How China's 13th Five-Year Plan Addresses Energy and the Environment

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Thank you for the opportunity to contribute to the deliberations of this Commission. My name is Deborah Seligsohn, and I am both a current PhD student at the University of California, San Diego, focused on Chinese environmental governance, and a long-time observer of China's energy and environmental performance, with over 17 years' experience living in China over the past thirty years.

I am delighted to speak with you today about China's plans for energy and environment contained in its 13th Five Year Plan, released at its National People's Congress last month. The 13th Five Year Plan represents the Chinese government's most significant commitment to addressing China's energy and environmental challenges to date. Of the 33 major targets listed in the document, 16 of them concern the environment and resource use. These cover a broad range of environmental issues from those that are frequently covered in the international press, particularly air pollution, to equally critical issues for Chinese people's health and livelihood, including forest cover and water quantity and quality. China's international climate change commitments are also embedded in the plan with a five year target for carbon intensity, as well as the key measures to reach that goal, energy intensity and non-fossil fuel development.

While this Five Year Plan devotes more attention to environment and resource issues than previous plans, it follows a clear policy trajectory that has developed and strengthened over the past decade. China first adopted what it calls "hard targets" for key energy and environmental indicators in the 11th Five Year Plan (2006-2010), and then added more such targets in the just-completed 12th Five Year Plan (2011-2015). 2006 marked a significant change in Chinese environmental policy. In addition to imposing hard targets for the first time, the Chinese government named "Energy Efficiency and Pollution Abatement" as a "National Policy." This put "Energy Efficiency and Pollution Abatement" on the same level as other key national policies, including "Reform and Opening," the overarching policy that has framed China's reform era since 1979, and the Birth Limitation Policy (often called the one-child policy). As in these other cases, naming a national policy signals to local governments and industry the central government's serious intention to implement. Moreover, the government followed up in 2007 by raising the level of its environmental enforcement apparatus to full ministry status.

Major Improvements in the Past Decade

This new seriousness was followed by results. The most dramatic has been in the reduction in sulfur dioxide pollution, which began to be regulated rigorously in the 11th Five Year Plan (other air pollutants were added in the 12th). The latest NASA satellite data analyzed by a team led by Dr. Nickolay Krotkov at NASA's Goddard Space Flight Center shows that sulfur dioxide pollution over the North China Plain (the most polluted area in China) peaked in 2007 and has now fallen by fully half.[i] The same scientific paper shows that nitrogen oxides peaked in 2011 (coinciding with their inclusion in the 12th Five Year Plan), after having risen rapidly over the preceding years, and are now back to the level they were in 2005. Indeed, Greenpeace examined NASA's data, not just for the North China Plain, but for the entire country, and found that air pollution has improved steadily since 2011 in almost all parts of the country. Greenpeace found for the nation as a whole PM 2.5 declined by 17%.[ii] China has experienced similar success with other energy and environment targets, as shown in chart 1 below.

This information may seem new or surprising to many. The reality is simply that China is starting from a very low baseline – air, water and soil quality are all poor. Before 2005 China's energy efficiency had actually worsened for several years. Turning such a large ship around is neither easy nor quick. But the clear trends over the past decade, particularly in both air pollution and in energy policy, have been toward improvement. Some of this progress, such as the major improvements in energy efficiency that have driven most of China's climate-related policies to date, are not observable to the public. Others are simply masked by daily variability and the poor baseline from which China starts. On bad days, for example, air quality in some of China's cities can be twenty times a truly clean level. It is not easy for the general public to observe the difference between ten and twenty times good air quality. This is the work of multiple five-year plans. There are clear indications that this 13th Five Year Plan is designed to make significant progress on both the energy and environmental fronts.

Increasing Accountability

As I'll discuss further below, many of the targets in the 13th Five Year Plan take the next expected step from the previous five year plans – new targets for various pollutants, greater ambition in pollution reductions and in shifting to cleaner energy. But two aspects of the plan point to intensified scrutiny of local governments as institutions and of the officials themselves. Localities now face hard targets not just for specific pollutants, as had been the case in the 11th and 12th Five Year Plans, but for overall ambient air quality improvements. One of the most remarkable aspects of China's progress, as Greenpeace outlined in advocating Chinese-style air pollution policies for India, has been the network of air quality monitoring stations in over 400 cities.[iii] There is simply no other country in the developing world with this level of capacity to track its own emissions. As a result Chinese policy is able to move from one of the key building blocks of an effective air pollution control system, namely regulating sources (like vehicles and power plants) to also regulating the overall mix of pollutants in the air and holding localities responsible for adjusting limits to respond to weather changes. In other words, on "bad air days"

cities are required to do more. The new target in the Five Year Plan, which requires cities to meet "good" or "excellent" standards, defined as scoring below 100 on China's 0-500 Air Quality Index (AQI), builds on the Regional Air Quality regulations announced in May 2010,[iv] and the specific plan under those regulations, which was issued in September 2013.[v]

I can tell you from field visits I've conducted in several provinces over the last three years that the new air quality regulations have resulted in substantial upgrades in pollution abatement equipment, particularly in power plants. At the same time they have also challenged local governments to develop much more sophisticated air quality management modeling and program design. To reduce pollution when the weather is exacerbating the production of secondary pollutants in the air – the pollutants we really care about, PM 2.5 and ozone – requires a sophisticated understanding of both the sources and the potential abatement strategies. Many of China's best academic experts are involved in helping localities develop this capacity. It is not easy, and it isn't clear that all localities will be able to do so by the 2017 deadline contained in the 2013 plan. Nonetheless, the pressure to do so is resulting in material improvements, as we can see from the data I cited above.

But this plan goes beyond holding localities responsible to emphasize the responsibility of individual polluters and officials. In his Work Report[vi] to the National People's Congress Premier Li Keqiang stated that both those who violate environmental regulations and those who fail to report violations will be "severely punished." This is the first time such a statement has been made at the National People's Congress, and again serves to underscore the seriousness with which the central leadership is addressing environmental issues.

Capping Dirty Energy

The Five Year Plan delivers a comprehensive set of targets for controlling the growth of carbon emissions and ultimately peaking them. In China's Independently Determined National Contribution (INDC), submitted to the United Nations Framework Convention on Climate Change in June 2015, the Chinese government promised to peak carbon emissions by 2030 and also make "best efforts" to peak earlier as well as to lower greenhouse gas emissions per unit GDP by 60-65% below 2005 levels. This follows on the Copenhagen commitment to lower emissions by 40-45% below 2005 levels by 2020. The 13th Five Year Plan target embeds the 2030 commitment and actually increases its ambition for 2020 as shown in figure 1 below.

Perhaps the most striking aspect of the Five Year Plan is that it also sets a total cap on energy consumption, at 5 billion tons coal equivalent (or TCE)[vii] in 2020. 2015 energy consumption was 4.3 billion TCE, a rise of less than 1 percent from the previous year. Thus, while setting an outside limit on energy consumption growth is an important policy step, this particular target aligns with reforms already well underway, in particular the dramatic decline in coal use. Coal consumption actually peaked in 2013, and fell 2.9% in 2014 and 3.7% in 2015. Indeed some observers believe that China's carbon emissions may have actually fallen in 2015. Robert Jackson of Stanford University and fellow

researchers estimate that Chinese emissions fell 3.9% in 2015 with a margin of error that still shows a decline, with a range of -1.1% to -4.6%.[viii] It is still too early to tell whether this is the ultimate peak for both coal and carbon. More likely, we will see fluctuations for several years before we see a steady trend. Nevertheless, the most recent figures do suggest merit to the argument by analysts, such as Dr. Jiang Kejun at China's Energy Research Institute, who suggest that early peaking is likely.[ix]

The 13th Five Year Plan's energy policy is to continue to increase energy efficiency (measured by energy intensity, energy consumed per unit GDP) and to increase the use of non-fossil energy. Energy efficiency improvements have been the major portion of China's reductions in carbon intensity to date. These have mainly focused on upgrading technology in heavy industry and the power sector. Because industry has been China's dominant energy consumer, that strategy has been effective, and indeed, there continues to be room for efficiency gains here. China's vehicle efficiency standards are also comparable to those in the United States.[x] To continue to improve efficiency, the Chinese are going to need to make gains in areas where consumption is more dispersed. This includes small-scale manufacturing, buildings and commercial users, all of which are mentioned in the current five-year plan.

While heavy industry can benefit from efficiency improvements, the real gains in energy efficiency and greenhouse gas and pollution reduction in this sector will come from cutting overcapacity, in other words, not operating unnecessary plants. There are some indications that the Chinese government has become serious about overcapacity. Reuters reported just this past week that the Chinese government has announced plans to cut capacity in both steel and coal, including a fund of RMB 100 billion ($15.45 billion) for those made unemployed.[xi] In late March, the National Energy Administration also halted construction of power plants in 15 regions that were experiencing power oversupply.[xii] If the Chinese government can maintain these policies, the goal of peaking greenhouse gas emissions earlier than the 2030 target becomes realistic.

Looking to the future, fuel switching becomes a much more important part of the total effort to reduce carbon intensity and an important part of the pollution reduction story. The 13th Five Year Plan follows on the pattern in previous plans in encouraging development of all non-fossil sources. While much international attention has focused on solar and wind power, where indeed China is now the top producer and installations are growing at a prodigious rate, it is worth noting that hydropower continues to be the largest non-fossil source in China, and nuclear is growing rapidly. Figure 2 below shows the percentage of electricity produced from China's major power sources in 2014.

Thermal power in this chart includes both coal and natural gas, but natural gas use in power is minimal. Solar power production is as yet so small as to not register in these national statistics, but capacity has grown 13 fold since 2011. Nuclear and hydro fit in well into China's traditional grid management. Solar and wind's fluctuations and intermittency have proven to be technical challenges, while its distribution in the country (mainly in the north and west) has reportedly left State Grid with insufficient lines to transmit the power to demand centers. In March, State Grid Chairman Liu Zhenya

announced a program to spend RMB 2.3 trillion ($355 billion) over the next five years to address the problem.[xiii] This development is essential to the Plan target to have non-fossil energy comprise 15% of the total energy mix by 2020 and 20% by 2030.

Cleaning the Air

While fuel switching helps improve air quality, the reality is that coal will be the largest energy source in China for decades to come, and oil as a transport fuel, is also an important part of the mix. As a result, end of pipe pollution abatement strategies are still a critical component of China's effort to improve air quality. As noted above, local governments are under considerable pressure to improve air quality performance. And so are major industries. In particular, the power sector has been out in front with new standards, proposing their own "ultra low emissions" standard for coal-fired power plants, which they argue would make coal plants' emissions comparable to natural gas plants. In interviews in Jiangsu and Shandong provinces over the past several years, I've found the provinces increasingly likely to require new power plants be either gas or non-fossil energy, while the power sector is concerned about gas cost and supply. To counter this trend the power sector has produced this new standard.

The challenges in meeting China's standards come in other sectors. About half of China's coal is used outside of the power sector. Thus, enforcement of other heavy industries is also critical. China still has numerous small-scale boilers and households using coal. Moving these small-scale users to electricity or gas is important, both to reduce ambient air pollution, and in the case of households to reduce even more lethal indoor air pollution. Chinese cities have been building combined heat and power plants and providing piped gas, and both of these trends are slated to continue under the current plan.

A major addition to the 13th Five Year Plan is a 10% reduction target for Volatile Organic Compounds (VOCs), which are a major contributor to both PM 2.5 and ozone pollution. VOCs are emitted not just from fossil fuels (though vehicles are a major source), but from paints, solvents and industrial processes. Thus, regulation will be more of a challenge than for some of the other pollutants.

Chinese vehicle standards have been improving over the years, but the quality of fuel in them has lagged behind. The 13th Five Year Plan also prescribes that vehicle fuel be produced suitable for cars and trucks at the China V (essentially Euro V) emissions standard, a standard adopted in the European Union in 2009. The challenge to date has been that the petroleum industry has failed to produce high-quality fuels. This issue was the target of the on-line documentary "Under the Dome" last year and has been a persistent concern of the Ministry of Environment (which endorsed the film before it was removed by censors).

The reality as noted above is that air quality is improving, but it is not yet become noticeable to the public. We can expect to see continued improvements over the course of this plan. The addition of NO_x in the 12th Five Year Plan and now VOCs in the 13th

suggest that China should be able to make significant progress in air quality. The Ministry of Environmental Protection has suggested that truly cleaning the air is a 15-year task, and given the percentage reduction targets that are used in these plans, that sort of a time frame seems realistic.

Cleaning Up the Water and Soil

In addressing public health and safety, water and soil pollution continue to be critical issues. China faces both water quantity and quality issues. The Premier's work report cited "relatively poor" water quality and "severe" over-extraction of groundwater in some regions. Unlike the energy and air pollution goals, which were met or exceeded the last Five Year Plan, China failed to meet its target to cap total water consumption at 600 billion cubic meters. Consumption was 618 billion cubic meters in 2015, and the new cap is set at 670 billion cubic meters. To stay within this cap the Plan also sets a target of reducing water consumption per unit GDP by 23% over the next five years. While China faces real limitations on water supply – its per capita water availability is only 1/3 the world average – numerous researchers have suggested approaches to reducing excess water use, from changing pricing policies to shifting agricultural use from water short (i.e. North China) to more water rich (Southern China) areas.[xiv] Many reforms have been implemented, at least partially, including the use of local water users groups or canal managers and shifting the types of crops produced in the greater Beijing area. However, more complete implementation would yield greater savings. These reforms are not necessarily popular at the local level, and it isn't clear how high a priority these goals are.

Another approach to improving water supply would be to improve water quality, an issue that does appear to have some greater urgency among Chinese policymakers. If the water were cleaner, more of it would be available for use. Perhaps more importantly in terms of the political profile of the issue, both water and soil pollution are associated with the Chinese public's grave concerns about food safety. A recent scientific article with lead authors from the Chinese Academy of Sciences, for example, found an association between both water and soil pollution, unsafe food, and an even scarier topic for the Chinese public, "cancer villages."[xv] Food safety is regularly discussed in the Chinese-language press from all angles, including the concern of its association with pollution.

Both industry and agriculture are major sources of China's water pollution, while agricultural chemical use is the major contributor to soil pollution. The two water pollution targets in the 13th Five Year Plan address two different types of pollution. The first, chemical oxygen demand (COD), was listed as a hard target a decade ago. It addresses the type of chemical discharge typical of industry. In the 12th Five Year Plan, five years ago, the Chinese government added ammonia nitrogen, a measure of the pollution caused by organic waste and fertilizer mainly from households and farms. The current plan doesn't add a specific soil target, but it proposes a number of pilot programs to test how to ameliorate the chemical problem in soil. While industrial pollution is relatively straightforward to address, because it is concentrated and pollution abatement equipment can be installed, agricultural pollution is much more difficult. It is known as non-point source, because the sources are so diffuse. The challenges China is facing are

not distinct, but in a densely populated country with so many households, farms and livestock, the challenges are significant. Moreover, pollutants can accumulate, especially in the soil. Thus, these issues are likely to continue to be a challenge well after we see cleaner air and lower carbon emissions.

Absorbing Carbon

An often overlooked component of China's environmental record is its success in increasing its forest cover from just 8.6% of its landmass in 1949 to over 21% today. Both the 13th Five Year Plan and the China's climate commitments contain plans to continue to increase forest cover – up to 23% in 2020. Chinese forest policy has been criticized in the past for emphasizing area over forest quality and forests over grasslands. We see attempts to remedy both issues, although the remedy will not answer all critics – especially those that emphasize species variety. China's climate commitment contains a commitment on forest stock volume rather than just area of coverage. The Five Year Plan also contains a target for grassland vegetation.

Improving Quality of Life

Overall, the 13th Five Year Plan looks likely to contribute to improving quality of life for most Chinese. China has already solved one of the great challenges for most developing nations – enabling access to commercial energy. Almost all Chinese have access to electricity. Over the next five years, we can expect that energy to become cleaner as the coal-fired power industry continues to clean up its act, and renewables and nuclear energy become a larger part of the total mix. It also seems likely that the Chinese will be able to address some of the major grid problems that have prevented full utilization of its rapidly growing solar and wind resources. What had been less clear was whether they would be able to prevent overbuilding in the thermal power sector, but most recent reports on shutdowns are promising.

Greater challenges exist in cleaning up other sources of air pollution – in particular small-scale industry and vehicle fuel. The level of focus on these issues in this plan is promising, as is the emphasis on local and professional accountability. Water and soil, too, are much more of a challenge than energy and air. The level of concern about food safety suggests that these issues are now a higher priority, but translating that priority into real improvements will be a challenge.

One critical issue in quality of life is safety, and the last year has had a number of incidents that have highlighted poor safety in China, including the Tianjin warehouse explosion. The plan includes both a national survey to look for dangerous pollutants and provisions to upgrade China's nuclear safety apparatus.

What is Driving this Change?

There is considerable disagreement among observers on what forces are driving this effort to clean up in China. There is fair consensus that there is commitment from the top.

We've seen President Xi Jinping publicly support environmental efforts, particularly the two agreements he signed with President Obama, his attendance at the COP and support for the Paris Climate Agreement, and his signing of the Agreement on Earth Day along with other world leaders. We also have long had indications that the Chinese Ministry of Environmental Protection (MEP) wished to play a more forceful role and sought greater power to enforce environmental regulations. The previous Minister of Environmental Protection Zhou Shengxian initiated letters to the public on the MEP website outlining initiatives. MEP officials have also always been much more open to the press, including the local Chinese press, than other government ministries. The current Minister of Environmental Protection, Chen Jining, is a prominent academic expert on water quality and former President of Tsinghua University, one of China's top universities.

The airing last year of the web video "Under the Dome" demonstrated both the extent and the limits of the Ministry's efforts to engage the public. The film, by independent journalist Chai Jing, engages with China's air pollution crisis in a manner quite similar to that of Al Gore's "An Inconvenient Truth," combining a lecture from a stage with reported video and interviews. A number of office directors from MEP appeared on camera for frank interviews about the causes and solutions to the air pollution problem. As a former bureaucrat myself, I think it is safe to assume that office directors don't appear on film without the boss's permission. Given the timing, the film was likely made during the previous minister's tenure, but Chen endorsed it when it came out. Perhaps more well-known in the West, at least in China-watching circles, is that the Chinese censors removed it from the web after 4 days, which was also after some 250 million people had viewed it. While this was certainly a blow for free speech, it is less clear that it was a blow to the effort to control air pollution. Surely among the 250 million viewers were many if not most of the intended target audience. Moreover, we've seen no evidence that Minister Chen has suffered politically from his original endorsement.

While public engagement has been one of the Ministry's strategies, it has also focused heavily on improving top-down accountability. It has created regional offices covering multiple provinces and modeled after the US Environmental Protection Agency's regions to supervise and inspect the provinces. It has also required considerably more automated monitoring, both of ambient pollution levels and pollution from fixed sources. And it has revised and implemented tougher laws with more precise regulatory requirements.

At the same time there is certainly significant demand for environmental improvements from the general public. Whether public concern has driven central government attention is less clear. The bulk of the discussion of air pollution on line is centered in major cities. In contrast, the improvements we've seen have not been not restricted to the cities where public interest is greatest, but have occurred throughout China. Moreover, public concern rose rapidly after the "air-pocolypse" of 2013, while improved air quality can actually be dated to 2011, while the first major improvements in individual air pollutants began in 2007. These changes reflect the timing of the previous two Five Year Plans. Moreover, air quality is the type of public good that if Chinese leaders want it for themselves, they need to supply it to the general public.

The public and the media do actively engage on environmental topics. While no topic avoids censorship, a relatively large amount of information is available in china.

Civil society also involves non-governmental organizations (NGOs). Overall the NGO movement in China is weak. Chinese NGOs are restricted in how they can raise money, register and recruit members. Most are quite small. In the capital most depend on project funding from international donors and to some extent are perceived by others in China as project contractors more than as civil society. The only groups with actual members don't take international money, which considerably restricts their ability to expand.

Despite these limitations, NGOs have had an influence. There are a number of environmental innovations that do seem to stem at least in part from the efforts of environmental NGOs. The three I list below all have a significant aspect in common – they propose a simple idea that can make a real difference to a specific problem. While international academic and regulatory experts have made enormous contributions in everything from assisting with monitoring apparatus to solving problems with wind power intermittency, NGOs seems to be particularly good at proposing straightforward solutions to certain types of problems. Three stand out.

- The coal cap. This was an effort pushed by a consortium of NGOs. While the Chinese government was long at work on air pollution mitigation measures, the idea of simply capping coal stems from the NGO community, and was led by Dr. Yang Fuqiang, now at the Natural Resources Defense Council. This idea has now been applied to both coal and total energy.
- Banning free plastic bags at grocery stores. This was an initiative developed by Sheri Liao of Global Village of Beijing. It began as a bottom up initiative and was then embraced by various local governments. The key insight here was that such a rule helps local governments save money by reducing trash.
- The 26 degree campaign. This again is a bottom up initiative then embraced by government as an energy and cost-saving measure. The idea, which was copied from Japan, was to pledge to lower thermostats in summer to no lower than 26 degrees Celsius (or 78.8 F).

There are others, as well, including initiatives to regulate China's international forest practices, and a large number of areas where NGOs work often in combination with others including government to create policy. In the climate area, a large number of NGOs have been active and have provided considerable policy advice. NGOs have also been active in advocating for information transparency, including efforts to put more environmental information on the web.

At the same time there are also very local groups, some organized, many not. Many are involved in opposing specific projects. Some of this opposition is rooted in environmental principles. There are projects that are polluting or dangerous. Other opposition groups are involved in what is known as NIMBY (not in my backyard) protests, a phenomenon we also see in other countries, but which is a new challenge for China. Indeed a great deal of Chinese academic work on the environment is focused on

the NIMBY issue. Still other local groups are more educational or public service oriented.

A Huge Domestic Industry

The Chinese have supplied the bulk of their energy infrastructure themselves for decades. Opportunities typically arise in areas where there are new technologies or approaches that international companies can market. Some of these do exist in the new energy area. China has purchased a number of Westinghouse power plants, for example. The solar industry is also one with quite a bit of synergy, as Chinese companies purchase the manufacturing equipment often from US venders, and then US companies provide a great deal of the value added at the installation end, as well.

Coal-fired power has been an almost entirely domestic endeavor, and China is now the leading low-cost producer of modern coal-fired power plants. The same has rapidly become true of pollution abatement technology. The reality is that most of the end-of-pipe technologies in use were developed decades ago and are essentially commodity products. Chinese producers rapidly came to produce flue gas desulfurization (FGD, for SO_2) and selective catalytic reduction (SCR, for NO_x) at considerably lower cost than imported models. As domestic demand becomes saturated, we can expect Chinese companies to increasingly market these technologies abroad. China has long been a major international dam builder, and is now exporting large numbers of coal-fired power plants, as well.[xvi] This supply of relatively low-priced technology has both risks and benefits, since many developing countries still need to supply more energy to their populations, and Chinese companies can offer pollution abatement at a relatively low cost. At the same time, low-cost coal power may lead some producers to choose it instead of less carbon-intensive options. China, of course, is also a major exporter of more carbon-friendly options, like wind and solar, and its current ambition is to export more nuclear power plants, as well.

Opportunities for international companies exist where they can provide solutions to challenges the Chinese are facing. The Chinese are trying to reduce both greenhouse gas emissions and air pollution. Current air pollution technologies use considerable energy, for example, so new less energy intensive technologies might be attractive. Another key opportunity is in monitoring technologies, and a number of companies are active in this area. All the targets in the 13th Five Year Plan require monitoring of industries and localities. The Chinese have already installed continuous emissions monitoring systems (CEMS) on all its power plants and on a number of other large facilities, as well. CEMS data is available in real-time to local enforcement officials on their smart phones and in provincial and central government offices. But small facilities are monitored through spot inspections, which are much easier to defeat. Lower cost monitoring that allowed officials to track small-scale boilers and factories in real-time would be highly valuable.

Programs that promote public-private partnerships are an effective way to fully engage with Chinese partners. The Clean Energy Research Centers have been one such effective approach. An area like carbon capture and storage offers real synergies, because the US

has expertise in storage, while the Chinese have done a great deal of capture work. The real issue is that both sides need to bring something to the table, including funding, for these programs to be sustainable.

Safety is another area where there is a need for solutions. The US and China have longstanding nuclear cooperation on both the safety and security sides. This is definitely an area with opportunities, not just for government-to-government cooperation, but for companies with good solutions for energy sector monitoring and prevention.

Overall, a cleaner China is a real opportunity for the United States. China's focus on greenhouse gas emissions reductions is critical to a major global goal. Its pollution abatement is mainly good for the Chinese people, but it also does reduce the amount of pollution coming across the Pacific. China has already shown itself to be an effective partner in the lead-up to Paris. The type of leadership Presidents Obama and Xi applied to the climate talks could be applied to other areas.

The slowing growth of China's energy demand and its greater diversification are also good trends for energy security. China's government is no longer worried (as it was a decade ago) that it has to face ever-rising energy demands. This should enable the two countries to coordinate somewhat more easily in addressing problems in resource rich states.

The concern is how all of this development affects markets. The reality is that strong investment on energy development at home makes a country's industries more competitive overseas. We've seen that with China's coal sector. Having built coal-fired power plants for the domestic market, China is now exporting them. The Chinese wish to apply this model in additional energy areas. But this approach can work for the US, as well. Investing in clean power and new environmentally friendly technologies for the US market will assist those companies in then marketing their products to other nations. The US has a great deal of innovative technology. The best way to show it is valued is to use it at home.

Charts

Chart 1. Key Energy and Environment Outcomes and Targets

	12th Five-Year Plan (FYP)'s Targets (Compare to 2010 level)	12th Five-Year Plan (FYP)'s Achievements (Compare to 2010 level)	13th Five-Year Plan (FYP)'s Targets (Compare to 2015 level)
Energy Intensity (Energy Consumption per Unit of GDP)	-16%	-18.2%	-15%
Carbon Intensity (Carbon Emissions per Unit of GDP)	-17%	-20%	-18%
Non-Fossil Fuel Percentage	11.4%	12%	15%
SO_2	-8%	-18%	-15%
NO_x	-8%	-18.6%	-15%
Ammonia Nitrogen	-10%	-13%	-10%
Chemical Oxygen Demand (COD)	-10%	-12.9%	-10%
Forest Coverage	21.7%	21.63%	23.04%

Source: Seligsohn and Hsu, "How China's 13th Five-Year Plan Addresses Energy and the Environment," ChinaFile, March 10, 2016.

Figure 1. China's carbon intensity in context[xvii]

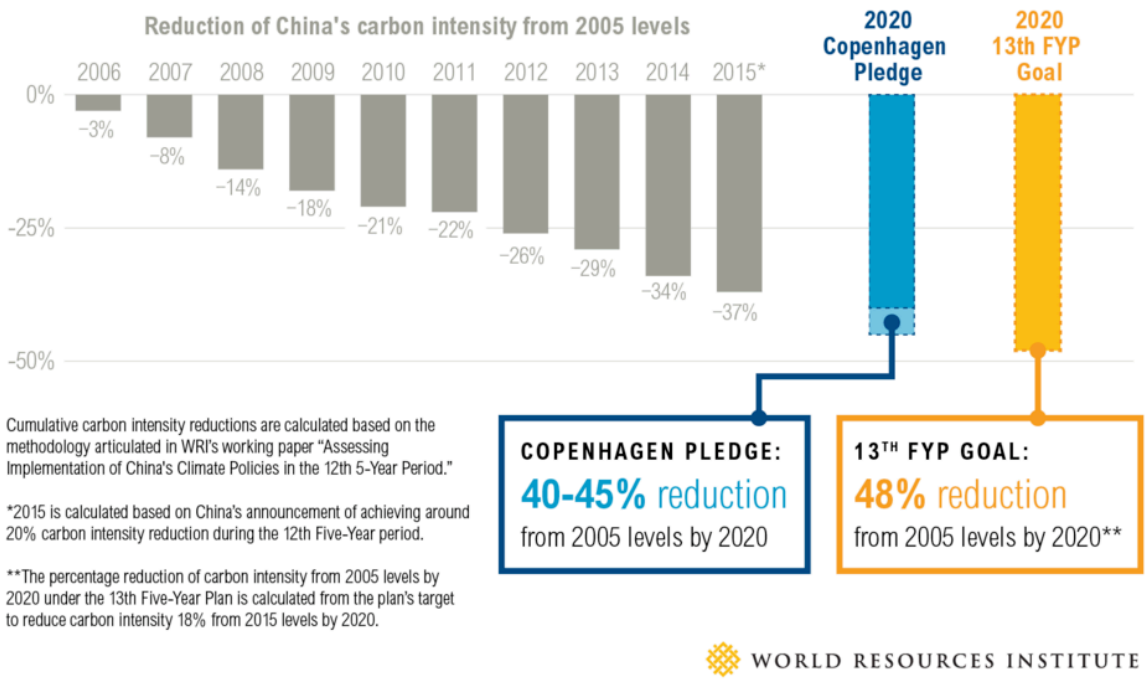
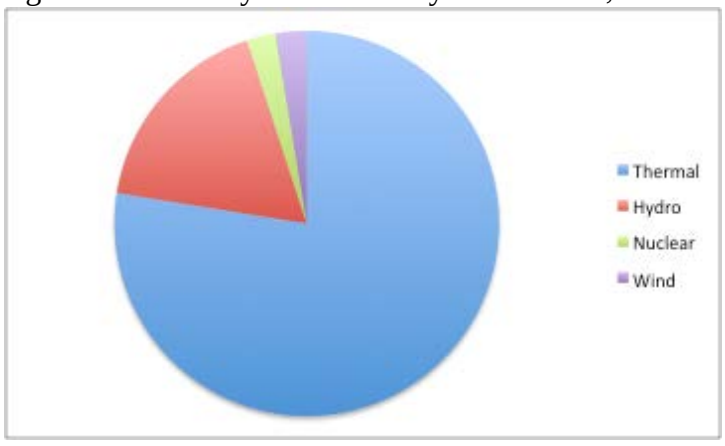


Figure 2. Electricity Production by Fuel Source, 2014



Source: All China Data Center

[i] Krotkov, N. A., et al. "Aura OMI observations of regional SO 2 and NO 2 pollution changes from 2005 to 2014." *Atmospheric Chemistry and Physics Discussions* 15.19 (2015): 26555-26607. http://www.atmos-chem-phys.net/16/4605/2016/acp-16-4605-2016.pdf

[ii] Greenpeace India, "Clean Air Action Plan: The Way Forward," February 2016. http://www.greenpeace.org/eastasia/Global/eastasia/publications/reports/climate-energy/2016/Clean%20Air%20Action%20Plan,%20The%20way%20forward.pdf

[iii] Ibid.

[iv] A full translation of the regulation is available at http://www.chinafaqs.org/library/chinas-new-regional-air-quality-regulation-translated.

[v] "The State Council Issues Action Plan on Prevention and Control of Air Quality Introducing Ten Measures to Improve Air Quality," Sept. 12, 2013. http://english.mep.gov.cn/News_service/infocus/201309/t20130924_260707.htm

[vi] http://www.nytimes.com/interactive/2016/03/05/world/asia/china-li-keqiang-work-report-full-text.html?_r=0

[vii] TCE is the metric the Chinese use to capture energy consumption from all sources, similar to the use of total oil equivalent used by the World Bank and most other institutions as a measure of primary energy use. Because China relies heavily on coal, it has always used coal equivalent, rather than oil equivalent for these metrics.

[viii] Jackson, Robert B., et al. "Reaching peak emissions." *Nature Climate Change* (2015).

[ix] Fergus Green and Thomas Spencer, "Models of China's future emissions have got it wrong," *China Dialogue*, August 12, 2015. https://www.chinadialogue.net/article/show/single/en/8422-Models-of-China-s-future-emissions-have-got-it-wrong-

[x] Hui He and Anup Bandivadekar, "Passenger car fuel-efficiency, 2020-2025; Comparing stringency and technology feasibility of the Chinese and US standards," The International Council on Clean Transportation, August 2013, document that the Chinese and US standards are similar, although because Chinese cars are smaller on average, meeting the standard is less challenging. http://www.theicct.org/pv-efficiency-standards-china-us-2020-2025

[xi] David Stanway and Ruby Lian, "Update 1-China to strictly control credit for new coal, steel projects," *Reuters*, April 21, 2016. http://www.reuters.com/article/china-overcapacity-idUSL3N17O2DY

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