



THE TRUTH ABOUT CHINA

Why Beijing will resist demands for abatement

Patricia Adams

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Foreword

By Harlan Watson

There are high expectations there will be a 'meaningful' agreement at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties meeting in Paris between 30 November and 11 December 2015. The conference will consider 'a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties' to come into effect and be implemented from 2020.

Patricia Adams argues this will fail primarily due to the long-standing disagreement between developing countries and developed countries 'over how to allocate the burden of mitigating climate change' and the '1992 "firewall" that divides the world into developed and developing countries'. I concur with her assessment and question whether there can ever be a 'meaningful' agreement under the current UNFCCC regime developed over almost 25 years of negotiations.

The 1997 Kyoto Protocol reinforced this 1992 developed–developing country 'firewall' by setting legally-binding greenhouse gas emission targets for the five-year period 2008–2012 for 38 developed countries and the EU, but requiring no developing country commitments. This was a primary reason for the United States not joining the Protocol, Canada's 2012 withdrawal, and Russia, Japan, and New Zealand's decision to not participate in a second Kyoto Protocol commitment period.

Much attention has focused on China's Intended Nationally Determined Contribution (INDC) and the issue of whether or not it can be successfully implemented. Some analyses have criticised its INDC as being 'business-as-usual', while others have questioned the feasibility of its implementation. What is clear, however, from the available data is that China's energy and coal consumption, and greenhouse gas emissions will continue to grow for at least the next decade if China's economy is to meet its growth targets.

What is also clear is that neither China nor the US nor indeed many other parties will agree to legally-binding INDCs, particularly during this time of global economic uncertainty and regional turmoil and instability. Rather, there will likely be agreement to legally-binding reporting requirements on INDC implementation under the Convention, with the details of those reporting requirements left to be decided in future meetings. There will also be much clamour by developing countries about developed country financing and technology transfer, but expect the lawyers to come forth with some soothing language, finessing those concerns.

In summary, Patricia Adams has drawn upon her more than three decades of China

expertise to produce a comprehensive, well-researched and well-documented report covering a myriad of climate- and energy-related topics, as well as important insights into China's motivations for its policies. I recommend it highly.

Harlan Watson
November 2015

Dr. Harlan L. Watson, Adjunct Fellow at the Competitive Enterprise Institute in Washington DC, was Ambassador and Special Envoy to the UNFCCC and Senior Climate Negotiator and Special Representative at the US Department of State from 2001 to 2009 under President George W. Bush.

About the author

Patricia Adams is an economist and the executive director of Probe International, a Toronto-based NGO that has been involved in the Chinese environmental movement since its nascency in the mid-1980s through the publication of books such as *Damming the Three Gorges* and *Three Gorges Probe*, a news portal published in English and Chinese. As editor of the English language translation of *Yangtze! Yangtze!*, the book by Dai Qing that helped inspire China's democracy movement, and as an author and contributor to books and journals on China's environmental crises, she is an authority on China's environmental policy. Ms Adams, a founder of the World Rainforest Movement and the International Rivers Network, has testified before Congressional and Parliamentary Committees in the US and Canada, and has often appeared in major media, including the BBC, CBC, NPR, *New York Times*, *Wall Street Journal*, the *Globe and Mail* and *National Post*.

Summary

China, the world's largest emitter of carbon dioxide, is under intense international pressure to reduce its use of fossil fuels. Although China's leaders aim to reduce the country's fossil-fuel consumption to 80% of its energy mix by 2030, they will not forsake national economic growth for the supposed global good. This is because China's Communist Party knows that to stay in power – its highest priority – it must maintain the economic growth rates that have raised the incomes of much of its population and kept opposition at bay. China's leaders know that GDP growth is tied to fossil-fuel use.

China's government is also under intense domestic pressure to clean up its air pollution, which has made air unbreathable in many cities and has become a major flashpoint for political unrest. China's air pollution is estimated to kill at least half a million people each year.

In an attempt to induce China to join global efforts to curtail carbon at the upcoming UN conference in Paris in December, President Obama and others argue that China's abysmal air quality will improve if it cuts its carbon dioxide emissions.

The opposite is true. Not only do the goals of reducing carbon emissions and air pollution not reinforce each other, they conflict. Carbon dioxide is a colourless, odourless, tasteless gas that does not harm health. Efforts to reduce it rely on unproven abatement technologies, and are prohibitively expensive. In contrast, abating air pollutants such as nitrogen oxides and sulfur dioxide rely on proven technologies and are relatively inexpensive.

The West's climate change establishment is worried that if Beijing focuses 'narrowly' on eliminating the air pollutants that worry the general population, China will entrench cleaner-burning fossil fuels in its economy, costing the West its leverage over China's energy policies. Yet the Chinese public is unlikely to tolerate a 'carbon-first' abatement strategy while it continues to breathe noxious air.

The apparent contradiction between what the West wants and what China's leadership needs is easily resolved. China's leadership knows that what China says to the West is more important than what China does, absolving it of the need to make any binding commitment to reduce its carbon dioxide emissions. China also knows that Western leaders' have no firm expectation of concrete commitments in Paris. Rather, their paramount goal is to maintain face at the Paris talks, which would collapse without China's presence.

China is deftly preparing the stage in Paris to position itself as the Third World's defender and also as a recipient of the billions in climate aid that it is demanding from the West. We can expect more announcements, agreements, and soaring rhetoric from global politicians at the Paris Conference, along with an agreement to meet again next year. What we cannot expect are reforms designed to reduce China's carbon emissions.

1 Introduction

China's Communist Party faces intense domestic pressure to develop its economy in order to raise its standard of living. Under normal circumstances, China could accomplish this goal by increasing its use of fossil fuels. It also faces intense domestic pressure to eliminate air pollution, which in many cities has become a major public health threat. Ordinarily, it could accomplish this goal by burning those same fossil fuels efficiently and cleanly, as does the West.

But China's goals are complicated by intense international pressure to curb its use of fossil fuels in order to lower its carbon dioxide emissions. Curtailing its use of fossil fuels would slow economic growth and, contrary to popular belief, compromise China's desire to reduce air pollution. The goals of economic growth and blue skies reinforce each other but conflict with the goal of reducing carbon dioxide emissions.

The economic advance of developed countries has been marked by increases in fossil-fuel use. The developed world – chiefly the United States and European countries – now insists that China adopt a different, unproven path to economic development by curtailing fossil-fuel use. Not only has no country since the Industrial Revolution ever become developed by eschewing fossil fuels, but even those developed countries that have set explicit carbon dioxide reduction targets for themselves have generally been unable to meet these while growing their economies.

While the West's per capita carbon dioxide emissions changed little in the decades preceding the great recession of 2007–2009,¹ its per-capita emissions of NO_x and SO_x pollutants declined markedly (see Figure 1). The developed countries tackled their air-pollution problems without cutting fossil fuels. Using abatement technologies, the developed world found economic growth and improved air quality compatible objectives. But despite decades of effort, no technology has been found that decouples fossil-fuel use and carbon dioxide emissions on anything other than a small scale, at very high cost. The West is now asking China to accomplish something no Western economy has been able to do – to maintain high rates of economic growth while simultaneously cutting carbon dioxide emissions.

Many governments in the West falsely claim that, as a by-product of reducing carbon dioxide, China's air quality will also be improved. As this paper will show, Chinese and Western governments must understand that an aggressive policy geared towards reducing conventional air contaminants in China would likely undermine efforts to reduce China's carbon dioxide emissions, and vice versa. Yet it is in the political interests of all concerned to perpetuate the myth that the goal of reducing air pollution complements the goal of reducing carbon dioxide.

Chinese and Western observers also must understand that China has made no binding commitment to curb carbon dioxide emissions, and that a meaningful curb is unlikely to occur without a painful reduction in its economic growth. This was true before the dramatic setbacks seen in China's economy this past summer and it re-

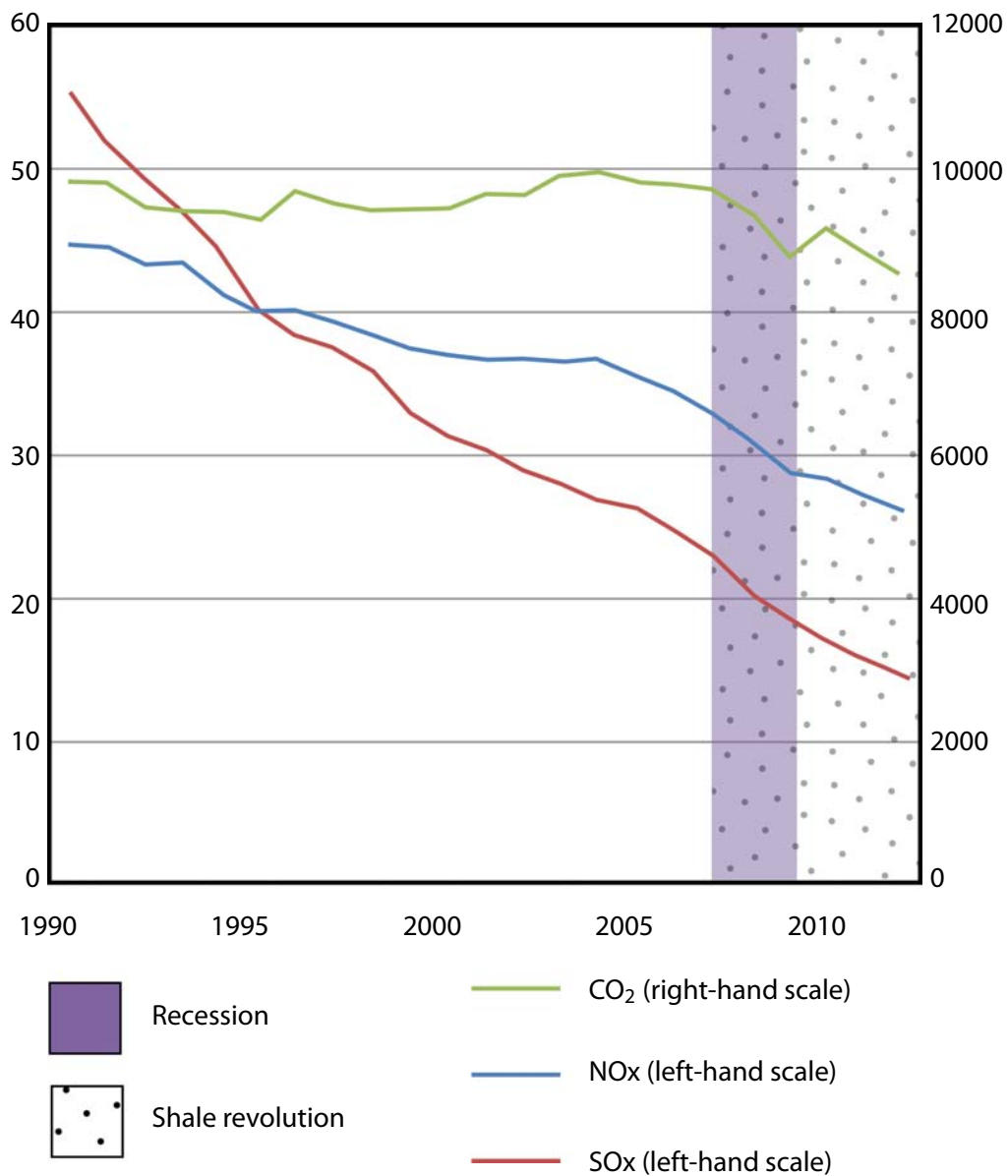


Figure 1: OECD SOx, NOx, CO₂ emissions per capita

Excluding Mexico, Chile, and Israel. All figures in kg per capita. Source: OECD *Air and Climate*, 2015

mains so now, when the Chinese leadership is focussed above all else on an economic recovery. Yet it is in the political interests of both camps to perpetuate the pretence that China has as a priority a reduction in carbon dioxide emissions, as appeared to be the case on 11 November 2014, when the presidents of the United States and China announced their shared intention to produce a global agreement at the UN Climate

Conference in Paris in December 2015.²

The world's two largest carbon dioxide emitters, who for decades had battled over who was responsible for the planet's warming and who should stop it, seemed to have called a truce. But the contradiction between what the West wants and what China needs belies that truce. Friendly rhetoric can never do more than paper over this underlying contradiction.

It is of course conceivable that China could dramatically reduce its carbon dioxide emissions should its economy experience a protracted contraction. For the purpose of this analysis, we will assume that the Chinese economy becomes stable and that the Chinese Communist Party's paramount concern is the pursuit of economic development, upon which the continuation of its rule depends. Under these assumptions, it follows directly that China will not be reducing its carbon dioxide emissions.

2 How China is meeting its short- and long-term energy needs

China is the world's largest user of energy, 90% of it coming from fossil fuels, primarily coal (66.0%), oil (18.4%) and gas (5.6%). Only 9.8% of China's energy needs are met by non-fossil fuels, most of that – 7.7% – coming from hydroelectricity, long a favourite among China's economic planners. Wind (1.1%), nuclear (0.9%) and solar (less than 0.1%) complete the picture.³

Although China's per capita energy consumption is relatively low – roughly one-third of American consumption⁴ – China burns more coal than the rest of the world combined.⁵ Moreover, much of the energy China consumes is consumed inefficiently. To produce one unit of GDP, China uses 3.3 times more energy than the US, 5.4 times more than Japan, and 40% more than India.⁶ 'Energy consumption per unit GDP is very high', affirmed Li Yizhong, president of the China Federation of Industrial Economics. (See Figure 2).⁷

This inefficiency is caused by heavily subsidised state-owned energy producing and consuming behemoths, which use outdated technologies and are bereft of incentives for competition and innovation. This situation is not only a drag on the economy but also a major cause of excessive air pollution. For this reason, China's leaders, President Xi Jinping and Premier Li Keqiang, have called for an energy revolution. They have 'declared war' on pollution and, after deeming China's model of economic development 'unbalanced, uncoordinated and unsustainable', said China will henceforth 'accelerate the transformation of the growth model, and make China an innovative country', gradually shifting the focus of the economy from heavy industry to domestic consumption and the service sector.⁸

In 2014, China's cabinet, the State Council, unveiled its blueprint Energy Devel-

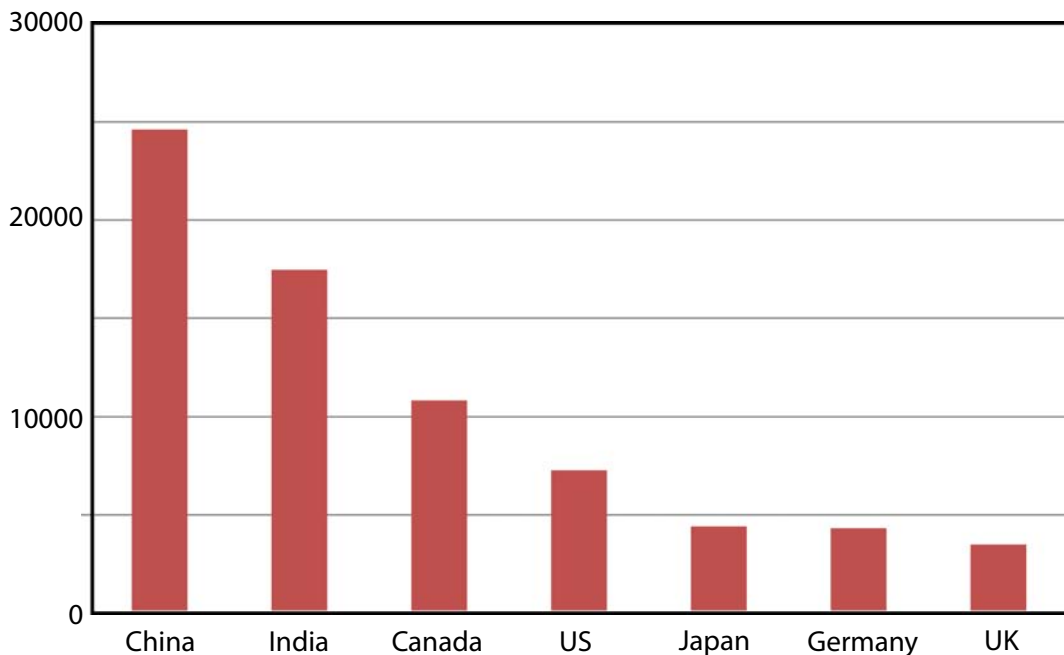


Figure 2: Energy intensity of GDP, 2011

Primary energy consumption in BTU/year per dollar of GDP. Source: US EIA *International Energy Statistics*.

opment Strategy Action Plan (2014–2020), spelling out that China’s reliance on fossil fuels will drop from 90% to 85% by 2020, while overall energy consumption will increase by 28%.⁹ By 2030, it expects fossil fuels’ dominance to drop another 5%, to around 80%. Meanwhile, the Chinese Academy of Engineering predicts that total energy consumption will continue its upward march until 2050.¹⁰

China’s annual coal consumption is projected to increase by 16.3% by 2020.¹¹ Coming on the heels of a tripling of coal use since 2000, this increase is seen as necessary to maintain China’s economic growth, which China’s leaders have targeted at 7% for 2015, its lowest level in nearly 25 years.¹² Coal consumption generally tracks China’s economic growth, electricity demand, and industrial sector output.

In percentage terms, the State Council calls for coal to fall to 62% of all energy by 2020, oil to fall to 13%, and gas to rise to more than 10%. The balance would be taken up largely by renewables and nuclear, which combined would make up 15% of all energy by 2020 and, should the US–China announcement be realised, 20% by 2030.¹³ The dominant renewable energy technology would remain hydroelectric, accounting for over 7% of supply in 2020 and over 8% in 2030.¹⁴

Notwithstanding the proportional shift away from coal and oil, the stated plan indicates that coal will remain by far the dominant energy source for China in the

decades ahead. And that assumes the plan encounters no practical roadblocks to implementation.

Although China's coal consumption and production last year declined (BP's *Statistical Review* estimates growth at 0.1%, while the Chinese government claims it shrank by almost 3%),¹⁵ the International Energy Agency (IEA) expects China's coal consumption to continue to grow beyond 2020, but more slowly than in the past, unless economic growth is much lower than assumed.¹⁶ 'Economic growth in China needs more energy than nuclear, gas, oil and renewables can supply', says the IEA, so China will be 'the coal giant for many years in the future.'¹⁷ Zhang Yuzhuo, chairman of Shenhua Group, the country's largest coal mining company, offered another reason for coal's importance:

China's coal-dominated energy mix will not change for the next two decades because increased reliance on imported oil poses a threat to the country's energy security.¹⁸

Coal represents but one challenge, and a lesser one. 'The biggest difficulty comes from reducing the proportion of oil consumption', Luo Jianhua, Secretary-General of the Environmental Chamber of the National Federation of Industry and Commerce, told Beijing's *Economic Observer* in late 2014.

By the end of 2013, the proportion was 18.6%, but it will be very hard to reduce the percentage to 13% by 2020, which means we have to reduce 0.8% each year in the next seven years. Currently, oil is the main transportation fuel, and China's car ownership is on the rise year after year. So how can we achieve this goal by 2020?¹⁹

Despite projecting a drop in the percentage of China's energy that comes from oil, the State Council calls for a steady increase in domestic oil production by consolidating old oil fields, developing advanced oil recovery, and speeding up offshore and deep-water oil development. As of 2014, China was the world's largest net importer of petroleum and other liquid fuels and it is expected to overtake the US as the world's largest oil importer by 2020 and oil consumer by 2030.²⁰

As for natural gas, the State Council says consumption will increase through increased imports,²¹ accelerated exploration and development of conventional natural gas reserves, both on and off shore, and by 'breaking the bottleneck' in the exploration and development of unconventional natural gas resources, such as shale gas and coalbed methane.²²

To displace some fossil-fuel-generated power, the State Council wants to more than triple nuclear power by 2020, from the current installed capacity of almost 18 GW to 58 GW.²³ By 2030, says Zhou Dadi, vice-president of the China Energy Research Society, China could boost nuclear capacity to 200 GW, and by 2050 to 400–500 GW.²⁴ To feed these reactors just until 2020, China will somehow need to secure about 16% of global uranium supply. China's domestic uranium production capacity would have

to triple in size, and even then would only cover approximately 25% of the country's needs.²⁵

China's renewables expansion would also be daunting, but plausible since Chinese companies are among the world's largest producers of solar panels and wind turbines²⁶ and are the world's largest dam builders.²⁷ Solar capacity would need to expand sevenfold, and wind capacity two-and-a-half times by 2020.²⁸ Although most rivers have already been harnessed, hydropower would need to rise by 25%.²⁹

If China's highly ambitious targets for oil, gas, nuclear and renewables are fully met, by around 2030 it will depend on fossil fuels for 80% of its total energy requirements, down from today's 90%, while having dramatically increased its greenhouse gas emissions, which might otherwise then be reaching a peak.

3 How China's Communist Party responds to domestic and international pressure

The Communist Party of China is highly sensitive to domestic pressure, which has the potential to threaten its existence. It is much less concerned about international pressure. Because of the irrelevance of global carbon dioxide levels to most Chinese citizens,³⁰ China's leadership has had few qualms in fending off international pressure to contain its emissions at successive UN climate change meetings. Its diplomatic position has been dictated by its understanding of its needs: China is a developing country that must increase its per-capita energy use in order to lift its citizens out of poverty.

This position began to change once widespread air pollution emerged as an issue of public derision and concern in China. Because of pollutants such as nitrogen oxides (NOx)³¹ and sulfur oxides (SOx)³² – but not carbon dioxide, which is colourless, odourless, and a natural component of the air³³ – Beijing is now mocked as 'Greyjing' and its level of pollution has been dubbed an 'airpocalypse'.³⁴ The problem is not limited to Beijing. Most of China's major cities fail to meet World Health Organization standards for air safety; pollution sometimes exceeds safe levels by 40 times.³⁵

Chinese citizens have long suspected that the smog isn't just a 'fog', as environmental officials used to claim.³⁶ But it wasn't until the Internet flourished, and China's online citizens, or 'netizens',³⁷ could access and share information with each other that the extent of the problem became clear. A turning point occurred in 2008, when the US Embassy in Beijing installed a particulate monitor and fed its output into the Embassy-managed Twitter feed every hour.³⁸

This turning point provides a textbook example of a type of dynamic often at play between the Communist Party of China and its citizens. Beijing's netizens leapt at the US Embassy particulate data, which confirmed what Beijing residents had suspected

for years: Beijing's air was dangerously polluted. As a result, Beijing's Environmental Protection Bureau got a black eye; although it had the capacity to collect fine particulate data – measuring 2.5 micrometers in diameter and popularly known as PM2.5 – it had not published it and had denied the problem.

Unhappy with this exposure, particularly since it led to widespread criticism of the government on social media, China's Ministry of Foreign Affairs summoned the US Embassy staff for a diplomatic dressing down, saying the Embassy data was unscientific and that publishing it was a violation of China's internal affairs.³⁹ The US persisted, arguing that it was obliged to share information with US citizens in Beijing 'that will assist them to make prudent decisions about their own safety under its "No Double Standard Policy"'.⁴⁰ Defeated by this diplomatic manoeuvre, the Chinese government changed its protocols and also released PM2.5 readings. Soon, private individuals produced an app showing Beijing residents PM2.5 levels, as provided by Beijing's Environmental Protection Bureau *and* the US Embassy, allowing them to take precautions on heavy pollution days and simultaneously to keep tabs on their government's transparency.⁴¹ US consulates across China and the local environmental bureaus soon began posting PM2.5 data, too.

Because this index is indirectly a measure of human health risks, the public, and thus the government, takes it seriously. The state-run *China Daily* newspaper reports that the lung cancer rate in the Chinese capital has climbed by 60% over the past decade even as levels of smoking have fallen.⁴² Asthma cases have risen 40% in the past five years, and China's former health minister, in a coauthored 2014 report in *The Lancet*, concluded that air pollution kills between 350,000 and 500,000 Chinese every year.⁴³ Several winters of especially bad smog levels provoked Premier Li Keqiang to 'declare war' on pollution in 2014.⁴⁴ As *News China* put it, 'the legitimacy of China's government has become tied to its ability to maintain economic growth and improve living standards'.⁴⁵ Contamination of the country's air, but also its water and soil 'has shaken this key source of legitimacy and grievances over pollution have become a major flashpoint for political unrest'.

Domestic and international diplomacy then merged in the lead-up to the November 2014 Asia-Pacific Economic Cooperation meeting in Beijing. According to US administration press briefings, the White House decided to stress China's air pollution in their negotiations, rather than global climate catastrophes, in the 'hope the bad air quality will prod the government to finally make a significant commitment to fight climate change'.⁴⁶ To sweeten the pot, the US then offered President Xi the prospect of foreign technology and funding to help finance the clean-up. The US-China climate statement was the result.⁴⁷

4 How China describes its climate policy

At its heart, China's climate policy is the 'energy revolution' that President Xi touts as necessary 'to rein in irrational energy use and control the country's energy consumption by fully implementing energy-saving policies'.⁴⁸ Its climate policy has little to do with external demands to curb carbon dioxide per se, and everything to do with increasing the efficiency at which energy is exploited to further China's long-standing desires for economic development and energy security. As explained by Xie Zhenhua, its vice-minister of the National Development and Reform Commission (NDRC):

All our policies, measures and actions for addressing climate change are conducive to national development mode transformation and structural adjustment, thus promoting the quality and efficiency of our economic growth. That is an internal requirement for the sustainable development of our country. As President Xi Jinping has said: 'addressing climate change and implementation of sustainable development is not what we are asked to do, but what we really want to do and we will do well'.⁴⁹

Part of China's role – what it says it really wants to do and intends to do well – is to organise a Third World lobby to hold the West accountable based on 'the principles of equity, common but differentiated responsibilities and respective capabilities'.⁵⁰

The differentiated responsibilities lay out the respective roles for developed and developing countries. Developed countries will commit to legally binding 'absolute quantified emission reduction below their 1990 levels in accordance with their historical responsibilities and as required by science'.⁵¹ In contrast, developing countries will be subject to no legally binding targets. They merely commit to take 'enhanced mitigation actions' funded by developed countries.

From China's perspective, the developing countries have already done more than their share, through ambitious nationally appropriate mitigation actions. 'Their further actions are dependent on additional finance, technology and capacity-building support provided by developed countries'.⁵² These funds must be 'new, additional, adequate, predictable and sustained', starting at '\$100 billion US per year by 2020 – with a clear roadmap on scaling up financial support to be elaborated, including specific targets, timelines and identified sources'. After 2020, the developed countries should contribute⁵³ 'at least 1% of their GDP per year'.⁵⁴

These funds, which would be channelled through a 'Green Climate Fund', would benefit China directly and indirectly: directly because China would receive a developing country share of the money and indirectly because China would be a major supplier of green technologies to the other developing countries receiving their own shares. Under China's policy of 'Deepening South–South cooperation', it is already donating climate-related products and services such as energy-saving light bulbs, air conditioners, solar-powered road lamps and solar generation systems, satellite monitoring, agricultural drought-resistant technology, water resources use and manage-

ment technology, desertification prevention and treatment, and the training of climate change officials.⁵⁵ On this basis, NDRC vice-minister Xie Zhenhua stated on the eve of the December 2014 United Nations Climate Change Conference in Lima, that 'China has been making great efforts to promote South–South cooperation on climate change.'⁵⁶

China repeatedly stresses the West's responsibility for climate change. After the Lima Conference of Parties, China's state news agency Xinhua reiterated that:

...attempts to tackle climate change are dogged by the same problem year after year – the split between developed and developing countries. While developed countries are historically responsible for decades of carbon dioxide build-up that has heated up the planet, they argue that virtually all nations must cut emissions, and there are ongoing disagreements over how much each country should cut.⁵⁷

China's leadership believes it should be applauded for shouldering its share of the burden in addressing climate change. Not only does China present itself as a victim of extreme weather⁵⁸ and of the countless costs of a warming planet, but China also bears another burden: the Western countries 'became rich and transferred their highly polluting sectors to developing countries.'⁵⁹ To highlight the inequity in the West's position, China contrasts the point in the West's development at which it began to trade economic for environmental gains with the point at which China first assumed responsibility. 'China cannot be like developed countries, whose peak carbon emissions appeared when gross domestic product (GDP) per capita hit \$40,000 US,' said NDRC vice-minister Xie Zhenhua.⁶⁰ Instead, he said China started to adopt measures to reduce carbon dioxide emissions when its GDP per capita reached \$3,000.

The Chinese government communicates via slogans. Whether it is Premier Li's 'war on pollution' or President Xi's 'energy revolution', slogans represent the Communist Party's operating principles. As such, they are both a signal to economic actors of how to justify their actions and a statement of best intentions that provides cover when the plan doesn't work out. China's Communist Party has realised that the UN war on global warming can legitimise its goals as well as extract concessions and cash from the West while establishing China as a 'responsible world power.'⁶¹ Most of all, as a centralised, top-down mechanism that conditions investments globally, the UN climate negotiations speak the language of the Communist Party of China and entrench the Party's role.⁶²

5 China's leadership views the West's interest in climate change opportunistically

For three decades, the Chinese Communist Party leadership has sought Western technology to pull its economy into the industrial age. Even though it is now the world's

largest economy,⁶³ dubbed 'the factory to the world' and able to send a man into space, China still relies on Western innovation to achieve its overriding goal – the rapid economic growth needed to maintain the populace at peace and the Chinese Communist Party in power.

China lacks a robust R&D sector in part because its economy is dominated by some 155,000 state-owned enterprises, in part because obeisance to five-year plans is rewarded over innovation.⁶⁴ Lacking homegrown capabilities, China obtains Western technology by any means necessary, whether copying it through reverse engineering, stealing it through industrial espionage,⁶⁵ or negotiating for technology in exchange for access to the Chinese market.⁶⁶ With China's status as the dominant carbon dioxide emitter, it has a new lever with which to bargain for technology.

China is well practised in the exercise of acquiring Western technology. In the 1990s, the China Three Gorges Project Corporation acquired turbine and generator manufacturing capability from General Electric, Alstom, ABB, Voith Hydro, Kvaerner and Siemens, to whom it awarded contracts on the condition that they subcontract with and train state-owned Harbin Electric and Dongfang Electrical machinery companies.⁶⁷ Through this process, and with ample state subsidies, China has become the world's top builder of megadams, having largely pushed out the Western suppliers. China used a similar approach to acquire technology in high-speed rail, air transportation, and IT.⁶⁸ The experience was similar in the renewable energy field, where foreign companies set up shop in China to manufacture wind turbines, supplying 75% of China's wind market. Then their Chinese state-owned competitors, aided by cheap capital and free land, started to squeeze them out.⁶⁹ The government slapped a 40–70% local-content requirement on wind turbines and hiked tariffs on imported components. By 2010, the foreign share of the domestic Chinese wind market was down to 11%⁷⁰ and Chinese competitors were flooding the international market with cheaper systems.

China also wants to achieve prowess as a global nuclear supplier by developing the next generation of nuclear technologies through acquisitions from the US firm Westinghouse and the French nuclear giant Areva. To that end, it has obtained from Westinghouse an agreement to transfer technology to the State Nuclear Power Technology Corporation.⁷¹ With its own nuclear brand, and with intellectual property rights, China's goal is to export nuclear technology to Latin America and Asia. It has already signed a contract with Turkey.⁷²

Nuclear export markets aside, nuclear power satisfies multiple goals for China's leaders, most of them symbolic. It satisfies Beijing's ambitions to develop high-tech industries, it wins international prestige and, to the extent it displaces coal, it will help to reduce air pollution. While nuclear power has languished in the West due to its expense and public opposition, China's leaders are prepared to overcome the expense through subsidies and to overcome the public opposition by citing the need for a re-

duced carbon footprint⁷³ and, if necessary, crackdowns.⁷⁴ Worldwide global warming fears act as an accelerant for China's hydro dam⁷⁵ and nuclear exports as well as providing the rationale for exports of renewables and other decarbonisation technologies. China has already seized such opportunities through joint ventures between its state-owned enterprises and skilled foreign manufacturers.

6 Can China meet its low-carbon promises?

China has made grand promises about 'rebalancing' its economy to be energy-lite, en route to reaching its stated goals of capping carbon dioxide emissions and meeting 20% of its energy needs with non-fossil fuels by 2030. Many not only believe that these goals are achievable, they believe that in China, a dictatorship ruled by fiat, the goals are more easily achievable than in a messy democracy that must pander to different interest groups. This belief is mistaken. China's Communist Party dictatorship and top-down economy would be a hindrance rather than a help in meeting these goals, even assuming China ever expected to meet them.

China's stated goals are nothing but daunting. According to *Scientific American*:

China will have to build as much wind, solar, nuclear and hydropower in the next 10 years as it has built coal-fired power plants in the last 10 years – as much as 1,000 gigawatts worth of alternatives to coal, also including natural gas, whether pipelined from Russia or fracked out of the country's own shale deposits. And even if that dream is realized, an International Energy Agency analysis⁷⁶ suggests such a build out, though possible, is not sufficient to slow rising coal consumption unless China's economic or electricity use growth also slow significantly.⁷⁷

According to the US-based Breakthrough Institute, a think tank focused on development and the environment, because its economy will continue to grow 'a deep transformation of the present fossil energy economy is not on the horizon in China.'⁷⁸ Breakthrough agrees with others that China's target of meeting 20% of its energy needs from non-fossil sources merely represents a continuation of current trends and policies and 'reflects the naturally slow pace of energy transitions.'⁷⁹

Not only must a decarbonised future look expensive to the Chinese leadership but, given its history, it also looks impossible to implement.⁸⁰ Despite having immense power over the economy and its citizens, the Chinese government knows that it lacks the legal and governmental structures to implement its major reform plans. In the language of the Chinese Academy of Social Sciences, the country lacks the 'soft technologies' – among them cultural and institutional values such as property rights – needed to complement the more easily obtainable 'hard technologies'.⁸¹ The country's centralised rule creates perverse incentives that undermine economic efficiency⁸² and the corrupt, party-controlled judicial system makes environmental protection impossible. According to a 2014 study by Wai-Hang Yee et al. from the Lee

Kuan Yew School of Public Policy, when 'adherence to the rule of law as a governance principle is an exception rather than the rule' and the law is not highly regarded as a legitimate source of authority, 'formal regulations fail to serve as a useful guide for the regulatees', who may 'not believe the regulators intend on enforcing the formal regulations'.⁸³ The leadership is reduced to rhetoric and issuing blunt measures, such as token crackdowns on polluters. Even when a clean technology exists, it may not be used. As Xu Yuan at Princeton's Woodrow Wilson School of Public and International Affairs details, sulfur dioxide scrubbers are installed at a large proportion of Chinese coal power plants – a larger proportion than in the US – but they often run only during inspections by government officials; otherwise they tend to be turned off to save operating costs.⁸⁴

China's central government is good at announcing targets to reduce emissions – and even installing controls sometimes – but incapable of enforcing them.⁸⁵ For years China's leaders have promised to clean up the air and for years inspectors have been bribed to ignore infractions. Local officials who are charged with carrying out central government environmental diktats often cannot comply, being ill-equipped to meet the ever-growing list of environmental challenges central officials set for them.⁸⁶ Sometimes they simply don't want to. Instead, they welcome polluters, often job-creating state-owned enterprises who will set up shop in their communities, bringing bribes, taxes, and revenue from fines with them.⁸⁷ Air quality understandably worsens.

Lawsuits are also pointless because the judicial system delivers Communist Party-determined verdicts. Unable or unwilling to enact and enforce laws, the government relies on public relations. With pollution now the number one cause of popular dissent, the Chinese government has introduced a four-tiered air-quality measure to quell public outrage. At the blue level, all is well; at yellow the situation is acceptable; at orange and then the red level, factories and power plants must be shut and cars yanked off the road. Yet, when Beijing's smog levels went 'off the charts' in January of 2014, the code remained at yellow.

'Why doesn't the government declare an emergency?' everyone, including the state media, asked.⁸⁸ The government is reluctant to raise the alert level, says Ma Jun, head of the Institute of Public and Environmental Affairs, because measures that would shut down the economy simply 'are not feasible'.⁸⁹ And if enterprises and drivers were to ignore high alert levels, as many are likely to do, the government's edicts would be exposed for what they are: hot air. China's air isn't polluted simply because the technologies to keep it clean are unavailable but, more fundamentally, because the country lacks a credible regulatory regime⁹⁰ that makes polluters pay and which rewards innovation.

7 How China positioned itself at Lima (and what to expect in Paris)

The annual global climate summits that began in 1995 in Berlin have, in recent years, seen irreconcilable demands by rich and poor countries followed by high-pressure overtime negotiations, ending in agreement to meet at a later date. Throughout it all, China has steadfastly stuck to its guns: it would not be swayed from its path of fossil-fuel-fired development. That remained true at the 2014 Conference of the Parties in Lima and it will remain true in Paris when a new treaty to replace the Kyoto Protocol will be negotiated.

All parties in Paris will ultimately have no choice but to accept this line because China, as the world's largest greenhouse gas emitter, is indispensable to the negotiations. Without China's participation, the global climate apparatus would collapse. A charitable view of the reason that Western countries will capitulate to China's demands is that they fear countries would otherwise soon take to exploiting the atmosphere in a Garret-Hardin-style 'Tragedy of the Commons'. A less charitable view is that the Western governments need to save face for domestic political purposes: if the talks unambiguously fail, they will need to explain to their citizenry how they could be walking away from a threat they had claimed was existential.

Knowing that the West needs ongoing climate talks for political if not environmental reasons, China proffered a fig leaf in its announcement with Obama in the lead up to Lima: it would recast its own multiyear forecasts as non-binding targets, saying vaguely that it will work towards flatlining its emissions and securing a larger percentage of its energy from non-fossil fuels 15 years down the road. In doing so, China ensured the negotiations would continue, leading to the common view that the US–China announcement not only furthered Lima but also gave Paris a 'boost'.⁹¹

This diplomatic arrangement, which required no binding concessions from China, let alone a significant change of course, suited both the US and China. The US could claim a breakthrough, made all the more significant by effusive praise for China's stance; China could bask in the role of a green saviour while being immunised from demands that it make any further concessions. The international pressure is now off China. Any growth in its emissions – even to a point well beyond the UNFCCC limit designed to keep global temperatures from rising beyond 2°C above pre-industrial levels – will be excused because China recognises that 'climate change is a real threat' and accepts some responsibility to quash that threat.⁹²

China understands that what China says is more important to the West than what China does. Western governments realised at the UN Conference in Rio 1992 that the environment had risen to the top of popular concerns and that global warming was an ideal issue on which to appear green without doing anything: everyone, so no-one, was to blame for the problem. Governments could grandstand in the interna-

tional theatre knowing that nothing could bind them to action. President Clinton, for example, signed the Kyoto Protocol in 1998 knowing it had no chance of ratification: the US Senate in a 1997 resolution had unanimously voted against Kyoto.⁹³

At the same time, to win accolades and avoid brickbats at home, Western governments tailored their energy policies to be green and to satisfy special interests while spreading the costs to all consumers and the economy at large. Since the Copenhagen meetings in 2009, the principal goal of Western leaders has not been to reach an agreement that commits them to serious carbon reductions – they have known that the political costs of doing so would be too high. Rather, they have striven to use climate change discussions to justify their expensive renewable-energy programs and, for Europe, their troubled emissions trading scheme. On that, China and the Western delegations in Paris have much in common. Green policies can be manipulated to suit domestic political ends.⁹⁴ As the UN's climate chief, Christiana Figueres said at Lima, 'there are no environmental police'.⁹⁵

At the Paris talks late this year, the venue will change but little else will. Despite attempts by the West to level the playing field, the most contentious clash, as always, will come over how to allocate the burden of mitigating climate change. Unlike the 1997 Kyoto treaty, which required only developed countries to take action to fight climate change, the Paris agreement is billed as being 'applicable to all'. The developed countries want to tear down a 1992 'firewall' that divides the world into developed and developing countries.

The developing world, China at the helm, will insist that the developed world accept responsibility – which translates as the cost – for preventing catastrophic global warming. China argues that the 2015 agreement shall be 'applicable to all' in the same manner that the United Nations Framework Convention on Climate Change and the Kyoto Protocol was, with its legal form to 'be determined by the substance as a result of the negotiations'.⁹⁶

In China's 2014 Submission on the Ad Hoc Working Group on the Durban Platform for Enhanced Action, it insists that any new agreement arrived at in Paris should 'be based and built' on the structure and provisions of the Convention, 'with developed country Parties taking the lead in greenhouse gas emission reduction and honouring their responsibility and obligation in providing technology and finance support to developing countries'. There is no need 'to renegotiate, replace, restructure, rewrite or reinterpret the Convention and its principles, provisions and annexes'.⁹⁷

China states [emphasis added] that:

The Annexes of the Convention shall continue to be relevant and applicable for the post-2020 period, as developed countries are responsible for the current *and future* concentration of greenhouse gases in the atmosphere because of their historical, current and future emissions, and developing countries have the right to equitable development opportunities and sustainable development.⁹⁸

In contrast to demanding strict greenhouse gas mitigation measures of developed countries, the developing countries, of which China counts itself, would bear no such burden.

China surely knows the chances of extracting from the developed countries \$100 billion per year by 2020, followed by 1% of their GDP, are negligible, but it doesn't need the concessions to succeed diplomatically. To the extent that the money doesn't materialise, China and the rest of the developing world will be excused from decarbonising. As a bonus, China will wield clout as a defender of the poor and spokesman for the developing world.

8 Conclusion: The contradiction between what China needs and what the West wants

To stay in power, the Chinese Communist Party believes it must appease the public by quickly reducing the country's deadly smog. To save the planet, the West believes it must persuade China to contain the country's carbon dioxide emissions. Both parties will claim in Paris that the two goals overlap. And they do, to a point. But in practice, they strategically conflict.

Policies and technologies designed to reduce carbon dioxide face sobering hurdles. Some, such as hydro dams and nuclear power stations, have long lead times. Some, such as carbon markets, hydro, solar and wind, have limited success at achieving carbon dioxide reductions. Others, such as carbon sequestration plants, are entirely unproven or experimental. Even if the Chinese government can bring all its hoped-for-plans to fruition – something few observers believe likely – in all likelihood, fossil fuel consumption will continue to grow, at least until 2030, when the Chinese leaders say emissions might flatline.

In contrast to this time-consuming obstacle course to reduce carbon dioxide using unproven policies and technologies, the route required to combat smog is direct and free of technological unknowns. The abatement technologies are proven and available, if only China had the wherewithal to employ them. As is well understood in China, the West solved the problem of smog many decades ago through efficiency improvements, replacing dirty fossil fuels with clean ones, as well as introducing smokestack scrubbers.

But the West doesn't want China to tackle its smog without also tackling carbon dioxide: to the extent that China succeeds in reducing its smog – its overriding environmental priority – the West loses its leverage over China.

In a recent paper, MIT Sloan School of Management assistant professor Valerie Karplus warned that China's current policies place more emphasis on near-term air quality improvement than carbon dioxide emissions reduction:

The urgency with which Beijing is tackling air pollution is certainly positive, and these efforts will also have concomitant benefits in curtailing carbon dioxide (carbon dioxide) emissions – to a certain extent. But it would be a mistake to view the current initiatives on air pollution, which are primarily aimed at scrubbing coal related pollutants or reducing coal use, as perfectly aligned with carbon reduction.⁹⁹

They are not, says Karplus, who also heads the MIT–Tsinghua China Energy and Climate Project. Indeed, ‘air pollution measures, as they are currently being pursued in China, will quickly discourage further reduction in the absolute level of coal consumption, thereby stalling progress on carbon reduction.’¹⁰⁰

The fear, for Karplus and others who have climate change as their priority, is that Chinese officials, focussing ‘narrowly’ on air quality, will first implement low-cost opportunities to reduce coal usage,¹⁰¹ and then choose the relatively inexpensive pollution abatement systems – ‘end-of-pipe’ solutions – to relieve public suffering. For example, ‘installing a [catalytic scrubber] on a coal-fired power plant in China is relatively inexpensive at about 150 yuan (\$25) per kilowatt – which means operating a coal plant is still cheaper than displacing it with a wind or natural gas power plant.’¹⁰²

In the following few paragraphs, Karplus describes the conundrum that climate-change proponents face in tackling carbon dioxide from China.

But here is the rub: simply scrubbing end-of-pipe emissions does next to nothing to reduce CO₂.

Moreover, to the extent that cleanup equipment is applied to (and is powered by) carbon-intensive energy, it could actually increase CO₂ emissions even as air quality improves. These dynamics make climate change – which lacks the immediate social and environmental burden that poor air quality imposes – the tougher and more costly challenge. Indeed, carbon capture and storage would be the only viable way to ‘scrub’ CO₂, but it ranks among the most costly options for CO₂ reduction.¹⁰³

...the co-benefits of air pollution control for climate mitigation end abruptly, as air pollution mitigation measures lock in continued reliance on a carbon intensive fuel. By contrast, adding carbon capture and storage (CCS), an end-of-pipe solution to scrub CO₂, is estimated to increase the levelised cost¹⁰⁴ of generating power from coal in China by at least 50%, making it prohibitively expensive for large-scale use at present.¹⁰⁵

The strategy to tackle the conundrum, says Professor Karplus, could involve establishing a national carbon dioxide price to change what would otherwise be incentives to focus on smog.

[T]he introduction of a CO₂ price could ensure air pollution control does not come at the expense of sound, long-term climate change management. By putting early pressure on carbon-intensive energy sources also responsible for air pollu-

tion, a CO₂ price would reduce the extent of end-of-pipe air pollution controls needed to achieve air quality goals, thereby preventing carbon lock-in.¹⁰⁶

But a price on carbon dioxide would only marginally change China's emissions and would conflict with its current development plans.¹⁰⁷ Over the last decade China has been building 16 massive 'coal bases' – industrial complexes located near the mine mouth – in inland provinces. These include large power plants connected to coastal cities via ultra-high-voltage transmission lines,¹⁰⁸ plants to convert coal to liquid and gaseous fuels, and related facilities such as concrete and chemical plants.¹⁰⁹ The liquid and 'syngas', will also be transported to China's big cities to be burned in power plants, factories and cars. While this would curb smog in China's principal cities, it would thwart carbon dioxide reduction efforts.¹¹⁰

According to William Kelly, writing in *InsideClimate News*, 'By any measure, China's coal base plan is the single largest fossil-fuel development project in the world. So while more coal bases could mean cleaner air for many urban Chinese, scientists fear a nightmare scenario for global climate change.'¹¹¹ Kelly estimates that the coal base sites¹¹² will double the carbon footprint of the fuel over that of conventional coal and oil, 'spelling disaster for earth's climate'.

Fortune magazine explains that the plan forms 'the keystone of China's 21st century energy strategy. Simply put, China has plenty of coal but little petroleum.'¹¹³ Says a follow-up *Fortune* article,¹¹⁴

[Moving coal facilities inland] may well clean up the skies in cities like Beijing, Shanghai, and Shenzhen, thus reducing rates of respiratory disease and deaths linked to air pollution. It could also rationalise the coal industry, better matching supply to demand, and reduce China's imports of foreign oil. What it won't do is reduce the country's overall carbon emissions; in fact, it could drastically increase them, as more coal gets burned and more carbon-intensive processes – particularly coal-to-liquids conversion – are expanded.¹¹⁵

'We are very concerned' about the coal-base plan, Yang Ailun, a senior associate with the World Resources Institute who focuses on energy issues in China, told *Fortune*:

Enforcing tougher air pollution standards along the coast will lead to shutting down coal plants, and create demand for a lot more gas. The western parts of China want to supply the gas by turning coal into gas. That process will be very, very bad for the world.¹¹⁶

Late in 2014, China's national TV news agency reported that a huge coalfield, containing 11.6 billion tonnes, had been discovered in northwestern Xinjiang. Mining has already begun.¹¹⁷

'In light of such policy direction and industry trends, and despite last year's decrease in output and consumption, it is clear that China's leaders are not planning to cut domestic coal production. They are simply making it more efficient', says Hudson Lockett, writing in *China Economic Review*.¹¹⁸

Scientific American also raised the alarm about these coal-to-liquids plants on the grounds that they would worsen global warming. Amidst mounting pressure to clean up the air, and their balance sheets – seven out of ten coal companies are losing money – the traditional coal business has turned to the coal conversion business.¹¹⁹

State-owned coal giant Yankuang's coal-to-liquids plant project leader, Sun Qiwen, told *ClimateWire*, 'Converting coal into liquid fuels is a must. Maybe it is not a must for Europe or the United States. But it is a must for China.'¹²⁰ As Sun explained, China's demand for liquid fuels is increasing in line with its growing car ownership. Although the country is pushing electric vehicles to replace gasoline-powered vehicles, electric vehicles number 83,000, or a mere 0.087% of the country's 95 million cars, and even this trivial proportion comes courtesy of billions in subsidies to encourage purchasers to go electric.¹²¹ 'The future of China's coal-to-liquids sector is so bright, thanks to this huge market', Sun said.

Nature, more generally, highlighted the conflict between meeting carbon dioxide and air pollution goals:

Researchers need to spell out the benefits and trade-offs of separate and joint air-pollution and climate-change mitigation in terms of public health, ecosystem protection, climate change and costs. A suite of mitigation policies must be designed and applied on all scales – from cities to the global arena.¹²²

Put another way, tackling smog in a way that also reduces carbon dioxide would require a new form of large-scale central planning in which major sectors of a 1.4 billion people economy are reorganised by fiat. The beleaguered Chinese public, needless to say, will resist such grand planning exercises for such an abstract goal as reducing carbon dioxide, especially since it will delay relief for the visible and concrete smog problems that directly affect their health and quality of life.

In short, China's Communist Party has political, environmental and economic reasons to eschew carbon dioxide reduction, coupled with political and economic reasons to tell the world at Paris that it will nevertheless do its very best – a non-legally-binding best – amid a flourish of paper-signings and policy pronouncements.

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Notes

1. The post-2008 carbon dioxide emissions in OECD countries have been affected by a number of factors: anaemic growth; fiat decisions to shut down coal-fired facilities and regulatory changes that make coal uncompetitive; the shale revolution which has encouraged fuel switching from coal to gas; renewable energy-induced high electricity prices that have provoked conservation; improvements in energy efficiency; and the outsourcing of energy intensive industry to countries such as China.
2. 'US–China Joint Announcement on Climate Change', The White House Office of the Press Secretary, Beijing, China, 12 November 2014 available at <https://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change>.
3. These figures represent primary energy consumption in 2013, which totalled 3.76 billion tons of coal equivalent. One ton of raw coal equals 0.714 tons of standard coal or coal equivalent. 'China's policies and actions on climate change (2014)', The National Development and Reform Commission, PRC, November 2014 at <http://en.ccchina.gov.cn/archiver/ccchinaen/UpFile/Files/Default/20141126133727751798.pdf>, pp. 20–22. By 2014, non-fossil fuels (solar, wind, hydropower and nuclear energy) climbed to 11.1% of China's primary energy use and coal fell to 64.2%. 'Non-fossil energy rises in the mix', *China Daily*, 29 December 2014 at <http://en.ccchina.gov.cn/Detail.aspx?newsId=50281&TId=96>.
4. Energy use (kg of oil equivalent per capita), The World Bank at <http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE>.
5. 'The world's biggest coal consumers' in Mining Technology.com, 26 August 2014 at <http://www.mining-technology.com/features/featurethe-worlds-biggest-coal-consumers-4353695/>.
6. 'China cuts its energy efficiency goal: an analysis' by Michael Lelyveld, Radio Free Asia, 23 March 2015 at http://www.rfa.org/english/commentaries/energy_watch/china-cuts-its-energy-efficiency-goal-03232015111228.html.
7. 'China mainly depends on coal and it is exploited rudimentarily', said Zhou Dadi, vice director of the China Energy Research Society. 'China unveils energy strategy, targets for 2020', Xinhua, 19 November 2014 at http://news.xinhuanet.com/english/china/2014-11/19/c_133801014.htm. China's energy intensity/GDP is twice OECD levels. 'China's coal addiction' by Julian Snelder, *The Interpreter*, 30 October 2014 at <http://www.lowyinterpreter.org/post/2014/10/30/Chinas-coal-addiction.aspx?COLLCC=642615662&>.
8. 'China to 'declare war' on pollution, premier says' by Ben Blanchard and David Stanway, Reuters, 4 March 2014 available at <http://www.reuters.com/article/2014/03/05/us-china-parliament-pollution-idUSBREA2405W20140305>. 'The party's new blueprint', *The Economist*, 16 November 2013 at <http://www.economist.com/blogs/analects/2013/11/reform-china>. 'Decision of the CCCPC on some major issues concerning comprehensively deepening the reform', Third Plenary Session of the 18th CPC Central Committee in Beijing, 12 November 2013 at http://www.china.org.cn/chinese/2014-01/17/content_31226494.htm. In fact, China has been steadily making gains in energy efficiency and stated in its 'Intended Nationally Determined Contributions (INDC)' submission to the Secretariat of the UN Framework Convention on Climate Change that China would cut carbon by 60–65% per unit of GDP by

2030. 'China unveils new, ambitious climate goals', Xinhua, *China Daily*, 30 June 2015 at http://www.chinadaily.com.cn/china/2015-06/30/content_21146004.htm.

9. Energy Development Strategy Action Plan (2014-2020), State Council, PRC, 7 June 2014. Available in Chinese at http://www.gov.cn/zhengce/content/2014-11/19/content_9222.htm. Though this document was completed and issued to provincial levels, ministries and departments directly under the State Council on 7 June 2014, it was not released to the public until 19 November 2014, eight days after the US–China climate announcement. See 'China unveils energy strategy, targets for 2020', Xinhua, 19 November 2014 at http://news.xinhuanet.com/english/china/2014-11/19/c_133801014.htm, and 'China plans to slow energy consumption increase to 28% by 2020', Bloomberg News, 19 November 2014 at <http://www.bloomberg.com/news/articles/2014-11-19/china-plans-to-slow-energy-consumption-increase-to-28-by-2020>.

10. The Chinese Academy of Engineering (CAE) estimates that primary energy consumption will rise to 5.5–5.8 billion tonnes of coal equivalent by 2050. See the CAE's 2011 China's Energy Development Strategy for Mid and Long-Term: 2030 & 2050, Science Press, February 2011, available in Chinese at http://www.nea.gov.cn/2011-03/03/c_131088307.htm.

11. 'China sets cap on energy use', Xinhua, *China Daily*, 19 November 2014 at http://www.chinadaily.com.cn/business/2014-11/19/content_18942883.htm. 'China nears "peak coal" as carbon and clean growth policies bite' by David Stanway, Reuters, 28 November 2014 at <http://uk.reuters.com/article/2014/11/28/uk-china-coal-idUKKCN0JC0IQ20141128>. About half of China's coal is used for power generation, and the balance is used by the industrial sector.

12. 'China lowers GDP growth target to 'around 7%' by Tom Mitchell and Gabriel Wildau', *Financial Times*, 5 March 2015 at <http://www.ft.com/cms/s/0/1bc73e72-c2d7-11e4-ad89-00144feab7de.html>.

13. China reiterated these plans in its 'Intended Nationally Determined Contribution' submitted to the UN Framework Convention on Climate Change (UNFCCC) in advance of the UN climate conference in Paris, in December this year. See 'China submits its climate action plan ahead of 2015 Paris Agreement', UNFCCC UN Climate Change Newsroom, 30 June 2015 at <http://newsroom.unfccc.int/unfccc-newsroom/china-submits-its-climate-action-plan-ahead-of-2015-paris-agreement/> and 'Enhanced actions on climate change: China's intended nationally determined contributions', 30 June 2015, available at <http://www4.unfccc.int/submissions/INDC/Published%20Documents/China/1/China's%20INDC%20-%20on%2030%20June%202015.pdf>.

14. Chinese Academy of Engineering, *op. cit.*

15. 'Statistical Communiqué of the People's Republic of China on the 2014 National Economic and Social Development', National Bureau of Statistics of China, 26 February 2015, at http://www.stats.gov.cn/english/PressRelease/201502/t20150228_687439.html. 'Falling Chinese coal consumption and output undermine global market' by Timothy Puko and Chuin-Wei Yap, *Wall Street Journal*, 26 February 2015 at <http://www.wsj.com/articles/chinas-coal-consumption-and-output-fell-last-year-1424956878>. According to BP's *Statistical Review of World Energy 2015*, China's coal consumption grew by +0.1%. See BP *Statistical Review of World Energy* June 2015 available at <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html> and

<http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/review-by-energy-type/coal.html>.

16. 'Medium-term coal market report 2014'. OECD/IEA, 2014 available at <https://www.iea.org/Textbase/npsum/MTCMR2014SUM.pdf>.

17. *Ibid.*

18. 'Coal to remain at head of energy table' by Lyu Chang, *China Daily*, 23 March 2015 at http://www.chinadaily.com.cn/bizchina/2015-03/23/content_19879062.htm.

19. Mao Jiayang, deputy director of Sinopec's Economic Research Institute also calculated that if oil consumption is to reach 13% of the total energy consumed by 2020, this will equal 440 million tonnes of oil. But assuming an average annual growth in oil consumption of 2.5% from 2013–2020, by 2020, total annual oil consumption would be 600 million tonnes. At an average annual growth in oil consumption of 1% from 2020–2030, annual oil consumption would reach 660 million tonnes by 2030. 'An interpretation of national energy strategy: It's not an easy job in bringing the percentage of oil consumption down by 2020', *Economic Observer*, 19 December 2014 at <http://www.eeo.com.cn/2014/1219/270330.shtml>.

20. 'China is now the world's largest net importer of petroleum and other liquid fuels', US Energy Information Administration, 24 March 2014 at <http://www.eia.gov/todayinenergy/detail.cfm?id=15531>. 'China's great energy pause could have big impact on global oil and gas' by Yadullah Hussain, *Financial Post*, 17 March 2015 at http://business.financialpost.com/2015/03/17/chinas-great-energy-pause-could-have-big-impact-on-global-oil-and-gas/?__lsa=8ec7-c76f 'Country insights: China', *Energy Outlook 2035*, BP at <http://www.bp.com/en/global/corporate/about-bp/energy-economics/energy-outlook/country-and-regional-insights/china-insights.html>.

21. China will import gas from Russia and Myanmar, for example. 'Russia and China in major natural-gas supply pact', by James Marson, *Wall Street Journal*, 22 March 2013 at <http://www.wsj.com/articles/SB10001424127887324557804578376510628682312>. 'China starts importing natural gas from Myanmar' by Leslie Hook, *Financial Times*, 29 July 2013 at <http://www.ft.com/intl/cms/s/0/870f632c-f83e-11e2-92f0-00144feabdc0.html>.

22. China has the world's third largest shale oil deposits and largest shale gas deposits, yet development has been disappointing. The lack of technology, complex geology, uncertain regulatory framework, and the absence of property rights and competition in an industry dominated by state-owned enterprises has discouraged innovation and investment. As a result, China has not been able to replicate the US shale revolution and has had to slash its official target for developing its CO₂ and smog-friendly shale gas resources in half. See 'China cuts 2020 shale gas output target as challenges persist', Platts, 18 September 2014 at <http://www.platts.com/latest-news/natural-gas/singapore/china-cuts-2020-shale-gas-output-target-as-challenges-27641138>. 'China: the next shale-gas superpower?' by Anthony Fensom, *The National Interest*, 9 October 2014 at <http://nationalinterest.org/feature/china-the-next-shale-gas-superpower-11432>. 'Too much energy?: Asia at 2030', by Dan Blumenthal, Derek M. Scissors, American Enterprise Institute, February 2015 at <https://www.aei.org/wp-content/uploads/2015/02/Too-Much-Energy.pdf>.

23. The World Nuclear Association says China will expand its nuclear capability to 150 GWe by 2030, and much more by 2050. See 'Nuclear power in China', World Nuclear Associa-

tion, updated March 2015 at <http://www.world-nuclear.org/info/country-profiles/countries-a-f/china--nuclear-power/>.

24. 'China nuclear power capacity to hit 200 GW in 2030', China Coal Resource, 15 October 2014 at <http://en.sxcoal.com/122/109032/DataShow.html>.

25. Chinese companies have become shareholders in at least 15 uranium deposits in six different countries. The state-owned China General Nuclear Power Corporation acquired the Husab project in Namibia, one of the world's largest uranium deposits, and will begin operating the mine and mill by the end of 2015. Chinese companies also hold interests at three uranium producing mines abroad, including two in-situ leaching uranium facilities in Kazakhstan (Irkol, Semisbai) and one open-pit mine in Niger (Azelik). 'Uranium: China's chase' by Vladimir Basov, Mining.com, 29 January 2013 at <http://www.mining.com/web/chinas-chase-for-uranium/>.

26. 'Top solar energy companies' by Clint Ouma, Exploring Green Technology.com, 2012 at <http://exploringgreentechnology.com/solar-energy/top-solar-energy-companies/>. According to 'Top 10 wind turbine suppliers', Energy Digital at <http://www.energydigital.com/top10/3705/Top-10-Wind-Turbine-Suppliers>, China's Goldwind holds second spot next to Denmark's Vestas and accounts for 10.3% of the global market share.

27. According to *International Rivers*, Chinese companies and Chinese banks are involved in the finance and construction of some 330 dams in 74 different countries. 'China's global role in dam building', *International Rivers* at <http://www.internationalrivers.org/campaigns/china-s-global-role-in-dam-building>.

28. In 2013, on-grid solar photovoltaic power capacity in 2013 was 14.79 GW and on-grid wind power capacity was 81.23 GW. 'China's Policies and Actions on Climate Change (2014)', The National Development and Reform Commission, November 2014, The People's Republic of China, available at <http://en.ccchina.gov.cn/archiver/ccchinaen/UpFile/Files/Default/20141126133727751798.pdf>, p. 21.

29. 'China falling behind on 2020 hydro goals as premier urges new dam building', Reuters, 10 March 2014 at <http://uk.reuters.com/article/2014/03/10/china-parliament-hydropower-idUKL3N0M70VN20140310>.

30. In March of 2015, *Under the Dome*, an independently produced documentary about China's smog crisis by former news anchor, Chai Jing, went viral on China's Internet. Within days of its posting on video sharing sites, it had been viewed 200 million times and garnered 280 million posts on Sina Weibo, a Chinese equivalent of Twitter. The documentary, which Chai was motivated to produce because her baby had been born with a tumour, was both investigative and personal. Her video gripped the public with its inspirational call to make history by 'standing up and doing something' about air pollution on the eve of China's annual National People's Congress meetings. She advocated that China reduce pollution as developed countries did, by switching to cleaner coal, oil and gas and coming down hard on tailpipe and smokestack polluters. Nowhere in the nearly two-hour documentary did she mention carbon emissions or climate change as being a concern for China. Watch the video from this article, 'The anti-pollution documentary that's taken China by storm' by Anthony Kuhn, National Public Radio, 4 March 2015 at <http://www.npr.org/blogs/parallels/2015/03/04/390689033/the-anti-pollution-documentary-thats-taken-china-by-storm>.

31. The sum of nitric oxide (NO) and NO₂ is commonly called nitrogen oxides or NO_x. Current scientific evidence links short-term NO₂ exposures, ranging from 30 min to 24 h, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. See 'Nitrogen dioxide', US Environmental Protection Agency, <http://www.epa.gov/oaqps001/nitrogenoxides/health.html>. Researchers from Tsinghua University, the State Environmental Protection Key Laboratory of Sources and Control of Air Pollution Complex in Beijing and the International Institute for Applied System Analysis in Austria estimate that with the rapid rise in energy consumption, NO_x emissions more than doubled from 11.0 Mt in 1995 to 26.1 Mt in 2010, with an annual growth rate of 5.9. Power plants, industry and transportation were major sources of NO_x emissions. 'Although several control measures have been introduced for power plants and transportation, they were insufficient to constrain the strong increase of NO_x emissions'. Based on current legislation and current implementation status, they project NO_x emissions will increase by 36% in 2030 from 2010 level. 'The implementation of new energy-saving policies and end-of-pipe control policies is expected to change the NO_x emission pathway significantly in the future', unless, they say, higher GDP growth rates occur or if denitrification technologies for power plants were not actually in operation. See 'NO_x emissions in China: historical trends and future perspectives' by B. Zhao, S. X. Wang, H. Liu, J. Y. Xu, K. Fu, Z. Klimont, J. M. Hao, K. B. He, J. Cofala, and M. Amann, *Atmospheric Chemistry and Physics*, October 8, at <http://www.atmos-chem-phys.net/13/9869/2013/acp-13-9869-2013.pdf>.

32. SO_x refers to all sulfur oxides, the two major ones being sulfur dioxide (SO₂) and sulfur trioxide (SO₃). Sulfur dioxide is one of a group of highly reactive gasses known as 'oxides of sulfur'. The largest sources of sulfur dioxide emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of sulfur dioxide emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. Sulfur dioxide is linked with a number of adverse effects on the respiratory system.

33. While China's major air pollutants vary from city to city and region-to-region, they include sulfur dioxide, nitrogen oxides, volatile organic compounds (VOCs), ammonia (NH₃), carbon monoxide (CO), chloride, and PM_{2.5}, or fine particulate matter. PM_{2.5} can form from the interaction of pollutants such as SO₂, NO_x, VOCs and NH₃, but it can also be directly emitted into the atmosphere from the tailpipes of vehicles, dust, and coal and biomass combustion. PM_{2.5} is responsible for most visibility problems and is a health concern because the particles can penetrate deep into the lung. 'Performance evaluation on the action plan of air pollution prevention and control and regional coordination mechanism, CCICED special policy study report', China Council for International Cooperation on Environment and Development (CCICED), CCICED 2014 Annual General Meeting, 1–3 December 2014 available at <http://www.cciced.net/encciced/policyresearch/report/201504/P020150413497618655390.pdf>. China's Ministry of Environmental Protection measures airborne pollution using its Air Quality Index (AQI), which is based on the concentration levels of six major atmospheric pollutants: sulfur dioxide, nitrogen dioxide, PM₁₀, carbon monoxide, ozone, and PM_{2.5}. The index is employed at monitoring stations in 367 cities across the nation. 'China's air pollution in 2014' by Cedric Sam, Chris Luo and Wang Feng, *South China Morning Post*, 22 January 2015 at <http://www.scmp.com/news/china/article/1488887/china-air-pollution-2014>.

//multimedia.scmp.com/china-air-pollution-in-2014/. For a good comparison of the air quality measurements and standards used by China's Ministry of Environmental Protection, the US Embassy, and the World Health Organization, see 'China's air pollution reporting is misleading' by Steven Q Andrews, *China Dialogue*, 27 March 2014 at <https://www.chinadialogue.net/article/show/single/en/6856-China-s-air-pollution-reporting-is-misleading>. Carbon dioxide, a colourless, odourless gas vital to plant life on earth is a naturally occurring chemical compound and is also released when hydrocarbons are burned. It is not considered a form of air pollution.

34. 'As Beijing braces for winter, "airpocalypse" hits Harbin', *China Digital Times*, 21 October 2013 at <http://chinadigitaltimes.net/2013/10/airpocalypse-hits-harbin-beijing-braces-winter/>. "'Greyjing"? Air pollution fouls Beijing's name' by Ben Blanchard, Reuters, 29 July 2012 at <http://www.reuters.com/article/2012/07/29/us-china-pollution-idUSBRE86S0QK20120729>.

35. 'China smog emergency shuts down city of 11 million people; air pollution level 40 times higher than WHO safety standard' by Matthew Mientka, *Medical Daily*, 21 October 2013 at <http://www.medicaldaily.com/china-smog-emergency-shuts-down-city-11-million-people-air-pollution-level-40-times-higher-who>. 'Most China cities fail to meet air quality standards', BBC, 3 February 2015 at <http://www.bbc.com/news/world-asia-china-31110408>. See also 'China's environmental crisis' by Beina Xu, Backgrounder, Council on Foreign Relations, 25 April 2014 at <http://www.cfr.org/china/chinas-environmental-crisis/p12608>.

36. 'China smog isn't just fog, government admits' by Elizabeth Flock, *Washington Post*, 7 December 2011 at http://www.washingtonpost.com/blogs/worldviews/post/china-smog-isnt-just-fog-government-admits-photos/2011/12/07/gIQAPScIcO_blog.html.

37. For an explanation of why the portmanteau 'netizen' thrives in China, see "'Netizen": why is this goofy-sounding word so important in China?' by Brian Fung, *The Atlantic*, 11 October 2012 available at <http://www.theatlantic.com/international/archive/2012/10/netizen-why-is-this-goofy-sounding-word-so-important-in-china/263245/>.

38. 'Conflict in the air: US vows to keep reporting on pollution in China' by Austin Ramzy, *Time*, 6 June 2012 at <http://world.time.com/2012/06/06/conflict-in-the-air-u-s-will-keep-reporting-on-pollution-in-china/>. The US embassy in Beijing's air quality index can be viewed at <http://aqicn.org/city/beijing/us-embassy/>.

39. See Mark C. Toner, US Department of State, Deputy Spokesperson, Daily Press Briefing, Washington, DC, 5 June 2012 at <http://www.state.gov/r/pa/prs/dpb/2012/06/191782.htm#CHINA>. 'Thanks to the American embassy's "violation"', says Chang Ping, a Chinese political commentator, 'we know we have smog, not fog'. See 'China: Smog as a political analogy' by Chang Ping, Sri Lankan Guardian, 5 March 2015 at <http://www.slguardian.org/?p=27036>.

40. 'Messages for US citizens, and the no double standard policy', US Department of State Foreign Affairs Manual Volume 7, Consular Affairs, 7 FAM 050, Unclassified, Consular Information Program at <http://www.state.gov/documents/organization/86560.pdf>.

41. See 'China has no good answer to the US embassy pollution-monitoring' by Susan Shirk and Steven Oliver, 13 June 2012, *The Atlantic* at <http://www.theatlantic.com/international/archive/2012/06/china-has-no-good-answer-to-the-us-embassy-pollution-monitoring/258447/> and 'Beijing's air pollution: 'blackest day'', *The Economist*, 14 January

- 2013 at <http://www.economist.com/blogs/analects/2013/01/beijings-air-pollution>.
42. 'Exposure to smog is severe hazard' by Shan Juan and Wang Qian, *China Daily*, 6 December 2011 available at http://www.chinadaily.com.cn/china/2011-12/06/content_14216428.htm.
43. 'China pollution: blue skies over Beijing' by Barclay Bram Shoemaker, *The Diplomat*, 10 November 2014 at <http://thediplomat.com/2014/11/china-pollution-blue-skies-over-beijing/>. 'China's "airpocalypse" kills 350,000 to 500,000 each year' by Malcolm Moore, *The Telegraph*, 7 January 2014 at <http://www.telegraph.co.uk/news/worldnews/asia/china/10555816/Chinas-airpocalypse-kills-350000-to-500000-each-year.html>.
44. 'Xinhua Insight: China declares war against pollution', Xinhua, 5 March 2014 at http://news.xinhuanet.com/english/special/2014-03/05/c_133163557.htm.
45. 'China's climate change deal is a triumph', Editorial, *News China*, January 2015 at <http://www.newschinamag.com/magazine/chinas-climate-change-deal-is-a-triumph>.
46. 'President Obama presses China on climate' by Josh Gerstein and Andrew Restuccia, *Politico*, 9 November 2014 at <http://www.politico.com/story/2014/11/us-chinese-progress-112728.html>. 'China, the climate and the fate of the planet' by Jeff Goodell, *Rolling Stone*, 15 September 2014 at <http://www.rollingstone.com/politics/news/china-the-climate-and-the-fate-of-the-planet-20140915>. 'The secret deal to save the planet' by Jeff Goodell, *Rolling Stone*, 9 December 2014 at <http://www.rollingstone.com/politics/news/the-secret-deal-to-save-the-planet-20141209>. In an ominous first step to the 'historic' US–China climate deal, the Chinese government blocked the US Embassy PM2.5 postings during the APEC meeting, casting doubt on the ability to monitor any of China's pledges. See more at <http://marginalrevolution.com/marginalrevolution/2014/11/when-will-china-reverse-its-carbon-emissions.html> and 'APEC: China blocks access to US air pollution data for Beijing' by Tania Branigan, *The Guardian*, 10 November 2014 at <http://www.theguardian.com/world/2014/nov/10/apec-china-blocks-access-us-air-pollution-data-beijing>.
47. In a follow-up to the November 2014 announcement, the State Department issued a detailed list of US–China technical cooperation found at 'US–China Strategic & Economic Dialogue Outcomes of the Strategic Track', Media Note, Office of the Spokesperson, US Department of State, Washington, DC, 24 June 2015 at <http://www.state.gov/r/pa/prs/ps/2015/06/244205.htm>. See the Chinese Government's record of the meetings: 'Report of the US–China Climate Change Working Group to the 7th Round of the Strategic and Economic Dialogue, PRC', 23 June 2015 at <http://en.ccchina.gov.cn/archiver/ccchinaen/UpFile/Files/Default/20150629094252876092.pdf>. 'China's climate change plan is going to cost \$6.6 trillion' by Valerie Volcovici and David Brunnstrom, Reuters, 23 June 2015 at <http://www.businessinsider.com/r-china-puts-6-trillion-price-tag-on-its-climate-plan-2015-6?IR=T>.
48. 'Xi Says China needs energy "revolution"' by Andy Tully, *Oil Price.com*, 17 June 2014 at <http://oilprice.com/Latest-Energy-News/World-News/Xi-Says-China-Needs-Energy-Revolution.html>. 'Xi stresses implementing central economic policies', *Beijing Review*, 11 February 2015 at http://www.bjreview.com.cn/se/txt/2015-02/11/content_668709.htm. 'Shades of Carter in Xi's China energy revolution' by Clyde Russell, Reuters, 17 June 2014 at <http://www.reuters.com/article/2014/06/17/us-column-russell-china-energy-idUSKBN0ES16M20140617>.
49. State Council Information Office (SCIO) briefing on climate change, China.org.cn, 19

September 2014 at http://www.china.org.cn/china/2014-09/19/content_33560895.htm.

50. 'China's submission on the work of the ad hoc working group on Durban Platform for Enhanced Action', 6 March 2014, available at http://unfccc.int/files/bodies/application/pdf/20140306-submission_on_adp_by_china__without_cover_page.pdf, p. 1 and also found at 'Submissions from Parties to the ADP in 2014', United Nations Framework Convention on Climate Change at <http://unfccc.int/bodies/awg/items/7398.php>.

51. *Ibid.* p. 4.

52. *Ibid.* p. 9. As early as 2010, Xie Zhenhua, deputy chief of the Chinese National Development and Reform Commission and China's top climate change official, argued that China's ability to tackle its greenhouse gas emissions depended on receiving finance and technology from the West: 'We will try to get past the peak of emissions as early as possible, but this also hinges on how much money the developed nations will offer and what technology they will transfer as required by the international protocols...The more money they provide, or the earlier the money arrives, the sooner we should be able to pass the emissions peak'. See 'China says its earlier emissions peak depends on developed nations' Xinhua, 6 October 2010 at http://news.xinhuanet.com/english2010/china/2010-10/06/c_13544695.htm.

53. The \$100 billion will be paid into the Green Climate Fund (GCF), the designated operating entity of the financial mechanism of the UNFCCC. On its website, the GCF states that it will 'promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change'. See <http://www.gcfund.org/about/the-fund.html>.

54. 'China's submission on the work of the Ad Hoc Working Group on Durban Platform for Enhanced Action', *op. cit.*, pp. 6–7.

55. 'China's policies and actions on climate change (2014)', The National Development and Reform Commission, PRC, November 2014, p. 61 at <http://en.ccchina.gov.cn/archiver/ccchinaen/UpFile/Files/Default/20141126133727751798.pdf>. 'China stresses South–South cooperation, common development in tackling climate change', Xinhua, 9 December 2014 at <http://www.globaltimes.cn/content/895743.shtml>.

56. 'China participating in global effort against climate change', CCTV.com, 25 November 2014 available at <http://english.cntv.cn/2014/11/25/VIDE1416916799568631.shtml>. At the Lima COP 21 UNFCCC climate change summit, China announced the launch of a separate South-South fund and pledged to double the \$44 million in climate finance it has provided since 2011 and invited other developing countries to contribute. China provided few details on how the new fund will be managed. See 'Outcomes of the UN Climate Change Conference in Lima', Center for Climate and Energy Solutions, December 2014 at <http://www.c2es.org/international/negotiations/cop-20-lima/summary>.

57. 'Next year crucial for fight against climate change', Xinhua, 25 December 2014 at http://www.china.org.cn/environment/2014-12/25/content_34407744.htm.

58. 'China vulnerable to climate change', *China Daily*, 12 January 2015 at <http://en.ccchina.gov.cn/Detail.aspx?newsId=50489&TId=96>.

59. 'China must find unique way to build ecological civilization', Xinhua, 7 December 2013 at http://usa.chinadaily.com.cn/china/2013-12/07/content_17159568.htm.

60. *Ibid.*

61. State Council Information Office (SCIO) briefing on climate change, *op. cit.*

62. Stratfor, the global intelligence company, argues that President Xi is using his anti-corruption campaign to root out resistance in China's major oil corporations, in order to institute market-oriented reforms within the oil and natural gas sector. His primary target is more likely his political rivals within the Party. The Communist Party has historically had trouble relinquishing state control of 'pillar' sectors. Its 2002 reorganisation of the electricity sector, designed to introduce market reforms and achieve greater efficiencies, replaced a state monopoly with regional monopolies run by Party faithfuls and their children. The electricity sector remained firmly in the grip of the state. Moreover, it is hard to imagine that the Party will relinquish control of the fossil fuel sector, which it deems key to national security. Stratfor does acknowledge that the reforms will be limited: 'To be clear, China's national oil companies will retain the lion's share of the industry, but a crucial and fundamental part of this restructuring is allowing competition in all areas possible'. See 'Reforming China's energy sector', Stratfor, 18 May 2015 available at <https://www.stratfor.com/analysis/reforming-chinas-energy-sector>. Also see 'China's power sector revolution stalled' by Brady Yauch, Probe International, 14 October 2010 at <http://journal.probeinternational.org/2010/10/14/chinas-power-sector-revolution-stalled/>.

63. 'MoneySupply: The new world economy in four charts' by Chris Giles, *Financial Times*, 7 October 2014. According to the International Monetary Fund, in 2014, the size of the US economy was \$17.4 trillion and China's economy was \$17.6 trillion based on purchasing power parity. See <http://ftalphaville.ft.com/2014/10/07/1998332/moneysupply-the-new-world-economy-in-four-charts/>. According to the World Bank, the US economy is bigger. See <http://data.worldbank.org/data-catalog/GDP-ranking-table><http://data.worldbank.org/data-catalog/GDP-ranking-table>.

64. 'A long march for China's national champions' by John Lee, *China Spectator*, 13 November 2013 at <http://www.businessspectator.com.au/article/2013/11/13/china/long-march-chinas-national-champions>. 'The troubles with building "China's GE"' by Dinny McMahon, *Wall Street Journal*, 2 December 2014 at http://www.wsj.com/articles/the-troubles-with-building-chinas-ge-1417566236?mod=pls_whats_news_us_business_f. China's dysfunctional judicial system, absence of rule of law and property rights also handicaps the economy. See Blumenthal and Scissors, *op. cit.*

65. For example, 'AMSC taking Sinovel infringement suit to China's Supreme Court' by Ehren Goossens, Bloomberg, 9 April 2012 at <http://www.bloomberg.com/news/articles/2012-04-09/amsc-taking-sinovel-infringement-suit-to-china-s-supreme-court>.

66. See 'China vs the world: whose technology is it?' by Thomas Hout and Pankaj Ghemawat, *Harvard Business Review*, December 2010 at <https://hbr.org/2010/12/china-vs-the-world-whose-technology-is-it> and 'Adjusting to China: a challenge to the US manufacturing sector' by Martin Neil Baily, Brookings Policy Brief Series, #179, January 2011 at <http://www.brookings.edu/research/papers/2011/01/china-challenge-baily>. Yaxue Cao, founder and editor of ChinaChange.org, a website devoted to news and commentary related to civil society, rule of law, and rights activities in China, explains the Communist Party thinking when it comes to international competition: 'when I don't know how to do it, I welcome you to come

- and show me how. When I've learned how to do it, you can't make money from my market anymore.' See 'Under the China dome – a reality check' by Yaxue Cao, China Change.org, 9 March 2015 at <http://chinachange.org/2015/03/09/under-the-china-dome-a-reality-check/>.
67. Three Gorges Dam Hydroelectric Power Plant, China, Key Data, Power-Technology.com at <http://www.power-technology.com/projects/gorges/>. According to Xinhua, the deputy general manager of the China Yangtze Three Gorges Project Corporation (CTGPC) declared that 'we have made breakthroughs in new hydro-turbine design and air-cooling... The No. 26 turbine appears to be running more steadily than the other 15 generators mostly made by overseas companies.' See 'First China-made generator goes into operation at Three Gorges Dam', Xinhua, 10 July 2007 at http://english1.english.gov.cn/2007-07/10/content_679378.htm.
68. Hout and Ghemawat, *op. cit.*
69. *Ibid.*
70. *Ibid.* Also see 'Rising to the challenge: US innovation policy for the global economy', National Research Council (US) Committee on Comparative National Innovation Policies: Best Practice for the 21st Century; Wessner CW, Wolff AW, editors, Washington (DC): National Academies Press (US); 2012 at <http://www.ncbi.nlm.nih.gov/books/NBK100319/>.
71. 'Nuclear power in China', World Nuclear Association, updated March 2015 at <http://www.world-nuclear.org/info/country-profiles/countries-a-f/china--nuclear-power/>.
72. See 'SNPTC to build nuclear power unit in Turkey', *China Go Abroad*, 25 November 2014 at <http://www.chinagoabroad.com/en/news/15564>. It reports that 'On November 24, China's State Nuclear Power Technology Corporation (SNPTC), Westinghouse Electric Company and EUAS, the largest electric power company in Turkey, announced an agreement to enter into exclusive negotiations to develop and construct a nuclear power unit in Turkey. SNPTC indicated that the agreement is an important step forward in its cooperation with Westinghouse in the global market. The agreement will also vouch for China's global promotion of its latest nuclear technology and industrial systems. China's CAP1400 reactor technology, which has Chinese intellectual property rights, will be used in the construction of the nuclear power unit'. The *South China Morning Post* reports that 'For foreign buyers, the biggest attraction of Chinese nuclear technology would be its low cost, but the Chinese companies that would build the plants are largely untested'. A China Institute of Atomic Energy expert told the *South China Morning Post*, 'a major challenge of nuclear research and development in China is the shortage of talent. We need more scientists and engineers to meet the deadlines'. See 'China plans to be world leader in nuclear power by 2020', Stephen Chen, *South China Morning Post*, 14 September 2014 at <http://www.scmp.com/news/china/article/1591984/china-plans-be-world-leader-nuclear-power-2020>. Bloomberg reports that there is another hurdle for China's export drive: 'New technology needs the blessing of the US Nuclear Regulatory Commission, which is 'still regarded as the global accrediting body,' says Bo Kong, assistant research professor at Johns Hopkins School of Advanced International Studies. 'China has to convince the rest of the world it has the ability to build safely and securely.' See 'China wants nuclear reactors, and lots of them' by Christina Larson, Bloomberg, 21 February 2013 at <http://www.bloomberg.com/bw/articles/2013-02-21/china-wants-nuclear-reactors-and-lots-of-them>.
73. 'China's largest nuclear power base generates record electricity', Xinhua, 5 February 2015

at http://news.xinhuanet.com/english/china/2015-02/05/c_133970728.htm.

74. Concerned citizens don't trust the government to run nuclear facilities safely and are especially worried about water and air contamination from radioactive releases from China's nuclear fleet. They have good reason to worry: the nuclear industry itself acknowledges that China's nuclear workers and management lack a safety culture and that the regulatory regime will have difficulty coping with the massive expansion plans. See 'Inland provinces: nuclear at crossroads' by Wen Bo, *China Water Risk*, 13 August 2014 at <http://chinawaterrisk.org/opinions/inland-provinces-nuclear-power-at-crossroads/>; 'Nuclear power in China,' World Nuclear Association, updated February 2015 at <http://www.world-nuclear.org/info/country-profiles/countries-a-f/china--nuclear-power/>; 'China regulators 'overwhelmed' as reactors built at pace' by Tara Patel and Benjamin Haas, Bloomberg, 19 June 2014 at <http://www.bloomberg.com/news/articles/2014-06-18/french-nuclear-regulator-says-china-cooperation-lacking>; Chen, *op. cit.*

75. The Communist Party of China has been able to count on the Western media in aid of its dam-building program. As one example, Peter Hadfield, writing about the Three Gorges Dam in *New Scientist*, justifies it 'because CO₂ emissions would be rising even faster without it'. He felt guilty, he admitted, because 'it is the people living along the Yangtze, who have and will continue to pay a heavy price, but 'we all benefit from the Three Gorges dam, after all, even though we live nowhere near it'. According to his climate change calculus, harming millions is justified in the name of the planetary 'greater good'. See 'Simply the biggest: the great dam of China' by Peter Hadfield, *New Scientist*, 24 November 2014 at <http://www.newscientist.com/article/mg22429961.600-simply-the-biggest-the-great-dam-of-china.html>.

76. The IEA analysis 'shows that peaking coal demand in China within this decade necessitates either a significantly lower GDP growth or dramatic changes concerning power generation or energy intensity in the economy. While of course past performance is no guarantee of future results, neither development has been observed, not even closely, in recent history'. See 'Peak coal in China may happen in the medium term, but don't count on it', International Energy Agency, 3 November 2014 at <http://www.iea.org/ieaenergy/issue7/peak-coal-in-china-may-happen-in-the-medium-term-but-dont-count-on-it.html>.

77. 'Can China cut coal?' by David Biello, *Scientific American*, 25 November 2014 at <http://blogs.scientificamerican.com/observations/2014/11/25/can-china-cut-coal/>.

78. See Breakthrough's 'Chinese primary energy consumption by fuel source', Fig. 10, which forecasts fossil fuels continuing to rise in absolute terms until 2030. 'US-China climate deal underscores need for substantial energy innovation: China to add more electric power from coal than from nuclear, wind, or solar' by Arthur Yip, 9 December 2014, The Breakthrough Institute at <http://thebreakthrough.org/index.php/issues/decarbonization/us-china-climate-deal-underscores-need-for-substantial-energy-innovation>.

79. Breakthrough's modelling suggests that new coal power capacity additions between 2015 and 2030, at approximately 300 GW, will rival new additions in wind and solar capacity, and greatly exceed new additions of nuclear capacity.

80. As Ted Nordhaus, chairman of the Breakthrough Institute, said to Eduardo Porter at the *New York Times*, 'If the Chinese and the Indians found it much more economically efficient to build out solar, nuclear and wind, why are they still building all these coal plants?' 'I don't

think the Chinese and the Indians are stupid', Mr Nordhaus said. 'They are looking at their indigenous energy resources and energy demand and making fairly reasonable decisions.' 'For them', concluded Mr Porter, 'combating climate change does not look at all like a free lunch'. See 'The benefits of easing climate change' by Eduardo Porter, *New York Times*, 23 September 2014 at <http://www.nytimes.com/2014/09/24/business/economy/the-hidden-benefits-of-mitigating-climate-change.html>.

81. 'Soft technology – the essential of innovation', by Zhouying Jin, Chinese Academy of Social Sciences/ 2001/1, January 2001 at <http://millennium-project.org/millennium/beijing-0702.PDF>.

82. For an excellent review of the economic reforms that China needs to achieve energy security, efficiency, diversification and innovation – competition, property rights, capital market reform, the removal of subsidies, price reform, privatisation and monopoly-busting – see Blumenthal and Scissors, *op. cit.* For a good review of the distortions caused by China's energy subsidies, see 'How Chinese subsidies changed the world' by Usha C.V. Haley and George T. Haley, *Harvard Business Review*, 25 April 2013 at <https://hbr.org/2013/04/how-chinese-subsidies-changed>.

83. 'Regulatory compliance when the rule of law is weak: evidence from China's environmental reform' by Wai-Hang Yee, Shui-Yan Tang and Carlos Wing-Hung Lo, *Journal of Public Administration Research and Theory*, 2014 at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2433355.

84. 'Improvements in the operation of SO₂ scrubbers in China's coal power plants' by Yuan Xu, Woodrow Wilson School of Public and International Affairs, Princeton University, *Environmental Science & Technology*, 2011; 45: 380–385 at http://www.grm.cuhk.edu.hk/eng/research/RAE2011/XuYuan/2%20Operation%20of%20SO2%20scrubbers_EST_2011.pdf.

85. For a description of why, in the absence of a free press, free speech, rule of law and democratic institutions, dictatorships can't enforce environmental protections, see 'China's battle plans in war on air pollution under scrutiny' by Julie Makinen, *LA Times*, 10 September 2014 at <http://www.latimes.com/world/asia/la-fg-china-la-smog-policy-20140909-story.html>.

86. 'China's environmental enforcement glitch' by Elizabeth Economy, *The Diplomat*, 21 January 2015 at <http://thediplomat.com/2015/01/chinas-environmental-enforcement-glitch/>.

87. 'No quick fix for China's air quality' by Andrew Browne, *Wall Street Journal*, 15 January 2014 at <http://blogs.wsj.com/chinarealtime/2014/01/15/no-quick-fix-for-chinas-air-quality/>; 'China tries a new tactic to combat pollution: transparency' by Christopher Beam, *The New Yorker*, 6 February 2015 at <http://www.newyorker.com/news/news-desk/china-tries-new-tactic-combat-pollution-transparency>.

88. 'Beijingers – and state media – wonder why city gov't didn't act on weekend smog' by Sheng Menglu, *Caixin*, 18 February 2014 at <http://english.caixin.com/2014-02-18/100640141.html>.

89. 'Beijing issues rare air pollution alert', AP, *Mail Online*, 21 February 2014 at <http://www.dailymail.co.uk/wires/ap/article-2564583/Beijing-issues-rare-air-pollution-alert.html>.

90. Lawyer and a visiting fellow at Harvard Law School, Teng Biao, explains that 'legitimacy can come only via recognition given through free elections, and here the party is stuck...True rule of law would mean the end of the one-party system'. See

'China's empty promise of rule by law' by Teng Biao, *Washington Post*, 28 December 2014 at http://www.washingtonpost.com/opinions/chinas-empty-promise-of-rule-by-law/2014/12/28/16dc04ec-8baf-11e4-a085-34e9b9f09a58_story.html; 'Fatal misperception: how unsafe is Chinese food?' by Yanzhong Huang, 10 July 2013, Council on Foreign Relations at <http://blogs.cfr.org/asia/2013/07/10/fatal-misperception-how-unsafe-is-chinese-food/> illustrates the dysfunctional nature of the regulatory regime governing China's food supply.

91. 'US, China climate moves boost Paris prospects', UNFCCC, Press Release, 12 November 2015 at <http://newsroom.unfccc.int/unfccc-newsroom/us-china-climate-moves-boost-paris-prospects/>.

92. 'Obama-China global warming deal already running into trouble' by Michael Bastasch, *The Daily Caller*, 5 December 2014 at <http://dailycaller.com/2014/12/05/obama-china-global-warming-deal-already-running-into-trouble/>; State Council Information Office (SCIO) briefing on climate change, *op. cit.*

93. The Chinese government is fond of pointing out how unreliable the US is in international climate negotiations because of their democratic system, and especially because of the Republicans. See 'Next year crucial for fight against climate change', Xinhua, 25 December 2014 at http://news.xinhuanet.com/english/sci/2014-12/25/c_133877030.htm.

94. 'Obama puts climate on the 2016 ballot' by Rupert Darwall, *Wall Street Journal*, 1 December 2014 at <http://www.wsj.com/articles/rupert-darwall-obama-puts-climate-on-the-2016-ballot-1417478450>.

95. 'Lima climate talks: EU and US at odds over legally binding emissions targets' by Dan Collyns, *The Guardian*, 2 December 2014 at <http://www.theguardian.com/environment/2014/dec/02/lima-climate-talks-eu-and-us-at-odds-over-legally-binding-emissions-targets>.

96. 'China's submission on the work of the Ad Hoc Working Group on Durban Platform for Enhanced Action', *op. cit.*, p. 2

97. *Ibid.*, p. 1.

98. *Ibid.*, p. 1.

99. 'Double impact: why China needs coordinated air quality and climate strategies' by Valerie J. Karplus, *Paulson Papers On Energy and Environment*, University of Chicago, February 2015, p. 1 at http://www.paulsoninstitute.org/media/168736/ppee_air_and_climate_karplus_english.pdf.

100. *Ibid.*, p. 9.

101. These include such measures as shutting coal-intensive zombie companies that have overcapacity, increasing energy efficiency, and switching to other fuel sources.

102. Karplus, *op. cit.*, p. 8.

103. *Ibid.*, p. 3.

104. For a ranking of the overall competitiveness of different electricity generating technologies (representing the per-kilowatt-hour cost (in real dollars) of building and operating a generating plant over an assumed financial life and duty cycle) see 'Levelized cost and levelized avoided cost of new generation resources in the Annual Energy Outlook 2014', US Energy Information Administration, 17 April 2014 at http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

105. *Ibid.* p. 9.

106. Karplus, *op. cit.* p. 3

107. The tools to control CO₂ are cumbersome and distorting (pricing carbon), unproven and costly (capturing carbon), and unsuccessful (carbon credits have both failed to reduce CO₂ and created endless opportunities for fraud). Great stock is being placed in China's ability to decarbonize its economy through its nascent carbon markets, which are set to merge under the next 5-year plan to become the world's largest in 2016. But already, China's carbon markets have been described by one international carbon trading expert as a 'black hole,' because the customary reluctance of officials to release information makes it hard to understand how market prices are being set. If China's party-state control of markets is not enough of a handicap, China's carbon markets will suffer from the same problems affecting others. Unlike a real market where the commodity traded has inherent value, CO₂ has virtually none. The parties involved in trading carbon permits have no interest in the CO₂ per se; the value lies in the permit. If no CO₂ is actually offset, neither buyer nor seller would suffer a loss and the self-regulating nature of a market – in which sellers and buyers discipline each other in the trade of a product with real value – is missing. Because this faux market in Europe created many mechanisms for misrepresentation, fraudsters invaded it, with buyers and sellers exploiting their mutual interest in collusion and kickbacks. A government-mandated market of a commodity without inherent value is no market at all. It is another form of command-and-control regulation, and one that provides rich pickings for crooks. That is why Interpol issued a warning about the 'intangible' nature of the carbon credit 'commodity' and Deloitte calls carbon credit fraud the 'white collar crime of the future'. If Europe, with good transparency, securities regulation and rule of law was plagued by carbon trading fraud, China's national carbon market will create a new haven for fraudsters from China and elsewhere. See 'INTERPOL report warns carbon trading at increased risk of criminal exploitation', Media Release, 2 August 2013 at <http://www.interpol.int/en/News-and-media/News/2013/PR090/>. 'Carbon credit fraud: The white collar crime of the future', Deloitte, November 2009 at http://www.deloitte.com/assets/dcom-australia/local%20assets/documents/services/forensic/carbon_credit_fraud.pdf. 'The "black hole" of Chinese carbon trading' by Pilita Clark, *Financial Times*, 13 May 2014 at <http://www.ft.com/intl/cms/s/0/c9b0faf8-d9e1-11e3-b3e3-00144feabdc0.html#axzz3V3Wtn5U9>.

108. This is a modern and expansive coal infrastructure-building campaign known as the West–East Electricity Transfer Project that China's government launched during the Tenth Five Year Plan (2000–2005). 'Under the project, each electricity transfer corridor is expected to exceed 40 gigawatts in capacity by 2020 for a combined capacity equivalent to 60 Hoover Dams, according to a report from the Wilson Center's China Environment Forum. All of that power will be needed since the seven eastern provinces receiving power from the project together consume nearly 40% of China's total electricity' says by Hudson Lockett in 'China's carbon emissions could save the world – or doom it' in the *China Economic Review*, 2 March 2015 at <http://www.chinaeconomicreview.com/china-carbon-all>. Lockett quotes Andrew Driscoll, head of resources research for brokerage and investment group CLSA, who suggests, 'coal-fueled power plants' geographic shift source-ward was most likely motivated by a desire to overcome logistical constraints on domestic coal resources. Even today China's coal supply remains constricted by a lack of additional rail infrastructure to move larger volumes from mining centers to its East and Southeast, and Driscoll recalled the country's aluminum smelters

previously relocating closer to domestic mines to cut down on transportation costs for their chief forging fuel. Now its power plants are doing much the same’.

109. ‘Smog-choked China cuts a climate deal with Obama, and tries to tame its coal beast’ by Richard Martin, *Fortune*, 13 November 2014 at <http://fortune.com/2014/11/13/smog-choked-china-cuts-a-climate-deal-with-obama-and-tries-to-tame-its-coal-beast/>.

110. ‘Company surviving the “coal drums” by gasifying coal’ by Ross McCracken, *The Barrel*, Platts, 3 June 2015 at <http://blogs.platts.com/2015/06/03/coal-drums-gasifying-coal-china/>.

111. ‘China’s plan to clean up air in cities will doom the climate, scientists say’ by William Kelly, *InsideClimate News*, 13 February 2014 at <http://insideclimatenews.org/news/20140213/chinas-plan-clean-air-cities-will-doom-climate-scientists-say?page=show>.

112. According to *Scientific American*, no one knows for sure how many coal conversion projects are in the works, or what their production capacity is, because Chinese companies, including SOEs, which are rich in cash and are backed by local authorities eager for investment, often go ahead with project construction before receiving a final approval from the central government. ‘Chinese Plans to transform coal would worsen global warming’ by Coco Liu and ClimateWire, *Scientific American*, 23 February 2015 at <http://www.scientificamerican.com/article/chinese-plans-to-transform-coal-would-worsen-global-warming/>.

113. ‘China’s great coal migration’ by Richard Martin, *Fortune*, 11 July 2014 at <http://fortune.com/2014/07/11/coal-china/>.

114.

‘Smog-choked China cuts a climate deal with Obama, and tries to tame its coal beast’ by Richard Martin, *Fortune*, 13 November 2014 at <http://fortune.com/2014/11/13/smog-choked-china-cuts-a-climate-deal-with-obama-and-tries-to-tame-its-coal-beast/>.

115. *Ibid.*

116. *Ibid.*

117. ‘Massive coal field discovered in China’s Xinjiang’ CCTV.com, 23 October 2014 at <http://english.cntv.cn/2014/10/23/VIDE1414020843965143.shtml>.

118. While many analysts agree that coal will lose market share to other fuel sources, the absolute amount burnt in the next one to two decades will continue to grow. The *Wall Street Journal* reported that China’s coal output likely fell 2.5% in 2014, marking the first such decline in 14 years. Timothy Puko and Chuin-Wei Yap, *op. cit.*; Hudson Lockett, *op. cit.*

119. Liu and ClimateWire, *op. cit.*

120. *Ibid.*

121. ‘Global EV outlook 2015’; 2015 Global EV Outlook (GEO 2015) OECD/IEA at <http://cleanenergyministerial.org/Portals/2/pdfs/EVI-PR-GlobalEVO Outlook2015-v14-landscape.pdf>; ‘China offers billions to subsidize electric cars on gas’ Bloomberg, 10 December 2014 at <http://www.bloomberg.com/news/articles/2014-12-10/china-offers-billions-to-subsidize-electric-cars-on-gas>. As of 2013, China’s electricity sector’s installed capacity of 1244 GW was 69% thermal, 23% hydro, 6% wind, 1% nuclear, and 1% solar. See ‘China’s electricity sector at a glance: 2013’ by Michael Davidson, *The Energy Collective*, 3 February 2014 at <http://theenergycollective.com/michael-davidson/335271/china-s-electricity-sector-glance-2013>.

122. 'Air pollution: Clean up our skies' by Julia Schmale, Drew Shindell, Erika von Schneidemesser, Ilan Chabay and Mark Lawrence, *Nature*, 19 November 2014 available at <http://www.nature.com/news/air-pollution-clean-up-our-skies-1.16352>.

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For further information about GWPF or a print copy of this report, please contact:

The Global Warming Policy Foundation
55 Tufton Street, London, SW1P 3QL
T 0207 3406038 M 07553 361717
www.thegwpf.org

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