 4 Emission trajectories for the US[16]

In November 2014, President Obama announced, in coordination with China, that the US would aim at reducing emissions by 26 to 28% below 2005 in 2025 as its contribution to the post-2020 climate agreement (The White House, 2014). This anticipated reduction accelerates the emissions reduction rate compared to the US 2020 pledge, and the target is further in line with the US long-term target for 2050.

For the Copenhagen Accord, the US pledged an emissions reduction goal of 17% below 2005 levels for 2020, covering all sectors. The national long-term goal is to reduce emissions by 83% below 2005 by 2050 (United States Department of State, 2010).

In absolute terms, taken together, this results in absolute emission levels of 6000 $MtCO_2e$ in 2020, 5200 – 5350 $MtCO_2e$ in 2025 and 1450 $MtCO_2e$ in 2050 (excl. LULUCF). The level of the post 2020 contribution for 2025 is consistent with a linear interpolation between the 2020 pledge and the national long-term goal.

There is some uncertainty surrounding the consequences of these goals on industrial GHG emissions (all emissions excluding LULUCF) due to uncertainties in the estimation of LULUCF emissions in the base year, which have been previously corrected due to methodology changes. To some extent, the choice of accounting rules can also affect the absolute remaining emissions levels.

[16] The current policy CAT projections are a range of quantified outcomes, whereas the additional policy quantifications for the Clean Power Plant and RE and EE targets from the Climate Action Plan are single estimated added the max range of the current policy CAT projections.

With currently implemented policies, the US is expected to achieve emissions levels of approximately 6,770 – 6,790 $MtCO_2e$ in 2020 and between 6,950 and 7,050 $MtCO_2e$ in 2030 (excl. LULUCF). With a linear interpolation, this would mean a level between 6,860 and 6,920 $MtCO_2e$ in 2025. This includes only the policies that are fully implemented and not those that are planned or that are based on goals only without supporting policies (see Box 3).

With additional measures as outlined by the US Administration in "The President's Climate Action Plan" (CAP) in June 2013 (Executive Office of the President 2013), the 2020 pledge could be achieved. The National Communication further projects that in 2020, the US LULUCF sector's sinks will absorb between 614 and 898 $MtCO_2e$, and for 2025 573 to 917 $MtCO_2e$. The uncertainty is high and the final level in 2020 could have an impact on whether the pledge will be achieved as well.

Historically, US emissions constantly increased between 1990 and 2007. Since that time there has been a downward trend due to the financial crises, more recently a strong shift to natural gas as an energy source and some decrease in total energy demand. In the US, a variety of activities are taking place both on state and federal levels and in all sectors. Nevertheless, a more comprehensive approach with adequate coverage and momentum could more substantially reduce emissions.

The "Clean Power Plan," announced in 2014 has been through a public consultation period, and the EPA is now finalising the rules. The plan aims to reduce emissions from the power sector by 30% below 2005 levels by 2025. The CAT analysis from June 2014 indicates that this alone is an important step, but its sole impact is insufficient to meet the US targets. This policy may prevent a reversal of the shift from coal to gas in case of changing market conditions, together with the New Source Performance Standard – a regulation in the pipeline to limit specific emissions of new power plants.

Another important area in the Climate Action Plan (CAP) is its aim to increase energy efficiency in demand sectors, where it foresees, for example, energy efficiency standards for appliances and federal buildings, different financial incentives, and energy saving measures in federal agencies. Not all activities in the plan have been clearly defined.

Two of the CAP's overarching targets are to double renewable energy generation by 2020 and to double energy productivity by 2030 compared to 2010 levels. According to our assessment, complying with these targets would reduce emissions to 5,830 $MtCO_2e/a$ in 2020 and 5,690 $MtCO_2e/a$ in 2030.

For non-energy sectors, the plan includes measures concerning methane emissions, controlling HFCs and emissions from LULUCF, which need further refinement to be evaluated.

A few points from the CAP have already seen concrete activities in 2013 and 2014. The process to permit installations of renewable energy systems on public land has been modified, making it less complicated to prioritise renewable energy (U.S. Department of the Interior 2013b). Also, the auctioning of renewable energy is now an established process, which could be accelerated (see for example U.S. Department of the Interior 2013a).

The planned activities are not included in our projections of emissions "with" implemented policies, as these will depend on future decisions and actions. However, the framework being created at the moment is crucial for the US to prepare future actions, and demonstrates that the US government is creating opportunities to push forward climate change policies.

Successful implementation of the planned policies appears likely to secure achievement of the 2020 pledge. Further, state action is an important driver of US climate policies and dynamics on that level may lead to further reductions.

Box 3 – Comparison of CAT assessment with US government analysis

Our analysis is consistent with that of the US government, with the difference that CAT only includes *implemented* measures as a default. Differences in the scenarios result also from including also *planned* policies.

In the 6th National Communication to the UNFCCC, the US provides emission projections with all policies included until the end of 2012, and projections including the planned activities of the CAP.

The data provided shows that the pledge may be met, but that there is substantial uncertainty around the effect of the CAP and sequestration removals. The resulting emissions are in a range between 4,900 and 5,600 $MtCO_2e/a$ incl. LULUCF in 2020 (5,520 – 6,500 $MtCO_2e/a$ excl. LULUCF). For the lower end of the range, the emissions reduction pledge will be achieved. This means that using this data, the USA will need to fully implement the CAP and reach the high end of sequestration removals in order to meet the pledge.

The National Communication used the 2013 US DOE American Energy Outlook (AEO 2013) as the basis for projections of energy-related CO_2 emissions and adjusts the values to match international reporting requirements. That scenario includes policies implemented until December 2012. The EPA prepared data for non-energy related and non-CO_2 emissions.

The total emissions in 2020 under the reference scenario with policies implemented up to December 2012 are 6,815 $MtCO_2e/a$ excl. LULUCF in the National Communication, a 5.3% decrease in comparison to 2005 according to the document. The CAT current policy projections end up at 6,770 – 6,790 $MtCO_2e/a$ excl. LULUCF. The small difference results mainly from the update of the AEO to the 2014 (AEO 2014) version used by CAT, which includes the effect of policies implemented until December 2013.

The CAT defines "currently implemented policy" as any sort of regulation or legislation that is in place. Most of the activities under the President's Climate Action Plan (CAP) do not fall into this category and are therefore excluded from the CAT current policy scenario. This does not mean that their implementation is less likely: indeed, depending on how the initial ideas are eventually translated, they may turn into very effective policies. Examples of important action may be the reduction of methane and HFCs, two of the areas named in the CAP. However, the CAP contains no concrete activities regarding those, nor has legislation or regulation been implemented.

The CAT considers additional scenarios to reflect some planned policies: Including the Clean Power Plan, the CAT analysis results in emissions of 6,600 $MtCO_2e/a$ in 2020 excl. LULUCF. With the targets to double renewable energy electricity generation (excl. large hydro) and to double energy productivity laid out in the Climate Action Plan, the CAT estimates emissions of 5,830 $MtCO_2e/a$ in 2020. This is within the range of the National Communication and would be sufficient to comply with the 2020 pledge.

European Union

In October 2014, the European Council adopted a new set of climate and energy targets for 2030. Among those, the EU put forward a binding target of at least 40% aggregate domestic emissions reductions below 1990 levels by 2030. Currently implemented policies are projected to reduce emissions by 23-35% below 1990 levels by 2030 and hence do not - yet - put the EU on a trajectory towards meeting either its 2030 targets.

The EU's Copenhagen target for 2020 is to reduce emissions by 20% below 1990 and it has committed to the second commitment period of the Kyoto Protocol (2013-2020) with a QELRO equivalent to 20% reduction from base year emissions in 1990. Emissions of industrial GHGs in 2012 were approximately 19% below 1990 levels. Currently implemented policies are estimated to lead to a 22-27% reduction below 1990 levels, meaning that the EU is on track to significantly over-achieve its Kyoto second commitment period target. However, with current policies the EU is not on track to meet its more ambitious conditional target of 30% emissions reduction below 1990 levels by 2020.

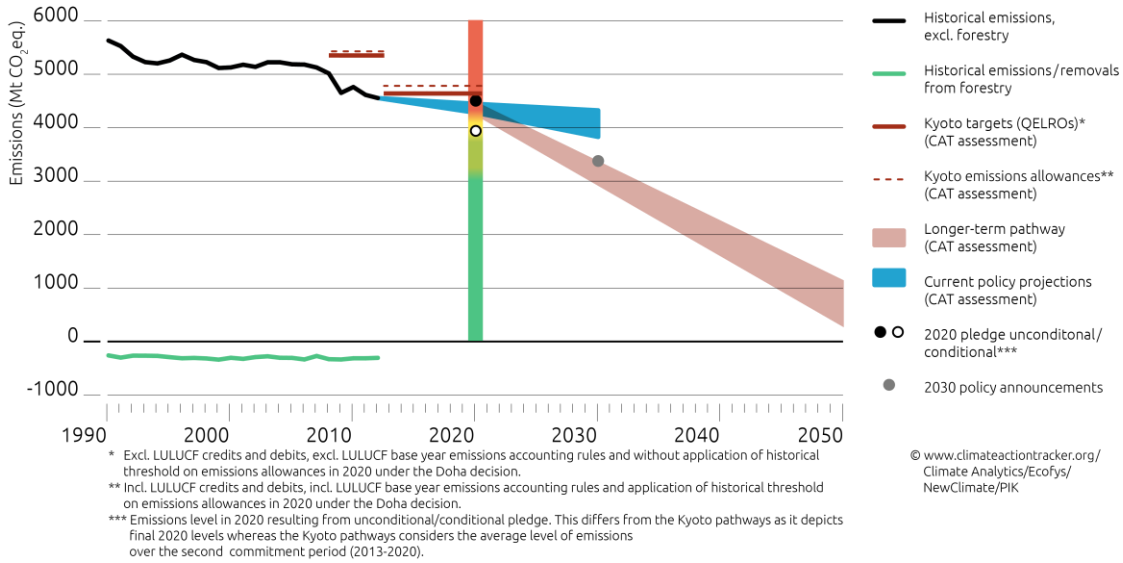


Figure 5 Emission trajectories for the EU28

Under the Copenhagen Accord the EU proposed to decrease emissions by 20 to 30% below 1990 by 2020 and by 80 to 95% below 1990 by 2050. The EU announced its target of 30% below 1990 emissions by 2020 as part of a global agreement provided other developed countries commit to comparable efforts and developing countries contribute according to their capabilities.

Emissions in the EU28 have been on a downward trend since 1990. In 2012, emissions (excl. LULUCF) were 19% below 1990 levels. After a steep decline in 2009 due to the recession and an upward spike following the recovery in 2010, they have subsequently declined.

According to our analysis, the future projections with currently implemented policies continue the past downward trend with similar to slightly reduced reduction rates each year, depending on which end of the range one is looking at. While emissions decreased with an average of 0.9% per year between 1990 and 2012, emissions are projected to decrease between 0.5% and 1.2% per year up to 2020, and between 0.1% and 1% per year until 2030. Emissions are estimated to be between 4,115 $MtCO_2e$ and 4,374 $MtCO_2e$ (a 22-27% reduction below 1990) in 2020 and between 3,681 $MtCO_2e$ and 4,317 $MtCO_2e$ (23-35% below 1990) in 2030.

Current policy projections include all major EU policies implemented, including the EU ETS, the Effort Sharing Directive and a wide range of other EU-wide regulations influencing GHG emissions such as the renewable energy directive. It also includes the most important national policies. Several new policy developments have taken place at EU level since last year's assessment. These include binding emissions

targets for new car and van fleets, a new regulation on fluorinated gases, and further implementation of the Ecodesign legislation for boilers and water heaters (EEA, 2014). With these existing policies, the EU still has one of the most comprehensive climate packages globally.

The framework for the EU has been its '2020 energy and climate package', which lays the basis for the 20% GHG target. Framed as the 20 -20 -20 targets it contains a 20% for renewable energy (RE), a 20% target for energy efficiency (EE) improvement and a 20% GHG reduction target. Analysis has shown that these targets are internally inconsistent; implementing the RE as well as the EE targets would lead to an emission reduction of 30% rather than 20% by 2020 from 1990 levels (Höhne et al. 2011). For 2020 the EU is on track to exceed its overall emissions reduction target (current projections foresee an emissions reduction between 22% and 27%), also its renewables target, but not yet the energy efficiency target.

The main development in the EU in 2014 has been the development of a framework for 2030. Under the EU '2030 framework for climate and energy policies', the European Commission proposed a package of targets, including the above mentioned GHG target of 40%, a renewable energy target of 27% and an energy savings target. The energy savings target for 2030 was introduced following a review of the Energy Efficiency Directive and originally included the proposal to reduce energy use by 30%. However the European Council only endorsed a target of 27%, which will be reviewed in 2020 to re-consider the 30% target originally proposed by the European Commission (EC, 2014). Given that the GHG target of at least a 40% emissions reduction below 1990 was defined based on the assumption of a 30% energy efficiency target, this could potentially undermine the achievement of the overall 2030 GHG target.

Under the EU ETS, one of the most important instruments of the EU to reach its emission target in 2020 and 2030, a surplus of emission allowance of ~1.8 $GtCO_2$ had been accumulated by the end of 2012 (EEA 2014). This surplus is expected to grow to 2.6 $GtCO_2$ until 2020 according to the EU's own calculations. This is larger than the EU's ETS cap for the year 2013. The introduction of this surplus could dilute the 2030 40% GHG target by 7% in 2030 if these allowances are used in the period to 2030 (Höhne et al 2013). The EU has agreed to introduce a so-called market stability reserve that aims to address this surplus issue. It is thus important for the achievement of the 40% GHG target that a robust market reserve is created that allows the EU to achieve real 40% emission reductions by 2030.

Decarbonisation

Figure 6 shows historical and projected GHG intensity to 2030. The GHG intensity is defined by the ratio between GHG emissions and energy consumption.

For the EU28 and US under current policies GHG intensity remains at about present levels to 2030, whereas with the post 2020 policies and announcements GHG intensity improvements would continue for the EU and accelerate for the US. Under this scenario US GHG intensity could decrease below EU levels after 2020. This could indicate the need for further ambition from the EU in terms of improved GHG intensity in its 2030 framework for climate and energy policies in order to match the US level of ambition in this area.

By contrast, GHG intensity for the pledge and current policy projections almost overlap in China for the next 25 years, with the rate of improvement slower than in the last decade. This indicates there is still significant room for improvement in China and that an important increase in emissions reductions could be achieved through the implementation of additional, more ambitious policies to reduce GHG intensity of economic activities.

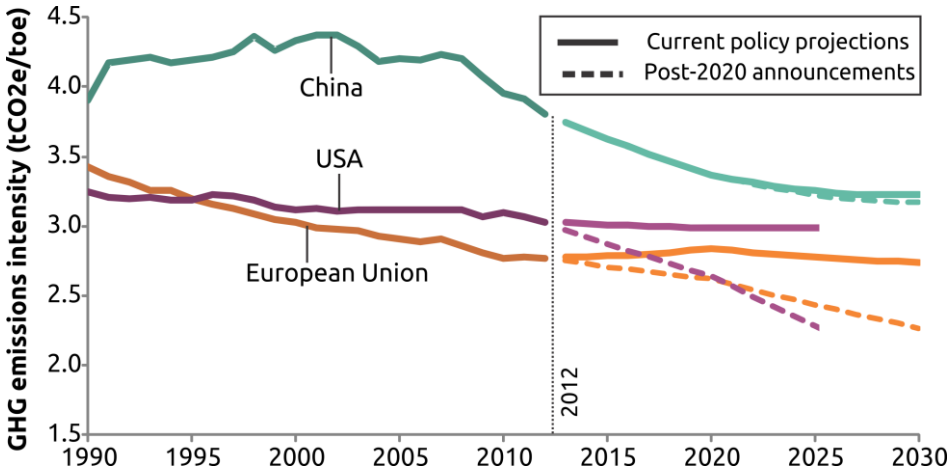


Figure 6 GHG intensity trends

Implications for the Carbon Budget

A further metric to assess whether the world is on track to meet the global warming limits is the cumulative CO_2 emissions budget, or 'carbon budget'. The cumulative emissions of CO_2 largely determine peak warming and hence there is a finite 'carbon budget' for any given warming limit (IPCC 2013). Policy progress towards limiting warming can therefore be measured by how fast we are using the limited carbon budget and how much remains at any given time.

In the Synthesis Report (SYR) of its Fifth Assessment Report (AR5) the IPCC presents a budget of 1,000 (or 750-1,400) $GtCO_2$ that can be emitted until the probability to stay below 2°C falls below 66% (IPCC 2014b)[17]. Based on scenarios that return to 1.5°C by 2100 with 50% probability, we estimate the budget is 800 (or 750-850) $GtCO_2$[18]. Those budgets are for CO_2 only. Their uncertainty stems primarily from the uncertainty in the emissions and climate effects of other greenhouse gases and air pollutants, and the (early or late) timing of rapid reductions in CO_2, non-CO_2 GHG and air pollutants. The comparison of cumulative emissions between current policy projections and pledge pathway provides an independent benchmark to complement the direct comparison of projected warming implied by these two cases.

Even with the upper end of the 2°C budget range the 1,000 $GtCO_2$ budget will be used up by around 2045 for the pledge pathway. Accounting for the more ambitious 2050 reduction targets only allows for one year more. In case of the current policy projections the budget lasts only until 2042-2043. For the global goal of keeping warming below 1.5°C under consideration in the UNFCCC process, the budget would be exhausted around 2030 for all cases. After the budget is used up the probability to stay below 2°C (or 1.5°C by 2100) falls below 66% (50%).

To avoid subsequently breaching the 2°C limit, CO_2 emissions would need to be reduced to zero within a decade. To ultimately limit warming below 2°C all emissions exceeding the budget have to be compensated by removing the same amount of CO_2 from the atmosphere later in the century. This shows that both pledge ambition and policy efforts to implement the pledges have to be ramped up considerably in order to avoid shifting the burden to future generations.

Importantly, emission budgets can also be applied to estimating 'allowed' cumulative emissions, for example between today and 2050. For a probability of 66% that warming stays below 2°C total CO_2 emissions through 2050 need to stay below 1,100 $GtCO_2$[19], whereas in the current policy pathway already

[17] The budget assumes emission counting towards the budget starts in 2011.

[18] Many of these scenarios are 'overshoot' scenarios, reaching higher than 1.5°C during the 21st century before returning to (below) 1.5°C by 2100. IPCC AR5 Synthesis report assessed a lower budget of 550 (or 550-600) $GtCO_2$ by the time warming reaches 1.5°C, i.e. without peaking first (IPCC 2014b).

[19] By necessity such "stay below" budgets need to be derived using a different method, drawing on likely 2°C scenarios, rather than high warming scenarios used to derive the "cross 2°C" budgets applied above. We applied an

1,900 $GtCO_2$ is emitted by that time. The pledges bring this down to 1,600 $GtCO_2$, or about 40% down towards 1,100 $GtCO_2$. This is consistent with the climate model projections, in which the pledges lead to 3°C by 2100, hence bridging about 40% of the 'temperature' gap between the 3.9°C of the current policy projections and 2°C[20].

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analysis comparable to Meinshausen et al (2009) to estimate an 1,100 $GtCO_2$ budget over 2011-2050 for the scenarios in AR5 (IPCC 2014a), for a 66% modeled chance to stay below 2°C.

[20] Small difference occur due to rounding.

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Annex 1 Table of pledges and projections

Country	Likelihood of meeting 2020 pledge	Pledges and post-2020 announcements (MtCO2eq, ex. LULUCF)*			Current policy projection (MtCO2eq, ex. LULUCF)*			Gap between pledges and current policies as % of 2010 emissions			Share of total global emissions
		2020	2025	2030	2020	2025	2030	2020	2025	2030	2010
Argentina	n/a	-	-	-	379–478	407–529	436–580	-	-	-	0.8%
Brazil	+	1977-2068	-	-	1749	2020	2335	0%	-	-	2.3%
Canada	–	611	-	-	762	789	815	22%	-	-	1.7%
Chile	–	118	-	-	148	164	179	31%	-	-	0.2%
China	+	13220	13920–14000	14620–14780	13200	14020–14150	14830–15090	0%	0%–1%	0%–3%	24.2%
Costa Rica	–	0**	-	-	15	17	20	157%	-	-	0.0%
EU	+	4505	3943	3379	4374–4115	3898-4345	3681–4317	0%	0%–8%	6%–20%	11.5%
India	?	3343–4110	-	-	3517–4336	4250–5345	4983–6354	8%–10%	-	-	5.6%
Indonesia	–	1689-2155	-	-	2544	2655	2797	16%–36%	-	-	1.9%
Japan	+	1300–1360	-	-	1230–1320	1180–1290	1120–1260	0%	-	-	3.0%
Kazakhstan	–	305	-	-	355–361	399–426	443–491	17%–20%	-	-	0.7%
Mexico	–	672	-	-	785–799	803–844	821–888	12%–14%	-	-	1.7%
New Zealand	–	49–58	-	-	80	84	85	30%–42%	-	-	0.2%
Norway	–	30–35	-	-	54–55	52–54	51–53	37%–44%	-	-	0.1%
Peru	n/a	-	-	-	200	215	230	-	-	-	0.3%
Russia	+	2520	-	-	2570–2600	2690–2730	2820–2860	2%–4%	-	-	5.4%
South Africa	–	417–602	417–633	-	650	683–695	715–740	8%-40%	11%–46%		1.4%
South Korea	–	543	-	-	579–637	590–667	601–697	6%–15%	-	-	1.7%
Switzerland	–	37–42	-	-	41–47	35–44	30–40	7%–9%	-	-	0.1%
Ukraine	Pledge above BAU	752	-	-	492–608	614–687	735–767	0%	-	-	0.9%
USA	–	6000	5200–5350	-	6770–6790	6860–6920	6940–7050	11%–12%	23%–24%	-	16.6%

*** Values for Brazil, Costa Rica, Mexico, Peru and Indonesia include emissions from LULUCF**

**** Pledge refers to 2021**

The Climate Action Tracker is an independent science-based assessment that tracks the emission commitments and actions of countries. It is a joint project of the following organisations:

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Climate Analytics is a non-profit organization based in Potsdam, Germany. It has been established to synthesize climate science and policy research that is relevant for international climate policy negotiations. It aims to provide scientific, policy and analytical support for Small Island States (SIDS) and the least developed country group (LDCs) negotiators, as well as non-governmental organisations and other stakeholders in the 'post-2012' negotiations. Furthermore, it assists in building in-house capacity within SIDS and LDCs. Contact: Dr. h.c. Bill Hare, +49 160 908 62463

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