

Environment as an Element of Development The Growing Role of Energy Efficiency and Environmental Protection in Chinese Economic Policy

Deborah Seligsohn
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China has suffered the environmental consequences of rapid development with poor environmental regulation for decades.ⁱ Environmental quality was poor, even before it began its period of rapid growth and industrial expansion with its reform and opening policy in 1979. By the time China began to grow rapidly (over the past three decades growth has averaged over 10% a year) attitudes stemming both from its communist central planning past and its developing country status lead to considerable disregard for environmental issues for a number of years.

But attitudes have changed dramatically in the past decade, and results are starting to be demonstrable on the ground. Energy efficiency and environmental protection have moved the periphery to recognition as central issues in Chinese government policy, highlighted in Five Year Plans and major policy speeches. Provinces are under pressure both from the central government and the general public to produce results, and in the past six years they have done so. The 11th Five Year Plan (2006-2010) was the first Five Year plan in which a pollution reduction target (sulfur dioxide) was met, and in fact it was exceeded. Moreover, China also came close to meeting its goal to reduce energy intensity (energy used per unit GDP generated) by 20%. This was particularly striking when contrasted with the first half of the decade (the 10th Five Year Plan period), when most indicators got considerably worse, including energy intensity, which in the 1980s and 1990s had been steadily improving.

When we look at the major indicators the Chinese government focused on, in particular energy intensity and sulfur dioxide emissions, 2006 appears as a clear inflexion point. Energy intensity had been gradually improving for decades, but actually rose in the early 2000s. With the inception of the 12th Five Year Plan energy intensity began to improve, and despite considerable challenges over the five year period, particularly the global economic crisis and China's massive stimulus spending, overall energy intensity was almost 20% lower at the end of 2010 than it had been at the beginning of 2006. Moreover, SO₂ emissions, where the goal was a 10% reduction, had actually fallen more than 14% during the same period.

Clearly a change occurred, but how did it happen? The challenges posed by both pollution and high-energy intensity were well known for decades. But a confluence of political, economic and institutional developments has changed both the priority for action and the government's capacity to act.

Energy security

Energy security has been one of China's major historic concerns, going back at least as far as the Sino-Soviet split in the late 1950s/early 1960s, when China was left without a stable supply of imported oil.ⁱⁱ While China has been self-sufficient in coal for centuries, it relied heavily on imported oil for the first decade of the new People's Republic. This changed when the Soviet advisors pulled out and China's import source disappeared. The fortuitous discovery of one of the world's largest oilfields at Daqing in Heilongjiang in the early 1960s, just after the Sino-Soviet split rescued China from an energy crisis. It also paved the way for decades of energy independence, and established itself as one of modern China's great narratives of self-reliance.ⁱⁱⁱ

Later oil finds were not nearly as large as Daqing. As the economy grew and Daqing's own reserves were being depleted, it became clear by the early 1990s that China was soon to become a net oil importer. In fact, China became a net importer in 1993, even though publicly delays and corrections in data meant that policymakers were not fully aware of the watershed for a year or two. Analysts had expected this change in trading position to be a major concern for the Chinese government, but in the event the change was barely remarked on and caused little change in Chinese government policy.

China became a net importer of oil during a period of global stable prices, and energy security slipped to the back burner. This began to change in the last decade, as energy prices became unstable, political instability in source countries became more apparent, and potential conflict with other consumer countries also became a greater concern. A confluence of events in 2005 brought this message home. The first was the run-up in both world oil prices and Chinese imports in 2004, the import data becoming apparent after the end of the year. Chinese imports rose particularly rapidly that year, and while they later slowed down, a significant amount of international media attention in 2005 focused on Chinese imports as a cause of higher oil prices. Moreover, there were two votes in the US House of Representatives in 2005 – one on the import of nuclear equipment and the other on a proposed purchase of a US oil company (UNOCAL by CNOOC) that made Chinese policymakers nervous. While neither vote was binding, both suggested there was some opposition to China's efforts to secure its energy supplies internationally.

At the same time, China became increasingly concerned about security of supply, even from domestic sources. In other words, heavy dependency on coal from a single region leaves China very vulnerable to natural disasters, such as the blizzards of 2008.^{iv} The net result of these energy security issues was to bring back energy efficiency programs that had lain dormant since the late 1990s. Controlling the rapid rise in China's energy demand was clearly a win-win – it reduced the need to turn to international markets, it reduced the pressure on China's own supply lines and it saved money. Similarly developing non-fossil energy sources reduces competition for foreign energy supplies and diversifies supply within China, reducing pressure on the coal transport system.^v

A Broader Notion of Development

The early 2000s were in many ways a watershed period for China's worldview and economic development. China joined the World Trade Organization in 2000. Negotiating entry and preparing the economy for this transformation had preoccupied much of Chinese economic and trade policy as well as international diplomacy throughout the 1990s. Now China could reap the benefits.^{vi} And these benefits turned out to be considerable. Growth averaged 10.5% in the decade 2001-2010 (World Bank), and while the full ten-year average had been the same in the 1990s, in fact, over the course of the 1990s growth had slowed, while in the 2000s, it accelerated for much of the decade. The net result of this cumulative rapid growth, extending back to when China initiated reform and opening in 1979, was that China was vastly richer than it had been just two decades earlier and by 2005, it was much wealthier than it had been even in the late 1990s. An economy growing at 10% a year doubles every seven years, thus China in 2005 when it looked at its next five year plan was more than twice as wealthy as when it had founded its first environmental enforcement agency, the State Environmental Protection Administration (SEPA) in 1998.

Institutional Capacity to Address Environmental Challenges

Hand-in-hand with greater wealth, China had gained considerably in institutional capacity. There is considerable debate in the literature as to whether China's growth post-2000 was due directly to increased trade generated by WTO accession or by the institutional developments that were required to meet WTO entry requirements. The Chinese central government along with the State-owned Enterprises (SOEs) were completely overhauled in the late 1990s. The general view is that Chinese reformers used the pressure of WTO accession to drive and reform agenda domestically, and their reason for doing so was to spur economic growth. Together the central government and the SOEs laid off tens of millions of workers in the late 1990s. While the majority of these employees came from the much larger SOEs, the result for both government and SOEs were much leaner and tighter administrations. In most (but not all cases)^{vii} the result was much more effective bureaucracies. While WTO accession has become a shorthand way to describe a number of very different processes – opening to trade, harmonization with international standards and practices, government reform, SOE reform, domestic regulatory reform – and there is considerable debate as to which contributed in what proportion to the growth rate, from the point of view of their influence on energy and environment policy, it is the sum total of these changes that matters.

Growth itself spurred a new concept of development, because both the government and the public felt richer and better able to address additional challenges. But the institutional change that came with WTO accession also aided this new conception, because there was greater confidence in the ability of the government to meet new challenges and adapt institutions.

This confidence was strengthened and its relevance to social issues made more explicit in the wake of the 2003 SARS crisis. It seems almost forgotten now that President Hu Jintao and Premier Wen Jiabao came into power in the middle of the global panic over SARS, and there were real fears that SARS could become a global pandemic and a long-term threat to Chinese public welfare and the Chinese economy. The epidemic was already raging in Southern China, Hong Kong, and much of Southeast Asia, the virus had yet to be identified, and on the day President Hu is sworn in, Canada reported its first eight cases. Just a month later, the city of Beijing virtually shuts its doors to focus on SARS eradication.^{viii} Remarkably, by July 5, 2003, the World Health Organization has removed all travel warnings from SARS-affected areas and the disease apparently has been removed from the human population. The effort to achieve this result was extraordinary, involving government and public mobilization, a rapid ramp up in public health capacity and extensive international cooperation.^{ix} This brief epidemic cost China 0.5% of GDP, but cost harder hit Hong Kong a full 4%,^x and, had the epidemic not been so rapidly contained, the risk in lost lives and livelihoods was even greater. The epidemic thus brought home to the Chinese leadership that social issues could rapidly and adversely affect development, and that China had the institutional capacity to address these issues. The public health infrastructure moved forward rapidly in the wake of SARS, taking on other challenges, including HIV/AIDS and avian influenza.

But neither the lessons nor the conclusions were restricted to public health. As they faced down SARS, Hu and Wen were also confronted by a public firestorm over the death of a college graduate named Sun Zhigang, who was detained and beaten in a migrant detention facility in Guangdong Province the day after Wen was sworn in. While the migrant detention facilities and their abuses had long been criticized by legal reformers and migrant advocates, middle class urbanites were galvanized by a story about a middle class professional in the way they had not been by the plight of ordinary workers. Strikingly, the State Council under Premier Wen Jiabao moved quickly to reform the entire system, not just try to address a smaller subset of cases. The story first surfaced April 25, and by June the Central government had eliminated mandatory detention for residency reasons.^{xi}

Through the 1990s the government consensus had been that not only was economic growth the primary goal, but it was really the only domestic social or economic policy goal.^{xii} The argument was that there simply were not enough resources for a broader focus. The new government in 2003 dramatically altered the range of possibilities, rapidly initiating new policies in areas ranging from health to public safety, and implementing them at the provincial and local level. This change reflected a growing sense of government capacity and institutional capability, greater wealth and thus economic resources to spend on new priorities, and the interests of the public. Both SARS and the Sun Zhigang case directly affected the middle class and spoke to their anxieties. Having reached a certain level of prosperity the urban public was much more aware of risks of losing it all – whether by entering a hospital and walking out with a poorly controlled disease or being picked up on the street in a case of mistaken identity. The middle class was expressing its desire for a higher, safer quality of life, and in the early 2000s the government showed much more awareness of these concerns and responsiveness to them.

A Clean Environment as a Development Goal

As the notion of development broadened to include both public health and quality of life, it would seem likely that environmental issues would become part of the package, but in 2003 and 2004 environmental issues and poor enforcement still seemed like back-burner issues. But by 2005 a number of factors increased governmental attention to the stressed state of China's environment. The first was as discussed above renewed interest in energy policy. The best approaches to energy security – energy efficiency and diversification of supply – both have obvious environmental co-benefits that advocates could highlight.

But the transforming event^{xiii} was the November 13, 2005, Songhua River spill – a major environmental incident that received sustained national coverage, first on the web and then in the media. While there were attempts at cover-ups, and ultimately coverage was limited, the public was exposed to a full two months' of coverage in the national media, particularly on television.^{xiv} This was the first such environmental disaster with national coverage, and its impact on the Chinese public was similar to the Exxon Valdez oil spill in the United States in the 1987 – a notable jump in environmental awareness and demands for greater action. The actual incident involved a fire at a petrochemical plant owned and operated by PetroChina, the world's sixth largest company,^{xv} and a major economic and political power in China. The fire caused a release of the several chemicals, including benzene and nitrobenzene, in the Songhua River near Jilin, upstream of the major city of Harbin, and contaminated river water then flowed into the Heilongjiang or Amur River, causing concern on both sides of the Sino-Russian border.^{xvi}

The government's immediate response included two forms of damage control. The first was obviously to address the pollutants in the river. The second was on the public relations front, and specifically to address the public's concern that someone be held responsible. The official fingered was China's top environmental enforcement official, then State Environmental Protection Administration (SEPA) Administrator Xie Zhenhua, who resigned. While much domestic and international media attention focused on the failure of Xie's agency to enforce environmental regulations at the PetroChina plant, it seems unlikely that anyone in the government leadership actually thought that Xie's subministerial body had the power to enforce regulations at one of the world's largest companies, whose leadership far outranked him in the Chinese Communist Party (CCP) hierarchy. More likely Xie took a fall for the team. Indeed he appears to have been rewarded for doing so: He came back to government the following year with full ministerial rank, responsible for climate change in the National Development and Reform Commission.^{xvii}

Ultimately the response to the spill helped SEPA build momentum for much greater change – setting and achieving clear goals in the Five Year Plan process and gaining greater enforcement authority. The two critical breakthroughs in environmental enforcement in the last decade have been the goal setting process in the 11th Five Year Plan (2006 – 2010) and the elevation of SEPA to ministerial level – the Ministry of Environmental Protection (MEP) – in 2007. Environmental goals had been part of previous Five Year Plans, but the targets set had never been met. SEPA took a new tack in the 11th Five Year Plan. Instead of setting a large number of goals and then failing to meet them, they chose just two goals – one air pollutant and one water pollution measurement – and focused all efforts on these. This was a novel approach – most developed countries use a combination of human health and ecosystem health factors to set standards, and the recommendations from the WHO, for example, are entirely based on human health. The 11th Five Year Plan targets are much more pragmatic. No one would suggest that reducing sulfur dioxide (SO₂) and chemical oxygen demand (COD) by 10% was sufficient, but achieving it was difficult in five years, and for the first time, the goals were actually met.^{xviii}

The next watershed event in China's growing environmental awareness and institutional confidence was the 2008 Beijing Olympics. In bidding for the Games in 2001 Beijing promised an ambitious program to clean the air, and despite international skepticism leading up to the Games, it largely delivered. After a very difficult first two days of the Olympics, with extreme heat, humidity and air pollution, the regional governments came up with a mix of control measures that ensured remarkably good air quality for the rest of the Olympiad period, which included both the Olympics and the Paralympics.^{xix} The cleaner air was a result of both long-term efforts – air quality slowly improved over the several years leading up to the Games – and a set of specific measures to guarantee well above average performance during the Games. The most well-known measure was the imposition of odd and even driving days, but of at least as great importance was the reduction in power plant operations by 30% and the imposition of restrictions not just on the city of Beijing, but on the other provinces within the Beijing airshed.^{xx}

Critics at the time doubted the impact of short-term measures given that they by definition would not continue beyond the Olympics themselves. However, the positive impact of those measures added to subsequent pressure to continue to address air pollution issues. The public and indeed government officials themselves, became aware of what an improvement in air quality meant to quality of life. The most immediate public pressure was to continue to restrict driving. The Beijing government initially planned to discontinue driving restrictions after the Games, but public outcry pushed them to modify the plan. The restriction was loosened from odd-even to a one-day-a-week restriction,^{xxi} and the government began actively seeking additional vehicle restriction measures. Since then Beijing has instituted substantially higher parking fees, kept public transportation prices low and most recently has begun to restrict vehicle license plates.^{xxii}

The advances made during the 11th Five Year Plan Period – reductions in SO₂ and COD as well as the overall improvement in air quality demonstrated during the Beijing Olympics – combined with the MEP's new bureaucratic heft as a full ministry to enable it to propose more ambitious goals in the 12th Five Year Plan. In addition to continuing to reduce both SO₂ and COD, the new plan added targets for an additional air pollutant, nitrogen oxides (NOx) and an additional water pollutant (ammonia nitrogen).^{xxiii} At the same time MEP was establishing a new regulatory mechanism for Regional Air Quality (RAQ) control.^{xxiv} Air pollution experts, including those within the SEPA and then MEP bureaucracy, knew full well that serious air pollution efforts would require a focus on entire regions and not just on major cities, but that level of political coordination is difficult in a country in which most mandates are delegated to the provinces. The

Beijing Olympics demonstrated the importance and effectiveness of regional control efforts, and enabled MEP to make the case to the State Council.

Regional air quality control is more complex than the types of emissions standards MEP has enforced to date. Environmental regulations involve a complex mix of regulatory standards tied to outcomes – total emissions loads allowed for various periods – hourly, daily or yearly – with specific standards for sources – technology and emissions requirements for automobiles, industrial users and electric power plants, for example.^{xxv} Given that both the meteorology and the number and type of sources vary by region, to achieve any specific environmental outcome in densely populated, heavily industrial or meteorologically challenging areas requires adjustments to the types of restrictions on sources.

In China in addition to regulatory limits and standards, there have also been the Five Year Plan goals, which are focused on making progress to achieve percentage reductions that rather than on specific environmentally determined outcomes. Given the size of the challenge, the Five Year Plans are a realistic way to move forward, but public frustration has grown as pollution continues to be a major health and quality of life issue.

RAQ management is a major step forward in tying environmental enforcement to environmental outcomes, but it is not easy to implement. MEP needs to add a number of pollutants to its control strategy to address some of the largest health risks, to monitor and measure these effectively and then to adjust controls to deal with variable conditions on the ground.

As MEP was in the midst of the spadework for implementing the RAQ regulations, public outcry again propelled their efforts forward. In the autumn of 2011 the Chinese blogosphere lit up with criticism of Beijing air quality, and shortly thereafter the domestic press joined the chorus. The trigger for the discussion was in part the poor equality in the autumn. It may also have been articles in the international press commenting on the poor air quality measured at a monitor set up at the US Embassy that is transmitted via twitter that were translated and shared on the Chinese Internet. The public outcry very much focused on Beijing. Thanks to a combination of the types of pollution sources in the area and Beijing's difficult meteorology, its air quality is markedly poorer than other wealthy areas such as Shanghai and Guangdong.

While Beijing city's initial response was quite defensive, but MEP in fact was well positioned to be responsive. Its annual meeting on RAQ management in November 2011 focused specifically on adding control of the additional pollutants that were needed to address the air quality problems. The focus at the time was on getting initial regulations in place within a year, and national level controls on PM 2.5 by 2016. Over the next several months, implementation sped up, and there are indications that nationwide PM 2.5 monitoring is moving forward.^{xxvi} Beijing also announced much more ambitious targets than the national plan, promising to reduce air pollution by 15% by 2015 and 30% by 2020.^{xxvii}

Public concern about water quality has also grown, although public attention has been more sporadic. Air pollution is a near constant concern for urban residents, whereas much water pollution isn't visible to the vocal urban public until a crisis occurs. The Songhua River was not the only such crisis in recent years. Two major algal blooms have attracted national attention – in Tai Lake north of Shanghai in 2007^{xxviii} and at the Olympic sailing course in Qingdao in 2008.^{xxix} Algal blooms are symptomatic of eutrophication, and there continue to be such blooms, including in both those locations with somewhat less national attention. As a result of the concern over eutrophication ammonia nitrogen was added as a target in the 12th Five Year Plan. This is a critical step forward, but the challenges overall are even greater than in addressing air pollution.

Climate change as a driver

Concern about energy security, economic health and a better quality of life by reducing local air pollution have clearly driven much of China's actions, but climate change itself is clearly part of China's concerns. The complexity is that the climate change discussion began not so much as a discussion of the impacts of climate change on China's economy and development, but a discussion of the costs of mitigation on China's future development.^{xxx} Thus, if we look back to the 1990s, the climate negotiations were seen mainly in terms of how to reduce the cost of engaging with the process. To not engage seemed risky, given that China's major trading partners were all engaged, but the process itself seemed to offer few benefits, especially given the time horizon of needs in a poor developed country. With immediate poverty to address, as well as ambition to strengthen itself as a nation, the Chinese government appeared less concerned about problems that at that time were predicted to be decades or even centuries in the future.

With climate change itself appearing much more remote than it does now, technology transfer became an important issue. If solving the problem wasn't a sufficient carrot, perhaps offering a development benefit that should also help solve the problem might be useful. The challenge is that technology transfer has since been a major sticking point with China, as well as other developing countries arguing that they have not seen major transfers of technology. This is in part definitional issue, since developing countries would like to see governments transfer technology, which has not happened under the United Nations Framework Convention on Climate Change (UNFCCC) or the Kyoto Protocol. At the same time, the Clean Development Mechanism (CDM), a program specifically designed to spur new technologies, has been well received and widely used in China. While not all projects have had cutting edge technology, CDM financing has been critical to such new industries as windpower, and important in spurring businesses that may not be cutting-edge, but were new to China, such as waste to energy.^{xxxii} In creating both new energy industries and a whole commercial network to support the CDM market, the CDM created new groups of domestic stakeholders for a climate regime.

The publication of the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment^{xxxiii} in February 2007 marked another turning point in China's climate change awareness. While climate skepticism of the sort found in the United States has had a much smaller influence in China, prior to the Fourth Assessment there were doubts in the policy community that climate change would be all bad for China. If one goes back to the Third Assessment^{xxxiii} in 2001, there was very little in the way of quality modeling to make predictions at mid-latitudes. Some research had even suggested that CO₂ might "fertilize" crops, increasing agricultural output. The research that fed into the Fourth Assessment suggested that any such effect would be outweighed considerably by changes in weather systems. Overall China could expect more droughts in the North and floods in the South, both diminishing agricultural yields, as well as leading to other hardships and losses.

Not only did the Fourth Assessment speak more directly to how China would fare, but for the first time significant numbers of Chinese researchers were involved in the effort. At least 10% of the co-authors were Chinese, and these included the Qin Dahe, who headed the Chinese Meteorological Administration and was co-Chair of the Science Working Group within the IPCC. Even before the published report these researchers were presenting their findings to Chinese policymakers. As a result there was a substantial shift in perspective within China on the extent of the risk of climate change itself, rather than the cost of mitigation. This focus has actually been heightened by the growing discussion of climate security as an issue internationally. In particular, the United States Defense Department's October 2003 report, "An Abrupt Climate

Change Scenario and Its Implications for United States National Security,”^{xxxiv} was highly influential in bringing home to the Chinese foreign policy establishment the security implications of climate change.^{xxxv}

The complexity for international observers, and especially for negotiating partners, is that the recognition of a national interest in climate mitigation is not one and the same as a commitment to any particular level of domestic mitigation. In fact, it raises the level of frustration within China at the failure of developed countries to act more rapidly after the signing of the 1992 Framework Convention,^{xxxvi} whose text specifically tasks developed countries with “taking the lead” at a time when Chinese emissions were a tiny fraction of what they are today.

Because of the global nature of both climate change mitigation and its impacts there is still a sense of a prisoners’ dilemma in who should move first. In fact, the Chinese have moved farther toward seeing mitigation as in their own interest than has the United States.^{xxxvii} The Chinese also see the range of technologies they have been able to develop and deploy, in particular wind, solar and nuclear power as giving them a comparative advantage in the future. Chinese policymakers recognize the positive energy security, economic and local environmental benefits of most climate mitigation actions – at least up to a point. The question really becomes how to justify actions that are more expensive than those other benefits might call for.

Adding it up: A New View of Development

China remains a developing country with a per capita GDP still less than \$5000.^{xxxviii} Thus, development remains the critical domestic policy goal. However, the definition of what development means has changed fundamentally in the past decade. A decade ago, the only real measure was GDP. Today, public health, attractive cities, technological development, long-term sustainability have all become critically important. While China’s per capita GDP is modest in global terms, it is dramatically higher than a decade or two ago. The result has been a rapid growth both in public expectations and in policymakers and leaders’ confidence in their ability to meet those expectations. Institutions are more sophisticated and there is a great deal more confidence in these institutions.

At the same time, environmental issues have become recognized as important for both energy and national security. Thus, in addition to the solid developmental reasons for supporting better environmental performance, China’s leaders now recognize the importance of both energy and climate security in existential terms.

Neither of these conclusions suggest that China is willing to go it alone on climate mitigation, in particular. Negotiations involve a complex consideration of what other countries can offer, and the Chinese are increasingly concerned about how much is offered from the non-EU developed world. It does suggest that China has its own national interest in these issues, and that it will continue to implement energy and environmental policies that align with what it defines as a national interest in sustainability.

ⁱ See the World Bank, *Clear Water, Blue Skies: China’s Environment in the Next Century*, 1997, for an early comprehensive evaluation of China’s environmental challenges. Also see SEPA’s and now MEP’s annual “The State of the Environment” reports for an annual appraisal of China’s challenges for the last 13 years.

ⁱⁱ [“China’s Energy Diplomacy and Its Geopolitical Implications,” Kent E. Calder, 2005 by the Edwin O. Reischauer Center for East Asian Studies, 2005](#)
http://www.reischauer.jp/pdf/China_Energy_Diplomacy.pdf

ⁱⁱⁱ Andrews-Speed and Dannreuther, [China Oil and Global Politics](#), Routledge, 2011.

^{iv} [“Severe snowstorms batter China,” Howard W. French, the New York Times, January 28, 2008](#) <http://www.nytimes.com/2008/01/28/world/asia/28iht-china.1.9543336.html>

^v Barry Naughton, “The New Common Economic Program: China’s Eleventh Five Year Plan and What It Means,” *China Leadership Monitor*, No. 16, 2005.

http://media.hoover.org/sites/default/files/documents/clm16_bn.pdf

^{vi} David Dollar, Aart Kraay, “Institutions, trade, and growth,” *Journal of Monetary Economics*, 50 (2003) 133–162

^{vii} There were some clear exemptions, such as the elimination of the energy efficiency bureaucracy, and over the course of the last decade some bureaucracies have been rebuilt.

^{viii} [A full chronology of the SARS epidemic is available at](#)
http://www.who.int/csr/don/2003_07_04/en/, [Hu and Wen’s dates for assuming office are at](#)
http://www.indexmundi.com/china/government_profile.html. [The full National People’s Congress was March 5-18, 2003.](#)

^{ix} Chan L-H, Chen L, Xu J (2010) China's Engagement with Global Health Diplomacy: Was SARS a Watershed? *PLoS Med* 7(4): e1000266. doi:10.1371/journal.pmed.1000266

^x Henk Bekedam, Speech at the International Forum on SARS Prevention and Control, December 15-16, 2003. http://www.wpro.who.int/china/media_centre/speeches/speech_20031215.htm

^{xi} Susan L. Shirk, [Changing Media, Changing China](#)

^{xii} Obviously there were political and foreign policy goals, as well, but development policy was focused on very direct economic issues. For a discussion of priorities under Jiang Zemin and Zhu Rongji see Lowell Dittmer, “Leadership Change and Chinese Political Development,” *The China Quarterly*, No. 176 (Dec., 2003), pp. 903-925 [https://webpace.utexas.edu/hl4958/contemporary-chinese-history/Dittmer%20-](https://webpace.utexas.edu/hl4958/contemporary-chinese-history/Dittmer%20-%20Leadership%20Change%20and%20Chinese%20Political%20Development.pdf)

[%20Leadership%20Change%20and%20Chinese%20Political%20Development.pdf](https://webpace.utexas.edu/hl4958/contemporary-chinese-history/Dittmer%20-%20Leadership%20Change%20and%20Chinese%20Political%20Development.pdf)

^{xiii} Tianfu Liu, “Pollution of the Songhua River: A Catalyst for Environmental Reform,” *China Law and Practice*, March 2006.

<http://www.chinalawandpractice.com/Article/1692202/Channel/9932/Pollution-of-the-Songhua-River-A-Catalyst-for-Environmental-Reform.html>

^{xiv} Bryan Tilt and Qing Xiao, “Media coverage of environmental pollution in the People’s Republic of China: responsibility, cover-up and state control,” *Media, Culture and Society* 32 (2), March 2010.

http://oregonstate.edu/cla/anthropology/sites/default/files/pdf/faculty/tilt/tilt_xiao_mcs_final.pdf

^{xv} Fortune’s Global 500. PetroChina is ranked below Shell, Exxon, BP and Sinopec (China’s other large integrated oil company).

^{xvi} United Nations Environment Programme, “The Songhua River Spill China, December 2005, Field Mission Report.”

http://www.unep.org/PDF/China_Songhua_River_Spill_draft_7_301205.pdf

^{xvii} Xie himself has been internationally recognized as an environmentalist, receiving the United Nation’s Sasakawa Environment Prize in 2003.

^{xviii} 12th Economic and Social Development Plan of the People’s Republic of China, March 2011. See Litao Wang et al, “Assessment of air quality benefits from national air pollution control policies in China,” *Atmospheric Environment*, 2010, for a discussion of implementation in the 10th and 11th Five Year Plans and modeled results.

^{xix} Wang, Yuxuan, Jiming Hao, Michael B. McElroy, J. William Munger, Hong Ma, Dan Chen, and Chris P. Nielsen, “Ozone air quality during the 2008 Beijing Olympics: Effectiveness of emission restrictions,” *Atmospheric Chemistry and Physics*, 2009. 9: 5237-

5251. <http://nrs.harvard.edu/urn-3:HUL.InstRepos:5029361> shows reductions in ozone levels. J. C. Witte et al, "Satellite observations of changes in air quality during the 2008 Beijing Olympics and Paralympics," *Geophysical Research Letters*, Vol. 36, L17803, doi:10.1029/2009GL039236, 2009 http://so2.gsfc.nasa.gov/pdfs/Witte_2009GL039236.pdf shows significant decreases in nitrogen oxides and carbon monoxide. Wentao Wang et al, "Atmospheric Particulate Matter Pollution during the 2008 Beijing Olympics," *Environ Sci Technol*. 2009 July 15; 43(14): 5314–5320 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2739612/> documents reductions in particulates during the Games, and a continued reduction afterwards.

^{xx} Y Wang 2009.

^{xxi} Dingding Xin, "Beijing Car Restrictions to Continue," *China Daily*, April 6, 2009 http://www.chinadaily.com.cn/bizchina/2009-04/06/content_7651378.htm explains the post-Olympics policy, which continues in place.

^{xxii} Tony Pugliese, "CHINA: Beijing drastically limits new vehicle registrations in 2011," Jan. 4, 2011, http://www.just-auto.com/news/beijing-drastically-limits-new-vehicle-registrations-in-2011_id108230.aspx

^{xxiii} Deborah Seligsohn and Angel Hsu, "How does the 12th Five Year Plan Address Energy and the Environment?" March 7, 2011, <http://www.chinafaqs.org/blog-posts/how-does-chinas-12th-five-year-plan-address-energy-and-environment>

^{xxiv} "Notice of the General Office of the State Council about Forwarding Guiding Opinions on Pushing Forward the Joint Prevention and Control of Atmospheric Pollution to Improve the Regional Air Quality Developed by the Ministry of Environment Protection and Relevant Departments," No. 33 [2010] of the General Office of the State Council, original at http://zfs.mep.gov.cn/fg/gwyw/201005/t20100514_189497.htm translation at http://www.chinafaqs.org/files/chinainfo/ChinaFAQs_Joint_Prevention_and_Control_of_Atmospheric_Pollution_by_State_Council_translated.pdf

^{xxv} They can also include cap and trade programs, such as the sulfur trading program in the United States, but it is important to remember that the sulfur trading program for acid rain is built on top of local emissions controls to deal with local human and environmental health standards. In China to date, there have been only limited attempts at trading.

^{xxvi} The *China Daily* headline of February 21, 2012 read "PM 2.5 to be Monitored Nationwide," http://www.chinadaily.com.cn/usa/china/2012-02/21/content_14660835.htm however the article gave no date. Importantly it discussed how China CDC plans to link the data to health data, a major gap in how data is used in China.

^{xxvii} <http://www.reuters.com/article/2012/02/09/us-china-beijing-pollution-idUSTRE8180C520120209> Reuters February 9, 2012

<http://www.reuters.com/article/2012/02/09/us-china-beijing-pollution-idUSTRE8180C520120209>

^{xxviii} Jeremy Goldkorn, "[Taihu lake pollution: Net frenzy and government response](http://www.danwei.org/bbs/taihu_lake_pollution_the_inter.php)," June 1, 2007, http://www.danwei.org/bbs/taihu_lake_pollution_the_inter.php

^{xxix} Jim Yardley, "To Save Olympic Sailing Races, China Fights Algae," *The New York Times*, July 1, 2008 <http://www.nytimes.com/2008/07/01/world/asia/01algae.html>

^{xxx} Interviews with key government advisors, including Professors He Jiankun and Zou Ji, 2008. The priority on development costs is also highlighted by Joanna Lewis, "China's Strategic Priorities in International Climate Change Negotiations," *The Washington Quarterly*, Winter 1007-08 http://www.twq.com/08winter/docs/08winter_lewis.pdf

^{xxxi} Joanna Lewis, "The Evolving Role of Carbon Finance in Promoting Renewable Energy Development in China," *Energy Policy*, 2010, describes the importance of CDM in promoting renewable energy in China, but also documents that the largest number of projects are in hydropower. While these projects may be additional, the technology certainly is not new to China.

http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

^{xxxiii} http://www.grida.no/publications/other/ipcc_tar/

^{xxxiv} By Peter Schwartz and Doug Randall http://www.climate.org/PDF/clim_change_scenario.pdf

^{xxxv} I am grateful to Prof. Zhang Haibin of Peking University for this chronology. He discussed the DOD report in an August 2011 talk at the United Nations office in Beijing.

^{xxxvi} <http://unfccc.int/resource/docs/convkp/conveng.pdf>

^{xxxvii} US opinion is of course quite varied and the Obama administration advocates a much stronger climate mitigation policy than the US currently has. However, as a nation the United States does not have a national climate law.

^{xxxviii} World Bank 2010 data China's per capita GDP in current US dollars is \$4428.