

# The End of China's Coal Boom

— 6 FACTS YOU SHOULD KNOW



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**GREENPEACE**



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The killer line in any domestic climate debate is: “What’s the point of reducing emissions here when China is building a coal-fired power plant each week?”

The facts behind China’s coal consumption are daunting. China is the world’s largest energy consumer and the leading emitter of greenhouse gases. In 2013, coal accounted for 65% of China’s overall energy consumption, making it the most coal-dependent country among top energy consumers.

China accounts for almost half of global coal consumption and from 2000 to 2010 its coal use and emissions grew on average at 9% a year. In 2010 alone, China’s increase in coal-fired power generation capacity equaled Germany’s existing generating capacity.

But recently adopted air quality policies and the growth of renewable energy show signs of a major change in trend. Given China’s major role in global emissions, this is of global significance.

For the world outside China, grasping the scale and significance of China’s energy choices is challenging. This briefing identifies the essentials of China’s changing energy trends, and what they mean for global efforts to fight climate change.

## BACKGROUND

China’s major cities have long endured high levels of air pollution. In 2013, 92% of Chinese cities failed to meet national ambient air quality standards. This has not held back the construction of new coal-fired plants and factories, adding to the problem. Coal burning is responsible for almost half of the country’s PM2.5 pollution (particulates with an aerodynamic diameter less than 2.5  $\mu\text{m}$ ).

In 2013 things started to change. “Airpocalypse” episodes, with exceptionally high levels of air pollution, in Beijing and many major Chinese cities raised public concern about air quality and created enormous pressure to change the country’s heavily coal-dependent outlook.

In September 2013, China’s State Council, or cabinet, released an “Airborne Pollution Prevention and Control Action Plan” in which the Chinese government recognised that tackling the air pollution crisis will require significant reductions in coal consumption. The plan was accompanied by specific coal consumption targets in provincial action plans.

For the first time, the plans introduce coal consumption caps for provinces. Furthermore, many provinces are now committing to reverse



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the trend of rapid growth in coal use and cut their coal consumption overall in just four years. No other major coal consuming country has ever implemented such rapid changes in their coal policies.

To date, the proposed coal control measures are ambitious. If achieved, the measures will not only fundamentally shift the coal consumption trajectory of the world’s largest coal consumer, but also significantly re-shape the global CO2 emission landscape.

**FACT 1: 12 OF CHINA'S 34 PROVINCES, ACCOUNTING FOR 44% OF CHINA'S COAL CONSUMPTION, HAVE PLEDGED TO IMPLEMENT COAL CONTROL MEASURES.**

So far, six Chinese provinces have included absolute coal consumption reduction targets in their air pollution action plans, with a 50% reduction targeted in Beijing, 13% in Hebei, 19% in Tianjin, 5% in Shandong, 21% in Chongqing and 13% in Shaanxi, by end of 2017, compared to 2012 levels.

The targets cover a significant slice of China's total coal use: Shandong is the largest coal consumer among Chinese provinces, burning as much coal as Germany and Japan combined; Hebei ranks fourth among Chinese provinces and Shaanxi is also in the top 10.

Another two key economic regions – the Yangtze River Delta (YRD), composing Shanghai, Jiangsu, and Zhejiang, with 11% of national coal consumption, and the Pearl River Delta (PRD) – are aiming for absolute reductions in coal use by the end of 2017. Additionally, two large coal-consuming provinces to the north-east of Beijing - Liaoning and Jilin - will have to limit growth in coal use to less than 2% per year in the period from 2013 to 2017. Until very recently, all of the provinces covered by the plans, with the exception of Beijing, have seen coal consumption grow rapidly.

**MAP OF CHINA'S COAL CONTROL MEASURES**

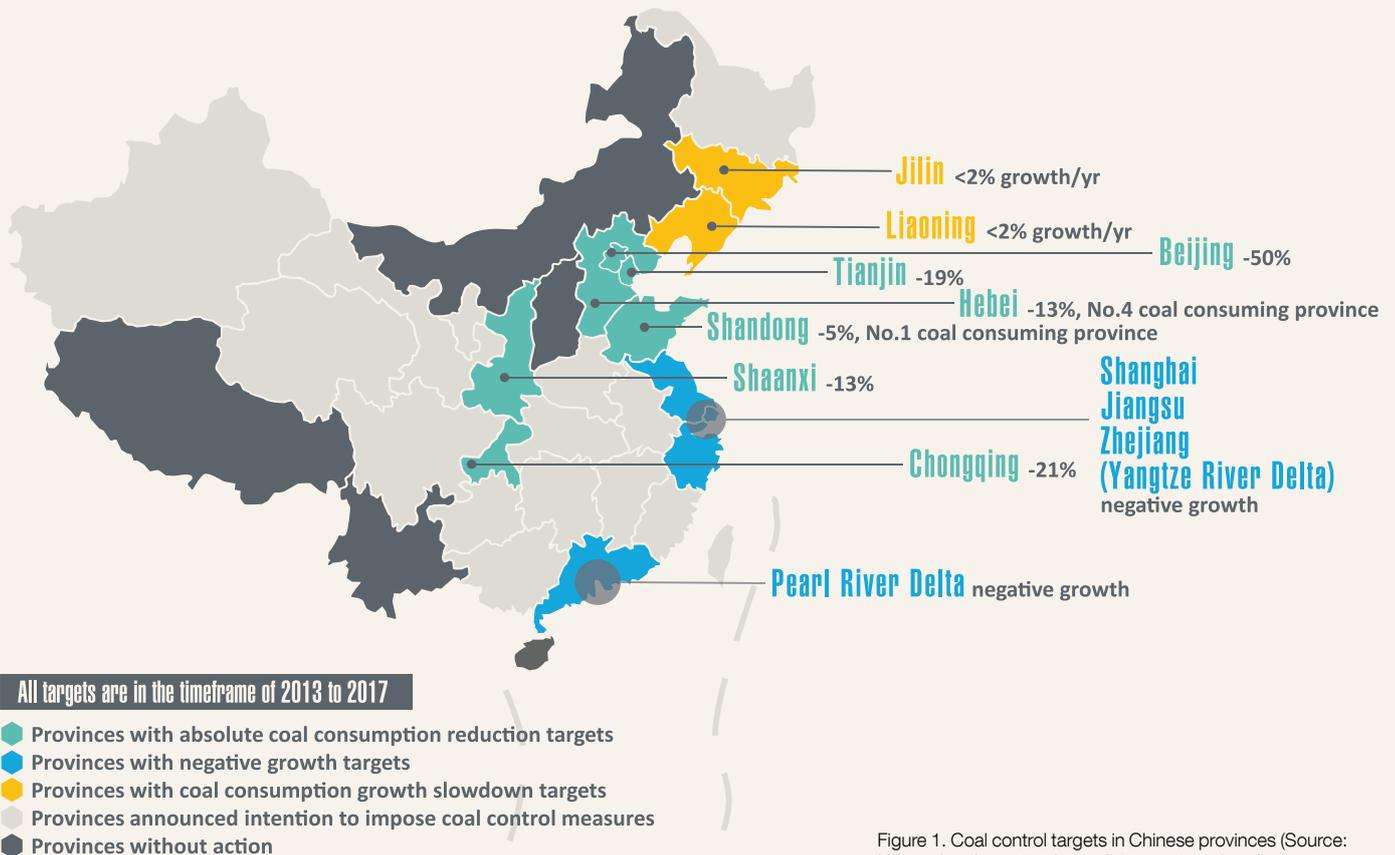


Figure 1. Coal control targets in Chinese provinces (Source: National and provincial air pollution action plans.)

**FACT 2:**

**COLLECTIVELY, THE COAL CONTROL MEASURES IMPLY A REDUCTION IN COAL CONSUMPTION OF APPROXIMATELY 350 MILLION TONNES (MT) BY 2017 AND 655 MT BY 2020, COMPARED WITH BUSINESS-AS-USUAL GROWTH. THIS TRANSLATES INTO AN ESTIMATED REDUCTION IN CO2 EMISSIONS OF ABOUT 700 MT IN 2017 AND 1,300 MT IN 2020.**

Assuming a business-as-usual scenario where all Chinese provinces maintained 2/3 of their average rates of growth in coal consumption between 2006-2011, in line with expected slowdown in GDP growth, then the coal control measures imply reductions in coal use of 350 million tonnes by 2017 in the provinces concerned. If we assume the rate of decline was to continue between 2018 and 2020, the measures would cut 655 million tonnes of coal use from the business-as-usual scenario.

When translated into CO2 emission reductions, these reductions equal to about 700 Mt in 2017 and 1,300 Mt in 2020. (To compare, 1,300 Mt is equal to Canada's and Australia's total emissions combined).

The air pollution action plans run until 2017, and action could be ratcheted up further in a review scheduled for 2015, and in the upcoming 5-year plan for the years 2016-2020. Coal caps could be introduced to a number of other key provinces, which would also ensure that polluting industries do not simply relocate to provinces without coal reduction policies.

Aside from the 12 provinces that have pledged coal control measures, 17 provinces have announced intentions to cap or to reduce coal use. Substantial further reductions in coal consumption covering most of China's coal use could be expected if these 17 provinces spell out the details of their intentions.

**CHINA'S PROJECTED COAL CONSUMPTION WITH COAL CONTROL MEASURES (MT)**

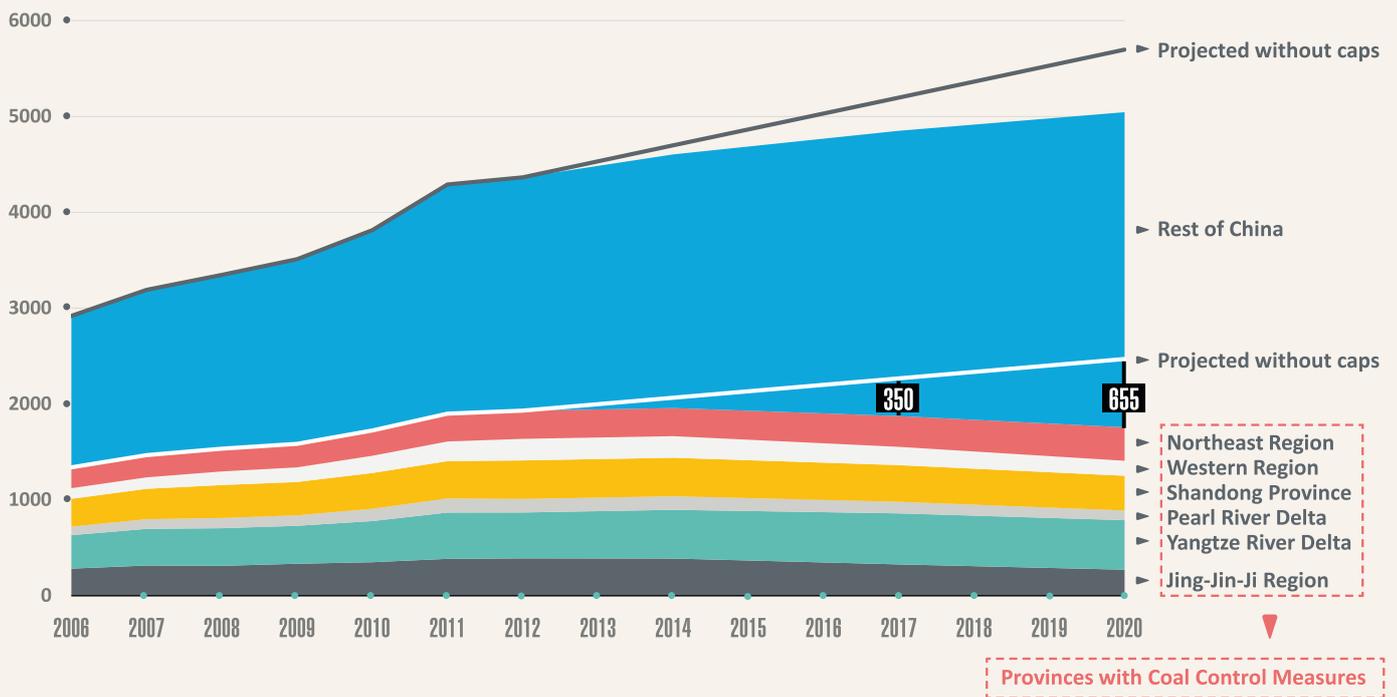


Figure 2. Impact of the coal control measures on projected consumption. (Source: Official energy statistics until 2012; Greenpeace projections based on past trends and announced policies.)

**FACT 3:**

**THE MAJOR SLOWDOWN IN COAL CONSUMPTION TRENDS OPENS UP A WINDOW OF OPPORTUNITY FOR PEAKING GLOBAL CO2 EMISSIONS. IMPLEMENTING THE COAL CONTROL MEASURES COULD PUT CHINA'S EMISSIONS ALMOST IN LINE WITH A 2 DEGREES TRAJECTORY.**

China's coal consumption has become the single most significant determinant for the future of the world's climate. Between 2002 and 2012, CO2 emissions from coal burning in China increased by 4.5 billion tonnes. This is equivalent to the European Union's entire emissions in 2011. Over half of global CO2 emission growth between 2002 and 2012 was due to increased coal burning in China.

Implementing the existing coal control measures as planned would significantly slow down China's CO2 emission growth. The expected

reduction from business-as-usual development from the 12 regions alone (about 700 Mt by 2017 and 1,300 Mt by 2020) would bring China's projected CO2 emissions in 2020 close to a trajectory that the International Energy Agency says would be in line with the goal of limiting global warming to 2 degrees Celsius. To get to the trajectory altogether, which would imply peaking of global energy emissions well before 2020, other big polluters will have to deliver on their emission cuts too.

**OVER HALF OF GLOBAL CO2 GROWTH OVER PAST DECADE CAME FROM CHINA'S COAL CONSUMPTION**

Change in global CO2 emissions 2002-2012 (Mt)

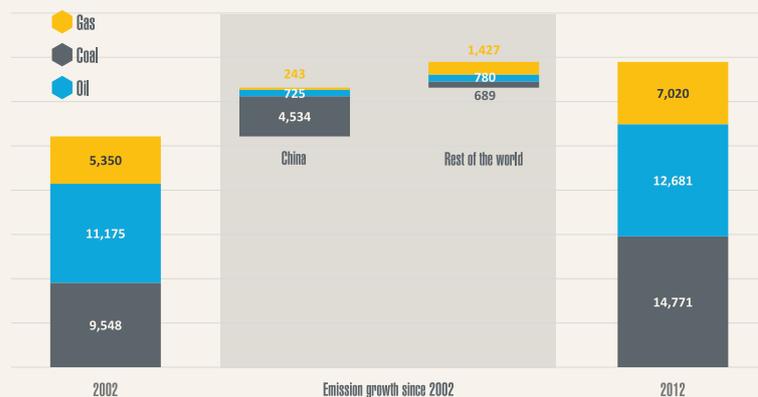


Figure 3. Changes in global CO2 emissions. (Source: calculated from BP Statistical Review of World Energy 2013.)

**IMPLEMENTING THE COAL CONTROL MEASURES COULD PUT CHINA'S CO2 EMISSION ALMOST IN LINE WITH 2 DEGREE GOAL**

China's CO2 emission 2000-2020 and projected effect of the Air Pollution Action Plan (Mt)

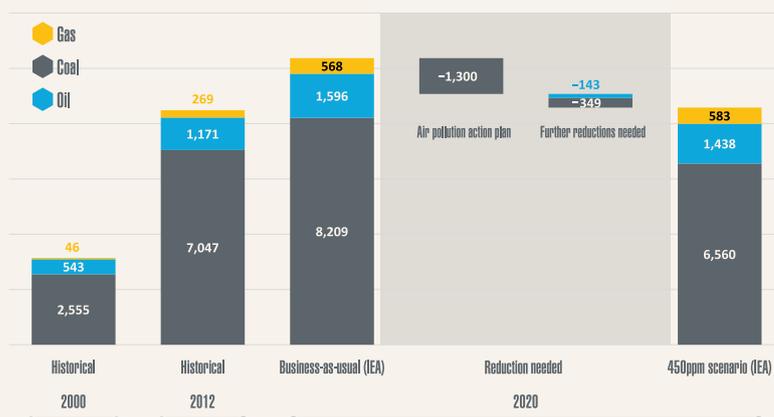


Figure 4. The projected effect of China's coal consumption policies in the context of International Energy Agency's climate protection pathway (450ppm scenario). (Source: Calculated from IEA World Energy Outlook 2013.)

**FACT 4:****CHINA'S COAL CONSUMPTION HAS ALREADY SLOWED DOWN RECENTLY, WITH A NUMBER OF KEY PROVINCES SEEING ABSOLUTE CONSUMPTION DECREASES IN 2012.**

China's annual growth in coal consumption slowed to 2.8% in 2012. While this still led to significant CO<sub>2</sub> emissions, it represented a significant deceleration from the trend over the past decade in which the country's use of coal grew at 9% per year.

Ten provinces including Beijing, Shanghai and Guangdong, have actually seen absolute levels of coal consumption fall from 2011 to 2012, the latest year for which province-level data are available. In total, these 10 regions reduced their coal use by 66.5 million tonnes. (Data for 2013 and 2014, shown in the graphic, are projected figures).

China's three key economic regions – Beijing-Tianjin-Hebei (JJJ), Yangtze River Delta (YRD) and Guangdong – cut their use of coal in 2012 by 0.7%. These three highly-developed regions burned over 1 billion tonnes of coal, accounting for 30% of China's total coal consumption in 2012, or as much as the United States and Japan combined. This trend towards a slow-down of regional coal consumption is already paving the way for broader national moves in this direction.

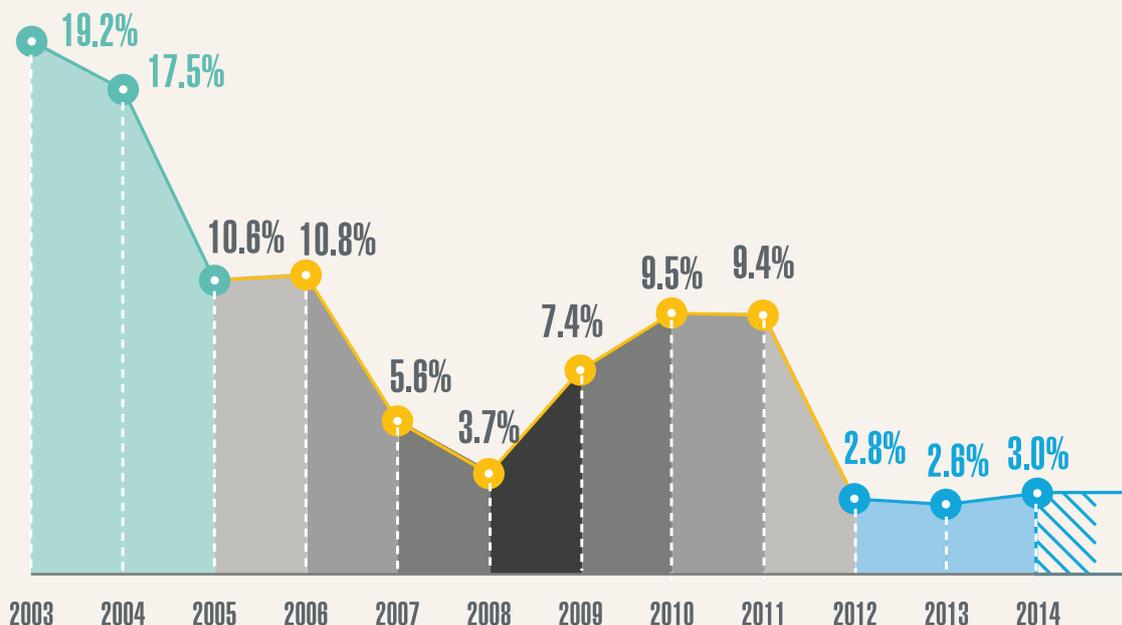
**CHINA'S NATIONAL COAL CONSUMPTION GROWTH RATE DROPPED SIGNIFICANTLY IN 2012**

Figure 5. China's coal consumption growth rate in 2003-2013 and industry projection for 2014. (Source: Official energy statistics until 2012; 2013 growth rate calculated from industry and customs data; 2014 growth rate based on industry projection.)

**FACT 5:**

**IN MAGNITUDE, THE SCALE OF EMISSION REDUCTIONS RESULTING FROM COAL CONTROL MEASURES COMPARES TO OR EXCEED THE EFFORTS OF THE OTHER TOP TWO POLLUTERS – EUROPEAN UNION AND THE UNITED STATES.<sup>1</sup>**

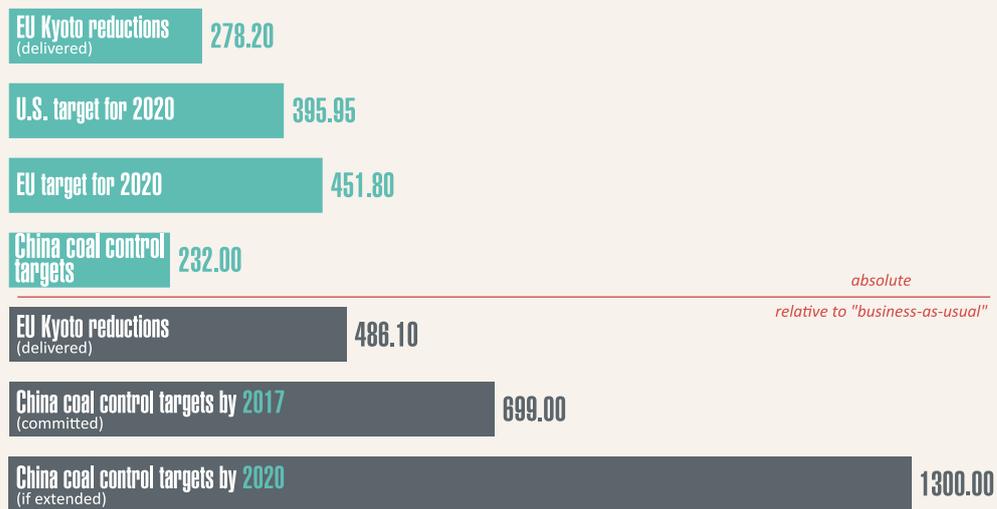
Under the Kyoto Protocol, agreed in 1997, industrialised countries committed to reducing their overall emissions by 5.2% below 1990 levels by 2008-2012. This implies a reduction of about 190 million tonnes of CO2 from 1996 to 2010 – a period of 14 years. In terms of overall required emission reductions, this is miniscule. It is explained by the fact that the targets overall were modest, and former Soviet bloc countries were allowed to increase their overall emissions from 1996.

The European Union committed to, and delivered, a 280 million tonne reduction in emissions from 1996 levels by 2010. The EU's emission reduction target for 2020 amounts to 450 million tonnes, or 12% compared to 2010 levels. The United States is aiming for a 400 million tonne, or 7%, reduction from 2009 to 2020.

China's leading provinces are already outdoing industrialised countries in terms of achieving absolute reduction commitments. The coal reduction targets in six Chinese provinces alone amount to a reduction of 230 million tonnes of CO2, or 10% of CO2 emissions, from 2012 to 2017. This is equivalent to the annual CO2 emissions of countries such as the Netherlands or Malaysia.

The Chinese provinces that are now committed to reducing their use of coal by 2017 experienced rapid growth in coal consumption up to 2011. It is therefore worthwhile to also assess and compare emissions reductions as reductions from a "business-as-usual" path.

**POTENTIAL CO2 REDUCTIONS FROM CHINA'S COAL CONTROL MEASURES COMPARED TO EU & U.S. CLIMATE TARGETS (MT)**



Figures 6a and b. CO2 reductions and reduction rates in the provinces covered by China's coal consumption targets, compared to achieved and anticipated emission reductions in the European Union and the United States. (Sources: calculated from PBL: Trends in global CO2 emissions: 2013 report and official Chinese energy statistics, based on assumption explained in the text.)

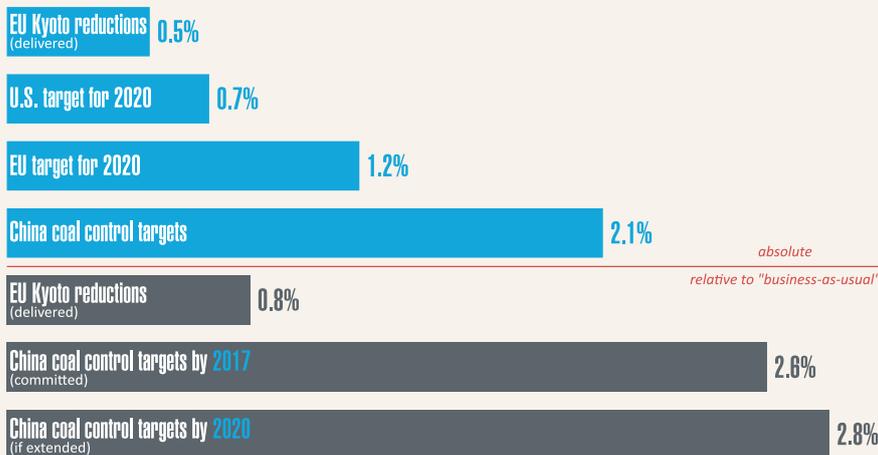
<sup>1</sup> All data for CO2 emissions in this section are based on PBL 2013: Trends in global CO2 emissions: 2013 report. <http://www.pbl.nl/en/publications/trends-in-global-co2-emissions-2013-report>. Coal consumption and CO2 emission data for Chinese provinces from 2006 to 2012 is calculated from National Bureau of Statistics' China Energy Statistical Yearbooks 2008 to 2013. All "business-as-usual" projections for Chinese provinces assume a 1/3 reduction in growth rates compared with this period, in line with the lower GDP growth target of the 12th five-year plan. No slowdown is assumed for industrialised country projections.

Compared to an assumed business-as-usual growth (estimated by extending past trends), the EU's Kyoto effort could amount to a maximum reduction of 490 million tonnes of CO2 over a period of 14 years. For the entire group of industrialised countries under the Kyoto Protocol, including the US, the reduction from business-as-usual would amount to around 800 million tonnes. At the time that they embarked on this effort in 1996, industrialised countries' total emissions stood at about 17 Gt.

Estimated in the same way, China's measures to reduce coal consumption would amount to a reduction in CO2 emissions of 700 million tonne over a period of five years below business-as-usual, equivalent to the combined total emissions of Poland and France. When China embarks on this effort, its emissions are about 10 Gt. If China's coal control policies are extended under the 13th five-year plan, the potential reduction in annual CO2 emissions, compared to business-as-usual, amounts to 1,300 million tonnes over the eight year period from 2012 to 2020, roughly equivalent to the combined total CO2 emissions of the EU's two largest emitters, Germany and the UK.

As the CO2 emissions of the Chinese provinces covered by the measures are smaller than those of the EU or the U.S., and their reductions are targeted over a much shorter period of time, the annual rates of CO2 reduction required to meet China's coal control targets are substantially more rapid than those achieved or targeted by industrialised countries, as shown in the Figure 6b.

## CO2 REDUCTION RATES FROM CHINA'S COAL CONTROL MEASURES COMPARED TO EU & U.S. CLIMATE TARGETS (PER YEAR)



## TRACING BACK THE SMOG – HOW PUBLIC CONCERN LED TO COAL CONTROL

Until a few years ago pollution was considered by most urban Chinese as an inevitable side effect of economic growth and few paid attention to the grey sky or considered its health implications. But in October 2011 an air pollution episode or "haze" which lasted for weeks prompted web commentators to question official air quality data for the first time. The discrepancy between hourly measurements of PM2.5 – small particle pollution – posted by the US Embassy in Beijing and the official API index sparked the first ever strong media discussion on this kind of pollution.

By explaining the problems of and solutions to PM2.5 pollution and highlighting the cost to human health, Greenpeace helped to catalyse discussion and action. Together with other groups, we demanded a monitoring network for PM2.5 and a public warning system. We also drew attention to coal as major source of pollution and demanded robust coal consumption reductions in the whole of Eastern China.

The Greenpeace clean air campaign has seen three major turning points. The first was in December 2011 when the government agreed to publish official measurements of PM2.5 and major cities were given reduction targets for PM2.5.

The second turning point was in January 2013, when pollution rose to a new record "airpocalypse" in China. Now that people were following measurements real time on their smart phones, social media witnessed spikes of public debate demanding to know "what's wrong?" and "what is being done?". Chinese traditional media began to stress the importance of curbing coal in the fight against pollution haze.

The third turning point came during September 2013 when, following internal negotiations between the new leadership and major polluting provinces the central government's air pollution action plan was announced. Subsequently, Chinese provinces were mandated to introduce further measures to tackle air pollution.

Chinese public, supported by NGOs including Greenpeace, have pushed for these changes. Citizens have started to demand a quality of life that cannot be measured in money – cleaner air and a healthier future for their kids. How long it will take to achieve truly clean skies in Chinese cities will be influenced by these agents of change.

**FACT 6:**

**AS COAL CONSUMPTION DECREASES, RENEWABLE ENERGY IS INCREASINGLY MEETING CHINA'S NEW ENERGY DEMAND.**

The rapid expansion of renewable energy in China is no longer news, but most recent renewable energy developments have placed wind and solar energy in a position to directly compete with coal. For the first time ever, in 2012 China's wind power production increased more than coal-fired power production. Thermal power use, predominantly based on coal, grew by only about 0.3% in China during 2012, an addition of roughly 12 terawatt hours (TWh) more electricity. In contrast, wind power production expanded by about 26 TWh. This rapid expansion brought the total amount of wind power

production in China to 100 TWh, making it the third largest source of power after thermal and hydropower, and larger than nuclear energy.

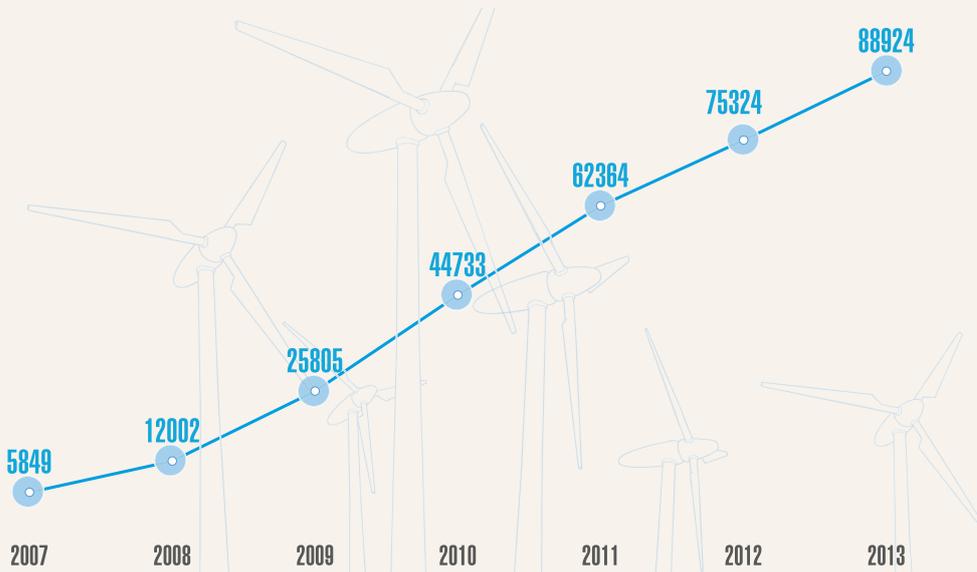
Solar photovoltaic power has also witnessed extremely strong growth. According to Bloomberg New Energy Finance, China installed 12GW of solar panels in 2013 – more than has been installed by any other country in a single year. It is also more than the total of capacity China had installed in all the years prior to 2013 combined.

**CHINA'S CUMULATIVE SOLAR INSTALLED CAPACITY (MW)**



Figure 7. Cumulative solar and wind power capacity installed in China.

**CHINA'S CUMULATIVE WIND INSTALLED CAPACITY (MW)**



## CHINA — A GAME CHANGER?

Despite these promising trends, tremendous challenges still lie ahead. The implementation of coal control measures will be crucial during the next few years, and additional action is needed from regions that have not yet announced their coal reduction measures.

The road away from coal is going to be long and challenging, but it has started. China's coal appetite is intertwined with its investment-driven, heavily industrialised development model. It will require additional political will to decouple the growing use of coal from economic development. Coal consumption is still expected to grow overall. Nonetheless, the good news is that there is now an active national debate about placing a ceiling on reliance on coal. Current discussions involving the majority of climate and energy experts now suggest that China should aim to peak its coal consumption much earlier than projected before.

China's environment and people are suffering from the reliance on coal. Aside from concerns about climate change, air pollution is becoming a nation-wide problem that is already affecting almost all major coal-consuming provinces. Meanwhile, a water crisis associated with large-scale coal-fired power exploitation is emerging in China's arid western regions, where untapped coal reserves are abundant. If air pollution pulled the trigger for slowing down China's coal consumption growth, water is poised to be the key determinant on the pace of this deceleration process.

Internationally, China has to make a paradigm shift in its negotiation strategy within the United Nations Framework Convention on Climate Change (UNFCCC). The country needs to be more proactive in communicating its domestic progress. Up to now, the latest coal control measures are still a significant "unknown" in terms of China's new climate ambition. But with these policies in the pipeline, China has the potential to be a game-changer within the UN climate negotiations for a new treaty to be adopted in Paris, in 2015. By taking on a more proactive role and delivering a progressive pledge for binding reductions in greenhouse gas emissions beyond 2020, China's leadership can catalyse further ambitions by all Parties to the Convention.





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Greenpeace is an independent global campaigning organisation that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace.

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