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Climate Change, China and the EU Different Policies, Same End?

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Main policy recommendations:

Both the EU and China are major greenhouse gas emitters. The EU has sought the position of a world leader on tackling climate change, while China has been widely regarded as a laggard. The role of both the EU and China will be important in achieving an international consensus at the Copenhagen Climate Conference in December 2009.

Despite a general perception in the West that China is a straggler on tackling climate change, the Chinese government has increasingly placed the issue at the top of its agenda. The urgency with which the climate change is now considered reflects domestic policy concerns over energy and climate security. As a result, China has adopted some ambitious goals that will have an important impact on carbon emissions.

While these goals focus primarily on the energy intensity of the Chinese economy and do not directly target carbon emissions, the overall effect of China's diverse policies will be to reduce greenhouse gas production. The EU should recognize and seek to harness China's domestic priorities to achieving international goals on climate change.

Duncan Freeman and **Jonathan Holslag** are research fellows at BICCS. This study was made possible with the support of the **European Climate Foundation**. This is the second paper in a series of three on China's climate change policies.

Climate Change, China and the EU: Different Policies, Same End?

Duncan Freeman and Jonathan Holslag

Abstract. Both the EU and China will be important actors in the setting an international agreement on climate change at the Copenhagen Climate Conference in December 2009. In Europe there is a common perception that these two are far apart in their attitudes to the question of climate change. This paper discusses the development of China's policy on climate change and compares it to those adopted in the EU. While China came relatively late to the conclusion that climate change was indeed a serious issue, it has adopted aggressive policy goals that indicate a strong ambition to become a leader in tackling greenhouse gas emissions and in the area of green energy. These policies are primarily driven by domestic concerns, and are formulated with regard to China's own context. The targets and methods adopted in China often differ from those in the EU, but there are signs that China is well on the path to achieving significant changes in its energy production and consumption. In the international context, China is likely to continue to focus on its domestic priorities, and will only accept international agreements that allow it to continue to pursue its domestic priorities. *Topics:* climate change, clean energy. *JEL-codes:* Q54.

1. Introduction

Economic development in China has brought great improvements in welfare for the Chinese people, but there have been many costs associated with these gains. One of the highest costs has been to the environment. Economic development, interpreted as high levels of Gross Domestic Product (GDP) growth, was the primary goal of Chinese government policy from the beginning of the process of "opening and reform" in the late 1970s, and protection of the environment was not given the same priority. Despite the enactment of a framework of environmental legislation in the 1980s, policies to protect the environment were given little emphasis.

Some of the most obvious costs associated with China's rapid economic development are to be found in air, water and land pollution. The air in most Chinese cities is highly polluted, as are many rivers and extensive areas of land. Major incidents involving environmental hazards are a frequent occurrence, and problems such as degradation of farmland are also widespread. The effects of climate change in China are less obvious, but the Chinese government has increasingly studied and recognized both the impacts that already exist, and the potential risks for the future. For instance, higher temperatures have been measured across China. According to the China National Climate Change Programme, annual average air temperature has increased by 0.5 to 0.8°C over the past hundred years, with an acceleration in the past fifty years.¹ There have been seasonal changes in temperature, with most of the increase occurring in winter, and the commencement of spring has advanced by several days.² National precipitation trends are less clear. There has been a decrease since the 1950s, but there have been strong regional variations. There has been a fall in precipitation in the north, with an average decrease of twenty to forty mm per hectare, while in the south and southwest there has been significant increase averaging twenty to sixty mm per hectare. There has been an increase in extreme weather events such as droughts in the north and floods along the Yangtze River and in the south. Effects have also been observed in the melting of glaciers in mountainous regions, which could further affect China's access to drinking water as well as the potential for hydro-power.³

China's greenhouse gas (GHG) emissions have increasingly contributed to global climate change in recent years, although historically they have been low. From 1904 to 2004, China's carbon emissions accounted for only eight percent of the world total, and on the basis of cumulative emissions per capita China ranked 92nd in the world.⁴ The Chinese economy has expanded enormously over the past three decades, and its energy consumption and GHG emissions have also increased. Expressed in British Thermal Units (Btu), China's primary energy consumption roughly quadrupled from 17.3 quadrillion Btu to 73.8 quadrillion Btu between 1980 and 2006.⁵ However, energy consumption has grown at a slower rate than the economy. The energy used to produce a unit of GDP of the Chinese

economy has fallen by about sixty percent since 1980. According to figures from the Energy Information Administration (EIA) of the US Department of Energy, the energy intensity of the Chinese economy declined from 37,299 Btu per 2,000 USD in 1980 to 13,780 Btu per 2,000 USD in 2006 and now has lower levels than the US and even approaches those of many European countries.⁶ However, the downward trend was reversed from 2001 to 2005, when the very rapid growth in the Chinese economy was accompanied by a huge expansion in energy intensive industries.

Even though the energy intensity per unit GDP in China has fallen since 1980, the growth of the Chinese economy has resulted in much higher GHG emissions. According to China's own official estimates, China's total greenhouse gas emissions were six gigatons of CO₂ equivalent in 2005, compared to 4.06 gigatons of CO₂ equivalent in 1994.⁷ Estimates of China's greenhouse gas emissions from different scientific bodies vary considerably and past forecasts of their future growth have often been very inaccurate, but it has generally been accepted that China has overtaken the US as the largest greenhouse gas emitter in the world.⁸ In absolute terms, growth of emissions by China has outstripped all other major economies. According to International Energy Agency (IEA) figures, between 1990 and 2005 China's CO₂ emissions from fossil fuels increased by 129 percent (See *Table 1*).⁹ This was greater than the 96 percent increase for India, another large developing country, and much more than the figures recorded for most major developed countries. Some developed economies such as the UK and Germany actually managed a reduction in emissions. Almost all of the recent increase in China has occurred since the turn of the century.

Measured on a per capita basis the trend is similar. China's per capita emissions doubled between 1990 and 2005, while those in India increased by 52 percent. In the US they increased by one percent, while in Germany there was a reduction of nineteen percent. Despite the significant increases in its emissions, as a relatively poor country, on a per capita basis China still consumes far less energy than developed nations. As a consequence,

In absolute terms, growth of emissions by China has outstripped all other major economies.

China's per capita CO₂ emissions also remain low compared to most developed nations. In 2005, carbon emissions from fossil fuels in China were 3.88 tons per person, far less than the US where the figure was seventeen tons per person, and also much lower than the most developed economies in the EU. China's relatively small but increasing per capita emissions reflect the level of development and the expansion of its economy.

In contrast to its low per capita CO₂ emissions, China produces large amounts of GHG in relation to its output. This reflects the still relatively low levels of energy efficiency in the economy despite the improvements that have occurred, and its structure, notably the high concentration of manufacturing industry compared to other economies, especially those sectors such as metallurgy and cement making that consume large amounts of energy. While CO₂ intensity, like energy intensity has been falling in China, this trend was reversed from 2001 as economic growth accelerated, and output in energy-intensive industries surged. Another important factor in the recent increase has been the rapid growth in China's export industries. It has been estimated that in 2005 one third of China's emissions came from export industries.¹⁰ Indeed, emissions from export industries between 2001 and 2005 grew more rapidly than those from the rest of the economy. The growth in export emissions has followed the expansion of different export sectors, but electronics are now amongst the largest contributors. The preponderance of high energy intensities in some domestic and export sectors results in the CO₂ intensity of China's economy being significantly greater than other major economies. Measured on the basis of emissions per unit GDP, according to the IEA, in 2005 China's CO₂ emissions were 0.65 tons per thousand USD, compared to 0.53 tons per thousand USD in the US. In general European economies have much lower intensities, for instance, 0.23 tons per thousand USD in France and 0.37 tons per thousand USD in Germany.

The largest share of emissions is accounted for by exports of electronics, which have expanded very rapidly in recent years.

This picture has been changing in recent years, as China's carbon emissions per unit GDP have decreased even as its economy has been growing. China's carbon emissions per unit GDP decreased by 46 percent between 1990 and 2005, among the fastest reductions in the world. India managed a decrease of eighteen percent and in the US emissions per unit GDP fell by 23 percent over the same period, while in France there was a fall of seventeen percent and a 34 percent reduction in Germany. In China the reduction has been the result of energy efficiency gains, and also a shift in the structure of the economy as the share of manufacturing industry has fallen and that of services has grown. This considerable advance has not been sustained constantly. After 2000 the trend of reduction was reversed as CO2 emissions per unit GDP began to rise again. This reflected a surge in demand for energy, especially from industrial sectors such as metallurgy and cement making, as the growth rate of China's economy accelerated.

If there is no change in current trends, China's emissions will continue to rise sharply, and even if efforts at mitigation are undertaken it is likely that they will grow for several decades. A number of predictions have been made for China's GHG emissions. The results of these forecasts are dependant on the assumptions made, including the future economic growth rate, mitigation policies adopted by the Chinese government and possible technological progress. The IEA has formulated a number of scenarios for the future development of China's energy sector. Under its reference scenario, energy-related CO2 emissions are predicted to grow from 7.2 gigatons in 2010 to 11.4 gigatons in 2030. Under its high growth scenario, CO2 emissions are forecast to grow to 14.1 gigatons by 2030.¹¹ McKinsey & Co in a widely discussed analysis gave a baseline forecast of CO2 emissions of 14.5 gigatons by 2030.¹²

Mitigation by government policy faces many challenges, among the most important of which is the structure of China's energy consumption. China is more reliant on coal for its energy supplies than any other major economy. China is largely self-reliant for energy, and the dominance of coal is determined by its domestic energy resources. In 2007, seventy percent of China's energy consumption was from coal and only 19.7 percent of energy consumption came from oil and 7.3 percent from hydropower, nuclear,

wind and solar sources.¹³ Even these shares represent a slight reduction for coal which in 1990 accounted for 76.2 percent of primary energy.

Despite the rapid growth and size of its economy, China remains a relatively poor country with a large population, most of whom have living standards well below those in developed nations. As economic development and growth continue, so will the rise in its energy consumption. In particular, as economic development continues, China will experience a rapid move towards urbanization, which will greatly increase demands for energy. The challenge faced by China will be different from that faced by developed nations, since it will have to find a path to a low carbon future from a much lower level of economic development.

	CO2 Emissions			CO2 Emissions per capita			CO2 emissions per unit GDP (PPP)		
	1990	2005	Change	1990	2005	Change	1990	2005	Change
France	355.4	388.4	9.3	6.11	6.19	1.44	0.28	0.23	-16.8
Germany	967.6	813.5	-15.3	12.19	9.86	-19.09	0.37	0.37	-33.9
Italy	398.4	454.0	14.0	7.03	7.76	10.45	0.32	0.30	-5.7
UK	557.6	529.9	-5.0	9.75	8.80	-9.70	0.47	0.31	-33.7
US	4,850.5	5,817.0	19.9	19.39	19.61	1.13	0.69	0.53	-23.1
Russia	2,188.6	1,543.8	-29.5	14.76	10.79	-26.90	1.44	1.12	-22.2
Brazil	192.7	329.3	70.8	1.29	1.77	36.97	0.20	0.24	17.7
China	2,210.9	5,059.9	128.9	1.95	3.88	99.16	1.20	0.65	-46.2
India	586.9	1,147.5	95.5	0.69	1.05	51.74	0.42	0.34	-18.2
Japan	1,058.0	1,214.2	14.8	8.57	9.50	10.90	0.37	0.35	-5.5
World	21,024.4	27,136.4	29.1	4.01	4.22	5.34	0.64	0.50	-21.9
OECD	11,091.6	12,909.7	16.4	10.63	11.02	3.69	0.53	0.43	-19.6
Non-OECD	9,283.4	13,267.5	42.9	2.21	2.52	14.26	0.77	0.55	-28.7

Table 1. Comparison of CO2 emissions from fossil fuels 1990-2005 (CO2 emissions in million tons; CO2 emissions per capita in tons; emissions per unit GDP in tons per 1,000 USD; change in percent between 1990 and 2005). Source: IEA.

2. Energy and Climate Policy in the Reform Period

A prevalent view that China has no concern for the environmental consequences of rapid economic growth, and specifically for climate change, has existed in the West for many years. To a large degree this view has been justified. Prior to the 1980s the environment had little significance as an object of political action in China, which under Chairman Mao was focused on revolutionary class struggle. The adoption of the policy of “reform and opening” in 1979 brought a fundamental change in China’s policy priorities. From revolution and class struggle, the focus shifted to economic development.

The shift in China’s priorities brought with it a process of reform of the economy resulting rapid economic growth. It quickly became evident that China needed to strengthen policies on the environment and in the 1980s the Chinese government began to adopt environmental legislation, much of it based on principles learned from the West. The requirement that the state protect the environment was included in China’s constitutions of 1978 and 1982, but the policy consequences were limited, even though the first major environmental legislation was adopted in the 1980s. In 1984, the Water Pollution Prevention Law was adopted, followed in 1987 by the Air Pollution Prevention Law, and in 1989 an Environmental Protection Law was enacted.

By the 1990s climate change had begun to climb up the international agenda. Increasing international concern over climate change was not reflected in any substantive change in Chinese domestic policy. Following the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, China began work on a white paper on the environment¹⁴, but fundamental policy did not change. Energy policy in China was to a large extent focused on the question of supply required to sustain high rates of economic growth.

Nevertheless, there were signs of a change in government thinking on energy questions. While China remained largely self-sufficient in energy supply, in 1993 it became a net importer of oil and rapid economic growth created domestic energy shortages. Legislative efforts, most importantly the

Energy Conservation Law of 1998, reflected increasing focus on development of policy to address energy issues, including efficiency and conservation, but environmental degradation continued and concern for the effects of climate change was not central to government thinking in China. Economic policy remained focused on output growth, which was seen as the most important measure of success and welfare.

The advent of the leadership of President Hu Jintao and Premier Wen Jiabao in 2003 has brought a significant change in the thinking of the Chinese government on broad questions of economic development, energy and environmental impacts, including climate change. The concepts of scientific development and a harmonious society with “people-centred” development that Hu and Wen have espoused implicitly rejects the previous policy that focused on GDP growth figures above all else.¹⁵ The concept of scientific development espoused by China’s government insists on the centrality of development in order to improve the welfare of its people, but this welfare is seen as being more complex than simple output or income growth. Sustainability of development is now one of the core issues of economic planning.

Under Hu and Wen the environment and energy efficiency have risen to the top of the policy agenda. Environmental, energy and climate security are now among the highest concerns of the Chinese government, and are arguably now considered to be a matter of fundamental national security. This is reflected in the institutions China has established to deal with the issue. In 1998, China had already established the National Coordination Committee on Climate Change. The importance of climate change in government policy was elevated in 2007 by the establishment of the National Leading Group on Climate Change, which is headed by Premier Wen Jiabao, and brings together twenty different government departments working on climate change. The National Development and Reform Commission (NDRC), the main economic planning entity in the central government, in effect has charge of implementing policy on climate change.

The Chinese leadership has increasingly recognized the enormous cost in terms of welfare and security that environmental degradation and climate change represents.

The importance attached to energy and climate issues is also shown at a policy level. At the annual National Economic Work Conference held each December where the economic policy targets for the following year are set, the environment and energy have in recent years begun to be ranked among the highest priorities. In December 2007 strengthening energy conservation and reducing pollution was ranked as the fourth most important task for 2008.¹⁶ In the following, year energy conservation was also cited as an important task, although its priority was somewhat downgraded in the midst of the economic crisis.¹⁷ The government has adopted long-term policy strategies to tackle energy issues. In 2004 the State Council approved the Medium- and Long-Term Energy Development Plan Outline 2004-2020¹⁸ and the NDRC formulated the China Medium- and Long-Term Energy Conservation Plan in the same year.¹⁹ The latter plan set comprehensive energy efficiency targets for the Chinese economy and key industry sectors. In addition to these policy plans, the government has adopted a number of laws that demonstrate increasing focus on energy and climate security. In 2005 the Renewable Energy Law was adopted and in 2008 the revised and strengthened Energy Conservation Law became effective. In August 2008 the Circular Economy Law, which sets basic principles on efficiency and recycling, was passed and became effective in January 2009.

The 11th Five Year Plan for 2006-2010, for the first time in one of China's Five Year Plans, which remain the country's key economic planning document, set clear targets to reduce energy intensity per unit GDP by twenty percent by 2010.²⁰ In 2007 the government issued the National Climate Change Programme setting out in broad principles on how climate change will be tackled in the period up until 2010. The broad guiding policy documents and laws emanating from the central government have been followed by many specific policies that put their general principles into effect. As the 11th Five Year Plan indicates, the focus of China's policy has been on energy efficiency targets. The main means to achieve these targets are twofold. Firstly, the Chinese government has adopted administrative means to set and enforce targets and standards, usually through regulations. Secondly, it uses industrial policy to shape economic

development, thus encouraging those sectors that will increase energy efficiency while discouraging those that are inefficient in their energy use.

Recent economic events have reinforced the perception in China that it must address the energy issue. The sharp rise in oil prices in 2007 and 2008 drove home the message that dependence on fossil fuels, especially those that are imported, may have serious economic consequences that may extend to the social and political spheres. The global economic crisis has reinforced the message that China cannot continue to rely on the model of development that it has followed for thirty years. The Chinese leadership has sought to portray the crisis as an opportunity to accelerate the rebalancing the Chinese economy.²¹ Included in this remodelling is an increased focus on questions of energy efficiency and development of a green economy, including renewable energy sources. According to Chinese government figures, a significant proportion of the 600 billion USD stimulus package announced in November 2008 to address the economic crisis will go to environmental and green sectors.

The broad plans adopted by the Chinese government indicate how it will tackle the climate change issue. These plans are intended to transform China's patterns of energy production and consumption, and as a consequence control carbon emissions. According to China's National Climate Change Programme, conservation of energy and optimization of the structure energy production will be key elements in this policy.²²

3. International dimension

Over many years China has been regarded as a laggard in addressing issues of the environment and climate change on the international stage. The perception in Europe of China has been that of a country that has dismissed these issues as the concerns of developed nations who can afford the luxury of tackling them. In the past China has emphasized the historical responsibility of the developed nations for greenhouse gas emissions, and their obligation to take action on them. This has been restated as the United Nations Climate Change Conference Copenhagen to be held in December

2009 approaches, as China has again said, "Developed countries shall take responsibility for their historical cumulative emissions and current high per capita emissions to change their unsustainable way of life and to substantially reduce their emissions and, at the same time, to provide financial support and transfer technology to developing countries."²³

China has been a participant in the international process on climate change through its participation in the United Nations Framework Convention on Climate Change (UNFCCC) and it has ratified the Kyoto Protocol. China has also participated in a number of other international frameworks. The Carbon Sequestration Leadership Forum set up in 2003 includes China in its membership. In 2004 China participated in the establishment of the Methane to Markets Partnership, and in 2006 it was one of the founding members of the Asia-Pacific Partnership on Clean Development and Climate. China has been the largest recipient of projects in Clean Development Mechanism under the Kyoto Protocol.²⁴

But the impact of these international frameworks on China's domestic behaviour in the past has been limited. Under the Kyoto Protocol China had no binding emission targets, and it insists that, "The first and overriding priorities of developing countries are sustainable development and poverty eradication."²⁵ Unless there is a drastic change in China's stance, domestic policy considerations will continue to be the main drivers of its efforts to mitigate climate change.

4. Policy Background

In Europe, at the EU level there is a relatively clear policy framework on climate change that addresses the issue directly. The EU's Climate and Renewable Energy Package of December 2008²⁶ was its effort to set out a comprehensive policy on the issue. In 2007 China issued a National Assessment Report on Climate Change,²⁷ which provides a scientific foundation for analysis and adoption of mitigation measures. The National Climate Change Programme promulgated in 2007²⁸ in theory sets out a coherent strategy for tackling climate change. The National Climate Change

Programme sets out broad principles, for instance that climate change will be tackled within the framework of sustainable development and that equal emphasis will be given to mitigation and adaptation and also asserts that China will rely on advancement and innovation of science and technology to address climate change. It also states that China will actively participate in international cooperation on the issue, but reiterates the basic principle of common but differentiated responsibilities. Despite this framework, China's climate change policy is much more diffuse than that found in the EU.

Economic development remains a central objective of the Chinese government, but this is increasingly considered in terms of sustainability. Energy and climate security have become fundamental to China's view of the sustainability of its economic development. In 2004, the China Medium- and Long-Term Energy Conservation Plan stated clearly that, "Energy conservation is a long-term strategic guideline in China's economic and social development, and an extremely urgent matter at present."²⁹ The Plan directly criticized the view of the issue that had been prevalent in China, saying, "Energy conservation is only regarded as an expedient to ease up

While it is recognized as an urgent international problem, China insists that its strategy for dealing with climate change must depart from its own circumstances.

the imbalance between energy supply and demand, paying attention to energy conservation only when energy supply is tight, and neglecting energy conservation when energy supply is improved." It went on to argue that, "Along with the increase in population and the acceleration of industrialization and urbanization,

particularly the rapid development of heavy industry and transportation, the demand for energy will increase significantly. The imbalance between energy constraints and economic development, and the environmental pollution brought about by energy utilization will become even more evident."

Since this plan was issued in 2004, the question of energy and climate security has become even more pressing. While it is recognized as an urgent international problem, China insists that its strategy for dealing with climate change must depart from its own circumstances. Thus, the policies

to tackle the issue will take account of China's position as a poor developing country, and be based on its own economic structure and energy needs. This results in some obvious differences with Europe. In the international context China has consistently refused to accept binding emissions targets and insists that the developed countries have the greatest responsibility for mitigation efforts. Nevertheless, in domestic policy it has set its own targets, but unlike the EU, these are not focused directly on GHG emissions. Instead China has set energy intensity reduction goals, such as the twenty per cent reduction target included in the 11th Five Year Plan which in effect serve as a proxy for emissions targets.

Not only is the key target of Chinese policy different, but the means China has adopted derive very much from the domestic environment. Even after thirty years of economic reform, the state still plays a central role in the Chinese economy. The Chinese state directly owns and controls many of the largest enterprises, but it also actively directs economic activity through a strong industrial policy and the many administrative levers that remain in the hands of government officials. Climate change policy is no exception. In addressing climate change, there has been an emphasis on state direction through administrative targets and enforcement, and industrial policy. Unlike in the EU, the Chinese government has not adopted market methods such as cap and trade.

5. Legislation

Policy documents such as the China National Climate Change Programme set the broad outlines of Chinese government policy on climate change, but the detail of implementation exists in numerous different laws, regulations and policy documents. In fact, climate change is often not directly the focus of many of these even though they do have an effect on emissions. One of the most important of the sources of policy is laws passed by the central government which often have a basic regulatory function, but also provide a legal framework for important policy goals. The enactment of legislation has been one of the key areas of action by the Chinese government, and is

one of the most important manifestations of its increasing attention to questions of energy security. Over the past decade, China has issued a number of important laws that have an impact on energy and climate change. Long before climate change became a focus for serious policy attention, the energy sector and its efficiency became the subject of legislation by the Chinese government. The Energy Conservation Law of 1997 was one of the most important initial steps in beginning the process of addressing energy efficiency. This law set out basic goals on energy conservation, and prescribed the means that could be adopted to achieve them.

Since the passage of initial legislation in the 1990s China has increasingly legislated on energy efficiency and sustainability. In 2002 the Cleaner Production Promotion Law was passed, in 2005 the Renewable Energy Law was adopted and in 2008 the revised and strengthened Energy Conservation Law became effective. In August 2008 the Circular Economy Law, which sets basic principles on efficiency and recycling, was passed and became effective in January 2009. The main function of these laws is to set the basic parameters for the relevant area of activity. Often they do not just provide a legal framework but also outline policy goals and the means that may be used to achieve them.

This basic legal framework does not in itself provide the detail of how the goals are to be achieved, but the passage of such laws indicates the fundamental direction of government thinking. None of these laws directly addresses climate change, but they nevertheless have a strong focus on energy conservation. The laws are implemented through subsidiary regulations, and other policy documents.

The legislation and government policy documents covering energy are increasingly expressed through detailed standards that set efficiency targets across many sectors. China first introduced energy efficiency standards for electrical appliances in 1990 and since then the number of products covered has been expanded. Between 2005 and 2008 three groups of electrical products were subject to energy efficiency labelling standards. Following on the amendment of the Energy Conservation Law, the government has taken new initiatives. These include energy efficiency

standards for seven types of appliance which were issued in 2008.³⁰ The standards cover variable-speed air conditioners, multi-connected air conditioners, electric water heaters, induction cookers, computer monitors and copiers.³¹ Previously three other groups were required to meet labelling requirements including water chillers, gas water heaters, motors, self-ballasted fluorescent lamps and high-pressure sodium vapour lamps.

Energy use in buildings is one of the most important sources of consumption. China has imposed increasingly stringent building standards as part of its strategy to raise energy efficiency. Buildings account for about eighteen percent of China's energy consumption, but this level is expected to rise as urbanization increases with economic development. The China Medium- and Long-Term Energy Conservation Plan set the target that all new buildings constructed must reduce energy consumption by fifty percent on current levels, while in some relatively developed cities such as Beijing and Shanghai, the requirement is a reduction of 65 percent.³² The Design Standard for Energy Conservation in Civil Buildings introduced in 2006 provided details on how the goals should be reached. The Design Standard requires the use of energy efficient materials and insulation, and energy saving technology for heating, air conditioning, ventilation and lighting systems in new buildings.

China has also set increasingly strict fuel economy standards for vehicles which are being implemented in two phases from 2005-2006 and 2008-2009. The vehicle fuel standards are less stringent than those applied in the EU and Japan, but are more stringent than those in Australia, Canada and the US,³³ and the requirements for fuel efficiency will become increasingly strict under the policy currently in place.

All new buildings constructed must reduce energy consumption by fifty percent on current levels, while in some relatively developed cities the requirement is a reduction of 65 percent.

6. Industrial policy

Industrial policy is increasingly at the heart of China's efforts to tackle climate change. That the Chinese government sees this as essentially an economic planning problem is indicated by the fact that the coordination for climate change policy is carried out under the auspices of the NDRC. Indeed, the China National Climate Change Programme and other key policy documents in this area are issued by the NDRC. The NDRC, which is China's most important economic planning body and which retains considerable power to direct the economy, is responsible for setting and implementing much of the detailed policy that puts into effect the goals that have been established and now has a Department of Climate Change. Industrial policy formulated by the NDRC has increasingly focused on energy efficiency and conservation.

The creation of government institutions in China is not just a reflection of the imperative of effective policy implementation. They are also a reflection of the policy hierarchy. The creation of National Leading Group on Climate Change in 2007 headed by Premier Wen Jiabao reflects the importance attached to the issue at the highest level of the Chinese government. Energy sustainability, and by implication climate change, are included at the very heart of China's economic planning. Energy conservation is now sufficiently important that leading officials at the provincial level and major enterprises are assessed on the basis of their success in achieving goals set in this area.³⁴ Failure to achieve targets is likely to end the promotion prospects of any official responsible.

Although China has adopted what in the West have often been called "market oriented" reforms since the late 1970s, it remains an economy where the state either directly or indirectly plays a central role. The state still dominates many key areas of economic activity through state owned enterprises (SOEs), and government-directed industrial policy. State policy often plays a direct role in setting targets and providing support to preferred sectors and eliminating capacity in those that are deemed to be undesirable. Such action has increasingly been taken in the area of energy production and consumption.

6.1 Energy efficiency

One of the key targets in the National Climate Change Programme is optimization of the structure of energy consumption. By this is meant the reduction in the use of fossil fuels, especially coal, through the use of renewable energy, nuclear power and coal bed methane. The National Climate Change Programme sets a target of ten percent of primary energy from renewables by 2010 and increasing extraction of coal bed methane to ten billion cubic metres a year. Even before the National Climate Change Programme was issued in 2007, China had begun to address climate change. This was often done under the auspices of other policy goals. For instance, the key target of a twenty percent reduction in energy intensity per unit GDP by 2010 found in the National Climate Change Programme had already been set in the 11th Five Year Plan, which covers the years 2006-2010.

The 11th Five Year Plan was the first of China's Five Year Plans to set clear energy efficiency targets. Even before then the Chinese government had issued plans that address issues related to energy efficiency and sustainability. The China Medium- and Long-Term Energy Saving Plan³⁵ of 2004 had already set a target of reducing energy intensity per unit GDP from 2.68 tons of coal equivalent (tce)/10,000 RMB in 2003 to 2.25 tce/10,000 RMB in 2010, an energy saving rate of 2.2 percent a year. In the decade from 2010 the rate of saving was planned to increase to three percent a year, and energy intensity to fall to 1.54 tce/10,000 RMB by 2020. The long-term target is that China's GDP will quadruple between 2000 and 2020, but that energy consumption will only double in the same period. Since the beginning of the 11th Five Year Plan, statistics from the Chinese government show that energy intensity has been reduced. In 2006, there was a reduction of 1.79 percent, and in 2007 and 2008 the reduction increased to 4.04 percent and 4.59 percent. In the first half of 2009, the reduction was 3.35 percent.³⁶

China's industrial policy with regard to energy efficiency has several aspects. One is the encouragement of desired outcomes through supports including subsidies, tax incentives or preferential pricing. Another is the elimination of enterprises, capacity or technology that are deemed to be

undesirable or the creation of barriers that prevent the entry into production of capacity that is unwanted. China uses all these methods to address climate change.

6.2 Electricity generation

China's future energy requirements will continue to largely be met by coal. Even under the ambitious targets set for renewable and other energy sources such as nuclear, coal will continue to dominate power generation in China. The technological development of coal-fired power stations will be important in China reducing the energy intensity of the economy, and mitigating GHG emissions increases as a result of economic growth. The danger of carbon lock-in as a result of investment in coal-fired generating capacity that will continue to produce high levels of GHG emissions is a critical factor in the future of China's mitigation efforts. Investment decisions made today will have consequences for emissions during the lifetimes of power stations over the next four to five decades. China's policy in this area includes both elimination of inefficient plants, and the introduction of highly efficient new plants.

The Chinese government has adopted a policy of supporting technological improvement and implementation. In the past China's coal fired power stations have had efficiency levels significantly below international averages, and the leading developed nations. Recent years have seen concerted efforts to change the situation. A key element of this is the introduction of large super critical or ultra supercritical plants. Since 2005 China has set requirements that all new large coal-fired power plants use super-critical technology. In 2007 China began constructing ultra super-critical coal plants that are even more efficient. China's large new power stations now use super-critical technology that has raised the overall efficiency of coal-fired power stations to thirty percent, close to the level of developed countries. The efficiency of the super-critical plants now used is over forty one percent, and this will be further increased to forty three percent by the ultra super-critical plants. Integrated Gasification Combined

Cycle plants being introduced will have an efficiency of forty five to fifty five percent.

European media in recent years have frequently referred to the number of power plants that China has constructed in recent years, which is often given as one a week. Much less well-known is that China also has a programme requiring the closing of small and inefficient thermal power stations. The NDRC has set a target of closing such power plants totalling fifty GW by 2010, of which forty GW are coal-fired and ten GW oil-fired. In mid-2009 the Chinese government announced that it had achieved the target more than one year ahead of schedule. According to the National Energy Administration, by the end of June 2009, a total of 7,467 thermal electricity generators with a total capacity of 54 GW had been taken out of service. The reduction is expected to reduce SO₂ emissions by 1.06 million tons and CO₂ emissions by 124 million tons.³⁷

Carbon Capture and Storage (CCS) has attracted considerable attention as part of the solution to mitigating GHG emissions both in Europe and China. The Chinese government has yet to fully commit itself to the idea, but it has provided funds for research and there are pilot plants under development. The Green-gen project is a major effort to develop CCS and other energy sectors with a CCS power plant being developed in Tianjin.³⁸ China and the EU have invested joint projects in development of CCS and made this a central pillar of their cooperation on climate change.

6.3 Renewable energy

Renewable energy has become a key element of China's efforts to reduce emissions. Under the Medium- and Long-Term Renewable Energy Development Plan issued in 2007,³⁹ China aims to increase the share of renewable energy in total primary energy consumption to ten percent by 2010, with a target of fifteen percent by 2020. The target for 2010 is to have installed hydropower capacity of 190 GW, and 300 GW by 2020. Biomass

energy is targeted to reach 5.5 GW by 2010, and thirty GW by 2020, while for wind power the target is to reach five GW by 2010 and thirty GW by 2020. For solar power the goal will be 300 MW by 2010 and 1.8 GW by 2020. Solar thermal applications such as solar water heaters will be expanded, with a target of 150 million m² in use by 2010 and 300 million m² by 2020. By contrast, nuclear power remains a relatively small part of China's energy mix and the target is that by 2020 nuclear will account for forty GW.⁴⁰

The means to achieve these targets will include favourable pricing policies, mandated market shares and also state investment and concession programmes. For instance, mandated market shares will require that in areas covered by large-scale power grids, non-hydro renewable power generation's share of total power generation will reach one percent by 2010 and over three percent by 2020. The Medium- and Long-Term Renewable Energy Development Plan states that power generators with self-owned installed capacity of over five GW will be required to have a non-hydro renewable energy installed power capacity that accounts for three percent of their total capacity by 2010 and over eight percent of their total self-owned capacity by 2020. The Plan commits the government to introducing favourable pricing policies for renewable energy, and the establishment by the central government of a renewable energy fund for investment in the sector. Local government authorities are also encouraged to set up funds. The plan also calls for favourable tax policies for the sector.

The goal of this industrial policy is not just to ensure that this production capacity is created, but also that it will be under the control of China. The Medium- and Long-Term Renewable Energy Development Plan emphasizes the need for China to enhance its own technological development in the renewable energy sector, stating that, "[t]he capacity to absorb and innovate should be strengthened, so that, as soon as possible, independent innovation capabilities are achieved. By 2010, a basic system of renewable energy technologies and industry will have been established, so that equipment capabilities based mainly on domestic manufacturing will have been established. By 2020, a relatively complete renewable energy technology and industry system will have been established, so that a domestic manufacturing capability based mainly on China's own

intellectual property will have been established, satisfying the needs for deploying renewable energy on a large scale in China.”

The strong policies of the Chinese government have resulted in China becoming a major investor in renewables with rapid growth in the sector. By mid-2009 China claimed an installed wind power capacity of 11.81 GW, an increase of 101 percent of one year earlier and far more than the target for 2010.⁴¹ China is now the second largest manufacturer of photovoltaics in the world after Japan.⁴² In 2007 annual production capacity was 1,300 MW, and this is predicted to increase to 4,000 MW by 2010. On current trends it is likely that the targets for renewables will be met well ahead of 2020. Officials have predicted that China will have one hundred GW of wind power capacity by 2020.⁴³ It has also been predicted that nuclear power capacity will far exceed the target previously set, and may reach over eighty GW by 2020.⁴⁴

The most significant recent example of government intervention in the economy was the stimulus package announced in November 2008 to address the economic crisis. This was intended to stimulate the domestic economy particularly in the face of falling international demand, nevertheless the environmental and climate change implications came to be seen as a vital element of the package. The full implications remain open debate, but the government has insisted that the package will not lead to a return to the previous attitude on energy and climate change. According to the Chinese government, out of the headline four trillion RMB package, 210 billion RMB was allocated to environmental and energy efficiency projects.⁴⁵ Other estimates have put the real “green” element in the package much higher. According to HSBC, the Chinese package offered the largest green stimulus of any of the efforts by governments around the world to tackle the economic crisis. The bank estimated that 38 percent of China’s package was “green”, including investment in railways, power grids as well as the environment and energy efficiency.⁴⁶

6.4 Energy consumers

Industrial policy applies to both energy producers and consumers. The Chinese government has adopted several programmes to reduce energy consumption. The role of the state in directing energy policy is evident in the Top 1,000 Enterprises Programme. This programme under the direction of the NDRC was launched in 2006 and targets energy efficiency in China’s 1,000 largest enterprises. These enterprises are estimated to account for about one-third of China’s primary energy consumption, and include both energy producers and consumers.⁴⁷ The Top 1,000 Enterprises Programme covers nine sectors: iron and steel, non-ferrous metal, chemical, petroleum and petrochemicals, construction materials, textiles, paper, coal mining and power generation. In 2004 the 1,000 enterprises accounted for 33 percent of national energy consumption and 47 percent of industrial energy consumption. Under the plan provincial governments signed agreements with the NDRC stipulating each province’s share of the energy saving target under the programme. The provincial governments then signed a contract with each enterprise setting the energy to be saved. Initial results suggest significant savings in energy will be achieved by the target date of 2010.⁴⁸

The aggressive industrial policy applies especially to sectors that are high consumers of energy. In 2007 the NDRC announced a programme to close inefficient producers in the cement, aluminium, ferro-alloy, coke, calcium carbide and steel sectors. The target was to decommission 250 million tons of outdated cement capacity by 2010, and in the pig iron sector to remove one hundred million tons of capacity and steel by 55 million tons.⁴⁹ Many industrial sectors in China are highly export-oriented and some of these are high-energy users. It has been government policy over a number of years to try and reduce reliance on such export sectors. In 2006 the government announced reductions in export Value Added Tax rebates across a wide range of high-energy using and polluting sectors. China imposes export taxes on certain products that are energy intensive in order to discourage their export. These include fifteen percent duty on exports of refined copper, nickel, aluminium and other metals, ten percent duty on steel products and five percent on petroleum, coal and coke.

6.5 Transport

Transport will be a key element of emissions policy. China's transport sector has been growing enormously. The Chinese government is taking steps to address the issue. Unlike in the EU, fuel prices in China are not freely determined by the market. For many years, prices for petroleum products have been set well below international market prices. But China has now adopted a policy of raising prices for fuel and bringing them more into line with international price movements.⁵⁰ At the same time, tax policy is used to direct vehicle sales. Cars with an engine size of four litre or more are taxed at a rate of twenty percent, while those with engines of under one litre are taxed at one percent.⁵¹ China's government R&D programmes support development of new vehicle technologies such as hybrids.

7. The EU Policy

The EU has had a significant policy climate change for much longer than China. The EU began taking action on climate change at an early stage, and has claimed a position as an international leader in mitigation efforts. The EU has entered into international agreements that have placed binding obligations on it. The EU has developed policies that deal directly with climate change, while others also impact the issue. Like China, in addition to concerns over climate change, the EU is faced with the question of energy security, which has been a stimulus to addressing energy efficiency. Under the Kyoto Protocol, EU Member States were subject to binding emissions reduction targets. The EU was required to reduce GHG emission to eight percent below the 1990 level by 2008-2012, and the EU was thus forced to adopt measures to achieve these targets. Thus, unlike China, targeting of emissions has important to climate change policy in Europe.

The European Climate Change Programme was launched in 2000 to coordinate policy on climate change, and has been central to the EU's efforts to address the issue. As in China, policy on climate change has number of disparate elements, some of which do not necessarily directly address

climate change, but do have a mitigating effect. Over a number of years, the EU has adopted a wide range of measures addressing energy conservation and climate change. The main plank of this EU approach to emissions reductions has been the adoption of the ETS. The EU has pioneered the adoption of emissions trading, an approach which China has yet to adopt. The ETS, which came into operation in 2005, covered 11,500 major emitters of GHG accounting for about half of the EU's emissions. In addition to the ETS the EU has also adopted a number of other measures that impact GHG emissions. The Integrated Pollution Prevention and Control Directive, which sets out requirements on approval of industrial plants, including their energy efficiency and emissions, requires that operating permits must be based on best available technology. Like China, the EU seeks to promote the use of renewable energy sources. The EU has also adopted measures to promote renewable energy production.⁵² The RES-E Directive of 2001 set an indicative target of 21 percent of EU gross electricity consumption from renewable energy sources by 2010. The EU has also adopted biofuels as a means of reducing GHG emissions in transport. In 2003, the Commission set a target of a 5.75 percent share for biofuels by 2010⁵³ and the EU has a biomass action plan that seeks to increase its use from 69 million tons of oil equivalent (Mtoe) in 2003 to 150 Mtoe in 2010.⁵⁴ The EU's Energy Efficiency Action Plan set a target of reducing energy intensity by one percent a year.

Transport is an important contributor to GHG emission in Europe and the EU had targeted the sector in its efforts to address climate change by adopting an agreement that requires car manufacturers to reduce CO2 emissions of their vehicles to 140 g/km by 2008/2009, or by 25 percent from the mid-1990s. Energy use in buildings accounts for significantly more energy demand in the EU than in China. The EU has targeted energy efficiency of buildings. Like China, the EU has adopted energy labeling of products, although much earlier. From the 1990s, the EU began energy labeling to domestic appliances. More recently it has adopted measure to promote energy efficiency of products.

In 2008 the EU adopted a Climate Action and Renewable Energy Package that is more ambitious in its goals, targeting a twenty percent fall

GHG emissions by 2020 compared to 1990 levels, an increase in the share of renewable energy sources to twenty percent and a twenty percent cut in energy consumption from the levels projected for 2020. If other developed nations commit to comparable goals, then the EU will set a target of a thirty percent reduction in GHG emissions.

The most important element in the Package is a strengthening of the ETS. Emissions permitted under the ETS will be reduced by 21 percent by 2020 and the system will be reformed so that a single EU cap on emission is set, and the free allocation of emissions which had existed previously will be phased out and replaced by auctioning of permits. There will be targets for emissions reductions by sectors, such as transport, housing, agriculture and waste, which are not included in the ETS. In the case of these sectors, there will be national targets that take into account the level of development of Member States. The more developed Member States will be required to achieve a 20 percent reduction in emissions, which the least developed will be permitted a 20 percent increase in emissions. The renewables target will also be achieved by binding national targets which will also vary in accordance with the conditions of each country. The Package also seeks to promote CCS, which seen as a key element in dealing with emissions. Also included in the Package are tougher binding emission standard targets for cars. The long-term target will be emissions of 95 g CO₂/km by 2020.

8. Different approaches

The need to reach agreement at the Copenhagen Summit will require that the EU, China and other governments find agreement on tackling climate change. The EU and China have adopted different means to dealing with climate change, but both in their different ways have set ambitious objectives for the coming years, and the ends may eventually be the same. The contrast can be seen in the different mechanisms used to achieve the goals adopted. The EU has no equivalent of the economic planning mechanism that remains central to the Chinese economy. While it is true that action by the EU and the Member States to direct business activity has

been a part of efforts to tackle climate change, it certainly does not have the same dimension as in China, and focuses on market mechanisms through the ETS. China has no emissions trading scheme and has chosen other methods to reduce emissions, notably through energy efficiency targets, such as those imposed in the Top 1,000 Enterprises Programme.

The methods that the EU and China will adopt to achieve their objectives will continue to differ in many ways. Their domestic goals are indicative of the positions that each side may take in the negotiations leading up to the Copenhagen Summit. The EU has through the Climate Action and Renewable Energy Package and other documents set out its position in the open. China has set out a position on the lead up to the Copenhagen Summit. This position differs from that taken by the EU, but the seriousness with which climate change is now taken in China, and very dynamic policy changes that have taken place there, indicate that there is room to reach an agreement where significant steps to tackling climate change can be taken.

China has committed itself to strong targets on energy efficiency. There are signs that it is well on track to meet or exceed many of the targets which it has set itself. Even if targets such as that for energy intensity reduction are not met, the achievements attained will be significant. China has a strong interest in continuing its commitment to seeking energy and climate security. While participation in the international process will be part of that commitment, the domestic policy process will be more important. Most of China's policy initiatives that affect climate change have come about without any direct reference to international frameworks, but have been driven by domestic policy needs.

It is likely that China's policy on climate change will be strengthened in the future as the government seeks to address energy and climate security. This is indicated by the fact that Chinese government is currently in the process of drawing up a stimulus plan for the energy sector, which will include industrial policy targets on renewable energy and efficiency.⁵⁵ The National People's Congress Standing Committee adopted a resolution on climate change in August 2009.⁵⁶ The current 11th Five Year Plan will come to an end in 2010, and the process of drafting its replacement will be

commenced. Significant reports from leading institutions have been issued which call for the adoption of stronger targets for a path to a low-carbon future.⁵⁷ At the moment the targets they advocate go significantly further than existing government policy, but their thinking will undoubtedly influence the formulation of future action and economic plans. China's domestic policy priorities will continue to inform its stance on international cooperation on climate change.

It is unlikely that China will accept onerous burdens as part of any international agreement, but national interest will ensure that climate change will remain at the centre of policy priorities, and that the government will continue to set ambitious targets in this area. In formulating its approach to China in the run up to the Copenhagen Summit, the EU will have to carefully consider the policy dynamic in China. While the EU has high expectations for its own leadership role in addressing climate change, China does not see itself as a laggard in its own efforts. Harnessing China's domestic policies in an international framework will benefit all sides in the negotiation.

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