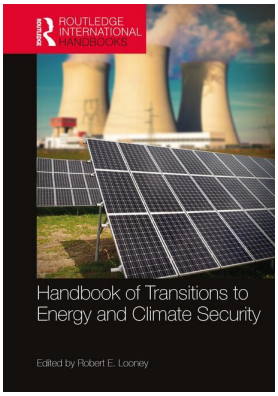

Handbook of Transitions to Energy and Climate Security

Robert E. Looney

The politics behind the three Es in China

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9781315723617-13
Xu Yi-Chong
Published online on: 29 Nov 2016

13

The politics behind the three Es in China

Economic growth, energy security and environmental protection

Xu Yi-Chong

Energy is a bundle of issues not only because it consists of a variety of sources each of which has its distinct issues, but also because there is an inseparable relationship between energy and development, energy and environment, energy and social and economic justice and energy and security – these are the entangled three E issues: economic growth, energy security and environmental protection. Energy has fuelled industrialization, modernization and urbanization. It is a necessary ingredient for modern society – no country has developed without adopting modern (commercial) energy and the more developed a country is, the higher its energy consumption. Not all countries are rich in natural energy endowment and access to it is a concern. Energy thus is a national as well as global issue: wars have been waged on its behalf; people are deprived of development opportunities due to lack of it; companies are enriched from discovering, producing and trading it; and the environment is threatened by burning it. Energy is a political issue as choices have to be made and making choices pits one group of interests against another.[1] Energy companies seek to benefit from high energy prices which affect end-users adversely. We like to maintain and improve the comfort of our living (driving SUVs and keeping electric appliances on stand-by) but do not want to see power plants, hydro dams, transmission grids, or uranium disposal sites in our backyard. While development of renewable energy is urgent and needs more resources, traditional fossil fuels refuse to retreat from their dominant positions. Energy exporting countries want to have the market power over production and marketing while energy importing countries hope to ensure adequate supplies at an affordable price. Developing countries need better access to modern energy in order to reduce poverty and want few restrictions on their development opportunities while few who take modern energy for granted are willing to sacrifice their economic well-being or standard of living by limiting or reducing their energy consumption. These contradictory demands exist in all countries. Yet, how they are balanced varies significantly across countries, depending to a large extent on the availability of natural resources, the stage and speed of economic and social development, popular demands, and the capacity of government to manage competing demands.

This chapter discusses the changes in energy policies in China in the past three decades, especially since 2002, and explains why specific policies were adopted, how climate change has shaped recent policies and how different interests are balanced. The challenges facing China regarding energy security and climate change can be categorized into three: structural, technical, and political. While to address energy-related security and climate change issues requires a fundamental change in our approach to producing and consuming energy and therefore structural change in economy and the way of life of its citizens, it is also at the core of the difficulties in dealing with the intertwined challenges of energy security, economic and social development and climate change. There is no one 'right' or 'wrong' way to meet these multifaceted challenges. This chapter focuses on three issues: (a) structural challenges regarding energy security and environmental pollution; (b) policies and measures undertaken by the government to deal with these challenges; and (c) the politics involved in developing and implementing the policies. It argues that (a) to address these challenges requires not only short-term and immediate adjustment in its economic development but, more important long-term structural changes in its economy which are much more difficult to accomplish; (b) policies that offer new opportunities can be implemented more easily than those requiring structural changes; and (c) contrary to the common assumption, the Chinese government has limited capacity to push through the necessary measures for a sustainable development.

First we need to clarify what we are talking about in terms of energy. The global discussion of 'energy security' is dominated by the concerns of access to energy resources, especially oil, in part 'because oil is a global commodity that can be shipped at a cost that is low relative to its value [and] the price of oil is essentially determined by the world market regardless of where it is produced.'[2] Yet, for most countries and most of the time, energy security is about providing citizens with safe, reliable and cost-efficient modern energy (electricity and heat predominantly). For China, access to secure supply of oil became an issue only in the 21st century. Its change from an oil exporter to an importer in the early 1990s did not draw much attention from policy makers in Beijing or the international community until the early 2000s when rapid urbanization took place.[3] Since then demand for oil has climbed up steadily while the country's oil reserves did not change (1.1% of the world total). In contrast, the main domestic energy issue has been how to meet rising electricity demand. There is a close correlation between electricity consumption and economic and social development: New York state with a population of 19.5 million in 2010, for example, consumed nearly the same amount of electricity as the whole Sub-Sahara (except South Africa) with a population of 791 million.[4] Electricity consumption per capita in China in 1981 (258 kwh) was lower than that of Ghana in 1968 (300 kwh). The Chinese story about energy development and its associated climate change issues in the past three decades has been about how to produce and consume electricity.

Electricity can be generated from a variety of sources, such as water, sun, coal, oil, natural gas, wind, and geothermal. As electricity cannot be economically stored and must be supplied in real time to meet fluctuating demand, different sources of generation require different management of the whole system. Renewable sources of electricity generation (solar and wind) are as available as intermittent and non-dispatchable. The more diverse sources a country has, the easier it is for the country to increase the share of renewables. China has four main sources of natural energy – coal, water (hydro), wind and sun. The discussion of the energy and energy-related climate change issues has to keep this in mind.

Structural challenges

Before 1980, energy development in China was severely restricted by central allocation of resources and the consequences were that all energy sectors were among the world's least

efficient ones and most electricity was consumed by industries. In the first two decades of the reform (1980–2000), as GDP quadrupled, energy consumption only doubled, thanks to a rapid decline of energy intensity. If energy intensity had remained the same as it was in 1977, China would have consumed double the amount of energy in 1980–1996 as it actually did and its CO_2 emissions would have surpassed the US in 1990.[5] In the late 1990s, suddenly the perennial power shortages that had dogged the Chinese economy disappeared after 1997 as a result of a combination of slowdown in heavy industry in response to slowing economic growth and state-owned enterprises (SOEs) reforms that led to shut-down of many inefficient small and medium-sized SOEs. The government banned investment in power generation for three years while resources were channelled to upgrading transmission and distribution infrastructure in urban and rural areas at the end of the 1990s. So far, the story about energy and energy security, energy and development and energy and environment was not too bad in China, with rapid movement toward a market-based system (dual pricing systems, enterprise reform, etc.). Unintended consequences of market reforms were the disappearance of some incentives for improving efficiency, such as elimination of energy quotas, elimination of tax breaks for efficiency with the new tax code (1994), and elimination of energy loan subsidies.

These unintended consequences had a long-term impact once economic growth picked up its speed in the early 2000s in combination with the structural change in society. First, the urbanization process placed tremendous pressure on energy and environment in part because energy consumption per capita in urban versus rural areas is about 4:1. For example, electric appliances started entering urban households only after the mid-1980s: by the mid-1990s, about 80% of the households in urban areas had washing machines and colour TV sets and by the end of the 1990s, 80% of the urban households also had refrigerators. Room air conditioners and computers started entering urban households in the 21st century, and at a much faster speed. Electrical appliance ownership in rural areas lagged urban households by 10–20 years. Second, from the mid-1990s onwards, about 15 million people every year moved to urban areas and by the early 2000s, the speed of urbanization escalated (Table 13.1). Population in Beijing, for instance, was 8.7 million in 1978; it doubled by 2005 to 15.4 million and reached over 23 million in 2015. Other major cities followed a similar pattern of population expansion: '85% of China's direct carbon emissions are from cities.'[6] Yet, as Professor Kenneth Lieberthal pointed out, when a 'cumulative population of over 400 million "middle class" people that are scattered around in a sea of over 800 million people who live very much in developing-country conditions,'[7] it is impossible and simply wrong to tell the 800 million people not to move or not have the living standard the other 400 million have. Pressure on energy and all its associated issues was structural and tremendous.

Third, several power shortages returned to China in 2002 when economic growth picked up its speed with China's entry into the WTO. Energy-intensive industries particularly expanded fast. There were three implications for energy and energy related issues: (i) energy consumption by industries as a share of total energy consumption in China was and still is much higher than most countries in the world. Among OECD countries, for instance, the share of electricity consumed by industries fell from 47.2% in 1972 to 30.8% in 2013. In China, industries

Table 13.1 Percentage of population residing in urban areas in China, selected years

	1980	*1995*	*2000*	*2005*	*2013*
Urban population (%)	19	31	36	43	53

Source: World Bank Data, and United Nations, *World Urbanisation Prospects 2014 Revision* (New York: United Nations, 2014), 21.

continued to consume a lion's share of the total electricity (74% in 2014). (ii) China was the world's large producer of most energy-intensive highly-polluting industries – in 2014, it produced 49.4% of the world's steel, 56.6% of cement, 50% of flat glass, and 38.5% of paper/pulp. Even though more than two-thirds of each of these products was consumed domestically, they still made China a virtual energy exporter. Consequently, about 25% of China's carbon emissions are caused by manufacturing products that are consumed abroad.[8] (iii) These Chinese industries fell behind other countries in energy efficiency. According to IEA, energy use per unit of output across eight sectors was about 48% higher than the best practice in the world.[9]

China's oil demand doubled from 1.7 to 3.4 million bpd between 1985 and 1995. It doubled again, reaching 6.8 million bpd by 2005, with the result that in 2005 China imported 2.46 million bpd – or about 40% of its oil needs. In 2005, 94% of overall energy supply came from domestic sources, but it was predicted China's dependence on energy imports would reach 20%. This prediction alarmed Chinese political leaders as it was believed that growing dependence on imports meant increased insecurity and it would also impose greater burdens on the economy. It also alarmed the world and global energy prices responded.

Given that these three factors were behind rapid growth of energy demand – urbanization, industry-centred and export-oriented economy, and low energy efficiency, the problems of rising energy demands and their associated environmental problems were 'not the usual complaints: an overabundance of cheap coal or a reckless disregard for the environment.'[10] Rather they reflect the fundamental structure of the economy. Adding to these structural issues is the low natural energy endowment. In 2014, China had about 1.1% of the world's oil reserves, 1.8% of world natural gas, and 12.8% of world coal reserves.[11] Heavy reliance on coal for electricity generation was primarily because coal was widely distributed in China, easy to mine and coal was cheap. The consequences of burning coal for electricity were apparent: (a) rapid depletion of coal reserves that raised concerns of energy security, and (b) significant impact on the natural environment – water, soil and air. See Table 13.2 for China's CO_2 emissions.

Managing the twin challenges

Energy shortages and their associated environmental problems have been discussed in policy making ever since the reform started in the late 1970s. In the first two decades, the focus was on increasing modern energy production and consumption – primarily electricity – because direct coal burning at the time not only had very low energy efficiency rates but also produced a large quantity of ashes and particulates. For example, in the early 1980s, the concentration of particulates of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) in the air in the centre of Beijing exceeded the national standard by two to four times, and in Beijing the average dust (total suspended particulate) levels were about seven times greater than the US air quality standard.[13] In rural areas, biomass fuel use caused serious hillside soil erosion, excessive water runoff, deforestation, and declines in soil fertility.[14] To prevent further increases in already unacceptably high levels of urban air pollution, as well as to economize on fuel, China invested heavily to replace decentralized and uncontrolled burning of coal in households and enterprises with centralized, large-scale, environmentally controlled combustion in order to produce cleaner forms of energy (gas, electricity, steam, hot water) for distribution to final users.[15] Its total primary energy supplies more than doubled between 1979 and 2000 (236%) and then almost doubled again between 2000 and 2007 (193%). Electricity consumption grew four and half times between 1979 and 2000 (532%) and then one and half times between 2000 and 2007 (245%).

Table 13.2 CO_2 emissions per capita in China, world and OECD countries (t CO_2/capita)[12]

	2002	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
China	2.55	2.89	3.65	3.88	4.27	4.57	4.91	5.13	5.43	5.92	6.08
World average	3.89	3.99	4.18	4.22	4.28	4.38	4.39	4.29	4.44	4.50	4.51
As % of world average	65	72	87	92	100	104	112	120	122	131	135
OECD average	10.96	11.08	11.09	11.02	10.93	10.97	10.61	9.83	10.10	9.95	9.68
As % of OECD average	23	26	33	35	39	42	46	52	54	59	63

Source: International Energy Agency, *Key World Energy Statistics, 2015* (Paris: Organization for Economic Co-operation and Development, 2015).

Table 13.3 Wind power generation capacity in China (MW) and increase from the previous year, 2002–2014

	2001	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
MW	404	470	568	765	1,272	2,559	5,871	12,024	25,828	44,733	62,364	75,324
%		16.0	20.9	34.7	66.3	101.0	129.0	105.0	115.0	73.2	39.4	20.8

Source: Global Wind Energy Council (GWEC), *Global Wind Report 2010*, April 2014, 39.

Before 2000, few talked about greenhouse gas (GHG) emissions in China. Even the World Bank took the view that economic and social development, and poverty alleviation, could not have been accomplished without people having access to modern energy. It had assisted China greatly in its expansion of electricity generation capacity by providing financial assistance, making connections with multinational companies to invest in China, and pushing and advising electricity reforms. During this period (1980–2000), energy intensity (energy consumption per unit of GDP) improved significantly 'by default' – that is, China had started the reform from a very low base in terms of living standards and economic performance. Technology change was the most important contributor to the reduction in energy intensity – in two decades, its economy quadrupled while its energy consumption doubled. By 2000, energy intensity had declined by 65% compared to 1980.

In 2002–2012, the gross national income in China nearly tripled in constant dollar terms and more than quintupled in current dollar terms, while the total energy consumption a little more than doubled. In the first five years of this period, several power shortages led to a rapid build-up of power generation capacities and many small-sized power plants went into operation. They were the main contributors to worsening the environment. In 2007, the State Council, the Chinese equivalent of a cabinet, adopted 'China's Energy Conditions and Policies', which acknowledged the worsening conditions of the environment, yet drew the conclusion that development was the only way for its survival; development could not take place without energy; China did not have adequate energy endowment; priority must be given to conservation, efficiency, technological break-through and international cooperation. 'It strives to build a stable, economical, clean and safe energy supply system, so as to support the sustained economic and social development with sustained energy development.'[16] In other words, measures to deal with climate change threats would be part and parcel of the broad efforts to secure energy supplies.

Three economy-wide policies were adopted as the government's 'green initiatives':

1 A *clean energy standard* mandating that 15% of China's primary energy come from non-fossil sources by 2020. China currently gets around 9% of its energy from these sources.
2 An *efficiency target* mandating a reduction in energy intensity of 20% below 2005 levels by the end of 2010. China had reduced energy intensity by around 13% by July 2009.
3 A *carbon target* mandating a reduction in carbon intensity of 40–50% below 2005 levels by 2020.

These economy-wide policies were reinforced by an array of sector- and technology-specific policies, targets and incentives. Most policies and measures designed to achieve the target of 15% of non-fossil energy sources were implemented more successfully than those to achieve energy efficiency and carbon reduction. Those concerning the first set of policies included specific measures to encourage development of non-fossil energy sources – wind, solar and nuclear. The Renewable Energy Law adopted in 2005 and a target set by the State Council for the five major power generation companies to have at least 3% of their generation capacity from renewable resources by 2020 provided further incentives for renewable development in China.[17] The central government also issued other taxation and fiscal policies to facilitate renewable and low-carbon energy development.[18] Value-added tax reductions and rebates for wind generators and imported materials used in wind turbine manufacturing were the major incentives for many firms to invest in wind generation capacity. Indeed, rapid expansion of wind and solar PV generation capacity in China brought down the cost of renewable energy worldwide (Table 13.3).[19]

By 2010, China had also become the world leader in installed solar hot water systems and indeed about 70% of the world's solar heating systems were in China. About 10% of Chinese households used solar water heaters. China also expanded its nuclear energy programme. It started its nuclear energy programme quite late and its first nuclear power plant went into operation only in 1991. In 2007, the Chinese government revised its initial target of 40GW installed nuclear capacity by 2020 to 60–70GW. By 2015, there were 31 nuclear reactors in operation and another 21 under construction, producing about 2.4% of the country's electricity. All in all, despite these rapid developments in renewable sources of electricity generation, they made little difference to the heavy dependence on coal.

Another two important measures to deal with the challenges of energy security and climate change were construction of large power generation plants that are much cleaner and more efficient and of advanced ultra-high voltage transmission grids. In the past decade China moved away from the construction of subcritical power plants, which accounted for around 95% of the additional power plants in the early 2000s, towards more efficient ultra-supercritical power plants; half of the additions in 2014 were supercritical and 85% of the new ultra-supercritical plants in the world were built in China (Table 13.4).[20]

The second measure was to construct ultra-high-voltage AC (1000kv) and ultra-high-voltage DC (±800kv) systems to connect power generation in remote areas to load centres with relatively low line losses and more efficiency. These infrastructures particularly helped integrate remotely located large-scale wind and solar generation bases to load centres with high-population density and high demand for electricity. Both measures of larger and more technologically advanced power plants and high voltage transmission grids involved serious investment but they were encouraged by international organizations to improve energy efficiency.

In addition, since the early 2000s, subsidies to energy had been dramatically reduced and energy prices in China increasingly reflected actual costs.[21] 'Three tax-related measures – corporate income tax, deductions, vehicles and fuel taxes, and export taxes – have been used to promote energy efficiency in China in recent years.'[22] Other taxation and fiscal policies were also adopted to encourage investment in low-carbon energy resources and to reduce energy consumption of those energy-intensive sectors. Together these constitute what the Chinese have called a 'recycling' industrialized economy. 'The aim of these measures is to increase energy efficiency and the share of renewable energies in order to cut energy costs, increase energy security … [and] overcome the negative effects of energy scarcity on economic growth.'[23]

Table 13.4 Coal capacity by technology, 2014

	OECD		*China*		*India*		*Rest of world*	
	GW	*%*	*GW*	*%*	*GW*	*%*	*GW*	*%*
Total	647		864		174		238	
Subcritical	415	64	529	61	149	86	158	67
Super-critical	147	23	205	24	25	14	28	12
Advanced	85	13	130	15			51	21

Source: International Energy Agency, *World Energy Outlook 2015* (Paris: Organization for Economic Co-operation and Development, 2015), 331.

Politics in balancing energy and environment

'To its credit', stated the World Bank, 'China's government fully recognises that [its development] trends cannot continue indefinitely and therefore is committed to building a resource-saving and environmentally friendly society as a stated national policy'.[24] The government in Beijing expressed its desire to move away from being the world's factory to an economy with larger high-tech and services sectors. It invested heavily in developing low-carbon energy sources and improving energy efficiency as a way to ensure sustainable energy and environmental security. As Kenneth Lieberthal stated in front of the US Senate Foreign Relations Committee:[25]

> China's rate of growth of carbon emission, especially since 2002, has been extremely steep, and pollution problems in China, I think, are rightly viewed as severe. Most Americans seem to believe that China is, therefore, ignoring its carbon emissions while pursuing all-out economic growth. But … the reality is that the leaders in Beijing have adopted serious measures to bring growth in carbon emissions under control, even as they have tried to maintain rapid overall expansion of GDP.

Acknowledging the importance of climate change and energy security is the first necessary step towards the adoption of proper policies and measures to deal with the twin challenges. However to translate these policies and measures into actions and produce immediate and desired results requires more than an acknowledgement of the problems or even the right diagnoses of the problems. It requires the capacity of the government to develop one set of consistent policies and to implement them accordingly. Such capacity first of all needs an institutional structure that can prescribe 'the rules of the game', provide both incentives and restrictions for economic players, and can facilitate cooperation among various energy sub-sectors, between the central and provincial government, and among enterprises and the public. More importantly, they need institutional capacities to make policies a political reality.

In China, policy and institutional failures were a major cause of these environmental and resource-use problems. China is regarded as a centralized state, with a hierarchical structure of the central, provincial, municipal and other levels of governments. The Chinese Community Party (CCP) dictates this 'party-controlled government' in whichever way it sees fit.[26] The Party-state is 'the absolute power centre' in Chinese politics. In political reality, the government has not been able to develop either a coherent set of policies regarding energy, security, development and environment; nor does it seem to have the institutional capacity to implement policies accordingly. These are the two sides of the same coin of governing. Two key functions of all governments are coordination and resolution of disputes. If we agree with David Lampton that China 'has gone from being ruled by strongmen with personal credibility to leaders who are constrained by collective decision-making, term limits and other norms, public opinion, and their own technocratic characters,'[27] it is important to understand the collective decision making – who is involved in the process, who coordinates, how coordination takes place, and how interests are balanced. The CCP may be in power, yet, at each stage of the 'seemingly endless process of making policy in China, there are struggles – over resources, over power, over ego.'[28]

More than a dozen central government ministries or commissions share responsibilities over energy policy making in 2003–12. The National Development and Reform Commission (NDRC) emerged in 2003 from the previous macroeconomic planning agencies. It was given the primary responsibility for energy coordination. That all ministries and commissions were at the same bureaucratic level of NDRC, accountable to the State Council, meant that leadership

would be needed and NDRC's ranks would not be sufficient. In 2005, the State Council created the Energy Leading Group – a supra-ministerial coordinating body headed by the Premier of the State Council. The Leading Group consisted of around 20 ministers from Finance, Foreign Affairs, Industry, Commerce, Land and Resources, the National Environmental Protection Administration (now the Ministry of Environmental Protection), the Ministry of Water Resources, the State Administration of Coal Safety, etc. In addition, as all major energy companies were state-owned under the supervision of the State-owned Assets Supervision and Administration Commission (SASAC), SASAC was part of the Leading Group too.

Each of these players had its distinct organizational interests; they differed in their mandates, in their ways of looking at things, in their political networks, and in their organizational culture and operational tradition. SASAC, for instance, wanted to consolidate energy firms and encouraged them to become the dominant players in their given sectors by acquiring weaker and small players, while NDRC demanded breaking up the monopolistic or dominant positions of energy companies in the name of encouraging competition. Yet, this was pursued as a result of the tilted power balance in favour of large state-owned energy corporations. As it was commented then 'the energy corporations initially served as a vehicle to resolve increasingly blurred rights and claims between central and local government control over energy assets, and also to attract foreign technology and financing to develop domestic resources under tight credit market conditions.'[29] With the SOE reforms in the 1990s and especially after commercialization and corporation, these energy companies transformed from government agencies to corporations whose first priority was to maximize their interest, including profit maximization. Indeed, they were expected to do so and assessed and awarded for doing so. When these SOE energy corporations were given the autonomy to operate as commercial entities, the NDRC's energy bureaucracy lost much of its expertise and access to information to the large SOEs. Insisting that economic stability would need some macroeconomic 'control', NDRC kept some of its key functions, among which were those of project-approval and price-setting.

Interests of provinces meanwhile added fuel to the chaotic situation of energy investment and energy production. For example, in the first half of the 1990s, the central government decentralized the loss-making coal industry – large ones to provinces and small-sized ones were in practice 'privatized' – as it did not have the resources to support the industry.[30] Small-sized and unregulated coal mines boomed, and their production jumped, so did their fatality rate, which was more than 10 times that of the large state-owned coal mines in 1998–2003 and remained 5–7 times for the rest of the first decade of the 21st century.[31] Together with waste coal mining and its associated pollution in soil, water and air, the coal industry drew not only domestic but international attention. The central government issued many 'orders' to close down small and dangerous coal mines, but had little impacts as they were supported by provincial and local governments. There were similar developments in electricity generation as subcritical coal-fired power plants were built regardless of environmental consequences, again supported primarily by provincial local governments to meet rising electricity demand and also to achieve higher GDP growth (discussed below).

The chaotic situation of energy production, rising dependency on oil imports, worsening environmental problems and conflicts among several energy sub-sectors 'forced' the central government to restructure its decision making apparatus to achieve greater coordination and more centralized policy making. In March 2008, the 11th National People's Congress established the National Energy Commission to replace the National Energy Leading Group. The State Council created the National Energy Administration (NEA) to replace the Energy Bureau of the NDRC. The NEA was given the mandate to coordinate energy policies and their implementations. The NEA was larger than the old energy department of the NDRC, with

240 positions allocated rather than 30, and had a higher status – vice ministry. Its first chairman was a senior official at the State Planning Commission, a veteran of both SOE and energy reforms, and at the minister level. The NEA might have been given a broad range of responsibilities, but little authority: it was responsible for planning, coordinating and governing activities of the oil, gas, coal and power industries. Yet, few people expected much from this newly created NEA not least because it was not clear how turf battles among sub-energy-sectors could be managed, but more importantly because NEA was neither 'independent' (placed under the NDRC, but bureaucratically half a level higher than the NDRC's departments) nor given much authority. NDRC maintains all key authorities – project approval and price setting. The NEA could propose changes to energy prices and be consulted on overseas energy investment project approval. The creation of the NEA was a compromise between the NDRC that did not want to give up its control over the energy sectors and those who called for a mega-ministry of all energy sectors. Since it is not a full ministry, it was unable to coordinate actions of relevant government agencies. It also lacks human capital, authority and instruments to bring in line the actions of all state-owned energy corporations.

While the chairman of the NEA might be the deputy minister of the NDRC, the NEA itself did not have independent authority over any energy policy issues. Its first chairman, Zhang Guobao, from the very beginning openly admitted that he was a powerless minister, without authority to coordinate, approve projects and regulate price regulation. He liked to tell people:

> One needs 5 licenses to operate a coal mine. None of the authority of issuing them is in the hand of the NEA. I lead an energy bureau which does not have any authority over pricing. When they increased petro price, I was not even told. I went to the Premier to complain. The Premier joked: it only showed our good work of confidentiality. When wind power expansion went too fast and much exceeded the transmission capacity to absorb it, the NDRC and 10 other government agencies issued a document on slowing down wind power development, the NEA was not even informed.[32]

There was a loud voice in 2007–08, calling on the central government to establish a mega-ministry equivalent to the US Department of Energy, giving it sufficient resources and authority to coordinate and enforce polices. It never happened. Meanwhile, various energy departments of NDRC turned their authority of project approval and price setting into rent-seeking opportunities. When the current government took over in 2013, nearly all senior officials of these departments were found guilty for being corrupt, taking bribery and some even more serious crimes.

In the midst of chaotic energy development and production, the environment suffered at least as much as energy resources. In March 2008, the State Council upgraded the State Environmental Protection Administration into a full-ministerial agency: the Ministry of Environmental Protection (MEP). This was a clear indication that environmental concerns attracted serious interest within the central government. Nonetheless, the MEP was neither given sufficient resources nor authority in making and enforcing environmentally related policies. For example, the MEP was allotted 2,600 positions with only 300 working out of the headquarters in Beijing. In contrast, the US Environmental Protection Agency has 17,000 employees with nearly 9,000 working in Washington, DC. MEP was dwarfed by both energy companies (large and small) and local governments; for them making profits and maximizing local interests were the first priorities, and both had much more resources at hand in resisting the MEP. More importantly, the MEP was not a heavy-weight player among central government agencies. Throughout the first decade of the 21st century, officials at the MEP (and its predecessor),

including its minister, warned about the neglect of the environment when economic decisions were made. The central government set a GDP growth at 8%, not as a ceiling, but as a floor target, reflecting a longstanding policy of 'bao ba' (保八) or, 'protecting the eight'. Annual GDP growth of 8% was believed to be sufficient to absorb the new workforce entering the market each year and thereby to maintain political stability. Governors of provinces were assessed and rewarded for their GDP growth.

When the economy slowed down affected by the global financial crisis, for instance, different parts of the government talked about different things: the Ministry of Finance emphasized the importance of boosting government revenue and controlled spending to balance the budget. Its minister cautioned against overspending while there was a clear sign that revenue would go down for 2008–09. The newly merged Ministry of Industry and Information Technology talked about the necessary restructuring of the economy as some industries were burdened with over production capacity. The MEP again raised its warning that pollution had deteriorated so quickly that it threatened the key components of Hu Jintao's 'harmonious society' and suggested balancing economic growth and environmental protection. For the State Council, keeping a minimum 8% GDP growth was the first priority. Even though it talked about 'green development', 'green' was subject to 'growth', and despite both experts and policy makers talking about 'rebalancing the economy' toward domestic consumption and reducing overcapacity, few knew how to do it without hurting economic growth. The government did what it knew how – by following its policies of the Asian financial crisis (1998–99) – to 'hit the downturn' quickly, with the greatest force it could muscle, targeting those areas which would have direct impact on the economy, as the Australian government at the time decided to 'go hard, go early and go household' to have the maximum impact.

The big stimulus package of 4 trillion yuan (the equivalent of US$586 billion) contained 'ten priorities' including: to speed up the development and construction of (1) social housing, (2) rural infrastructure, and (3) rail, road and airports, (4) health and education, (5) to improve environment and ecosystems, (6) to speed up economic structural readjustment and engage in innovation, (7) to speed up earthquake reconstruction, (8) to raise rural and urban resident incomes, (9) to reduce taxes for enterprises and encourage their technology innovation, and (10) to strengthen its financial support for economic growth. While $30 billion of the package was dedicated to 'green' projects, emphasis in allocating the fund was clearly in favour of 'development' rather than 'green': transport and electricity infrastructure took the lion's share of the package (38%); one-quarter of the package went to earthquake reconstruction; and the rest was split among affordable housing (10%), technology innovation (9%), rural infrastructure (9%), environment (5%), and health and education (4%). With the financial incentives, 'investment in China's clean energy sector was 60% higher than in the United States ($54.4 billion versus $34 billion) … and in 2009, China surpassed the United States in total installed clean energy production capacity.'[33] Yet, the environmental impact of the rest of the package was much greater than that of the 'green' energy as energy-intensity and polluting industries continued to expand despite many of them having already shown signs of over-capacity. Indeed these developments and the spreading environmental pollution led MEP officials, including its minister, to openly criticize the government for 'the lack of respect for the environment as the country carries out its economic stimulus plan.'[34]

The MEP was not the only central agency that held different views on how to balance economy, development, energy security and environment. Nor were these differences unique in China. Thus the key functions of all government are 'coordination and resolution of disputes'. The Chinese political system displays two seemingly contradictory phenomena: 'overcentralization' and decentralization: it is overcentralized as 'its leaders are overloaded' with

demands to make decisions and it is over-decentralized as decisions are made by so many players. In the US a system of checks and balances was created by design with a deep suspicion of government while the checks and balances existed in the Chinese system by default with a deep entrenched expectation 'that senior leaders are indispensable agents of dispute resolution across an infinite range of issues'.[35] Governing in China is like 'Whac-A-Mole' – top leaders are constantly pulled to all directions without institutionalized capacities as those government agencies that are supposed to 'assist' can seldom agree on major issues and on cooperation.

The situation continued: the Ministry of Commerce preferred to see continuing export growth while the MEP and NEA called for changing the export-oriented economic structure. The Ministry of Science and Technology would like to see the development of domestic low-carbon energy technologies, the MEP and NEA push for adoption of the most advanced technologies, domestic and international. While the NEA would like to see China's energy companies invest overseas to ensure direct access to energy resources, the Ministry of Foreign Affairs issues cautions about the diplomatic impacts of Chinese investments in certain countries and regions. The policy gap between the central and provincial governments is even larger. In sum, as the World Bank pointed out, it would be very difficult to adopt a set of coherent energy strategies and implement a national approach towards energy security and climate change, 'if different arms of government send conflicting signals'.[36] The weak governing capacity was also 'reflected in lack of adequate policy research to assist the government in making sophisticated policies'.[37]

In contrast with fragmented government agencies, large state-owned enterprises enjoyed oligopolistic positions in their respected fields, obtained substantial financial wealth and had significant political influence in shaping the policies in their favour. They are the modern corporations seeking to expand their profits by taking advantage of the market while the market was neither well monitored nor properly regulated. The abandonment of the old annual, five-year and long-term national plans that specified detailed material targets, based on which resources were allocated[38] would require better capacity for government to coordinate in order to achieve some degree of coherence in its policies. That was lacking. For instance, instead of providing long-term projections and well-planned national strategies based on the projections, senior officials at the energy departments of the NDRC and NEA were busy using their power and authority for rent-seeking. Energy companies did their own things: in less than 2–3 years after the government adopted policies to encourage renewable energy, both wind and solar sectors suffered over-capacity in some places where infrastructure was not in place. The solar manufacturing industry produced mainly for exports and sank into financial holes when global financial crisis dried up export markets. Rapid expansion of installed wind capacity was not matched by the similar expansion in transmission and distribution capacity, and electricity generated by wind farms could not be sent to load centres (known as curtailment). By 2010, the total installed wind capacity (44.7GW) was 6–10 times the initial projected target (3–7GW), creating insurmountable challenges for the T&D infrastructure. In addition, there was a concentration of these wind capacities, thanks to, at least, policies of another powerful government ministry – the Ministry of Finance. By 2011, five provinces and regions hosted over 70% of the country's total wind capacities – Inner Mongolia, Liaoning, Hebei, Jilin and Heilongjiang. Except Hebei province, they were all electricity surplus producers to begin with and had already developed more coal-fired thermal generation capacities than they could consume. Unwilling to close down thermal capacities which would affect local economies, they expanded their wind capacities due to the subsidy policies put in place by the Ministry of Finance. Without adequate T&D infrastructure, curtailment of wind power became serious financial and political issues.

In sum, in the past decade, the central government had repeatedly said that its policy priority was to 'rebalance' the economy by shifting its export-dependent to domestic consumption-driven economic development, to change from quantitatively rapid growth to a qualitative superior growth, and to have a better redistribution system to reduce inequality. These broad policy outlines were believed to provide a 'shared framework for understanding problems, even as vigorous debate raged about the amplitude and rigor of specific policy measures.'[39] In the aftermath of the global financial crisis, few knew how to have a high GDP growth rate while rebalancing the economy. Most economists including those at the World Bank then believed that China should not allow the economy to slow down and spending would keep China and the world out of trouble. The guiding principle in 2008–10 was summarized into 16 Chinese characters – control inflation, adjust structure, promote reform, and increase revenue while reducing spending (控制赤字、调整结构、推进改革、增收节支). The stimulus package, however, supported none of these objectives. Without 'rebalancing' the economy, energy-related climate change issues worsened.

Recent developments

Official reports found that 20% of China's arable land, more than 60% of its underground water, and 33% of its surface water are polluted. The World Bank and the State Council's Development Research Centre estimated the costs of this environmental degradation reached approximately 10% of GDP in 2008, representing a significant drag on the economy.[40] Furthermore, air pollution contributed to 17% of all deaths (or 1.6 million people) in China between April 2014 and March 2015 according to estimates by the US-based research non-profit Berkeley Earth.[41] The current government coming to power in early 2013 made its pledge to fight the 'war of air pollution'. It announced an Action Plan on Prevention and Control of Air Pollution, with bans on new coal-fired capacity in key regions and absolute reductions in coal use in eastern provinces in 2012 to 2017. To prepare for the UN conference on climate change in December 2015, the NDRC prepared a set of policies and actions on climate change in 2012, which was upgraded in November 2014, following the pledge the Chinese government made at an APEC summit in Beijing in September that year. It promised to peak CO_2 emission by 2030 and to raise the share of non-fossil energy to 20% by 2030. It also promised that by 2030, non-fossil fuel would reach 20% of the total primary energy consumption, and CO_2 emission per unit of GDP would be down by 60–65% from the 2005 level.[42]

The State Council formally adopted the Energy Development Strategic Action Plan (2014–2020) (能源发展战略行动计划 2014–2020) in 2014. The plan contains four objectives: (a) to improve energy efficiency and conservation, (b) to pursue low-carbon green energy (to cap coal consumption at about 420 million tonnes, accounting for no more than 62% of the total energy consumption by 2020, and to increase renewable energy capacity: between 2016 and 2030, China would have to add 10GW of nuclear capacity, 15GW of hydro, 30GW of solar PV and 40GW of wind power capacity), (c) to ensure self-sufficiency (85% of energy will come from domestic sources by 2020), and (d) to adopt innovation-led energy development. To achieve these objectives, the Plan sets two basic conditions: further reform in energy sectors, and improvement of energy policies and regulations.

China has been leading in investment in renewable power generation, in hydro, wind, solar PV and solar water heating capacity. By the end of 2014, it hosted a quarter of the world's renewable electricity generation capacity, including 280GW hydropower.[43] In 2014, the total renewable power generation capacity of wind, solar PV and biomass in China was 50% more than that in the US and double that in Germany. Nuclear, wind and solar PV together

generated only 5.5% of total electricity.[44] These targets and actual data tell several important features of the energy industry in China: (a) size matters;[45] (b) speed matters – institutional development did not catch up with the rapid economic growth and development; and (c) momentum matters – industries have been on a treadmill for high growth; it became very difficult to slow down without having significant impact on firms as well as the society as a whole. The recent economic structural changes and their related economic slowdown might be an opportunity for those inefficient and polluting power generators to withdraw from the market. Instead, slow economic growth in the past two years did not lead to equivalent slowdown in investment in electricity generation – signs of overproduction worried many in the industry.

The trend has been downwards (Table 13.5), but investment has not gone down, as one of the five national SOEs in generation complained:

> There is apparent over-capacity in generation. We are running fewer and fewer hours. But we are under significant pressures from provinces to build more coal-fired power plants. If we refuse, the province will take the licence back and give it to local power companies, which are less efficient and care less about environment.[46]

Many scholars who study Chinese politics and economics have all recognized the power of provinces and local governments.[47] The State Council in late 2015 reemphasized that 'no one should build coal-fired thermal plants without proper approval'. It seems feeble as the State Council has little capacity to enforce it or to monitor it. This was already shown in the previous policies: in late 2005, the Chinese leaders set an ambitious target to reduce the country's energy per unit of GDP by 20% and cut total CO_2 emissions by 10% in 2006–10. The following 12th Five-Year Plan (2011–15) called for a 16% reduction in energy intensity and a 17% reduction in carbon intensity. To achieve the goals, mandatory sub-targets were subdivided and assigned to provinces and lower administration levels and to administrators of key national programmes, with accountabilities for delivery. While it was reported that most provinces met their targets,[48] quantitative results in reducing the overall air, water and soil pollution were disappointing.[49]

Self-reporting systems always raised the issue about the accuracy of the reports from provinces. More importantly, it was the capacity of the central government to ensure adequate and proper implementation of its policies. Often central government agencies promulgate new national regulations and policies, set national targets, establish national standards, design and oversee implementation of a series of policies. Without a well-established operational legal system, it is difficult to regulate economic activities.

Conclusion

In China, environmental and climate issues have been incorporated in energy policies and development. Indeed, China has expanded its low-carbon energy sources significantly since 2003 and they are all developed in the name of ensuring adequate energy supplies and minimizing environmental and climate change threats. Meanwhile, fundamental structural changes in its economy are difficult to come by because of (a) fragmented government agencies competing for agenda, (b) the government lacking the capacity to adopt coherent and consistent policies and to implement them accordingly, and (c) slow creation of an operational legal and regulatory system. Policy makers in China are struggling simply to figure out what is unfolding on the ground while looking for points of leverage to achieve their desired changes. Given that the two issues cover a far wider range of implications on the economy and society, actions taken on one issue may or may not have the positive results on the other. Addressing energy-related

Table 13.5 Power plant utilisation rate (hours), 2001–2014

	2001	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Thermal	4,900	5,752	5,767	5,991	5,865	5,612	5,344	4,885	4,865	5,031	5,305	4,982	5,021	4,706
Hydro	3,129	3,289	3,239	3,462	3,664	3,393	3,520	3,589	3,328	3,404	3,019	3,591	3,359	3,653
Average	4,588	4,860	5,245	5,455	5,425	5,198	5,020	4,648	4,546	4,650	4,730	4,579	4,521	4,286

Source: China Electricity Council, 'Summary of the Electricity Industry in 2014,' China Electricity Council, 2015.

development, security, and climate change threats requires the political commitment of governments, wide participation of enterprises and the public and technological innovation. It has been a great challenge for leaders in Beijing to balance long- and short-term development and balance the diverse interests of urban and rural populations, coastal and interior regions, and the elite and the masses.

To manage these issues, the current government came to power, promising to tackle the problems of 'top design' of government institutions – 顶层设计, as Xi-Li team emphasized when they took over the government in 2013. Yet it remains to be seen what 'top design' might be for the energy industry. A mega ministry had been suggested since the beginning of the 21st century, but is still an illusion rather than the reality. After taking office, the current government quickly abolished the SERC, folded it into the NDRC and assigned it a very junior partnership role to the NDRC – 'participate in planning national energy development, suggest power tariff adjustments, suggest further electricity reform', etc.

Notes

1 J. E. Chubb, *Interest Groups and the Bureaucracy* (Stanford, CA: Stanford University Press, 1983); S. Haggard, and M. D. McCubbins, *Presidents, Parliaments, and Policy* (New York: Cambridge University Press, 2001).
2 J. Bordoff, M. Deshpande, and P. Noel, 'Understanding the Interaction between Energy Security and Climate Change Policy', in *Energy Security*, ed. C. Pascual and J. Elkind (Washington, DC: Brookings Institution Press, 2010), 212.
3 Bo Kong, *China's International Petroleum Policy* (Santa Barbara, CA: ABC Clio, 2010).
4 IEA, *World Energy Outlook, 2010* (Paris: OECD, 2010).
5 J. E. Sinton, M. D. Lavine, and Q. Y. Wang, 'Energy Efficiency in China: Accomplishments and Challenges', *Energy Policy*, 26, no. 11 (1998): 813–829; J. E. Sinton, and D. G. Fridley, 'What Goes Up: Recent Trends in China's Energy Consumption', *Energy Policy*, 28, no. 10 (2000): 671–687.
6 Zhu Liu, *China's Carbon Emissions Report 2015* (Cambridge, MA: Harvard Kennedy School, Belfer Centre for Science and International Affairs, 2015), 10.
7 Kenneth Lieberthal, *US-China Clean Energy Cooperation: The Road Ahead* (Washington, DC: Brookings Institution, 2009), 7.
8 Liu, *China's Carbon Emissions Report 2015*.
9 International Energy Agency (IEA), *World Energy Outlook 2007: China and India Insights* (Paris: Organization for Economic Co-operation and Development, 2007).
10 William Chandler, and Holly Gwin, *Financing Energy Efficiency in China* (Washington, DC: Carnegie Endowment for International Peace, 2008), 6.
11 BP, *Statistical Review of World Energy* (London: BP, 2015), www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html.
12 International Energy Agency, *Key World Energy Statistics, 2004* (Paris: Organization for Economic Co-operation and Development, 2004).
13 Xu Yi-chong. *The Politics of Nuclear Energy in China* (Basingstoke: Palgrave Macmillan, 2010).
14 World Bank, *Energy Sector Management Assistance Program* (no.101/89) (Washington, DC: World Bank, 1989).
15 World Bank, *China: Long-Term Development, Issues and Options* (Washington, DC: World Bank, 1985).
16 State Council of the People's Republic of China, *China's Energy Conditions and Policies* (Beijing: Information Office of the State Council of the People's Republic of China, 2007), 11.
17 World Bank, *Developing a Circular Economy in China: Highlights and Recommendations* (Washington, DC: World Bank, 2009); World Bank, *Winds of Change: East Asia's Sustainable Energy Future* (Washington, DC: World Bank, 2010); World Bank, *World Development Report 2010: Development and Climate Change* (Washington, DC: World Bank, 2010).
18 Eighth Senior Policy Advisory Council, *Tax and Fiscal Policies to Promote Clean Energy Technology Development* (Beijing: Eighth Senior Policy Advisory Council, 2005).
19 Joanna I. Lewis, *Green Innovation in China* (New York: Columbia University Press, 2013); Kelly Sims Gallagher, *The Globalisation of Clean Energy Technology* (Cambridge, MA: MIT Press, 2014).

20 Conventional coal-fired power plants, which use water boilers to generate steam that activates a turbine, have efficiency of about 32%. Supercritical and ultra-supercritical power plants that operate at temperatures and pressures above the critical point of water have energy efficiency of above 45%. Supercritical and ultra-supercritical power plants also require less coal per-kilowatt-hour electricity generated, leading to low emissions, including carbon dioxide and mercury, higher efficiency, lower fuel costs per kilowatt of electricity.
21 IEA, *World Energy Outlook 2007*.
22 Nan Zhou, Mark D. Levine, and Lynn Price, 'Overview of Current Energy Efficiency Policies in China', *Energy Policy* Z 38, no. 11 (2010): 15.
23 C. Richerzhagen, and I. Scholts, 'China's Capacities for Mitigating Climate Change', *World Development* 36, no. 2 (2008): 312.
24 World Bank, *Developing a Circular Economy in China: Highlights and Recommendations* (Washington, DC: World Bank, 2009).
25 Lieberthal, *US-China Clean Energy Cooperation*, 6.
26 Kerry Dumbaugh, and Michael F. Martin, *Understanding China's Political System* (R41007) (Washington, DC: Congressional Research Service, 2009).
27 David M. Lampton, *Following the Leader* (Berkeley, CA: University of California Press, 2014), 76.
28 Lampton, *Following the Leader*, 79.
29 Edward S. Steinfeld, Richard K. Lester, and E. A. Cunningham. 'Greener Plants, Greyer Skies: A Report from the Frontlines of China's Energy Sector,' *Energy Policy*,, 37, no. 5 (2008): 1809–24.
30 E. Thomson, *The Chinese Coal Industry* (New York: Routledge Curson, 2003); Huaichuan Rui, *Globalisation, Transition and Development in China: The Case of the Coal Industry* (New York: Routledge Curzon, 2004); T. Wright, *The Political Economy of the Chinese Coal Industry* (New York: Routledge, 2012).
31 Jianping Zhao, and Xu Yi-chong, 'The Shenhua Group', in *The Political Economy of State-owned Enterprises in China and India*, ed. Xu Yi-chong (Basingstoke: Palgrave Macmillan, 2012), 29.
32 Quoted in Wu Ge, 'Zhang Guobao in Their Views,' *China Economic Weekly*, 1 March 2011 (in Chinese).
33 Michael D. Swaine, *America's Challenge* (Washington, DC: Carnegie Endowment for International Peace, 2011), 263.
34 It is interesting to note that according to Michael Swaine, China was more effective in managing climate change issues than the United States because 'China's top official (currently Xie Zhenhua) is both chief climate negotiator and plays a major role in moving China toward a less carbon-intensive path, where as the top U.S. official (currently Todd Stern) is strictly a negotiator' (Swaine, *America's Challenge*, 271). The frustration of Xie about his inability to push through environmental issues among other government agencies was apparent.
35 Lampton, *Following the Leader*, 50.
36 World Bank, *Developing a Circular Economy in China*, 28.
37 Ibid., 23.
38 T. Kambara, and C. Howe, *China and the Global Energy Crisis* (Cheltenham: Edward Elgar, 2007).
39 Barry Naughton, 'A New Team Faces Unprecedented Economic Challenges', *China Leadership Monitor*, 26, 2 September 2008: 1.
40 World Bank, *China 2030: Building a Modern, Harmonious, and Creative Society* (Washington, DC: World Bank, 2013), 39, 233.
41 R. A. Rohde, and R. A. Muller, 'Air Pollution in China: Mapping Concentrations and Sources', *PloS one*, 10, no. 8 (2015): e0135749.
42 National Development and Reform Commission, *China's Policies and Actions on Climate Change* (Beijing: National Development and Reform Commission, 2014).
43 REN21, *Renewables 2015: Global Status Report* (REN21, 2015), www.ren21.net/wp-content/uploads/2015/07/REN12-GSR2015_Onlinebook_low1.pdf, 30.
44 China Electricity Council, 'Summary of the Electricity Industry in 2014' (China Electricity Council, 2015), www.cec.org.cn/guihuayutongji/gongxufenxi/dianliyunxingjiankuang/2015-02-02/133565.html.
45 Lieberthal, *US-China Clean Energy Cooperation*.
46 Interview in Beijing, 15 December 2015.
47 A. L. Wang, 'The Search for Sustainable Legitimacy: Environmental Law and Bureaucracy in China', *Harvard Environmental Law Review* 37, no. 2 (2013): 365–440; A. L. Wang, 'Chinese State Capitalism

and the Environment', in *Regulating the Visible Hand*, ed. B. L. Liebman, and C. J. Milhaupt (New York: Oxford University Press, 2015).

48 Liu, *China's Carbon Emissions Report 2015*.

49 Robert P. Taylor, G. J. Draugelis, Y. Zhang, et al., *Accelerating Energy Conservation in China's Provinces* (Washington, DC: World Bank, 2010).