Paper 4

The Role of Policies and Measures for Climate Mitigation in China

Rob Bradley and Hilary McMahon

World Resources Institute, USA

September 2007

The BASIC Project is a capacity strengthening project – funded by the European Commission – that supports the institutional capacity of Brazil, India, China and South Africa to undertake analytical work to determine what kind of climate change actions best fit within their current and future national circumstances, interests and priorities. Additional funding for BASIC has also been kindly provided by the UK, Department for Environment, Food and Rural Affairs and Australian Greenhouse Office. For further information about BASIC go to *http://www.basic-project.net/*

About BASIC

The BASIC Project supports the institutional capacity of Brazil, India, China and South Africa to undertake analytical work to determine what kind of national and international climate change actions best fit within their current and future circumstances, interests and priorities. BASIC has created a multi-national project team linking over 40 individuals from 25 research and policy institutions, the majority based in BASIC countries. Project activities comprise a mix of policy analysis, briefings, workshops, conferences, mentoring and training clustered around five tasks lead by teams as follows:

- Task 1 – Mitigation and sustainable development (China Team);
- Task 2 – Adaptation, vulnerability and finance (India Team);
- Task 3 – Carbon markets, policy coherence and institutional coordination (South Africa Team);
- Task 4 – Designing international climate change policy and enhancing negotiations skills (Brazil Team); and
- Task 5 – Creation of developing country expert group/mechanism on a long term basis (All Teams).

Funding for BASIC has been provided by Environment Directorate of the European Commission with additional support from the UK, Department for Environment, Food and Rural Affairs and Australian Greenhouse Office. For further information about BASIC go to: http://www.basic-project.net/

About this Paper

The views and opinions expressed in this paper have been put forward by the BASIC Task 1 Team for discussion and do not express the views or opinions of the funders or the BASIC Project Team as a whole. Task 1 is coordinated by the BASIC China Team which comprises: Lu Xuedu, Ministry of Science and Technology, Beijing, Lin Erda and Li Yue, Chinese Academy of Agricultural Sciences, Beijing, Jiahua Pan and Ying Chen, Chinese Academy of Social Sciences, Beijing and Duan Maosheng, Global Climate Change Institute, Tsinghua University, Beijing. The authors would like to thank the following individuals and authors for providing materials or comments on previous drafts: Erik Haites Margaree Consultants, Toronto, Canada, Farhana Yamin, Institute of Development Studies, University of Sussex, UK, Jiahua Pan and other colleagues at RCSD, CASS as well participants at the China BASIC Workshop held in February 2006. This does not imply support for the views expressed in this paper by these individuals and organizations.

Other papers produced by BASIC Task Team 1 include:

- Energy Models in China, a Literature Survey, Fei Teng, Alun Gu and Maosheng Duan, Tsinghua University
- A Preliminary Analysis of Modelling Results Relevant to China from the International Emission Scenarios Database, Ying Chen, Jiahua Pan and Guiyang Zhuang, Chinese Academy of Social Sciences, Lu Xuedu, Ministry of Science and Technology, China.
- Energy Requirements for Satisfying Basic Needs, China as a case for illustration, Jiahua Pan and Xianli Zhu, Chinese Academy of Social Sciences, China
- Technology Transfer by CDM Projects, Erik Haites, Margaree Consultants Inc., Canada, Maosheng Duan, Tsinghua University, China, Stephen Seres, Climate Change Analyst/Economist, Canada
- Climate Change Impacts, Vulnerability and Adaptation in China, Li Yue, Xiong Wei and Wu Yanjuan, Institute of Environment and Sustainable Development for Agriculture, Chinese Academy of Agricultural Sciences

Abstract

This paper examines the emerging landscape of Chinese engagement in national and international climate policy taking China's energy sector and current social, economic and developmental challenges as a starting point. The paper discusses the significance of China's 11th Five Year Plan and the more recent National Climate Change Programme (CNCCP), released in June 2007, and asks whether quantified emissions limitations are really the right policy instrument for China. The paper suggests that it will not be possible in the near future to set meaningful emissions targets for China as economic and energy statistics are uncertain for technical and political reasons and limited institutional, financial and administrative capacities exist to set, monitor and enforce such targets. The paper suggests that an alternative approach – embedding climate mitigation measures into non-climate specific policies and plans as described in the CNCCP - might yield considerable climate benefits and for that reason should form the basis of international cooperation and assistance. Designing a range of metrics by which implementation of such measures might be subject to assessment and comparison presents considerable analytical and technical difficulties. But the paper argues these should not detract from the need for increased international collaboration to support China's commitment to changing the trajectory of its GHG emissions.

Table of contents

Tables

Figures

The role of policies and measures for climate mitigation in China

Rob Bradley and Hilary McMahon, World Resources Institute, USA

Introduction

As we near the start of the Kyoto Protocol's first commitment period, matters appear to be at a deadlock. True, there are signs that the most serious bottleneck to progress in recent years may at last be uncorked: changes in the 2006 US elections and the prospect of a presidential election to come appear to have heralded a more constructive approach to climate policy in the USA. However, this optimism has to be tempered by two facts. First, while the U.S. may be showing progress towards positive climate policy at a domestic level there is little sign as yet that this will lead to a fundamental shift in its stance in international negotiations for the next 2-3 years at least. Second, and perhaps more fundamentally, key developing countries have shown no sign of moving from their basic stance that climate change is an issue for industrialized countries to deal with, and that the role of poorer countries – at least for now – should be to do no more than they are directly paid for. Can we find hope for a more constructive engagement?

Yes, and the shape of that engagement is already emerging. While to date the argument has been largely between two rigid visions—should China and other major developing countries take emission caps, or do nothing?—China in particular is showing that the assertion that developing countries are not acting is incorrect. Nearly all developing countries are implementing important policies and measures that reduce greenhouse gas emissions. These policies and measures are aimed at reducing energy use, diversifying energy supply options, addressing issues such as urban congestion or reducing local air pollution. But they have the important additional benefit of reducing greenhouse gas emissions. Helping these policies and measures go further and faster offers a major opportunity for international institutions and processes to engage developing countries in meaningful mitigation action while promoting rather than hampering their development.

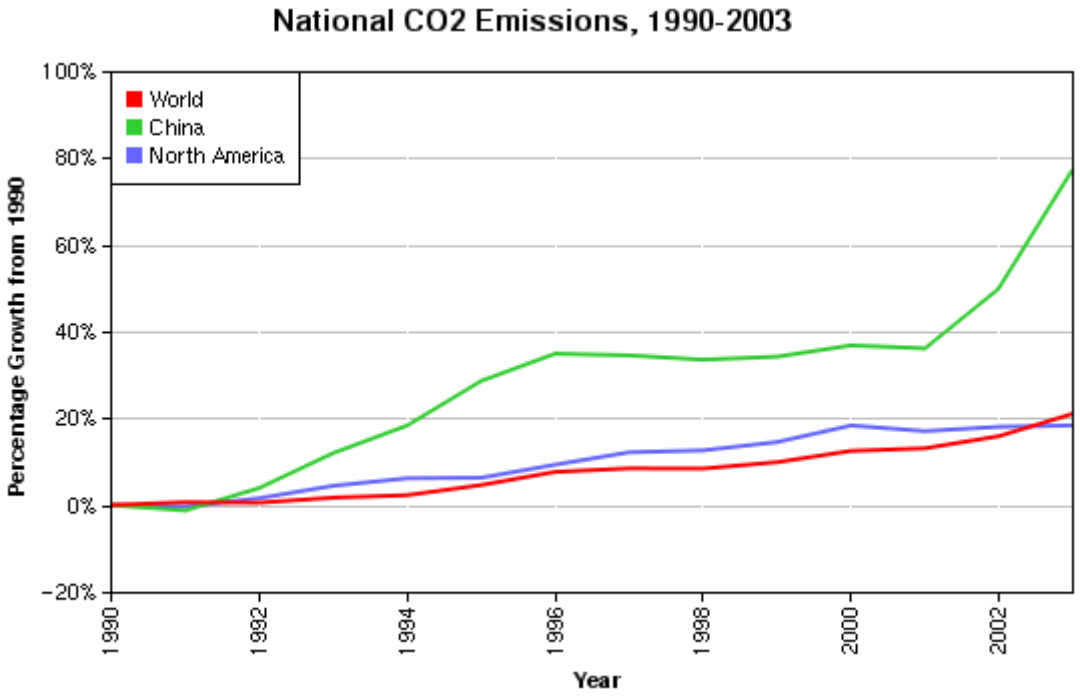
The work of the BASIC Team in China has investigated the huge challenges faced by China in understanding and fulfilling its energy needs. These challenges are qualitatively different from those faced by OECD countries. But the Team has also looked at the kinds of responses being taken already in China as well as indications of future trends in these policies.

In this paper we will introduce the emerging landscape of Chinese engagement in climate policy, and outline some of the work of the BASIC team in exploring this landscape. Section II presents the context of China's energy sector, pressing development priorities, and stance in climate policy debates. Section III explores some of the challenges in understanding China's emissions, the work of the BASIC Team in enhancing that understanding, and the implications for China's ability to take on quantified emission limitations. Section IV describes China's emerging climate policies, and analyzes the extent to which the emission impacts of these policies can be quantified. Section V poses the question of how to compare actions among countries with very different types of commitment. Finally, Section VI provides some concluding remarks on what lessons this analysis might bring for climate policy.

I. The international importance of China

The United Nations Framework Convention on Climate Change (UNFCCC) frames the basic approach to climate policy for all its Parties (most of the world's nations). Among other principles, it declares that "taking into account their common but differentiated responsibilities" all countries will play a role in limiting the impact of human activities on the climate. Much of the subsequent climate negotiations have essentially been between those who focus on the "common" aspect of these responsibilities, and the champions of their "differentiated" nature. The case for limiting emissions in major developing countries is well known, and is illustrated by Figure 1. As a matter of simple arithmetic an adequate solution to climate change is not possible without the collaboration of large nations such as China, India, Brazil and Indonesia. In addition to their large and growing total contribution to global emissions, they are vital parts of the world economy, and major suppliers and users of energy.

Figure 1 China, World and North America CO_2 Emissions



Chinese energy demand has nearly *doubled* since 2000[1]. The repercussions of this surge have reverberated across China and the globe. Inside China, energy shortages, high resource dependence, and environmental pollution have caused a wholesale re-evaluation of the Chinese industry-driven economic development model. Internationally, concerns over climate change, energy security, and geopolitical conflict have accompanied the rise in demand. The apparent inability of the central government to predict and influence key sectors of the economy—electric power expansion, for example—has raised further international concern over the viability of engaging China.

Coal demand in China, supplied almost exclusively by domestic sources, now exceeds 2.4 billion tons per year, nearly twice the level of the U.S. Petroleum consumption, on the other hand, was only one-third of that in the U.S. in 2006. Per capita figures are far less, but also illustrate the potential for continued future growth. China is now the world's second largest energy consumer (behind the US). This is due to the fact that total energy consumption has risen by an annual average of more than 11% during the past five years[2].

---

[1] BP, 2007
[2] Economist Intelligence Unit ViewsWire, Energy for China, Jul 12th 2007

China is increasing its consumption capacity each and every day. In 2006, approximately 81 GW of new power generation capacity was added by the Government and the Government is planning to invest a further Rmb600bn (or US$479bn) between 2007-12 with the goal of reaching 1,000 GW of generating capacity, 600 GW of which will be coal[3]. These plants and others under construction, will lock in emissions for 40 years or more, and account for a significant share of the remaining global carbon budget needed to stabilize atmospheric concentrations of greenhouse gases at a level scientists believe will prevent the worst impacts of climate change. China will soon surpass the U.S. as the leading emitter of greenhouse gas emissions, though predictions of exactly when this will happen vary greatly[4].

The challenges for China

China's importance for the climate issue is clear, and is well understood in China. In June 2007 China presented a National Climate Change Program[5], in part to preempt discussions among the G8 countries, which were negotiating international climate action while stressing the importance of China and other large developing countries.

Perhaps the most striking aspect of the Program is the clarity with which it outlines the urgent and serious consequences facing China from human-induced climate change. China already faces major concerns from water resource constraints and desertification, and is highly aware of the threat of climate change in exacerbating these issues. In addition, China's eastern seaboard, the cradle of its economic growth, is largely low-lying, and is vulnerable to the impacts of rising sea levels and more intense weather events. China has a major vested interest in ensuring effective international action to combat climate change, and recognizes fully that a country of China's size simply has to play a role in such action.

At the same time, China faces daunting development challenges. Per-capita GDP remains at $2,034 on market exchange rate terms, barely one twentieth of that in the United States, though using a purchasing power parity metric the average American is only 6 times richer than her Chinese counterpart. China is also home to about 18% of the world's poor[6].

---

[3] Economist Intelligence Unit ViewsWire, Energy for China, Jul 12th 2007

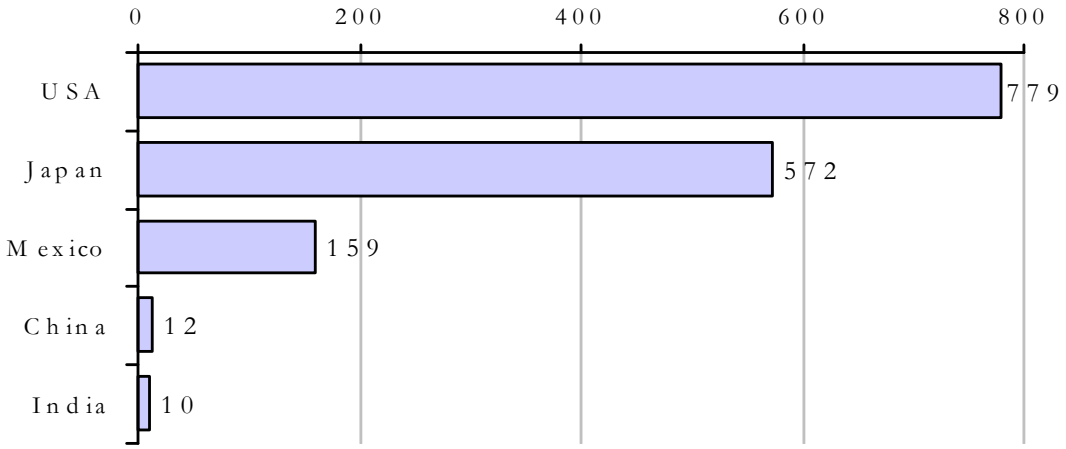
[4] The International Energy Agency, WEO 2006, for instance projects that Chinese emissions will pass those of the USA in 2009. The U.S. Energy Information Administration *International Energy Outlook 2000* (*IEO2000)* does not foresee this event until 2020; the Chinese government has rejected the notion that its emissions are close to those of the United States.

[5] The Peoples Republic of China, 2007

[6] World Bank data and statistics. Data for 2006. http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20399244~menuPK:1192694~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html . Viewed July

Penetration of many goods taken for granted in OECD countries remains at low levels. For instance, Chinese car ownership could expand 20-fold and still remain well below typical OECD levels (see Figure 2).

Figure 2 Motor Vehicles, Vehicles per 1000 people (World Bank, 2005. Data ranges from 1997-2000.)



Common and differentiated

Developing country governments are quick to point to these concerns, and note the high levels of poverty and the urgent need for economic development in their countries. As discussed above, these concerns for economic development are entirely legitimate, and any climate regime should leave full scope for economic development and the reduction of poverty.

At the same time, the major developing countries all have flourishing middle and upper classes, whose financial resources and patterns of consumption closely resemble those of their developed country counterparts. The 2007 Forbes list of rich individuals reports that China boasts 300,000 dollar millionaires (by assets), and accounts for 20% of the world's luxury vehicles market. Even looking beyond the very rich, China's economic success story has produced a middle class which, just like its Western counterparts, is grasping the consumer economy with both hands.

2007.

As these citizens use their cars, air conditioners and electronics, they clearly have as much an impact on the climate by emitting in Shanghai or Mumbai as they would in London or Tokyo. At present, high emitters in developing countries are not asked to play a role in mitigation simply because they share a country with a large number of low emitters. If climate policy is to be based on an equitable distribution of effort then clearly major developing countries will need to take mitigation measures of their own, though clearly not *equal* to those taken by rich countries.

Political dialogue and concerns

As one might expect from the range of concerns above, issues of principle still remain unresolved as to who should act and by how much. Should some developing countries take on commitments soon because of their high emissions today, as some rich countries argue? Do the pressing development needs outlined above mean that climate change, important though it is, remains too remote a problem to dictate policy, as many developing countries have often maintained?

Many ways exist of framing the climate problem so as to reflect these concerns to a greater or lesser extent. Some of these include per capita emissions[7]; cumulative historical emissions[8]; and emission intensity targets[9]. None of these however can wholly overcome all countries' objections, and any formulaic approach to setting obligations for mitigation is likely to encounter stiff political resistance[10].

At the same time, it now seems probable that *some* means of defining appropriate commitments for key developing countries is a prerequisite for future success in negotiating an international climate regime.

[7] See, for instance, Agarwal et al., 1999, and Meyer, 2000.
[8] See, for instance, UNFCCC, 1997; La Rovere et al., 2000
[9] For a full discussion of intensity targets see Herzog et al., 2006.
[10] See Baumert et al., 2005.

II. Understanding China's energy and emissions

Limits to understanding

China's energy profile was recently described as "a fusion of plan and market forces, formal regulation and seat-of-the-pants fixes, central intentions, and local interests"[11]. Changes in China's energy-economic relationship are important to understand. Chinese energy demand has surged since the arrival of the new millennium when a new round of energy-intensive investment began. Reported Chinese data indicate that the energy elasticity of demand (the growth rate of energy consumption divided by that of GDP) shifted from an average of approximately 0.5 during the 1980s and 1990s, to about 1.3 over the past four years. In other words, energy demand grew by 1.3 percent for every percent growth in GDP, instead of the historical half percent. Whether the new relationship is temporary or indicates a deeper structural change in the economy will have a profound impact on future global energy markets, energy security, and environmental quality. A satisfactory understanding of what is happening in Chinese energy markets may never be uncovered, but more research into the new energy-economic relationship would benefit the international community and China. BASIC Paper 1 on energy models explores the state of the art of energy modeling in China.[12] There have been major advances in recent years, but the authors find that the models (generally adapted from those used in developed countries) fail to adequately treat specific characteristics of the Chinese energy economy, such as the rapid rate of technological change.

More fundamentally, any model is only as good as the data that are put into it. Chinese economic and energy statistics are uncertain for both technical and political reasons[13]. Local officials may report data to the central government based on what they think supervising officials want to see, rather than what is really happening. While compilers of national statistics often massage out the worst distortions, important problems remain. For example, coal use from 1996-1999 is now acknowledged as significantly underestimated by analysts both inside and outside of China due to untracked output from small coal mines at the time. One of the contributing factors behind China's current energy crunch is indeed these poorly tracked

---

[11] Daniel H. Rose and Trevor Houser, May 2007

[12] Energy Models in China, a Literature Survey, Fei Teng, Alun Gu and Maosheng Duan, Tsinghua University

[13] See, for example, *Chinese Economic Performance in the Long-Run*, A. Maddison, OECD, Paris, 1998; or "What Goes Up: Recent Trends in China's Energy Consumption," J. Sinton and D. Fridley, LBNL, Berkeley, 2000.

energy statistics: good energy policy and energy planning require accurate data. Acknowledging this also explains some of the recent surge in energy intensity.

What are China's development needs?

As discussed earlier, China has insisted first and foremost on its right to economic development, and in particular its obligation to address poverty. This prerogative is broadly recognized by China's negotiating partners. But what precisely are these development needs? On one hand, there is a general understanding in both China and among other countries that a development pattern for China that mimics that seen in today's rich countries is very likely impossible, given natural resource constraints, and in any case would lead to a climate catastrophe. However, that is precisely the model of development which China is consciously pursuing. Work under the BASIC Project demonstrates some of the difficulties in defining even a set of basic human needs independent of direct comparisons with other countries.[14] In fact, both China and the industrialized countries together will have to adopt new types of technologies and solutions to allow continued prosperity. The work of Jiahua Pan and Xianli Zhu at CASS makes an important contribution in exploring methodologies for identifying and understanding basic energy needs, but also highlights the limitations of using today's technologies and data as a means of defining those needs.[15]

III. Institutional capacity and climate policies

Technical and data issues

It is debatable whether one can *even in principle* set an emission target in a country such as China. In a country experiencing such rapid GDP growth even relatively minor uncertainties in the rate of growth can throw off emissions projections dramatically. Baumert et al. (2005) examine the historical reliability of emission forecasts for developing countries over even quite short time horizons, and conclude that any proposed target for a developing country runs a high risk of either seriously constraining its economic development or of making the international carbon markets redundant by extravagant over-allocation. This fact also poses problems when trying to quantify the potential reductions from climate related policies; an exercise which will follow later in this paper. At the same time, emission intensity targets do not

[14] See discussion in BASIC Paper 3, Energy Requirements for Satisfying Basic Needs, China as a case for illustration, Jiahua Pan and Xianli Zhu, Chinese Academy of Social Sciences, China
[15] Id.

significantly reduce this uncertainty. Indeed a close study of emission trends since 1990[16] shows *more* variation in CO_2 emission intensity than in absolute emissions in China.

Chinese researchers are working hard at developing a greater capacity to understand and project emissions trends. BASIC Paper 2 explores the tools available to analyze a range of questions of interest to Chinese policy makers, including projected emissions growth, the cost of emission limitations, bottom-up engineering-based models as well as energy economy models.[17] While the sophistication of this analysis is rapidly improving, data limitations as well as the rapid transformations China is undergoing are likely to seriously limit the ability to usefully project Chinese emissions for years to come.

Legal and institutional issues

Adopting legally binding emission caps presupposes significant institutional, financial, and technical capacity that may not exist in many developing countries. New laws and regulations that cover the entire economies of some countries may be needed. Parties must have the ability to exercise regulatory control over their private and public entities, and must apply appropriate sanctions in cases of noncompliance. Kyoto-style targets require quantitative precision, and thus high-quality monitoring tools and robust national GHG inventories, developed in accordance with international standards. This is a major challenge, since to date, almost all developing countries have reported difficulty in compiling their emissions inventories under the UNFCCC. As suggested by the Convention, Parties should adopt commitments that are at least somewhat commensurate with their present or anticipated future capacities. Additional efforts to enhance developing country capacities are needed, but the success of these efforts should not be presupposed as the basis for framing developing country commitments.

Implications for Chinese climate policy

All these considerations suggest that it will not be possible in the near term to set meaningful targets for emissions in China, or for China to engage in cap and trade mechanisms at a national level. This would seem to create an impasse for international negotiations: after all, if rich countries will not accept deeper commitments without Chinese involvement, and China is

[16] Herzog et al., 2006.
[17] See BASIC Paper 2, A Preliminary Analysis of Modelling Results Relevant to China from the International Emission Scenarios Database, Ying Chen, Jiahua Pan and Guiyang Zhuang, Chinese Academy of Social Sciences, Lu Xuedu, Ministry of Science and Technology, China.

not yet ready technically, institutionally or politically to take on quantified emission limits, how do we proceed?

But the outlook is considerably brighter than this implies. Meaningful, even ambitious, contributions to the fight against climate change can be framed independent of specific emission targets and monitoring. A closer look at emerging Chinese policy gives us a vision of what this kind of contribution might look like.

IV. China's emergence into climate policy

Prior to the G8 summit in June 2007 China presented its National Climate Change Program (CNCCP). In part, the CNCCP was a response to growing international pressure for China to take a more proactive role in the climate policy debate. To a significant extent, it was a reframing of existing measures and plans that had been proposed earlier, in particular from the 11th Five Year Plan (FYP 11). However, in many ways it was a major step forward. Three points are particularly notable.

First, the Program includes a detailed recounting of the impacts that China faces from climate change. These are considerable, with pressure on scarce water resources perhaps the most daunting challenge. This demonstration that climate change as an issue in itself is something that China takes seriously, and that domestic policy will be shaped at least in part with this concern in mind, gives a new flavor to international debate.

Second, it illustrates the extent of the mitigation actions that China is already envisaging, and in some cases has already adopted. With far-reaching targets for renewable energy, vehicle emission standards, participation in international R&D programs among many others, China refutes the notion that it is not taking serious action. To be sure, most of these measures are existing policies, in particular from the FYP 11, and are driven largely by other imperatives, such as the concern for energy security. However, by and large this is true of OECD country policies as well. A perusal of the database of policies and measures at the International Energy Agency[18] suggests that, at least in intent, China's policy proposals stack up reasonably well against those of most IEA members. Larger question marks remain over the likelihood of effective implementation, given the deficits in data and institutional capacity mentioned earlier.

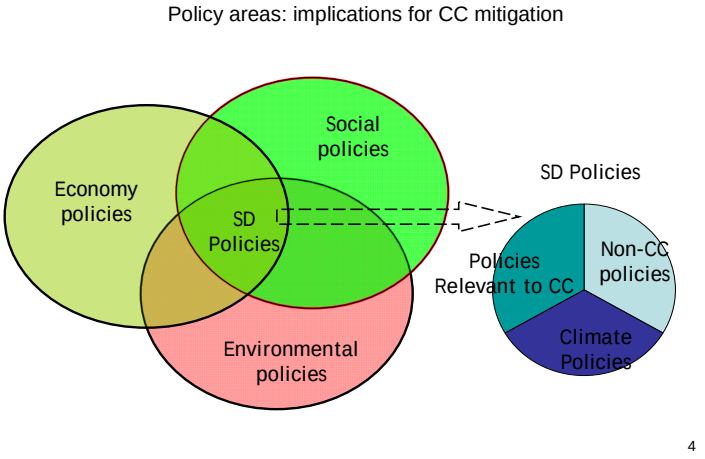
Finally, the Program suggests a form for ongoing international engagement with China. The policies and measures described in the CNCCP for the most part resemble those adopted

[18] See http://www.iea.org/textbase/pamsdb/search.aspx?mode=cc. Accessed July 2007.

in OECD countries, at least in form. International collaboration therefore may help China realize the implementation of its Program, may reduce costs by exploiting economies of scale (through coordinated deployment of similar renewable energy technologies in multiple countries, for instance) and may provide new opportunities for trade. Rather than applying new types of policy in confronting climate change in China, it will prove more effective to start with the kinds of policies and measures which China considers appropriate not only to its political priorities but also to its institutional capacity.

It should be noted that the policies and measures discussed here cover a variety of issues, including economic, social and environmental, which have important climate change mitigation results. On the other hand, while GHG mitigation may be the primary goal of some of the more recent policies, the need to simultaneously meet Chinese economic development needs (cleaner environment, energy security, and higher quality of life) have also been carefully considered by the Chinese Government. As illustrated in Figure 3, climate-relevant policies are developed where they complement a broader set of policy goals.

Figure 3 Climate policies in the context of broader Chinese priorities



(Source: Xuedu Lu, Li Liyan, Ministry for Science and Technology, China)

The policies and measures described here are outlined in the CNCCP, which presents objectives, basic principles, key areas for action, and policies and measures to address climate change for the period up to 2010. However, it is not an exhaustive list of all climate change related activities in China.

China's climate policies and measures

One of the more significant commitments of late in contained in China's FYP 11 and establishes a target for a reduction in energy intensity (energy used per unit of GDP) by 20% over the 5 years to 2010 (see Figure 4). This is potentially one of the more important endeavors as energy intensity in China is relatively very high, mainly due to inefficiencies in its industrial and manufacturing sectors. The energy intensity target is supported by a variety of other policies and measures. These include technology development and deployment, energy efficiency and land use policies outlined in Table 1.

These policies have been, and will be, implemented at both the national and regional level, according to the Chinese Government. The regions play a very important part in Chinese politics. To ensure success, the Government has announced that each province has been asked to do its part to help China meet its goal, and Beijing has warned that failure to do so will affect the career prospects of provincial officials, regardless of other performance indicators.

International partners in climate negotiations will seek metrics by which to gauge each others' performance in implementing their commitments. However, there are some difficulties in quantifying these reductions as the next section will illustrate with reference to measures from the CNCCP.

Figure 4 China's Energy Intensity target

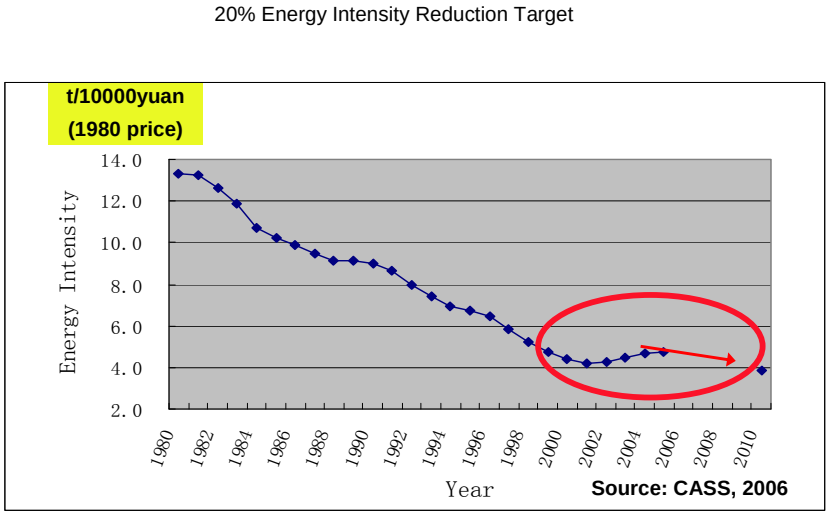


Table 1 Climate Change Policies and Measures in China (outside of the CNCCP)

Technology development and deployment	
Objective	***Measure***
Increase the share of Renewable Energy in China's energy portfolio[19]	**11th Five-year Plan:** 30 large scale wind farms with the capacity of 100Mw; Grid-connected wind and biomass will reach 5 GW and 5.5 GW respectively.
	Medium and Long term National Planning of Renewable Development: renewable energy supply 400-500 Mace, about 1/7 of primary energy consumption, installacapacity tion of renewable energy, 30% of the total generation capacity.
	Law of Renewable Energy issued in January 2005, specific measures including financial and economic incentives are under consideration.
	Solar thermal: Production capacity 15 million m2, annual increase rate 28% .
	Solar PV: Installed capacity over 70 MW, annual market growth 20%.
	Small **hydropower**: over 60,000 stations of installed capacity 50GW in rural area.
	Biomass: 17 million household biogas digesters, over 1,600 industrial-scale biogas plants, two ethanol fuel production bases, about 500,000 tons bio-oils produced, biomass power installed capacity 2,000 MW.
Increase use of nuclear power	**China's National Energy Strategy Plan** sets ambitious goals for the increase in nuclear capacity to 40 GW by 2020, contributing 4% of total generation capacity, and 6% of total electricity production.
Increase use if natural gas	Production of **natural gas** will increase from 39 billion m3 in 2004 to 200 billion m3 in 2020, as a result of significant infrastructure investments. The aim is for natural gas to rise from 2.9% of primary energy consumption to 10% by 2020[20].
Increase hydropower	The aim of the Chinese Government is to significantly increase **hydropower capacity**, by more than doubling it before 2020.
Deploy Clean Coal technology	GreenGen will promote **clean coal** technologies with a zero emission plant to be built with home grown

[19] Xuedu Lu, Li Liyan, Ministry for Science and Technology, China
[20] Economist Intelligence Unit ViewsWire, Energy for China, Jul 12th 2007

	clean coal technology by 2020.
Energy efficiency	
Objective	***Measure***
Increase energy efficiency and conservation	**Energy Intensity target:** This target aims to reduce over 1.5 billion tons of CO_2 by 2050[21].
	Top 1,000 Enterprises Programme: National Development Reform Commission (NDRC) compiled a list of the 1,008 top energy-consuming firms collectively accounting for one-third of total energy demand and instructed them to develop efficiency plans in cooperation with local officials.
	Retiring Inefficient Power Plants and Closing Inefficient Industrial Plants: An NRDC plan to limit the number of inefficient power plants in China, will close some down, as new facilities are built. The efficiency of manufacturing and general industrial facilities will also be measured and those which do not meet the grade will be closed.Energy efficiency.
	1997 Energy Conservation law: This law includes labelling systems and standards that cover industry, consumer goods and buildings.
	Fuel efficiency standards: These standards, which are more stringent than those in many developed countries, will ensure high fuel economy standards of all new vehicles.
	Export Taxes for Energy Intensive products: These taxes, introduced in 2006, is seen as a means of conserving domestic energy resources.
Land use	
Objective	***Measure***
Avoided deforestation	Policies to improve forest management and to encourage reforestation have helped in increasing forest cover in China, and therefore, sequestered large levels of CO_2.

[21] Pew Center. “Climate Change Mitigation Measures in the People’s Republic of China’, International Brief 1, April 2007

Quantifying emission reductions from Chinese policies

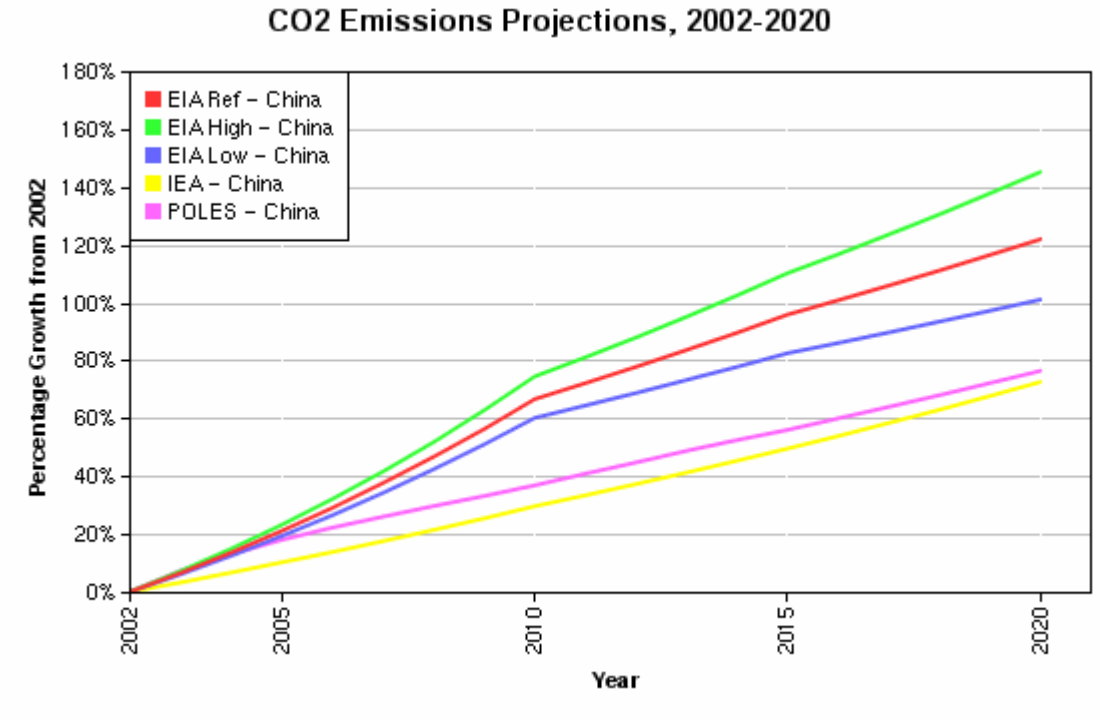
The greatest care must be taken in attempting to estimate emission reductions from particular policies. As BASIC Paper 2 suggests, defining a single business as usual projection for emissions in China is a near-impossible task. China's energy market is so fast-evolving, and data are so unreliable, that identifying the change in emissions due to particular policies is fraught with difficulty. [22]

According to the Initial National Communication on Climate Change of the People's Republic of China, China's total GHG emissions in 1994 were 4,060 million CO_2 equivalent (3,650 million tons of net emissions), of which 3,070 million tons were CO_2. According to further tentative estimates contained in the CNCCP the estimate for 2004 for CO_2 is about 5,050. This means that the share of CO_2 in total GHG emissions increased from 76% to 83% over the 10 years and that CO_2 increased by 1,980 tons of CO_2. This is a large increase, and it is only set to rise further unless drastic action is taken. These actions include the policies and measures outlined above (table 1) and the CNCCP measures (table 2).

It is interesting that rather than setting a direct target for the reduction or avoidance of greenhouse gas emissions, China chose to reduce energy consumption per unit of gross domestic product (GDP) by 20 percent by 2010 and to reduce the use of specific energy resources. According to Premier Wen in a recent speech "The ten nationwide energy saving programs, such as developing oil alternatives, upgrading coal-fired boilers and saving energy indoors, will save China 240 million tons of coal equivalent during the 2006- 10 period, including 50 million tons this year,"[23].

[22] A Preliminary Analysis of Modelling Results Relevant to China from the International Emission Scenarios Database, Ying Chen, Jiahua Pan and Guiyang Zhuang, Chinese Academy of Social Sciences, Lu Xuedu, Ministry of Science and Technology, China.
[23] Beijing, May 8, 2007, Xinhua

Figure 5 Selected emission projections for China[24]



These efforts come at an opportune moment as GHG emissions are projected to rise quickly, though the precise growth rate is still very uncertain, (see

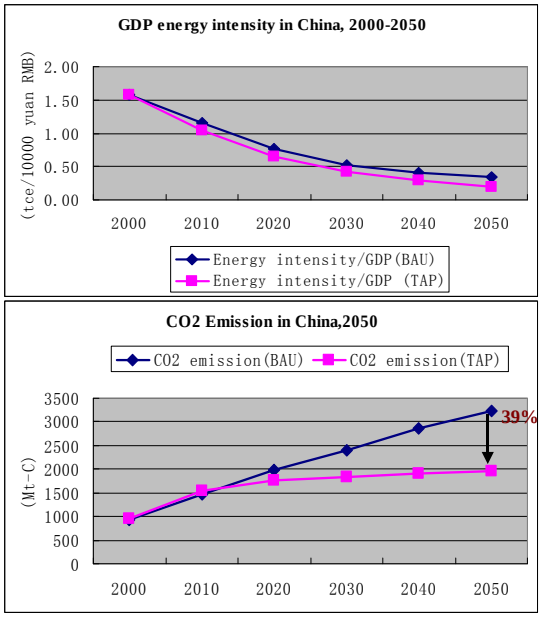
[24] Source: WRI, Climate Analysis Indicators Tool. http://cait.wri.org. Viewed July 2007.

Figure). Given such uncertainties over even the projected baselines, is it possible to quantify, in GHG terms, the mitigation potential of such China's climate change policies and measures?

The Energy Research Institute, in 2005 attempted to quantify the emission potential arising from the aforementioned measures (Table 1). According to their results, they will have a large climate change mitigation potential:

Figure 6 A projection of climate change mitigation in China

Climate Change Mitigation Potential Projected



Energy demand will be reduced by 27% (1708Mtce) in 2050 by technology and policy scenario compared with baseline scenario in China.

CO2 emission will be reduced by 39% (1263Mt-C)in 2050 by technology and policy scenario compared with baseline scenario in China

Source: ERI, 2005

Therefore, these mitigation potentials will be increased by way of the new policies and measures in the CNCCP.

The following is a summary of the carbon reduction potential of policies and measures outlined by the Chinese Government, where precise mitigation figures were provided:

Table 2 Climate Change Policies and Measure and Mitigation potential

Policy or measure	Sector	Source	Instrument type	Mitigation potential (CO_2) by 2010
Hydropower development	Power supply	CNCCP	Technological	500
Nuclear power development	Power supply	CNCCP	Technological	50
Thermal power generation (supercritical – 600MW)	Power supply	CNCCP	Technological	110
Coal-bed Methane (CBM) and coal-mine methane (CMM) development	Power supply	CNCCP	Technological and economic	200
Bio-energy development	Power supply	CNCCP	Technological and economic	30
Renewables (wind, solar, geothermal and tidal) development	Power supply	CNCCP	Technological	60
Implementing Conservation Priorities in Medium-and-Long-Term-Energy Conservation Plan	Power supply		Technological	550
Total Mt (cumulative by 2010)				1,500

V. Comparing international actions

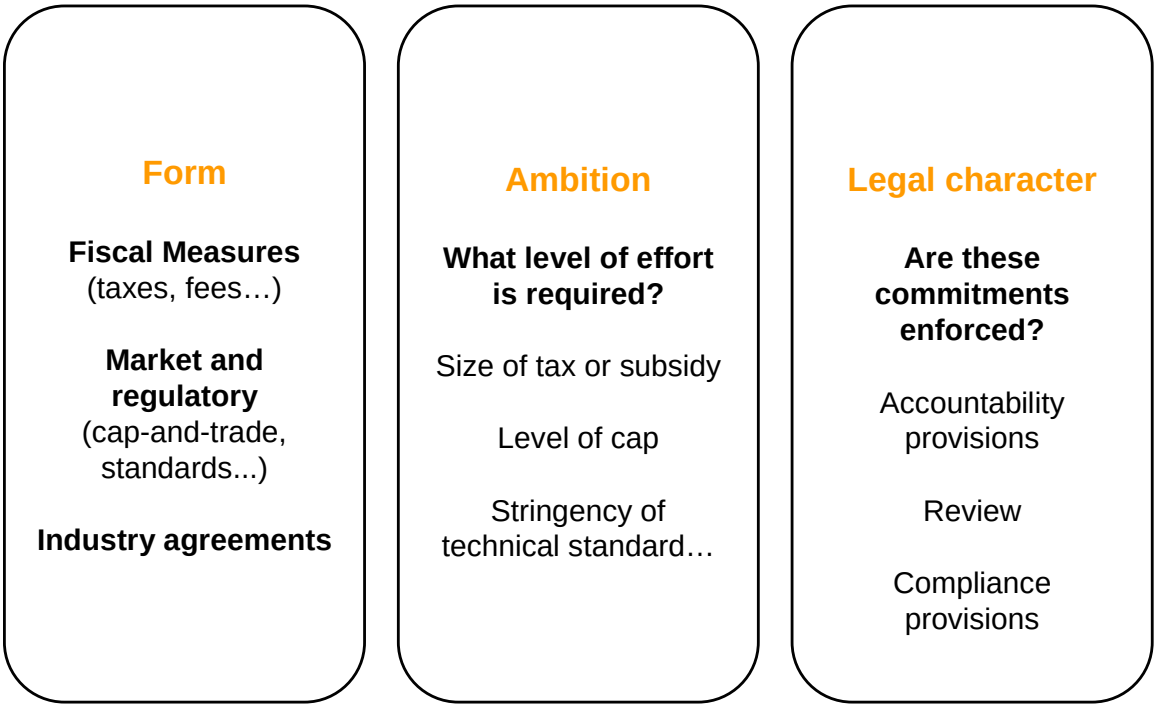
The emergence of a post-2012 climate regime will depend on some level of confidence among major negotiating Parties that their actions are being matched by appropriate measures in other countries. International comparisons are fraught with challenges. For instance, at present it is not obvious what it is that should be compared: the domestic mitigation *efforts* of a country, the *results* of those efforts, the efforts at *helping other countries*, and the overseas results achieved all seem to be relevant criteria when making cross-country comparisons?[25] Likewise, some policy actions (e.g., carbon tax) will result in *immediate* effects, whereas others (e.g., R&D) are expected to bear fruit over decadal timescales. Further complicating matters is that, as explained above, not all countries are expected to undertake the same level of efforts (or results). In particular, there is broad international consensus that those poorer countries with less financial, technological, and administrative capacities are not expected to expend the same amount of effort as other countries that have contributed to the build-up of GHGs in the atmosphere and have the financial and technological means to rein in emissions.

Quantitative indicators do not measure the level of effort on climate policy that a country *actually undertakes*. Rather, they measure a result that can be more or less difficult to achieve depending on a range of specific circumstances in that country.

As set out in Figure 7, it is important to distinguish between the **ambition** of a climate commitment and the **form** that the commitment takes. In addition, these are largely distinct from the **legal character** of the agreement. All three questions are of concern, particularly in framing developing country engagement, but the distinction between them is important.

[25] *See* Philibert, C. 2005. Climate Mitigation: Integrating Approaches for Future International Cooperation. Annex I Expert Group to the UNFCCC. Paris: OECD/IEA.

Figure 7 The distinction between form, ambition and legal character



Finally, as noted above, the principal of "common but differentiated responsibilities" laid out in the UNFCCC means that actions from different countries should be compared not with an eye to making them equivalent, but to ensuring that they are commensurate with a range of factors, such as responsibility for the climate problem and capacity to act. These factors also present a daunting range of subjective evaluations.

This is perhaps not as formidable a barrier to international agreement as it first appears. Intergovernmental negotiation processes regularly evaluate—formally or informally—relative efforts across countries. Indeed, this is a normal feature of international negotiations on trade, arms control, and environment, among others. For example, NATO's "burden-sharing" exercise involved "targets for national military participation, conscription of soldiers, investments in equipment, contributions to military infrastructure and real estate, and so on . . . . [T]he process was one of reciprocal scrutiny and cross-examination, with high-level officials spending months negotiating."[26]

[26] Schelling, T.C. 2002. "What Makes Greenhouse Sense?" *Foreign Affairs*. May/June.

China's policies and measures and international comparisons

From the discussion above, we consider that the *form* of any commitments taken up by a developing country to be less important than its *stringency*. Thus, informed international negotiators will be interested primarily in the effective effort represented by China's policies and measures, and how these compare to those undertaken by other countries.

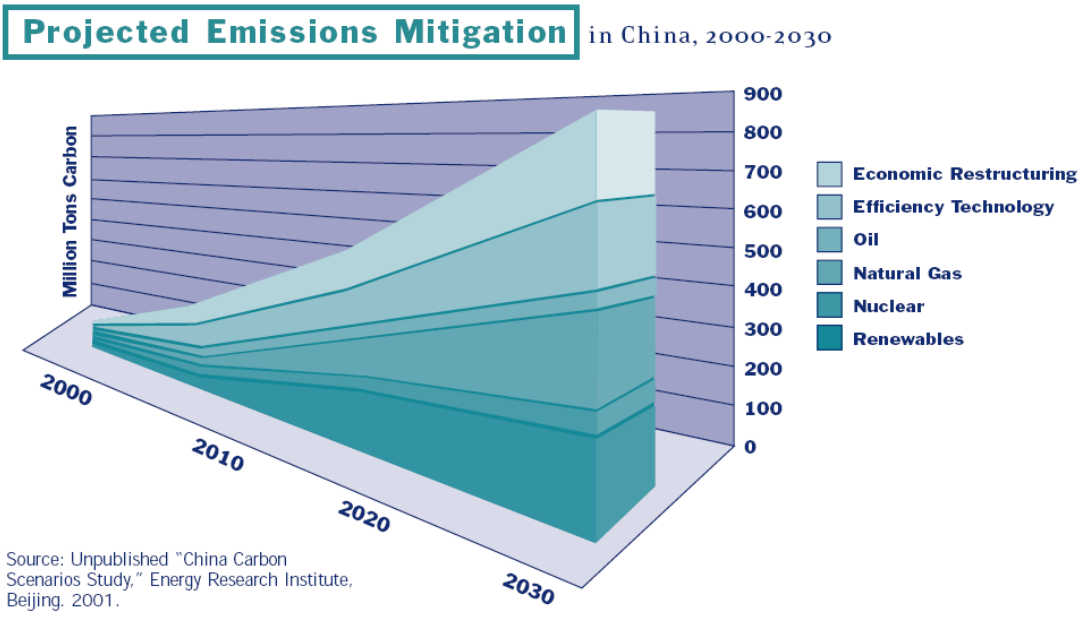
So what scope do we have for a quantified comparison between China's policies and measures and other international climate efforts? To date it would appear that this kind of comparison has been done at best at a very superficial level. A range of public estimates of the emission reductions achieved through Chinese policy initiatives exist.

However, there are various problematic issues when attempting to compare and contrast quantitative calculations of the mitigation potential in the long term of China's policies and measures related to climate change with other countries.

The first issue is the use, or not, of a baseline. Not only are the various estimates inconsistent in their choice of baseline years, but even if the same year is chosen, different methods of calculating those baselines are used. Furthermore the assumptions around population, economic growth and consumption patters vary to a great extent. Therefore, when China commits to a reduction by 2010 of at least 1,500 Mt CO_2, based on its baseline of 5,050 Mt CO_2 for 2004, its seems rather small in comparison to the PEW[27] projection of 250 Mt CO_2 per year, if all policies recently outlined by China are implemented. In ERI's opinion, a more moderate reduction of 4,631 CO_2 is achievable, and only by 2050, by 2030 (see Figure 6) this number is more than 3000 Mt CO_2, according to the ERI.

27 Climate Change Mitigation in Developing Countries: Brazil, China, India, Mexico, South Africa, and Turkey, 2002

Figure 8 ERI mitigation calculation



This demonstrates that as yet, it is not possible to calculate the mitigation impacts of the policies laid out above with any degree of certainty. However, this does not undermine the legitimacy of China's efforts, once the necessary form, ambition and legal character of any commitments are clear.

VI. Conclusions

Any future climate agreement will depend for its success on the balancing of two sets of concerns: on one hand the determination of developing countries not to compromise their sustainable economic development, and on the other the insistence of richer countries that major developing country emitters must play an appropriate role in reducing emissions. Clearly, this requires some shift from today's climate policy mix.

While the case for key developing countries taking some kind of commitment is strong for scientific, economic and equity reasons, their particular characteristics mean that these commitments should not necessarily take the same form as those of developed countries. In particular, there are major technical and institutional barriers to the adoption of cap-and-trade at national level in important developing countries. The distinction between the form, the ambition and the legal character of a commitment is important to keep in mind.

The research undertaken by the BASIC Team and others suggests that certain forms of climate policy—in particular those which depend on significant in-country institutional and legal capacity—are likely not practicable. China has some way to go before it has a firm understanding of its current emissions, still less of future trends. More work is needed to enable energy models to reflect Chinese realities, but the day when Chinese GHG emissions will be monitored to a level of precision comparable to OECD countries remains far off.

Yet this does not mean that China is helpless in the face of rising emissions. China's announcement of a National Climate Change Program is a significant advance in international climate policy debate. Apart from its importance as a statement of serious concern in China about the impacts of climate change, it provides a basis for a more constructive international dialogue. In particular, the policies and measures outlined in the Programme lend themselves in many cases to international cooperation, and suggest the kinds of commitments China is able to take on in view of its institutional capacity constraints.

Further work will be needed to help ensure and measure implementation of the policies and measures in the Programme, which in several cases are highly ambitious. We suggest this is a much more promising framing for international climate policy than the often sterile debates between North and South to date.

References

Agarwal, A., S. Narain, and A. Sharma. 1999. "A Boiling Point," in *Green Politics — Global Environmental Negotiations I*. New Delhi, India: CSE Press.

An, F. and A. Sauer. (2004). *Comparison of Automobile Fuel Efficiency and GHG Emissions Standards around the World*. Pew Center on Global Climate Change.

Aslam, M. 2002. Equal per capita entitlements: A key to global participation on climate change? In *Options for protecting the climate*, ed. K. Baumert. Washington, DC: World Resource Institute.

Baumert, K., T. Herzog, and J. Pershing, 2005. *Greenhouse Gases and International Climate Change Agreements: Insights from the Data.* World Resources Institute, Washington, DC.

Blanchard O (2002) Scenarios for Differentiating Commitments: A Quantitative Analysis. In *Options for protecting the climate*, ed. K. Baumert. Washington, DC: World Resource Institute.

Bodansky, D., S. Chou and Christie Jorge-Tresolini, 2004. *International climate efforts beyond 2012: a survey of approaches.* Pew Center on Global Climate Change, Washington, DC.

BP, 2007. Statistical Review of World Energy.

Climate Action Network, 2003. *A Viable Global Framework for Preventing Dangerous Climate Change – CAN Discussion Paper.* http://www.climatenetwork.org.

Den Elzen, M.G.J. and M.M. Berk, 2004. "Bottom up approaches for defining future climate mitigation commitments". RIVM, The Netherlands

Herzog, T., Kevin A. Baumert, and J. Pershing, 2006. *Target: Intensity. An Analysis of Greenhouse Gas Intensity Targets.* World Resources Institute, Washington, DC.

La Rovere, E., L. Valente de Macedo, and K. Baumert. 2002. "The Brazilian Proposal on Relative Responsibility for Global Warming," in Baumert et al. (eds.), *Building on the Kyoto Protocol: Options for Protecting the Climate.* Washington, DC: WRI.

Meyer, A. 2000. "Contraction and Convergence: The Global Solution to Climate Change". Schumacher Briefing No. 5. Devon, England: Green Books.

Mqadi, Lwandle, Harald Winkler and Angela Churie Kallhaug, 2005. *South Africa beyond Kyoto*. Swedish Environmental Protection Agency. www.naturvardsverket.se/dokument/press/2004/juni/postkyoto/southafrica.pdf

Ng, Wei-Shiuen and Lee Schipper. 2005. "China Motorization Trends: Policy Options in a World of Transport Challenges." In *Growing in the Greenhouse: protecting the*

climate by putting development first. Rob Bradley and Kevin A. Baumert, eds. World Resources Institute, Washington, DC.

People's Republic of China, June 2007. "China's National Climate Change Programme"*.* Prepared under the auspices of the National Development and Reform Commission.

Pew Center, 2007. "Climate Change Mitigation Measures in the People's Republic of China", International Brief 1.

Pew Center, 2002. "Climate Change Mitigation in Developing Countries: Brazil, China, India, Mexico, South Africa, and Turkey".

Philibert, Cédric. 2005. "Climate Mitigation: Integrating Approaches for Future International Cooperation" OECD/IEA Information Paper, Paris

Rose, Daniel H. and Houser, Trevor. 2007. *China Energy: A Guide for the Perplexed*, A Joint Project by the Center for Strategic and International Studies and the Peterson Institute for International Economics,

UNFCCC. 1997. "Paper no. 1: Brazil: Proposed Elements of a Protocol to the United Nations Framework Convention on Climate Change." Presented by Brazil in Response to the Berlin Mandate, UNFCCC/AGBM/1997/MISC.1/Add.3 GE.97. Bonn.

Winkler, H. et al., 2002. "Policies and Measures for Sustainable Development," *in* Baumert et al. (eds.), *Building on the Kyoto Protocol: Options for Protecting the Climate*. World Resources Institute, Washington, DC.

Winkler, H, Howells, M & Baumert, K. 2005. "Sustainable development policies and measures: Institutional issues and electrical efficiency in South Africa". Center for Clean Air Policy. Washington, DC.