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China's capacities for mitigating climate change

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Contents

Abbreviations

ADB	Asian Development Bank
CASS	Chinese Academy of Social Sciences
CDM	Clean Development Mechanism
CMA	Chinese Metereological Administration
DNA	Designated National Authority
DAC	Development Assistance Committee
ERI	Energy Research Institute
EU	European Union
GONGOs	Government organised non-governmental organisations
GHG	Greenhouse gas
GDP	Gross Domestic Product
IDA	International Development Assistance
MOFA	Ministry of Foreign Affairs
NCCCC	National Coordination Committee on Climate Change
NPC	National People's Congress
NDRC	National Reform and Development Commission
NGOs	Non-governmental organisations
OECD	Organization of Economic Cooperation and Development
SEPA	State Environment Protection Agency
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States

Summary

Economic growth and structural change have turned China into the second largest emitter of greenhouse gases in the world. The country has no international commitments to reduce its emissions, but it has developed domestic policies and climate-relevant capacities which do have mitigative effects. Economic and political reforms have supported capacity development. However, so far China’s climate-relevant actions have not been influenced by climate considerations. Potential emission reductions are mainly a by-product of measures embedded in energy and transport policies aimed at cutting energy costs and increasing energy security.

1 Introduction

The economic rise of China has given it not only a major role in the global economic, technological and political arenas but also a larger share of responsibility for averting dangerous climate change. The substantial absolute increase of China's greenhouse gas (GHG) emissions between 1990 and 2007 has been accompanied by impressive increases in per capita incomes and investment in science and technology, which may be seen as rough indicators for a country's problem-solving capabilities.

As China becomes an economic rival for industrialized countries, and with carbon emissions being assigned a price, at least for energy-intensive economic sectors in the European Union, two concerns are growing in the economic and environmental communities: economic actors fear that China may derive additional advantages from the fact that it has not made any formal emission reduction commitments; environmental actors are concerned that it will be impossible to limit global warming within a manageable range without emission reductions from China as well, even if industrialized countries succeed in achieving considerable reductions.

Developed countries bear the major share of historical responsibility for the accumulation of GHGs in the atmosphere, and they still account for 40 percent of global emissions. But their share is expected to decrease drastically in relative terms within the next 10 to 15 years. Already today, China is the second largest emitter in the world, with a share of 14.7 percent of global emissions, following the United States, with its share of 20.6 percent. The EU-25 rank third with 14 percent. Even viewed against the background of cumulative emissions between 1850 and 2002, China already ranks fourth, with a share of 7.6 percent, behind the US (29.3 percent), the EU-25 (26.5 percent) and Russia (8.1 percent) (Baumert / Herzog / Pershing 2005). More alarmingly, the latest World Energy Outlook 2006 estimates that China's emissions will more than double between 2004 and 2030 and that China will overtake the US as the world's largest emitter before 2010 (IEA 2006). However, compared to many industrialised countries, China's per capita emissions remain relatively low.

This development is due to the sheer size of the country in terms of its population and high economic growth rates since the 1990s. China's economic rise is taking place at a time where crucial technological and organizational innovations are expected to materialize; these could help to overcome the energy crisis that is likely to result from dwindling reserves of fossil fuels. The earlier China joins the search for low-carbon development trajectories, the better not only for global climate but also for China's long-term energy security and the competitiveness of the Chinese economy. From the perspective of climate change, this coincidence increases the probability that development patterns in China will be oriented towards these innovations and not reproduce the energy-intensive "new world" pattern exemplified by the United States, Canada, Australia and New Zealand (Baumert / Herzog / Pershing 2005). In so doing, China would become an important actor in energy-related research and development, as its application markets are potentially very large.

But it must not be seen as a given that China will embark on a low-carbon development path. The country will have to face the end of global oil reserves in 40 to 60 years time, and this represents a strong incentive for it to develop alternative fuels for transport. However, China belongs to the group of six countries (US, Russia, India, Australia and

South Africa) which hold 81 percent of global coal reserves. These reserves are expected to last for more than 160 years, which means that coal will be a fixed element in the Chinese fuel mix, especially as far as electricity generation is concerned (Baumert / Herzog / Pershing 2005).

The international climate regime offers few incentives likely to lure China onto a low-carbon development path. China has ratified the United Nations Framework Convention on Climate Change (UNFCCC), which requires all parties to implement measures to mitigate climate change (Article 4.1), but it has repeatedly objected to quantified commitments under a post-2012 climate regime. In the debate on possible approaches to the further development of the climate regime, reference has repeatedly been made to the importance of policies and measures geared to sustainable development on national level (Bradley / Baumert 2005; CCAP 2006). These can be seen as a first step towards commitments on the international level, which could first be voluntary in nature and eventually become part of a package of binding commitments. Another approach would be to use the stage of voluntary policies and measures (and the quantification of their contribution to emission reductions) as an option for postponing the stage of legally binding international commitments.

In any case, climate-relevant national policies and measures are an important learning ground for policymakers, government advisors, research and development, economic actors and civil society. It is here that public administration, the private sector and civil society learn to negotiate, to integrate global issues into national priorities, to innovate and to include lessons learned about energy intensity, new energy technologies etc. elsewhere into their own strategies for future development.

We ask in this article what mitigative capacities China has developed and to what extent these capacities have been utilized to influence sectoral policies that are responsible for generating most GHG emissions. We also ask whether existing instruments for policy coordination are effective as regards the mainstreaming of mitigation objectives. The analytical framework we have used is introduced in Section 2. We start out by analysing Chinese climate-relevant policies (Section 3) and turn then to the structural framework conditions which influence China's climate capacities (Section 4) and the country's main climate actors (Section 5). Finally, we will draw some conclusions on the actual utilization of climate capacities in China (Section 6).

2 Climate capacities

Building on the concept of *capacity development in environment – CDE*, elaborated by the Development Assistance Committee (DAC) of the Organisation for Economic Cooperation and Development (OECD) in the aftermath of the Rio Earth Summit in 1992, we define climate capacity as the ability of individuals, groups, organisations and institutions to address climate issues as part of a range of efforts to achieve sustainable development (OECD 1995). Looked at from a national capacity-needs perspective, climate capacity assumes four dimensions: (i) climate science and assessment, (ii) formulation of climate strategies and policies, (iii) their implementation, and (iv) international climate negotiations (Sagar 2000). In this paper we focus on the capacities relevant for the formulation of national climate policies and their implementation. China

has also developed considerable capacities in international climate negotiations and in the climate sciences, but these are analysed in this paper only to the extent that they relate to domestic policies.

It is possible to differentiate between adaptive and mitigative capacities. This paper refers to mitigative capacities since it focuses on how China can, at the same time, mitigate GHG emissions and sustain its economic development.

Efforts to address climate change require specific capacities and affect many areas of public policy. Climate capacities partly overlap with general environmental capacities. Therefore, we can differentiate between climate-specific capacities, which may influence other policy areas but mainly aim to fulfil climate objectives, and climate-relevant capacities, which are sometimes referred to as non-climate capacities. Climate-relevant capacities are developed for reasons other than the need to address the climate change problem and implemented in different sectors, for example energy, transport, agriculture and forestry, although they may have significant impacts on the success of climate actions or policies (Willems / Baumert 2003, 17). Climate-specific and climate-relevant capacities are interdependent.

According to the OECD (1995), climate capacity can be assessed on three different levels: the individual level, the organisational or institutional level and the systemic level. The individual level concerns all relevant actual and potential actors, e. g. policymakers, negotiators, the private sector, and local population. Therefore, individual climate capacity depends on the availability, the skills and the performance of human resources. Climate capacity at the organisational level focuses on overall organisational performance and management capacities. Climate-specific capacities on the organisational level include, for example, the existence of an organisation with a specific mandate on climate change or of a specific climate "unit" within organisation. The systemic level focuses on the creation of "enabling environments", i. e. the overall policy, economic, regulatory, and accountability frameworks within which organisations and individuals operate. Relationships and processes between organisations, both formal and informal, as well as their mandates, play an important role in this regard (CDI 2000, 2).

In our study we use a somewhat different framework based on the approach of Environmental Capacity proposed by Weidner and Jänicke (Weidner / Jänicke 2002). We differentiate between the actors or proponents of climate policy and their resources (i. e. we merge individual and organizational capacities) on the one hand and on the other the systemic context, which is constituted by the structural framework conditions needed for an effective climate policy.

Following this framework, the relevant actors are those who carry out tasks or functions related to climate change management and participate in the climate policy process. These include individuals, formal organisations, informal institutions, and networks of organisations (OECD 1995, 25). Their participation and the development of capacity depend on the strength, competence, number, organisation, actor constellations, personal will and skills, but also on the structural framework conditions given. Competing claims and interests of the different actors responsible for climate-related policies have important ramifications. Their resources are inputs used by actors to build climate capacity. They may be human, informational, financial, technological and ecological.

The systemic context describes the long-term framework conditions for climate action and therefore the opportunity structure of climate actors. It comprises three dimensions:

— economic-technological (i. e. the structural features of economy and society as well as the availability of climate-relevant economic, financial and technological resources);

— political-institutional (i. e. governance arrangements, administrative structures and procedures as well as climate-related policies and laws which influence participation and the coordination of policies and activities of public administration and other relevant actors); and

— cognitive-informational (i. e. the existence of climate-related information and the degree of public concern about climate problems).

To analyse China's climate capacity, we evaluate how these framework conditions influence the opportunity structure for climate actions, i. e. whether they limit and impede, facilitate, or even incentivise climate actions.

The actual use made of existing capacity depends on a variety of factors. What is decisive on the level of actors or proponents of climate actions is the quality and quantity of human resources as well as their strategies, will and skills. Only with sufficient and skilled personnel is it possible to undertake climate-specific actions, e. g. the key factors include the design and implementation of climate policies and measures as well as active participation in international negotiations. The same applies to mitigative actions in climate-relevant sectors such as energy, transport, agriculture, forestry, industry, R&D, the economy, finances, and education (Willems / Baumert 2003, 18). One specific indicator for the utilization of climate capacities is the elaboration and implementation of a climate strategy, i. e. a systematic plan of action to approach the climate problem. The strategic plan will include the application of instruments and efforts to tap opportunities to achieve goals previously determined. It thus indicates how actors intend to use their capacities and their resources within the systemic context.

Still on the level of actors and organisations, it is important that the climate objectives formulated are compatible with the other mandates of the organisation, its structures and processes, as well as its financial and human resources (Willems / Baumert 2003, 18).

On the systemic level, capacity much more climate-relevant than climate-specific is required in view of the fact that effective climate capacity depends on the effectiveness of governance systems in general. Climate-relevant capacities are a condition needed to create climate-specific capacities and actions. An effective governance system requires instruments for policy coordination, rule of law and control of corruption.

Another indicator for effective capacity utilization is whether situative opportunities are exploited for the promotion of specific actions, thus overcoming hurdles put in place by structural conditions. Situative opportunities may be seen as a short-term variable stemming from events or sudden circumstances that suddenly create propitious conditions for otherwise difficult political decisions. For instance, environmental disasters such as floods or hurricanes can sensitise society and decision-makers, inducing them to undertake climate actions, whereas an economic depression may push environmental issues off the political agenda.

The need for climate capacity is country-specific, even though many similarities can be made out between the capacity needs of different countries. Country-specific conditions influence capacity building and lead to country-specific characteristics (Willems / Baumert 2003, 21). In this paper we study the case of China in order to identify the existing capacities constituted by the actors, their resources and the systemic context as well as to analyse the ways in which these capacities are utilized.

3 Climate-relevant policies in China

How has China responded to the threats arising from climate change? In this section we describe the main climate-relevant policy fields in China – energy, transport, and environment – as well as the degree to which climate-specific measures have been integrated into sectoral policies. In our analytical framework, climate-relevant policies serve as a two-pronged unit of analysis: they are both part of the political framework conditions and an outcome of the political process. In other words: they limit and reflect the actual quality and the uses made of climate capacities in China.

So far, the reduction of greenhouse gas emissions in China relative to the absolute growth of economic output has mainly been a by-product of measures embedded in energy and transport policies. The aim of these measures is to increase energy efficiency and the share of renewable energies in order to cut energy costs and increase energy security. The main driving force behind these measures is the determination to overcome the negative effects of energy scarcity on economic growth. China pursues a "no regret" strategy for climate policy, choosing measures consistent with its economic development goals.

In this section we analyse energy and transport policies because they represent the main sources of GHG emissions. We also look at environmental policies, which are relevant for two reasons: First, the ultimate objective of climate policy is protection of global ecosystems, and it is thus directly related to the overarching goal of any national environmental policy designed to protect national ecosystems and the economic, social, cultural, and ecological services they provide. Second, environmental policy has many interfaces with energy and transport policies that hold a large potential for synergies between mitigation policies and specific environmental programmes, e. g. to reduce air pollution.

(a) Energy policy

Energy policy is central for economic growth, and at the same time, energy generation is the main source of Chinese GHG emissions. Since 1998, the increase of China's energy supply has been complemented by measures for energy conservation and efficiency. In its *11th Five-Year Plan for National Economic and Social Development* (2006–2010), the Chinese government committed itself to quadruple Chinese Gross Domestic Product (GDP) while only doubling energy consumption (Zhuang 2006, 3). Energy security is the plan's main concern, due to the impacts of energy shortages on the economy and the country's rising dependency on external energy sources.

China has implemented different measures in order to improve energy efficiency and decrease energy intensity (the ratio of energy consumption to GDP). China's first Energy

Conservation Law entered into force on January 1, 1998; its aim was to promote energy conservation activities. It requires provincial, sectoral and departmental levels to formulate implementing regulations. The law is very general, a fact that may have hindered its effective implementation (Yao / Li / Steemers 2005, 1976). Currently, the law is under review to improve its effectiveness. The *10th Five-Year-Plan for Social and Economic Development* (2001–2005) specified the goal of energy saving and defined quantified targets for energy conservation in cement and glass production, in newly built residential buildings and public works and for fuel consumption of vehicles (Hieber 2004). These targets, however, have not been met (Xinhua 2006).

Until 2002, China's percentage increase in energy consumption was lower in relative terms than its economic growth rate, which indicates efficiency gains. Since then, however, growth in energy consumption has been higher than economic growth (Pan et al. 2006, 18). This assessment is supported by an international comparison of energy consumption per unit of GDP: Chinese consumption is 2.4 times higher than the global average, 4.9 times higher than in EU countries, and 8.7 times higher than in Japan (China Daily 2006). These developments are due to the rapid expansion of energy-intensive heavy industries, e. g. cement, steel, and aluminium.

In 2006 the Chinese government responded to this situation, defining a very ambitious target to decrease the use of energy in the *11th Five-Year Plan for National Economic and Social Development* (2006–2010). One objective was to reduce the energy intensity of the economy by 4 percent by the end of 2006 and by 20 percent by 2010. To advance and monitor implementation, specific targets were set for provinces and industrial sectors. Energy efficiency improvement criteria were adopted to evaluate the job performance of local government officials. However, in the first half of 2006 China's energy intensity increased by 0.8 percent compared to the corresponding period in 2005, while it decreased again in the second half of the same year, and thus the net result is expected to be zero. Facing this situation, central government has used specific measures to increase pressure on local governments, and it published a list of provincial regions that have lagged behind in increasing energy efficiency. In 2006, 1,008 enterprises in nine major energy-consuming industries participated in an energy efficiency program. Export tax rebates on coal, natural gas and some primary wood products were abolished and tax rebates on steel, cement, textile and non-ferrous metal were reduced (Xinhua 2006).

One crucial factor that weakens the impact of energy conservation and efficiency policies is disproportionately low energy prices (Pan et al., 2006, 14/21). Although coal subsidy rates fell from 61 percent in 1984 to 11 percent in 1995, price controls on coal were removed and development of private coal mines was encouraged, energy prices have still not become an incentive for energy saving. Also, institutional reforms in Chinese energy industries and management have not been forceful enough to effectively introduce a more market-oriented approach in the energy sector, to improve its efficiency and competitiveness on the world market (OECD 2002, 610).

A qualitative change is starting to take hold in China with respect to the use of renewable energy, which until recently had been viewed as highly peripheral. In 2001, official specific goals were defined for the first time for the increased use of solar electricity and solar water heating, wind power, geothermal energy, and bioenergy, and by 2009, up to US$ 35 billion are earmarked for the development and production of renewable energy

equipment (NREL 2004; IEA 2000, 73). In 2006 the Renewable Energy Law came into force; it establishes renewable energy as a top priority in China's energy strategy. It is based on the "feed-in laws" which have successfully advanced renewables in Germany and other European countries. It aims to increase the share of renewable energy technologies (hydro, wind, biomass and solar) in energy production from the current level of one percent to ten percent by 2020. The law is expected to lead to increased use of small hydro-power stations as well as of wind and biomass capacity (Austin 2005, 19).

(b) Transport policy

The road transport sector is one of the fastest growing GHG emission sources in China, and motor vehicles are the major source of China's urban emissions (World Bank 1997, 103). Transport policy aims mainly at improving and enlarging China's road network and air transport capacities. While all modes of transport have increased in absolute terms, the relative market share of railways has decreased (Zhou / Szyliowicz 2006, 10). So far, efforts to reduce GHG emissions can be found only with regard to motor vehicle emissions.

The main motive behind these efforts has been the need to reduce urban air pollution because of the high health costs associated with exorbitant pollution loads and reduced labour productivity (World Bank 1997, 102). China has begun to address pollution at the national level through vehicle registrations and ownership regulations, but these are not properly enforced. Other efforts rely more on technical improvements than on alternative transport systems (SEI / UNDP 2002, 60).

Significant changes have been introduced in connection with the compulsory implementation of Euro standards for motor vehicles. In 2000 China stopped producing and selling leaded gasoline. In 2001 all new cars that entered the Chinese market were required to meet a Euro I emissions equivalent standard. In 2003 and 2004 diesel and gasoline vehicles were required to meet the Euro II emissions standard. In China's large cities Beijing and Shanghai, these standards have already been met. Since April 2006, Chinese consumers who buy large cars with engines larger than four litres are required to pay a consumption tax of 20 percent, while more efficient cars enjoy considerably lower taxes. This is a clear incentive to buy efficient and environmentally friendly cars (Li 2006). Another incentive is a subsidy for the replacement of old motor vehicles.

(c) Environment policy

The previous two sections have made it clear that climate policy concerns do not have a strong influence on the definition of energy and transport policies in China. However, environmental policy has important interfaces with these sectors: Efforts to reduce air pollution, for instance, may affect both taxes on motor vehicles and future policies regarding coal plants.

Since 1998 environmental policy has received greater attention and environmental institutions have been strengthened in China. The Chinese government has realised that short-term considerations and acceptance of environmental degradation for economic reasons is not sustainable, jeopardises stability and cannot maintain China's growth in the long run (SEI / UNDP 2002). Domestic environmental policy is increasingly being

integrated into the national economic policy framework. But environmental policy competes with economic development policy because in the short-term the costs of environmental protection measures are usually higher than the collective benefits which arise from the improved environmental situation.

China has enacted numerous specialised laws, regulations, procedures and initiatives on protection of natural resources and the environment, e. g. the Law on the Prevention and Control of Air Pollution of 1995 and the Environmental Impact Assessment Law of 2003. The *10th Five-Year Plan for National Economic and Social Development* (2001–2005) stated that sustainable development is the "guiding principle and strategy" for the country's economic and social development (Government of China 2001). The Plan contains several goals aimed at saving and protecting natural resources. Energy saving and development of new energy sources are considered to be important for national economic and social development. However, priority is still given to economic development and poverty alleviation. The *11th Five-Year Programme for National Economic and Social Development* (2006–2010) goes further and stresses that GHG emissions should be controlled, that the total amount of major pollutants discharged will be reduced by 10 percent, and that forest coverage will be raised to 20 percent of the national territory (Government of China 2006).

At present, the effectiveness of environmental policy is weak, and its potential to support mitigative measures is therefore not fully utilized. Environmental plans are implemented by means of administrative measures, i. e. bans designed to stop undesired activities and investment programs or campaigns to promote positive changes on the local level. Despite enormous efforts to improve the state of the environment, implementation on the local level of the actions proposed is weak due to lack of incentives and conflicting interests, which result in neglect of environmental activities. Environmental laws are very broad and do not provide local officials with specific guidance on implementation. In comparison with laws in the Western sense, Chinese laws must be regarded more as policy statements (Economy 2004, 101).

In sum, China's answer to climate change has been very limited nationally as well as internationally. External pressures generated by international negotiations on climate change have placed the issue of global warming on China's domestic agenda and forced the country to respond. However, as most of the important and influential Chinese actors in this process prioritize economic development, Chinese participation in international cooperation on mitigating climate change is quite limited (Hatch 2003, 44). Only recently China has developed an explicit climate strategy (Xinhua 2007).[1]

4 Structural determinants of China's climate capacities

The structural determinants of China's climate capacities are socio-economic and resource-related (e. g. high GDP growth rate, structural change and population size), political and institutional (e. g. governance arrangements and administrative structure) as well as informational factors. These factors provide the corridor for long-term action as

1 The strategy had not been published when work on the article was finished.

well as the opportunity structure for climate-relevant actors. The structural constraints for climate policy measures may be overcome through political strategies and through the exploitation of situative opportunities. Situative incidents provide a chance to raise awareness among the population and policymakers about the links between growth, climate change and its impacts, and they may thus give rise to climate actions.

(a) Socio-economic factors

With more than 1.3 billion people, China is the world's most populous country. Now that China is turning into one of the key players of the world economy, with growing shares of global production and consumption, the sheer size of its population is producing strong impacts on global environmental services. Economic growth, structural change and integration into world markets were unleashed by the post-1978 reforms, which transformed China's centrally planned economy into a market-based economy (Prasad 2004 as well as Messner / Humphrey and Altenburg / Schmitz / Stamm in this issue). Its economic growth is mainly built on China's booming manufacturing sector, which ranks fourth in the world after the US, Japan and Germany and produces a whole range of goods, from textiles to electronic equipment. It is expected that by 2015 China will be the world's largest automobile producer (Li 2006, 5).

Structural economic change in China led to high economic growth rates (above 7 percent between 1992 and 2004), growing incomes and a higher urbanisation rate (Prasad 2004); (World Bank 2005, 64); (Dayong 2004). These trends have resulted in drastic increases in energy demand.

As China's energy consumption continues to rise, GHG emissions are expected to increase in the future, because almost 90 percent of China's CO_2 emissions are due to energy use. Today, China is the second largest global energy consumer after the US, but also the second largest energy producer in the world. Estimates indicate that China's total primary energy consumption will more than double between 2000 and 2020 (World Bank 2006, 50). It is expected that if China succeeds in quadrupling its GDP, without achieving drastic improvements in energy efficiency, energy use will increase by 70 to 130 percent. These figures underline how ambitious the goal set by the 11th Five-Year Plan in fact is (see Section 3). Per capita energy use, however, is low compared to international standards. It is equivalent to about half of the world average and only 10 percent of the per capita energy use in the US (SEI /UNDP 2002, 55).

China is the world's largest emitter of industrial GHG emissions (Baumert et al. 2005, 69). Chinese industry currently consumes 70 percent of energy, and industrial energy consumption is rising by 4.2 percent annually, i. e. faster than the 3.9 percent annual growth rate of overall energy consumption (Sinton et al. 2005, 10). In second place is the domestic sector, which reaches about 10 percent of total energy consumption, followed by transport with 6 percent. China's increasing urbanisation will also contribute to increasing energy demand, because in rural areas, where more than 60 percent of total population live, energy consumption is still low (Bang / Heggelung / Vevatne 2005, 13). Between 1977 and 1997 China's energy intensity declined about 60 percent (Chandler et al. 2002, 13). However, in absolute terms it is still very high and has even increased since 2002.

China's own resources are not sufficient to cover its energy demand, and the country will depend more and more on energy imports to maintain and expand its economy. Moreover, it is expected that more energy-intensive industries will move to China. This will cause higher pressure on energy supply and resources, and it will further increase GHG emissions (CCICED 2004, 167ff).

In today's China, almost 70 percent of energy generation depends on coal. The dominance of coal in China's energy supply is explained not only by the country's large domestic deposits but also by coal's superiority over other energy sources in terms of cost, time, reliability, controllability and the sales potential of oil in international markets (Hatch 2003, 46). Coal releases almost twice as much CO_2 per unit of energy as natural gas and causes air pollution through sulphur and other particulates (Chandler et al. 2002, 13). Between 1980 and 1999, China's coal consumption increased by 173 percent (Shi / Su 2001, 2). Between 1993 and 2004, China developed from one of the world's largest exporters of coal to an importer of oil in order to meet its energy demand. According to Zhou et al. (2003), in 2020 coal will account for 54 to 65 percent of China's primary energy use. Renewables will play only a minor role for primary energy use. These calculations point to growing increases in GHG emissions.

The transport sector is another key user of energy. Transport activity has surged in the last ten years and the transport sector's share of energy use has doubled. Oil will thus play a more important role in China's future energy mix due to its growing use in transport. Before economic reforms, networks of airlines, trains and busses were weak and used only by few vehicles. But today China's transport infrastructure is in urgent need of improvement if it is to maintain the country's development efforts, and the choice of transport infrastructure will determine the sector's GHG emissions for decades to come (SEI / UNDP 2002, 58).

China's integration into the world economy also entails the opportunity to achieve quicker improvements in technology, scale and structure, as it exposes the industrial sector to more competition and increases its openness for foreign investment. This will enhance productivity as well as energy and resource efficiency in general, which could lead to environmental benefits and reduce GHG emissions. But the positive effects reached by a reduction of environmental pressure per unit of output could be undermined by the pressure created through absolute increases in output.

(b) Political and institutional factors

Political and institutional framework conditions form the opportunity structure of Chinese climate actors and are important determinants for the utilization of climate capacity. They provide "the rules of the game" which determine both chances and restrictions for climate actors in China. The main elements are administrative structures, rule of law, corruption control, participation, and policy coordination.

China is a centralised state with a strong hierarchy, including provinces, cities, counties, and towns. Still, decentralisation has been initiated, with local governments gaining autonomy and power in connection with economic reforms. Yet the central government still retains control over e. g. the appointment, transfer or dismissal of provincial leaders (Schwartz 2004, 29). However, central government has far less influence on the provinces

than one would expect. Local governments have been granted considerable economic and financial power and they have a certain authority over local industries and financial resources on the local level (SEI / UNDP 2002, 68). Provincial, municipal, township and village governments as well as local environmental protection offices have assumed greater responsibility for environmental protection and resource management.

This degree of local political autonomy, together with China's size and complexity, make it difficult for central government to oversee the course of actions on the local level. Often, local officials are overwhelmed by their tasks because they lack training and access to new laws and regulations and the capacity to interpret and implement laws (SEI / UNDP 2002, 78). In addition, China's reforms have strengthened profit orientation in the industrial sector, and economic growth has entailed adverse environmental impacts. Local governments thus face a conflict between economic and environmental aims and usually give priority to economic development of their region, postponing environmental recovery to the future.

Efficient division of labour between different administrative levels is closely related to the rule of law. In the Chinese tradition, laws were not understood as binding parameters governing the behaviour of public administrations and individuals. Since 1979, the Chinese government has tried to change the tradition of arbitrary decision-making by gradually separating the lawmaking process from the political agenda in order to develop the rule of law. Before the reform process started, decisions were taken by influential or respected individuals rather than on the basis of laws or regulations. Networks of informal relationships played an important role here. Today China has a comprehensive set of rules and laws, especially in the environmental sector, but traditional behaviour needs time to change. Many decisions are still taken by individuals with a view to short-term and profit-orientated considerations and without heed to the law. Environmental problems in particular are often a consequence of profit-oriented actions that run counter to the legal set-up (SEI / UNDP 2002, 67).

The power of individuals creates opportunities and even incentives for corrupt behaviour. According to the Corruption Perception Index, corruption has increased, and by comparison with the rest of the world, China fell from rank 71 in 2004 to rank 78 in 2005 (ICGG 2005). Just recently, the director of the State Environment Protection Agency (SEPA) complained that a government investigation into pollution control approvals for construction projects worth more than US $12.5 million had found violations in almost 40 percent of cases (Lague 2006).

Still, the influence of individuals on policy implementation has been slowly undercut by the effects of the reforms. Environmental law is now implemented more effectively, and environmentally harmful decisions and obvious misconduct can be prosecuted (SEI / UNDP 2002, 68). The increasing number of legal cases involving environmental matters may be cited in support of this. In general, the number of commercial litigation cases, lawsuits against the government, and civil lawsuits has increased exponentially, and class action suits against local officials have become a popular means of obtaining redress against corrupt local officials (Economy 1998, 16).

Not only have local governments gained power, public participation in China has also increased significantly. Since the 1980s, village-level elections and elections of National

People's Congress (NPC) deputies and township governors have taken place (Ye 2003, 10). Aware of the fragility of their positions, politicians have neglected further democratic reforms. Public participation has also increased through greater participation of research, media and NGOs in the political process. In recent years, NGOs and research institutions have gained more independence, and their increased participation in international networks has contributed to their development into impartial advisers. Media coverage of environmental issues has been encouraged by the government, and the government has even endorsed the establishment of NGOs (SEI / UNDP 2002, 71).

Participation of non-governmental actors in Chinese policy-making has been poor, but it is increasing, with the government undertaking a number of limited political reforms on different levels in order to ensure social stability.

Policy coordination is still a major challenge for China's climate policy. Before environmental and sustainable development considerations entered the political agenda, China was quite successful in dealing with single sector measures due to its strong centrally planned vertical power structure, with many ministries and agencies aiming to boost production. But this structure was not functional when it came to addressing cross-sectoral problems such as environmental deterioration and climate change. With the reforms, China loosened its grip on some old sectoral strongholds. It abolished production-oriented sectoral ministries or added sustainable development or environmental units to them. In the wake of the 1998 government reform, institutions with cross-cutting responsibilities in the area of environment and sustainable development were developed or strengthened (for more details, see Section 5). The main coordination body for climate policy is the National Coordination Committee on Climate Change (NCCCC). Its members are the National Reform and Development Commission (NDRC), the Ministry of Foreign Affairs (MOFA) and thirteen other ministries and agencies. The NCCCC is chaired by the NDRC. Yu (2004) classifies policy coordination in the case of climate change as comparatively well developed, and states that scientific knowledge plays a strong role both in (re)defining sectoral interests and in coordinating policies.

(c) Informational factors

The third and last determinant of China's climate capacity and governance must be seen in informational factors. In this paper, we consider public awareness to be the main element of the informational opportunity structure. In China, the communicative and informational capacities that shape public awareness are weak and very limited. Public statements and positions regarding all policy issues, including climate change, have to be coordinated with central political institutions. Scientific results and findings are taken very seriously, and some observers believe that it is the political will of the Chinese leadership to boost academic knowledge and raise awareness on climate issues, in particular to pave the way for climate measures (Nordqvist 2005, 21).

About five years ago, public awareness of environmental issues, including climate change, was very low in all parts of China. Chinese thinking saw nature as a good that only serves the purpose of exploitation (Economy 2004, 55). But this is changing thanks to more active media and support of the government for public debates on this issue (SEI / UNDP 2002, 48). Because they are better educated, urban people are better informed than people who live in rural areas, and the existence of non-governmental networks has placed them

in a better position to express their views. In rural areas, which are much more affected by environmental problems, knowledge levels are very low (SEI / UNDP 2002, 72).

The strong influence of the government on NGOs and the media and the present lack of sufficient numbers of environmental experts and persons with environmental knowledge indicate, first, that China lacks public awareness and knowledge of the climate change problem and, second, that the state largely controls the ways in which society interprets the problem. Therefore, the absolute influence of public awareness on the initiation of a policy process is estimated to be relatively low.

However, situative events with far-reaching implications, such as environmental disasters, energy shortages and the political will to host the Olympic Games in 2008, have sharpened the environmental awareness of Chinese society and consciousness of the tense energy situation. These events have pushed society and decision-makers to undertake climate-related actions, and, in the case of the Olympic Games, they even have forced China to commit to certain environmental standards. Environmental disasters have demonstrated existing vulnerability for these occurrences and provoked civil society to demand that policymakers take protection measures. Energy shortages have a potential to sensitise the government, industry and individuals to the economic impacts that energy insecurity can have.

5 Climate actors

The second main determinant of China's climate capacities is the country's climate actors, their strength and competence. These capacities can be assessed on both the individual and organisational level.

In China, climate policy has not diffused much beyond central policy-making bodies, and the core group of relevant policymakers and experts is quite small. Unsurprisingly, governmental actors are the strongest actors within this group. They are organised in the NCCCC, in which NDRC and MOFA take the lead. The influence of non-governmental actors and external actors, i. e. the science community, civil society, media, and donors, is restricted because the systemic framework conditions do not leave much scope for independent action. However, with increasing efforts related to economic reforms and the growing awareness about the latent power of these actors, China has granted them more influence and leeway. Privatization has deprived actors from the private sector of some of the direct linkages with the centre of political power they once enjoyed.

(a) Governmental actors

In China, climate policy is viewed not mainly as an environmental problem but as a policy field with high external and economic significance. This is reflected in the actor structure of this policy field. In 1998, when it became clear that climate change involves not only scientific analysis but also policy changes, especially in the area of economics and energy, the responsibility for climate change issues was moved from the China Meteorological Administration (CMA) to the NDRC. Since then, the central and most influential governmental actors in Chinese climate change policy-making have been NDRC and MOFA.

NDRC is one of the most important and influential institutions in the Chinese political system. It is a macro-economic regulatory department mandated to develop national economic strategies and long term economic plans, and it relies on generous human, political and financial resources for fulfilling its mandate. NDRC is also China's Designated National Authority (DNA) for the Clean Development Mechanism[2]. The Commission's priority is to maximise economic development. From the beginning, the Commission's position was very sceptical towards scientific concerns regarding the causes and impacts of climate change, and it opposed any commitments not in line with economic growth, e. g. GHG emission reductions. NDRC's attitude towards climate change impacts and China's vulnerability has changed, but it still rejects the acceptance of mitigation commitments (Bjørkum 2005, 43). NDRC has also played a key role for energy policy since its Energy Bureau took over responsibility for all energy issues in China. Since then, climate and energy issues have been concentrated in the same institution. The Energy Research Institute (ERI) is subordinate to the NDRC, and it is a powerful player in modelling future energy demand and likely GHG emissions as well as in elaborating policy instruments for emission reductions.

The Ministry of Foreign Affairs (MOFA) is in charge of international climate diplomacy. The ministry has established China's contact office and focal point for the UNFCCC. It coordinates China's delegations to UN climate change meetings and is the lead agency in negotiations on the international climate change regime. In the international arena, it has been China's priority to ally with other developing countries and to speak with one voice. MOFA's position in international negotiations has always been defined by concerns related to economic development, energy security and the protection of sovereignty (Bjørkum 2005, 43). MOFA has therefore always concentrated on preventing the imposition of emission ceilings and maintaining a narrow understanding of the principle of differentiated responsibilities (Hatch 2003, 50).

NDRC and MOFA are also the most important actors in the NCCCC, China's highest climate policy-making body. It consists of 15 bureaucratic units dealing with climate-related policies and activities; it is chaired by NDRC.[3] The committee members are vice-ministers, deputy director generals of the ministries, state commissions or administrations (Nordqvist 2005, 11f). In 2004 a team of Chinese officials and experts led by NRDC produced the National Communication on Climate Change of the People's Republic of China under guidance of the NCCCC (Government of China 2006).[4] Furthermore, NCCCC has initiated the process to draft the national strategy dealing with the causes and impacts of climate change. SEPA's influence in NCCCC is thought to be quite weak

2 The Clean Development Mechanism provides for industrialized countries that are obliged to reduce emissions to implement project activities that reduce emissions in developing countries, in return for certified emission reductions.

3 Other units are MOFA, Ministry of Science and Technology (MOST), CMA, SEPA (deputy chairs), and the Ministry of Finance (MOF), Commerce (MOFCOM), Agriculture (MOA), Construction (MOC), Communications (MOC), Water Resources, State Forestry Administration (SFA), Chinese Academy of Sciences (CAS), State Oceanic Administration (SOA), and Civil Aviation Administration of China (CAAC).

4 The UNFCCC stipulates that every party to the convention has to produce and submit national communication reports. The document that China submitted provides information on the country's 1994 GHG emissions inventory and on the steps that China has taken to address the challenge of climate change.

because the institution is always confronted with the interests of strong sectoral ministries and the NDRC, which assigns lower priority to climate protection (Bjørkum 2005, 44). Yu (2004) interprets SEPA's weakness regarding climate policy as caused by its failure to create specific capacities in this area.

Unlike the case in most other countries party to the UNFCCC, in China climate and environmental policies are not administered by the same agency. The institutional arrangements and relevant actors for climate and climate-related policies differ from those in general environmental policy because climate change is viewed as a cross-cutting international issue with a strong bearing on economic development and foreign affairs (Lee 2005, 149). For these reasons, SEPA, the administrative department in charge of environmental protection, only plays a marginal role in climate-related policies. Officials from this agency seem to be more open for actions that limit GHG emissions than representatives from other departments (Hatch 2003, 49).

Even though national level governmental actors dealing with climate-related policies are strong, this does not mean that they have strong control over the implementation of these policies on the provincial or local level. On the contrary, central state influence here is weak, and due to a lack of incentives and conflicting economic and environmental interests, activities promoting energy efficiency, and thus also emission reductions, are often neglected.

(b) Non-governmental actors

Besides governmental actors, non-governmental actors have great potential to play a larger role in China's climate policy. There are many non-governmental actors from different sectors (e. g., science, industry, NGOs, media, donors). Even though they have a certain climate capacity, their influence is limited. At present it is the science community, and especially think tanks close to the government, that play the most important role among the non-governmental actors.

In China, research institutions and academic organisations are closely related to governmental agencies. They are usually non-profit organisations that provide services for government and society, and they often succeed in influencing the work of public administration (OECD 2005, 524). Since China's involvement in the international preparations for the climate convention in the late 1980s, national research and research communication strategies have changed and activities related to climate change science have increased. By 1989 China had put together a large climate change research programme based on 40 projects and involving twenty ministries and 500 experts. The programme was supported financially by international donors. But in 1998, when the lead in the negotiations moved from scientific, environmental and technological ministries to MOFA and the SPC (later NDRC), scientific research has become less important and the influence of the international community has diminished (Economy 2004, 183).

The science community that deals with climate issues can be divided into two groups. On the one hand, there are scientists who are concerned with the natural sciences of climate change and technological advances and solutions to address climate change. This is the more numerous group, while political scientists, sociologists etc. involved in research on climate policy issues are rare.

Scientific research on climate change is more or less far removed from political leaders, and exchange between the two areas is concentrated on issues such as the development implications of climate change. The centre of climate research is the Chinese Meteorological Administration (CMA) in Beijing, but research on climate change science and technologies is carried out countrywide by meteorologists, physicists and engineers at different universities.

Due to its foreign policy component, climate policy research is centred in Beijing, close to policymakers. There are very few researchers involved here. Most research institutions are related to the leading bodies of the NCCCC. The two key institutions that conduct climate policy research and advise the government on climate issues are the Energy Research Institute (ERI), which is affiliated with NDRC, and the Research Centre for Sustainable Development at the Chinese Academy of Social Sciences (CASS), which operates under the State Council. There are only a few other important academic institutions that conduct research on climate policy, e. g. the Chinese Academy for Agricultural Science, Tsinghua University and to some extent Peking University (Nordqvist 2005, 13).

Another important group of actors is to be found in the private sector. The energy and energy-intensive industries (e. g. steel, cement), which are major polluters, are important players in climate policy. In the past, the leaders of the major state-owned energy companies played an important role in determining the policies and plans for their respective industries. They fulfilled at the same time the functions of government and enterprises. In 1998 the Chinese government initiated reforms aimed at progressive corporatisation and disaggregation of the sector. These reforms have changed the access of these executives to the centres of political power (Andrews-Speed 2005, 17). Central government and the energy-intensive private sector will have to introduce new forms of consultation and cooperation in order to negotiate the pace and direction of change towards more energy efficiency, a larger share of renewables and implementation of Clean Development Mechanism (CDM) projects. This will not be easy because China’s industry consists to a large extent of small-scale rural industries that operate in a horizontal structure characterised by ties of dependency and loyalty between individual business and local authorities. Since climate policy issues are not much debated outside central government, climate performance is still a non-issue for most industry actors (Nordqvist 2005, 13).

In general, civil society in China is seen as a relatively weak actor whose political space is constrained and that is limited in its ability to influence the state. Chinese NGOs are divided into GONGOs (government organised NGOs), which receive governmental resources, and grassroots NGOs, which are more independent and do not rely on governmental financial support (Lu 2005, 2). The development of NGOs in China has been difficult due to certain administrative regulations that govern their operation and activities. In particular, constraints in registration procedures cause frustration among NGOs (Schwartz 2004, 42f). About 2,000 registered environmental NGOs exist in China, but it is estimated that there are about 100,000 environmental groups that refer to themselves as non-profit enterprises or university student environmental groups in order to avoid the tedious NGO registration process (Siarnacki 2006).

China's environmental NGOs are not only constrained by government restrictions but also by lack of funds and human resources. Since climate policy has a strong foreign policy

focus and Chinese NGOs avoid challenging central policy, they are not significantly involved in climate change issues. International NGOs and GONGOs, however, are involved in climate change issues (Economy 1998, 16). ERI and CASS are two prominent examples for GONGOs that have an excellent research capacity (Nordqvist 2005, 16).

Still, environmental NGOs enjoy the advantages of a special relationship with SEPA, which serves interests on both sides. Local NGOs have become active as a watchdog over local officials' practices and thus increase SEPA's information base and scope. Government has realised that environmental political activism helps to attract funding, training and technology transfer from abroad, and it therefore allows it to occur. At the same time, government closely monitors these activities in order to ensure that they do not at the same time serve as a catalyst for challenges to the regime (Economy 1998, 20).

In recent years the media has taken an increasing interest in the environmental situation, and environmental reports, including climate change and climate-related reports, are now an important part of media coverage. The media and many NGOs profit from a "tacit" agreement with SEPA. Government has discovered the positive side of their potential both to monitor government and industry activities, especially on the local level, and to raise awareness about environmental and climate issues in civil society. Most media and NGOs regard themselves as cooperative partners of government, and those who operate within a scope acceptable to or even demanded by the Chinese government are granted more freedom and increased political participation (SEI / UNDP 2002, 48).

SEPA uses the media to support official environmental initiatives or to improve the implementation of environmental laws. One example is the official award system for reporting environmental violations (SEI / UNDP 2002, 48).

(c) External actors

Bi- and multilateral donors play a key role in addressing the climate change problem. China is the largest recipient of environmental aid from the World Bank and the GEF, and it also receives large amounts from other aid agencies, especially the Asian Development Bank (ADB) and the United Nations Development Programme (UNDP). 80 percent of China's environmental budget comes from abroad (Economy 2004, 189). Many countries (e. g. Canada, Germany, EU, Australia) have provided support for climate-related projects. However, China's relationship with international donors and its status as recipient has changed in the meantime. The World Bank, for example, has sharply reduced funding because China does not qualify for International Development Assistance (IDA) funds and also because NDRC exerts heavy influence on which projects receive World Bank funding. Projects that address climate change are funded by GEF and applied for by SEPA, which excludes NDRC from deliberations (Economy 2004, 190).

6 Assessment of the utilization of climate capacities

China is faced with the challenge of addressing the problem of climate change. Pressure arises from two sides. On the one hand, in some years, when China has improved its socio-economic conditions, the demands of economic and environmental actors in industrialized countries will increase and force China to assume responsibility as the

world's largest emitter of greenhouse gases. On the other hand, China is highly vulnerable to climate change. The economic costs of climate change and the side-effects of fossil fuel combustion (e. g. air pollution) are already very high and threaten further economic growth. Against this background, China has chosen a dual-track path to address the climate change problem. Internationally, China has so far rejected accepting any commitments to reduce GHG emissions. Nationally, however, China has built up considerable capacities that have helped to develop and implement specific climate-relevant measures within other, climate-relevant policy fields. These have been prompted by their expected direct economic benefits, but they also have positive impacts on the mitigation of climate change. The actual utilization of climate capacities in China can be assessed on the level of policies, structural framework conditions and (individual and organisational) actors.

(a) National climate-relevant policies

Today, climate-related and environmental aspects are an integral part of China's Five-Year Programs for National and Social Development. Implementation is suffering, though, because the ambitious objectives and targets set out in the plans are not matched by corresponding processes designed to monitor and evaluate target achievement. Most climate-related strategies and measures are based on the desire to maintain economic growth, e. g. measures to increase energy efficiency, to ease dependence on external energy sources, to secure energy provision, and to reduce urban pollution and related damage to human health. In most cases, reduction of GHG emissions is a desirable by-product but not the primary objective. As long as the results are the same and time does not matter, this is no reason for concern. But it is clear that China will have to make clear policy choices in favour of emission reductions in the near future, and then the short-term contradictions between economic growth and climate-related objectives (e. g. additional investment in energy conservation or renewable energy technologies) will become more apparent.

China has the legal capacity to develop climate-related measures and has already done so in many cases. However, only recently has the country has developed an explicit climate strategy. So far China has concentrated on single sector measures in the areas of environment, energy, and transport. But the country lacks enforcement capabilities, especially in the environmental area. There is a large discrepancy between regulations and laws and actual implementation on the local level. Compliance with environmental, but also energy saving regulations remains low. Responsible local institutions are not equipped with sufficient resources to meet their tasks, e. g. monitoring and sanctioning. Besides, local government follows priorities other than environmental protection. In many cases, this leads to compromises when it comes to environmental objectives.

(b) Structural framework conditions

The structural changes introduced on the systemic level in the past 20 years have facilitated, and sometimes even created, incentives for the development of climate-relevant capacities. Economic liberalization and openness have promoted enormous economic growth and provided economic, technological and scientific resources to build up capacities to address the manifold causes and consequences of climate change, but it has also provided new constraints. On the positive side, economic growth supplements

China's financial resources and widens the financial scopes available for climate-relevant measures. Foreign companies and competition have brought with them technology and knowledge transfers which have enhanced productivity and efficiency and thus reduced the energy and resource intensity of production, with corresponding effects on relative emissions. With increased integration into competitive global markets and accession to the WTO, China has had to adopt environmental standards required in certain sectors, e. g. the automobile industry.

However, China's development path has also established constraints. Expansion of production and transport, urbanization, higher living standards, increased consumption by private households have all contributed to boosting energy demand and thus to increased GHG emissions and overexploitation of natural resources.

Privatization and decentralization have transferred responsibility and discretion to individuals. However, both elements can only contribute to protection of the environment and climate if they are embedded in a political and economic framework that sets the right incentives. Here there is much room left for improvement, especially regarding energy prices. Improvements in the rule of law would also contribute to giving more weight to collective interests in individual decisions. For this purpose, environmental laws and regulations need to be streamlined, and adverse incentives should be abolished.

Policy coordination within public administration needs to be improved. China has ambitious targets regarding the integration of the concept of sustainable development into all relevant policies, and the government has shown that it has the capacities to do so. In the case of climate policy, however, policy coordination could be improved. Climate change is a cross-sectoral issue, but China considers it mainly as an economic issue. It seems that climate-related sectoral measures are still largely isolated in nature and that there is very little by way of interrelations and coordination. The process of decoupling between local and central environmental administrations has created serious problems for policy coordination and implementation. Strengthening climate capacities in the environmental administration on all levels could help to improve policy coordination.

Opportunities for participation of non-governmental actors need to be enlarged in order to fully utilize their potential. China's reform process has had a strong impact on the economic system, while the political system has done very little to adapt to the changes. China's capacities for participation are limited for this reason. Public awareness of climate change is still low due to the existing restrictions on non-governmental organizations and the media. Its early participation in the international climate regime enabled China to build up strong research capacities related to the scientific issues involved in climate change. However, the country still lacks adequate actors and mechanisms to diffuse such information. The government controls and restricts the activities of these important climate actors. Media and NGOs are thus obliged to develop close links with sectors of the government and to accept certain restrictions in order to maintain their ability to work, mainly with regard to the gathering and dissemination of environmental or climate-related information and public awareness building. This makes it impossible for an important part of the capacities of these actors to be utilized.

(c) Actors

The distribution of capacities among Chinese climate actors reflects the priority of economic over environmental goals. Although the Chinese government is increasingly aware of both the negative impacts climate change may have on China's social and economic development and the need to play a more constructive international role, the capacity of Chinese actors whose aim is provide protection for the climate and the environment is limited. The key climate actors in China are governmental actors who seek to ensure that all climate-related activities undertaken are in harmony with China's economic policy and goals. The priority of economic objectives is mirrored in the composition of the National Coordinating Committee on Climate Change, which is dominated by the NDRC and the Ministry of Foreign Affairs, while SEPA and the Ministry of Science and Technology remain in the minority. This means that the actors with the greatest influence on climate policy are not the same as the actors whose priority is to protect the environment and to address climate change. However, NDRC is very strong and influential. Since it is responsible for the governance of economic and social development, it is an institution highly qualified to embed climate policy into other policy branches. But as long as economic goals remain the only priority, climate goals will remain beyond reach. NDRC and MOFA would be in a better position to fulfil their role as climate-relevant policy coordinators if they were to decide to substantially strengthen their own climate capacities, and if they demanded the same from the energy, transport and environmental departments. This would require climate protection to be explicitly integrated into their official mandates.

With regard to climate policy science, capacities for policy research within China should be strengthened with a view to improving knowledge concerning factors of success and failure for specific climate-related measures and the monitoring and evaluation of existing policies.

China has considerably improved its climate capacities in recent years. However, our analysis shows that there is still considerable scope to develop further capacities designed to strengthen China's climate governance. The main challenges are still to be found on the national level, i. e. to embark on a pathway leading to of a low-carbon economy. Here China is equipped with good technological and scientific capacities as well as a high potential for policy coordination on the central government level. Serious shortcomings remain regarding policy coordination with provinces and local administrations, coordination with private actors, implementation, monitoring and sanctioning of climate-related laws, and making good use of the self-organizing potential of civil society.

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