CLIMATE ACTION TRACKER

China

History: 2017 | 2016 | 2015 | 2014 | 2013 | 2012 | 2011

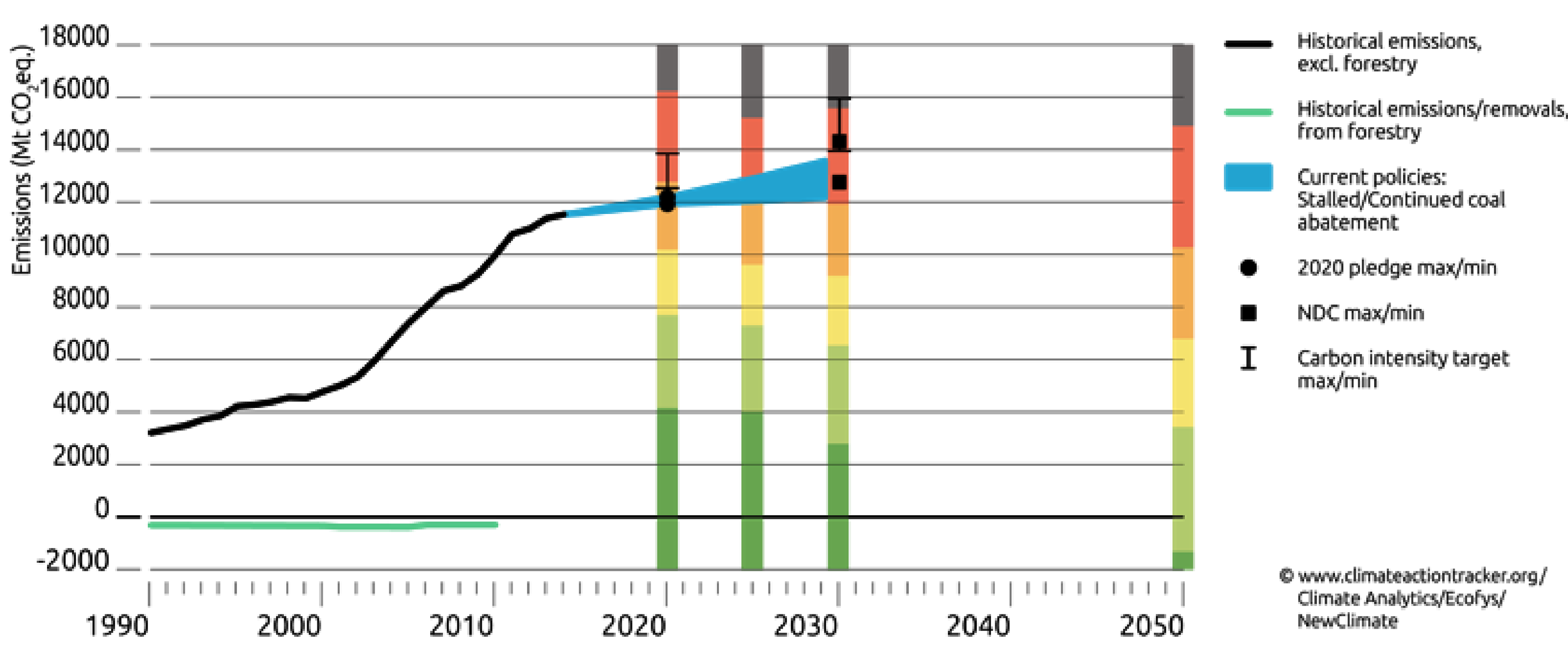
Page last updated: 6th November 2017

Rating

CRITICALLY INSUFFICIENT | HIGHLY INSUFFICIENT | INSUFFICIENT | 2°C COMPATIBLE | 1.5°C PARIS AGREEMENT COMPATIBLE | ROLE MODEL

Current Rating:
HIGHLY INSUFFICIENT

Basic | Intermediate



Assessment

China's CO_2 emissions appear to have peaked more than a decade ahead of its Paris Agreement NDC commitment to peak its CO_2 emissions before 2030. The latest analysis from the Climate Action Tracker indicates that CO_2 emissions may, in fact, already have stopped increasing and reached peak levels.

The on-going reduction in coal use for the third year in a row has had a major impact, and, if they were to continue at similar rates in the next decade, total Chinese GHG emissions will only show a very slight increase in the period 2015–2030, and essentially plateau at close to 12.0 GtCO_2e/year.

China has already surpassed solar PV deployment target for 2020, and has now doubled its PV target for 2020 in response. Wind energy deployment is also on track to exceed its 2020 target by roughly one-fourth. However, the absence of comparable commitments on other, non-CO_2, gases means that total greenhouse gas emissions could continue to increase until at least 2030.

China's policies and actions are set to overachieve its "peak by 2030 CO_2" goal in its Nationally Determined Contribution (NDC), as well as its own national targets. Based on progress to date, the NDC itself is ripe for an update, and is not ambitious enough to limit warming to below 2°C, let alone the 1.5°C limit in the Paris Agreement, unless other countries make much deeper reductions and comparably greater effort than China, which is why the CAT rates it "Highly Insufficient."

On 3 September 2016, China ratified the Paris Agreement, and it has policies in place to reach its NDC goals. These policies are currently centred around the targets set in its NDC, which include a commitment to peak CO_2 emissions by 2030 at the latest, lower the carbon intensity of GDP by 60%–65% below 2005 levels by 2030, increase the share of non-fossil energy carriers of the total primary energy supply to around 20% by that time, and increase its forest stock volume by 4.5 billion cubic metres, compared to 2005 levels.

China's NDC's targets, if reached, would result in GHG emission levels of roughly **12.8–14.3 GtCO_2e in 2030**, a 64%–70% reduction of emissions intensity below 2005 levels (using the latest projections on GDP development (IEA, 2016b)). The NDC carbon intensity targets on their own would lead to 2030 emission levels of **14.0–16.0** GtCO_2e. As the intensity targets are likely to be reached automatically if the non-fossil targets are achieved, and our rating is based on achieving all NDC targets, we do not address the intensity targets separately here. (China's intensity target on its own would result in an "Critically insufficient" rating.)

However, this range also implies that China's NDC and its national actions are not yet consistent with limiting warming to below 2°C, let alone 1.5°C. We therefore rate the emission levels estimated for 2025 and 2030 resulting from the most ambitious aspects of the NDC as "Highly insufficient."

Our analysis shows that China will achieve both its 2020 pledge and its 2030 plans. Current policy projections show that emissions in 2030 could lie in the range of **12.2–13.7 GtCO_2e**, implying that China may well overachieve the target levels implied by its NDC with its current policies.

China is implementing significant policies to address climate change, most recently aiming to restrict coal consumption, which may well have already peaked, based on recent estimates. China's 13th Five-Year-Plan stipulates a maximum 58% share of coal in national energy consumption by 2020 (NDRC, 2016). The CAT assesses two scenarios of future developments in coal consumption: a **continued coal abatement** scenarioas well as a **stalled coal abatement** scenario:

- Under the "continued coal abatement" scenario, where the recent decreases in coal consumption continue at a similar pace for the next few years—forming the lower range of the 2030 projections—CO_2 emissions would already have plateaued in 2015, and will decrease substantially up to 2030, reaching the NDC peaking target around ten years early.
- In the "stalled coal abatement" scenario, total coal consumption stabilises after the recent decreases and remains constant through the decade 2020–2030 (see Current Policy section for more detail).

However, total GHG emissions are likely to continue increasing until 2030, as China has not yet implemented sufficient policies addressing non-CO_2 GHG emissions (CH_4, N_2O, HFCs etc.), although the rate of increase of total emissions would become near-zero under the most optimistic assumptions of continued coal abatement (at an average growth rate of 0.3%/year in total GHG emissions between 2017 and 2030). As the NDC acknowledges that addressing these gases is important, further policy action may be expected to address non- CO_2 emissions as well.

Pledges and targets

Paris Agreement targets

On 3 September 2016, China ratified the Paris Agreement and submitted its NDC to the UNFCCC, which **includes a number of elements:**

- Peak CO_2 emissions by 2030, or earlier if possible;
- Increase the share of non-fossil energy sources in the total primary energy supply to around 20% by 2030;Lower the carbon intensity of GDP by 60% to 65% below 2005 levels by 2030;
- Increase the forest stock volume by around 4.5 billion cubic metres, compared to 2005 levels.

Copenhagen pledge	
2020	Carbon intensity: -40% to -45% below 2005 by 2020
	Non-fossil share of energy supply: 15% in 2020
	Forest cover: +40 million ha by 2020 compared to 2005
	Forest stock: + 1.3 billion m³ by 2020 compared to 2005
Conditions	None
Paris Agreement target	
Ratified	Yes
2030 targets	
	Peak CO_2 emissions latest by 2030
	Non-fossil share: 20% in 2030
	Forest stock: + 4.5 billion m³ by 2030 compared to 2005 Carbon Intensity: -60% to -65% below 2005 by 2030
Coverage	Economy-wide
LULUCF	Unclear how LULUCF is included

Among measures to implement enhanced actions on climate change, it also lists the following elements:

- Increase the share of natural gas in the total primary energy supply to around 10% by 2020;
- Proposed reductions in the production of HCFC22 (35% below 2010 levels by 2020 and 67.5% by 2025) and "controlling" HFC23 production.

2020 pledge

China's 2020 pledge consists of the following elements:

- Overall reduction of CO_2 emissions per unit of GDP by 40–45% below 2005 levels by 2020;
- Increase the share of non-fossil fuels in primary energy consumption to around 15% by 2020;
- Increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic metres by 2020 from 2005 levels.

We analysed the effects of all these targets – if achieved - on emissions, including the non-fossil target for 2020 and 2030. To do this, we assumed energy-related emissions until 2020 would follow current policy projections from the IEA WEO 2016 time series, which we adapted to reach the targets of 10% gas by 2020 and 15% and 20% non-fossil fuels by 2020 and 2030, respectively.

Fair share

Is China is doing its "fair share" towards global efforts to reduce emissions to levels that would hold global warming below 2°C?

China's climate commitments in 2030 fall between two categories: "Highly insufficient" and "Critically insufficient". We base our rating of China's NDC on its commitment of having 10% gas and 20% non-fossil fuels in the primary energy mix by 2030. On this basis, the target falls into the "Highly insufficient" range. Were we to base the NDC on the carbon intensity target only, it would be "Critically insufficient", but we have noted in previous years' assessments already that this target seems substantially less ambitious than other elements of the NDC.

The "Highly insufficient" rating indicates that China's climate commitment for post-2020 is not consistent with holding warming to below 2°C, let alone limiting it to 1.5°C as required under the Paris Agreement, and is instead consistent with warming between 3°C and 4°C: if all countries were to follow China's approach, warming could reach over 3°C and up to 4°C. This means China's climate commitment is not in line with any interpretation of a "fair" approach to the former 2°C goal, let alone the Paris Agreement's 1.5°C limit.

The range of China's current policy pathways straddles the range of "Highly insufficient" and "Insufficient", with its lower end just in the latter category. Since the range is relatively large (nearly 2 GtCO_2e) and only the lowest 10% of the range falls into the "Insufficient" category, we rate China's current policy pathway also "Highly insufficient".

For further information about the risks and impacts associated with the temperature levels of each of the categories click here.

Current policy projections

In the CAT current policy projections, China will reach a GHG emissions level (excl. LULUCF) of between **11.9 and 12.2 GtCO_2e** in 2020 and **12.2–13.7 GtCO_2e** in 2030. A total of **9.1–9.4 GtCO_2e** in 2020 and **8.6–10.1 GtCO_2e** in 2030 are energy-related CO_2 emissions. This is an increase in emissions of 2%–4% above 2015 levels by 2020 and 5%–17% by 2030.

This means that according to our assessment, China will meet its 2020 pledge and its NDC targets, but still be slightly above current emissions levels. The projected increase in emissions is in spite of the decrease of coal consumption, mostly related to emissions of gases other than CO_2, because in the lower range of the current policy projections, overall CO_2 emissions peak between 2015 and 2020.

China is implementing a range of policies in most sectors. Most significant is its commitment to limit the use of coal, and a strong increase of renewable and low-carbon energy. For example, coal consumption in China has decreased every year since 2013 and, since the 2007 Medium and Long Term Development Plan for Renewable Energy, China has increased its renewable energy capacity plans multiple times. We elaborate on this below.

Controlling coal consumption

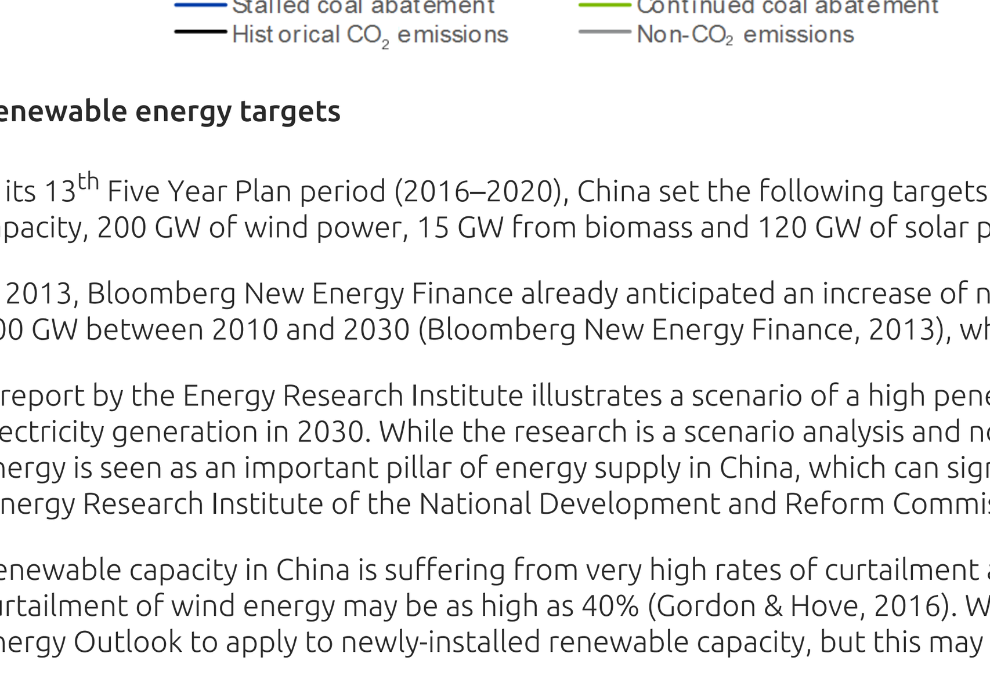
China's National Action Plan on Climate Change mentions—in the context of the "reasonable control of the total coal consumption"—a target to increase the share of gas in the total primary energy supply to 10% in 2020. The Energy Development Strategy Action Plan (2014–2020) further defines the "reasonable control of the total coal consumption" as limiting coal to a maximum of 4.2 billion tonnes by 2020. Recently, the cap on coal has been quantified as a maximum 58% share of coal in total primary energy consumption by 2020 (Lin, 2017)

In February 2015, the Ministry of Industry and Information Technology (MIIT) and the Finance Ministry released the 2015–2020 action plan on the efficient use of coal, aiming at decreasing coal use by 160 million tonnes in the next five years (Xinhua 2015). The 13th Five Year Plan period (2016–2020) introduced more coal-related targets, such as a ban on new coal-fired power plants until 2018, and a cut in annual production capacity of coal of 700 Mtce—which translates to around 14% of total coal production capacity (Enerdata, 2016; Reuters, 2016). To combat air pollution, China is also shutting down coal-fired power plants, for example in Beijing, where the last remaining coal fired power plant was shut down in 2017 and replaced with gas power plants (Xinhua, 2017). These actions lead to significant emissions reductions in the CAT assessment of China's current policy projections.

It has been claimed that overall coal consumption in China may already have peaked in 2013, as it dropped 2.9% in 2014, by 3.7% in 2015 and by 4.7% in 2016. This appears to be mainly due to two factors: a decline in growth in the construction and manufacturing sector as a result of the overall slowdown of China's economic growth, as well as a continued policy drive to lower coal use in order to reduce air pollution and greenhouse gas emissions (Korsbakken & Peters, 2017; Qi, Stern, Wu, Lu, & Green, 2016).

In our current policy projections (see Assumptions below), we have included these most recent trends on coal abatement (Korsbakken & Peters, 2017; National Bureau of Statistics of China, 2017) to estimate energy-related emissions in 2015 and 2016, two years ahead of the latest IEA data, which is based on 2014. Based on optimistic or pessimistic assumptions of further coal abatement in the future, we then calculate the 2020 and 2030 levels of energy-related emissions. This gives a range of emissions under this assumed peaking of coal consumption in 2013. CO_2 emissions from other sectors, cement and industry, as well as non-CO_2 emissions, were assumed to follow present policies. This results in absolute emission levels of 12.2–13.7 GtCO_2e excl. LULUCF in 2030.

Our assessment suggests that continued abatement of coal consumption could have already stopped the rise in China's CO_2 emissions. Others have noted the same possibility and the large associated uncertainties (Peters, 2017). The actual timing of a true peak in CO_2 emissions will likely hinge on developments in the next couple of years.



Renewable energy targets

In its 13th Five Year Plan period (2016–2020), China set the following targets for non-fossil capacity installed by 2020: 340 GW of hydropower capacity, 200 GW of wind power, 15 GW from biomass and 120 GW of solar power, as well as 58 GW of nuclear capacity (NDRC, 2016).

In 2013, Bloomberg New Energy Finance already anticipated an increase of non-fossil capacity of a similar order of magnitude, more than 800 GW between 2010 and 2030 (Bloomberg New Energy Finance, 2013), which would add up to more than 1100 GW in 2030.

A report by the Energy Research Institute illustrates a scenario of a high penetration of renewable energy, reaching a share of more than 50% of electricity generation in 2030. While the research is a scenario analysis and not linked to any policies, the report still shows that renewable energy is seen as an important pillar of energy supply in China, which can significantly contribute to a long-term sustainable energy system (Energy Research Institute of the National Development and Reform Commission, 2015).

Renewable capacity in China is suffering from very high rates of curtailment as grid integration lags behind installation. In some provinces, curtailment of wind energy may be as high as 40% (Gordon & Hove, 2016). We have assumed default load hours calculated from the World Energy Outlook to apply to newly-installed renewable capacity, but this may be an optimistic assumption given such high rates of curtailment.

Recently, it was reported that China had already surpassed its 2020 targets on solar PV deployment, leading to the NEA to roughly double its solar capacity target for 2020 in response. Wind energy deployment is also on track to exceed its 2020 target by roughly one-fourth (NEA, 2017; Yan & Myllyvirta, 2017). We estimate that if such deployment is indeed achieved by 2020 for solar PV and wind power, this could lead to further emission reductions by 2020 and 2030 of roughly 100 MtCO_2. These numbers have not yet been included in the current assessment, but will be part of future CAT assessments of China's current policies.

Energy intensity and non-CO_2 emissions

China's energy intensity targets are supported by policies to reduce energy consumption. In the industrial sector, the TOP 1000 enterprises programme has led to effective energy savings, and has been extended to 10,000 installations. There is also an increasing number of efficiency standards for appliances, buildings and cars, and the uptake of electric vehicles (full and hybrid) is happening faster and faster (Forbes, 2016). It has been suggested that China may implement a mandatory quota of new electric vehicle sales in 2018 (Bloomberg, 2016). However, it has recently emerged that this quota may be pushed back or lowered under pressure from car manufacturers (Reuters, 2017), as sales of electric vehicles fell sharply following a reduction in state subsidisation of electric vehicle purchase and carmakers indicated the quota may be "too aggressive" (Green Car Reports, 2017).

In 2014 and 2015, China also started to tackle non-CO_2 emissions, most notably HFC emissions. The National Development and Reform Commission (NDRC) is investing in demonstration projects for the controlled disposal of HFCs in industry. Further, it is setting up a reporting and monitoring instrument for F-gases for industrial companies (ESCO Committee of China Energy Conversation Association 2015). The NDC document also states targeted reductions of HCFC22 production of 35% by 2020 and 67.5% by 2025 below 2010 levels, and also refers to controlling HFC23, which is largely a by-product of HCFC-22 production. According to our initial assessment, this could lead to reductions of HFC23 of 230 MtCO_2e in 2020 and 300 MtCO_2e in 2025, which would help further bend the emissions curves downwards. As there is no clear regulation that assures implementation of these targets, we have not included these reductions in the current policy projections. However, they are an important stepping stone towards tackling this sector (EIA 2015).

Assumptions

Historical data series

We obtain energy-related emissions from the IEA Statistics and Balances (IEA, 2016b), a time series from 1990 until 2014.

Non-energy-related emissions are calculated as the sum of CO_2 process emissions from industry and non-CO_2 emissions. We obtain these from the data submitted to the UNFCCC for 2000 and 2005, and from China's first Biennial Update Report (BUR1) for 2012 (People's Republic of China, 2016; UNFCCC, 2017). This data is extrapolated to past and future years (up to 2030) using growth rates of the sum of process and non-CO_2 emissions. The latter is calculated as follows

- CO_2 emissions from processes (excluding cement making) and non-CO_2 emissions come from (JRC & PBL, 2014), giving a data series 1990–2010.
- Growth rates from the US EPA projections on non-CO_2 emissions are used to extrapolate the non-CO_2 emissions series from (JRC & PBL, 2014).
- CO_2 process emissions are obtained from (Boden & Andres, 2016) for cement-related emissions, and from (JRC & PBL, 2014) for all other types, again giving a data series 1990-2010. This data series is extrapolated until 2030 using the growth rates in cement emissions from the 2016 IEA Energy Technology Perspectives for non-OECD regions (IEA, 2016a).

The resulting time series 1990-2030 on (a) non-CO_2 emissions and (b) CO_2 process emissions are then added up. Their aggregate growth rate is subsequently applied to the non-CO_2 emissions time series 2000-2012. The resulting data series constitutes the "current policy scenario" of non-CO_2 emissions.

2020 Pledge and NDC

The estimate of the 2020 and 2030 pledges reflects China's announcement to aim at a share of non-fossil fuels in primary energy consumption of 15% and 20% (excluding biofuels), respectively, as well as reaching a share of 10% in gas in primary energy supply by 2020. For these targets, we start from the current policy scenario of the WEO2016 and add the effect of recently-adopted policies including the target for gas of at least 10% and a share of 20% non-fossil fuels (excl. biomass), insofar as these are not already reached by the WEO 2016 Current Policies Scenario.

Since the NDC contains the target of peaking CO_2 emissions latest in 2030, the implications for what an "NDC scenario" constitutes can be interpreted in a variety of ways—for instance, the least ambitious way would be to assume emissions keep rising and simply peak in 2030, a more ambitious interpretation would be to assume that this peaking happens somewhat earlier. We take the peak level of the "continued coal abatement" scenario as the lower bound of CO_2 emissions under the NDC scenario, and the scenario of emissions reaching only the non-fossil and gas targets as the upper end of the range of the NDC scenario, by 2030.

For the calculation of the intensity target, we use historic data from China's Statistical Yearbook and GDP projections from WEO2015 and IMF. Our projection calculations are based on the GDP growth rate from the IEA World Energy Outlook 2016 (6.4% annual growth between 2012 and 2020, and 5.3% annual growth between 2020 and 2030). We have used the IMF 2015 as an alternative scenario for 2012 to 2020 (average of 6.6% annual growth). It would seem unlikely that the Chinese government is actually planning for a lower GDP growth rate than in our central estimate case, as the 13th Five-Year-Plan targets a growth of 6.5% until 2020 (The People's Republic of China, 2016).

Based on projections (as described above), however, non-CO_2 GHG emissions will continue to grow. This growth will determine the absolute level of total GHG emissions in 2030, and the continuing upward trend points to a need for further policies. China has started to implement some of the actions on non-CO_2 emissions indicated in the NDC (see section on current policies), but those are not yet concrete enough to quantitatively include them in our assessment.

We also look at the target to increase the forest stock, under limited data availability: Assuming a wood stock density of around 1.3 tonnes of biomass per cubic metre with a 50% carbon content, the increase in forest stock by 4.5 billion m^3 by 2030 from 2005 levels translates into an additional sink of around 430 MtCO_2/year, on average, over the period from 2005 to 2030. In comparison, the sink was historically around 400 MtCO_2/year. China does not specify whether emissions from forests are included in the carbon intensity target.

Current policy projections

For projections of energy-related CO_2 emissions, we use projections from the World Energy Outlook 2016 (IEA, 2016b). We adjust the renewable energy capacity based on the most ambitious numbers among those reported in the Bloomberg New Energy Finance report (Bloomberg New Energy Finance, 2013) and official communications from China (NDRC, 2016). For non-CO_2 emissions, the approach for extrapolating historic data series beyond 2010 is explained under "historical data series".

China's cap on coal, at 58% of total primary energy consumption in 2020 (Lin, 2017), would be overshot in 2030 following the WEO2016 projections. In this year's CAT assessment of China, based on the latest data, we therefore adapt the mix of energy demand based on recent trends in declining coal consumption in China. Measured in tonnes, China's coal consumption declined for three straight years: by 2.9% in 2014, 3.7% in 2015 and 4.7% in 2016 (National Bureau of Statistics of China, 2017; Nature, 2017). However, the actual reduction in energy use was reportedly lower, at 1.3% (Korsbakken & Peters, 2017), discounting for the poor quality of coal. Data from China's national statistics (National Bureau of Statistics of China, 2016) also indicate that the difference in coal consumption between February 2016 and February 2017 was 1.3%. We use the ratio between the latter number and the reduction in tonnes to estimate the reduction in energy demand from coal in 2015 and 2016.

We consider two scenarios of further development of coal abatement, representing optimistic and pessimistic assumptions. The optimistic **continued coal abatement** scenario assumes that a similar rate of reduction as in 2016 can be kept up in the next decade up until 2030. The pessimistic **stalled coal abatement** scenario assumes that coal use will stabilise after the recent reductions at close to today's level and no further reductions beyond those in the last three years will occur.

To then quantify emission reductions from the fuel switch, we consider two options of fuel mix development. The first is to maintain the total

primary energy demand as in the current policy scenario of the WEO 2016 (from coal towards gas and renewables, which helps achieve the NDC targets on share of gas and non-fossil fuels). The second option is to allow for some flexibility in the total primary energy demand and assume that the coal reduction is accompanied by increasing efficiency, additionally to the already expected development of renewable energy and gas.

To calculate the reductions of HFC23, we assume that a direct correlation exists between HCFC22 and HFC23 in China. This means that we apply the reduction targets for HCFC22 from the NDC to HFC23 emissions in 2010. We compare this against the reference case—the current policy projections—where we use a historic value from the EDGAR emissions base for HFC23 and growth rates from US EPA for HCFC22, again assuming a linear correlation to HFC23. As mentioned above, the resulting reductions are not included in the current policy projections, given the lack of clearly defined policies or actions in the area.

We use Global Warming Potentials from the Second Assessment Report of the IPCC.

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