

China Sustainable Development Strategy Report 2009

---- China's Approach towards a Low Carbon Future

Executive Summary*

CAS Sustainable Development Strategy Study Group

Climate change has become the most significant environment and development challenge to human society in the 21st century. Responding to climate change is the core task to achieve global sustainable development, both for today and for a rather long period of time from today. International negotiations on prevention of global warming and related actions not only concern human living environment, but also directly impact the modernization process of developing countries. Although the process of global climate protection depends on the consensus of our scientific awareness, political wills, economic interests, society's level of acceptance, as well as measures adopted, a low carbon development path is, undoubtedly, the critical choice of future human development.

The science basis of climate change and its extended political and economic implications

Global warming of the climate system has become an unequivocal fact. According to a large amount of monitoring data, global average land surface temperature has risen 0.74 °C over the last century (1906~2005). And the rate of rising has been sped up. In the meantime, global average sea level has been constantly rising too. Global warming has posed serious challenge to China's climate, environment and development. In the global context of climate change, China's climate and environment is changing too. For instance, in the last century, the land surface average temperature has witnessed obvious increase; though the precipitation has not changed too much, its interdecadal variations and regional disparity have been big. In the last 50 years, there have also been major changes in the frequency and intensity of extreme weather and climate events (China's National Assessment Report on Climate Change, 2007).

* The summary was written by Prof. WANG Yi, Team Leader and Chief Scientist of the CAS Sustainable Development Strategy Study Group and Deputy Director-General of Institute of Policy and Management of the Chinese Academy of Sciences (CAS). The report has been published by the Science Press in March 2009. For further information, please send email at "wangyi@casipm.ac.cn" or visit "www.china-sds.org"

The IPCC integrated assessment shows (IPCC, 2007a) that since 1750, human activities have been a major cause of global warming, while in the last 50 years, most of the global warming is the consequence of human activities with a probability of more than 90%, in particular from the greenhouse gases emissions due to the human use of fossil fuels. It is forecast that before the end of the 21st century, global warming will continue, and how much the temperature will rise depends on what actions humans will take. According the Third Working Group Report of the IPCC 4th Assessment (IPCC, 2007c), human actions to mitigate climate change are feasible, both economically and technologically. Actions to deploy key mitigation technologies in various sectors, adopt policy and administrative interference and shift the development pathway could all contribute greatly to mitigation of climate change. Thus, the IPCC assessment report has become the most important scientific foundation for global climate political decisions.

Over the last two decades, though climate change science has been progressing, climate research somehow remains a complicated integrated scientific field. Firstly, due to its broad coverage of subject areas and inadequacy of research, climate change seems hard to fully master. As a result, there remain many uncertainties in basic scientific research, including the basic theory of the occurrence and development of climate change, future climate change forecast and impact, regional response of climate change, as well as possibility of carbon capture and storage (CCS) (refer to Chapter 1 for details). And secondly, along with the inclusion of social sciences and various other social groups, climate change has gone far beyond the boundary of basic science, instead, evolved into a development and political issue. And it is getting more “politicized”. To certain extent, scientists from different countries, in the name of protecting global climate, have all been seeking useful proofs and indicators that would potentially benefit their own national interest. This seems natural and hard to blame.

Actually, along with the international negotiation on climate change started in the 1990s, disagreements and arguments have never stopped and are expected to continue for a long time. Due to the fact that the key to prevention of climate warming is to reduce CO₂ emissions, or in other words to control the consumption of fossil fuels, as well as to increase natural carbon sink or adopt CCS technology, the nature of participating in international negotiations by the two opposite camps -- industrialized countries versus developing countries -- is to fight for the fair allocation of emissions and the rights of reasonable development. The fight for both political and economic interests has been rather fierce. In the current international climate regime, the UNFCCC, adopted in 1992, clearly stated “common but differentiated responsibility”; it also pointed out that “the largest share of historical and current global emissions of GHGs has originated in developed countries”. In 1997, the Kyoto Protocol stipulates that the Annex I countries, major developed countries, take the lead to achieve the set emissions reduction targets for the first compliance period (2008~2012). Up till now, all the above-mentioned

mechanisms in response to climate change have basically reflected the actual responsibility and obligation of various key parties.

Different from any other international negotiations, global climate politics to deal with climate change appears more complicated and complex. The balance of diverse national interests and global consensus becomes the key element to decide whether the negotiation will be effective. No single authority would be able to totally dominate the negotiation process. To stabilize the GHG emissions requires multi-party cooperation. As a result, lack of the participation of large-emission countries will greatly weaken the impact of any agreement, while superpower control and military forces become helpless in front of the global climate politics. In the meanwhile, one major feature of global climate politics is the importance of the opposite forces. In many cases, anti-climate alliances could play a key role in global environmental negotiations and negatively affect the processes. Exactly because of those factors, various camps formed around global climate negotiation are characterized with obvious geo-regional and economic characteristics. This is also where the serious disagreements exist that reflects the concerns of different nations and regions in response to climate change.

The universal voice reflected from some latest studies, including the IPCC 4th Assessment Reports, says that human society shall immediately adopt actions to lower the degree of temperature rise to the lowest possible level (e.g. 2 °C). All those reports demonstrate the prominent desire of all interested parties on the basis of new and latest studies and the constantly changing political and economic context, and they together dominate the mainstream discourse (IPCC, 2007d; Stern, 2006, 2008; Blair, 2008; McKinsey & Company, 2007, 2009). Let's use the Stern Review as an example, published in 2006 and 2008. The Stern report emphasizes that "climate change is a serious global threat, and it demands an urgent global response"; it says that "the benefits of strong and early action far outweigh the economic costs of not acting". Even though the Report recognizes the difficulties, it tried its best to convince global society to accept the 2 °C target to control the rise of global average temperature. And this has been used as the foundation for a series of follow-up policy and mechanism design. The Report represents not only UK's views but also those of EU.

At present, the post-Kyoto international negotiation has entered a crucial period of time. The Bali Roadmap adopted at the 2007 COP 13 has decided to integrate into the negotiation agenda for post-Kyoto -- mitigation, adaptation, technology transfer and financing mechanism. It also expects that the measureable, reportable and verifiable actions adopted by developing countries be linked up with the technology transfer and financial support from developed countries, which shall also be measureable, reportable and verifiable. This signals a big step forward. Whether this will be achieved, of course, remains to be seen in the final negotiation. Impacted by global financial crisis and various

countries' political processes (in particular the US legislation process), whether agreement will be reached at the end of 2009 in Copenhagen remains unknown. No matter what the outcome will be, the final global agreement on degree of temperature rise, or GHG stabilization concentration, as well as the mid- and long-term GHG emissions reduction targets, will be a political decision based on the compromises from various parties. And it will have a deep and long-term impact on future climate protection, economic growth and even the structure of potential strategic competition.

With China becoming the world's largest CO₂ emitter, China faces increasing pressure to reduce its emissions. Being a responsible country, China will take actions to tackle climate change. When developing its mitigation target, China will consider such factors as level of development, technology know-how, social impact, international image and a new international climate regime underpinned by fairness and effectiveness. China will move into a win-win development path to achieve climate protection, quality economic development and other related policy targets.

To develop low carbon economy – background, opportunities and challenges

As illustrated above, systematic solutions are required to tackle climate change, due to the complexity of global climate system as well as its coverage of broad social and economic issues. After nearly two decades' exploration, human society has realized that in order to effectively mitigate and adapt to climate change, we have to fundamentally reduce our reliance on fossil fuels, which means that we have to achieve the shift to a low carbon future from the way we produce and consume to how global assets are allocated (including industries, technology, capitals and resources) and how they are transferred. From the perspective of the limited storage capacity of GHGs in the climate system as a global public good, both high level of human wisdom and a new international climate regime to deal with market failure are required, which also demands the participation of all stakeholders and together they shall charter a new development pathway. Human society has to pay the economic prices to solve climate warming. Thus, the three flexible "mechanisms" in the Kyoto Protocol (Joint Implementation, Emissions Trading and Clean Development Mechanism) demonstrate a meaningful experiment for the Annex I countries to decrease their emissions reduction costs. What is needed is to move forward from where we are now to explore a more universally applicable mechanism that would effectively allocate the resources among the key responsible stakeholders. The low carbon development path embodies an integrated solution strategy. It aims to build up a low carbon society through low carbon economic development, tries to achieve the re-structure of all the key elements discussed above, and offers new opportunities for human society in response to climate change through collaborations.

As a fundamental venue to coordinate social and economic development, guarantee energy security and respond to climate change, development of low carbon economy is

gradually gaining the needed consensus from more and more countries. Though without a fixed academic definition, the core of developing low carbon economy is to establish a development pathway that has high energy efficiency, low energy consumption and low emissions. Under a fair and effective international climate regime, the efficiency of energy exploration, generation, transmission, transformation and use is expected to be increased greatly and energy consumption greatly reduced, so that the carbon intensity in energy supply for economic growth is dramatically reduced, so are the carbon emissions from energy consumption. Through increasing carbon sink and using CCS technology, the GHG emissions from fossil fuels that are hard to reduce can be offset. In the meanwhile, through the establishment of reasonable and fair technology transfer and financial support mechanisms, developing countries can undertake the costs to shift towards low carbon patterns while being at the lowest end of the value chain in the international trade structure. The perspectives of development value need to be changed in order to promote the transition of consumption towards a sustainable and low carbon future.

The United Kingdom is the first country that put forward the concept of “low carbon economy”. UK had its own historic and realistic reason for doing so. Its major purpose is to guarantee energy security, mitigate the impact of climate change, utilize the opportunities from retrofitting its energy facility infrastructure and its advantage in low carbon technology, increase its own economic efficiency and vitality, take a potentially larger piece of the future low carbon technology and products market, and obtain its leadership role in international politics as well as increase its international influence. It is obvious to see that the dominant driver is economic and political competitiveness though reduction of emissions is a primary objective. Other EU countries, Japan and other major developed countries have also gained progress around “low carbon economy” on the basis of their own advantages in energy, environment, economy and politics, as well as their own social and economic contexts and global strategy. They are beginning to lead the trend of global revolution towards a low carbon future through various strategies and models (refer to Chapter 3 for details).

Special attention shall be given to the US latest development after President Obama took office. In his newly announced stimulus package, President Obama put energy-related sectors at its core. In his energy policy, President Obama put together an integrated package of energy reform and transformation that includes energy saving and improvement of energy efficiency, development of renewable and clean alternative energy, investment in new energy and clean energy technology R&D, shifting away from its over-reliance on imported oil, and reduction of GHG emissions. This not only has inherited the country’s tradition of paying primary attention to clean energy technology, but also possibly implies that a new mechanism to respond to climate change be established.

What needs to be clarified is that, due to the differences of various countries' social and economic contexts, the starting points towards a low carbon future might vary, so might the pursued goals. For developed countries that are taking the lead to commit to reduction targets, their first objective to develop low carbon economy is to reduce emissions. For developing countries whose economies are still at a fast growing stage, their first priority is development and their per capita energy consumption is expected to continue to grow. The objectives shall be multiple. At the current stage, it is hard to mainstream the climate change policies domestically. What is possible is to reduce energy intensity and increase carbon productivity in order to gradually decouple economic growth and carbon emissions. What is equally important is that there exist many uncertainties in development of low carbon economy, particularly for developing countries. Tremendous difficulties and barriers need to be overcome in the process.

At the international level, the uncertainties of developing low carbon economy include:

1. Costs and markets -- at this moment we could hardly be able to estimate the whole costs that are required to develop low carbon economy. It is far from being as simple as calculating the direct costs of adopting low carbon technologies. It also takes time to establish low carbon technology and product markets, especially now when global financial crisis hit everyone hard and when no one could give a good estimate about when the world economy could turn around and recover, though many experts and scholars hold that the response to the long-term climate change could bring new opportunities to economic recovery (Stiglitz, 2009; Wang Yingchun, 2008). What makes the situation more complicated now is how US, China, India and other key countries would participate in the establishment of low carbon market.
2. Establishment of a fair international climate regime and mid- to long-term targets to tackle climate change -- the development of low carbon economy also depends on the international climate negotiation process and its result, of which the most critical element is whether it will result in legally-binding global emissions reduction targets and the corresponding mechanisms of technology transfer and financial support (refer to Chapter 6 for details).
3. Till today, even though some EU countries have achieved the decoupling of economic growth and carbon emissions, low carbon economy has not generated universally applicable successful experiences. And what those experiences mean to developing countries still needs to be figured out and tested over time.

For developing countries, the difficulties and barriers to developing low carbon economy are obvious, including current stage of development, international trade structure, economic costs, inadequate market, technology diffusion system, institutional arrangement, incentive policy and management system. From the historic evolution of the

relationship between economic growth and carbon emissions in industrialized countries, most countries experienced successively the inverted U-shape curves of carbon intensity, per capita carbon emissions, and then total carbon emissions. But different countries or regions vary greatly in the economic development level or per capita GDP relative to the carbon emissions peak. This shows that there does not exist a single, exact turning point between economic growth and carbon emissions. If you examine those countries or regions that have passed the carbon emissions peak, roughly 24 to 91 years, on average 55 years, are required between the peak of carbon emissions intensity and that of per capita carbon emissions (refer to Chapter 2 for details). The point is, without strong mandatory emissions reduction measures and external support, developing countries will need relative longer time to reach the peak of carbon emissions growth and then stabilize and decrease.

As the largest developing country, China faces both opportunities and challenges to develop low carbon economy. Firstly, for a longer term, embarking on a low carbon development pathway suits the basic trend of global energy being low-carbonized. This is also in line with China's efforts to transform the way its economy grows, restructure the economy, achieve the targets of energy saving and pollutants reduction, as well as achieve sustainable development. The opportunity exists for China to develop low carbon economy so that some key sectors can gain more competitive advantage in energy saving and pollution reduction technologies. And in some cases, China can even lead the world. As a result, China can reach the turning point of energy consumption and carbon emissions sooner. And this has been proved by various scenario analyses (refer to Chapter 5 for details). In the meantime, some cities and regions have expressed their enthusiasm to shift their economic growth towards a low carbon future and seek new economic growth points. Some demonstrations and pilots are now being rolled out on the ground (refer to Chapter 7 for details).

But from short- to mid-term perspective, China is somewhat stuck in its current stage of development. To achieve the transition to a low carbon economy is challenged by rapid economic growth, being at the very end of the value chain in international trade, increasing employment pressure, energy structure that is dominated by coal, relatively lagging behind in technology development, and inadequacies in its current institutions and policies. As a large developing country that has been leading the economic rise, China is situated in the middle of an important strategic opportunity when it could surpass the heavy-chemical industrialization stage quickly by taking advantage of all kinds of favourable conditions both domestically and internationally. In the reference scenario/case of the WEO 2008 and the IEO 2008, the world's endowment of fossil fuels is large enough to support the projected rise in production beyond 2030 but much bigger carbon emissions (IEA, 2008; EIA, 2008). However, the comparatively low price in the one to two decades may offer China the last opportunity to complete the main tasks of

industrialization. On the other hand, the failure to achieve the transition to low carbon economy would potentially put China in face of a risk of unsustainability and maybe a border carbon adjustment tax in exporting. China is stuck in the middle of the choice of economic growth opportunity and low carbon economic transition. Thus, we must abide by the general rule of economic society and climate protection and go along with the trend of development of low carbon economy. In the meantime, we need to seek a low carbon development pathway that would better coordinate the long-term and short-term interests and also balance various policy targets.

A Low Carbon Development Strategy with Chinese Characteristics

Strategic Approach

A low carbon development path with Chinese characteristics shall be built upon China's basic national conditions and proceed gradually in line with global development trend (refer to Chapter 4 for details). The strategy shall have clearly defined targets by phases and also development roadmap of priority actions. Five aspects shall be considered in its strategic approach, which include:

1. Low carbon development shall take place in the context of sustainable development, in which the priority is to build up resource-efficient and environment-friendly society, as well as innovation-driven nation. All those shall be reflected in the practice to achieve sustainable industrialization and urbanization.
2. "Low-carbonization" shall be taken as part of the national strategic target for social and economic development, with improvement of energy efficiency and achievement of the energy-saving and pollution control targets as the core for short- and mid-term. That is to lower the energy consumption intensity and increase the carbon productivity, try best to reduce the rate of increase of CO₂ emissions, and achieve a gradual decoupling between carbon emissions and economic growth. Thus the potential negative impacts and risks from climate change could be reduced through various integrated measures.
3. National interest has to be the first concern, while balancing the relationship between economic development and climate protection, as well as between short-term and long-term targets. It is crucial to tackle effectively the relationship between how to use the strategic opportunity to achieve the leapfrog over the heavy-chemical industrialization and how to achieve a low carbon transition. In the meantime, integrated consideration shall be given to the co-benefits between carbon reduction and energy security and environmental protection. Opportunities shall not be missed. Firstly, China shall take full advantage of the relatively favourable resource and energy conditions, both domestically and globally, to complete its task of heavy-chemical industrialization. And secondly, the low carbon business opportunities shall be grasped to increase China's competitiveness in energy saving and pollution

reduction, as well as low carbon technology and products in key sectors, in order to avoid the potential lock-in effect during the leapfrogging process .

4. Low carbon development demands sectoral and regional collaboration and attract the broad participation from various interested parties, so that all forces in the society can play their roles actively, especially through a new international cooperation model and mechanism innovation, so that the transition can be achieved jointly in production and consumption patterns, both in China and globally.
5. China shall actively participate in international climate regime negotiation and rule setting in order to gain more development space in the industrialization process. China could also demonstrate its political will to reduce emissions by committing to appropriate targets (such as energy consumption intensity or carbon emissions intensity) in accordance with its own national conditions and its actual capability. This will showcase China's actual contribution to mitigate global warming while elevating China's international image as a large responsible nation. In the meantime, developed countries should be asked continuously to take the lead to reduce GHG emissions by a big margin, and establish a new mechanism to support developing countries in technology transfer, financing and capability-building in a "measurable, reportable and verifiable" way.

Strategic Targets

Integrating all kinds of studies (Sustainable Development Strategy Study Group of the Chinese Academy of Sciences, 2006; Jiang Kejun, 2007; He Jiankun, 2008), we propose that, by 2020, China's low carbon economic development target be set at 40%~60% reduction of energy consumption per unit of GDP over the 2005 level, and CO₂ emissions per unit of GDP be decreasing by about 50%. With support of reasonable and fair technology transfer and financing mechanism, if more restrictive policy and measures were adopted for energy saving and carbon reduction (including CCS), China's carbon emissions could be expected to peak between 2030 and 2040, and then stabilize and start to decline afterwards.

Strategic Focuses

Taking a low carbon development path must link up with domestic priority strategic development targets and the real-life conditions of each sector. Special attention shall be paid to grasping key low carbon areas in order to gain the maximum co-benefits through the lowest possible costs and carbon emissions, thus to achieve, gradually, the "low-carbonization" of the whole national economy. The priority areas that need special attentions include:

1. Conducting energy efficiency benchmarking management for those high energy-consuming industries, in line with the current key strategic measures of energy saving

and pollution reduction to tackle the low energy efficiency problem in industrial production and end-use energy consumption, as well as the future potential large scale rise of energy demand from rapidly growing transport and building sectors. Attention shall also be given to other major energy-consuming units and departments, phase-out of outdated production unit and strengthening energy efficiency regulation for newly constructed facilities and buildings.

2. Any large-scale infrastructure construction shall be completed by low energy consumption, high energy efficiency and low carbon emissions in the process of China's rapid industrialization and urbanization. This is to avoid the potential lock-in effects in asset capital investments.
3. Speeding up the development and demonstration of poly-generation technology that is led by coal gasification and commercialization of IGCC technology, in the context of mid- to long-term energy security and responding to climate change. This is based on the consideration that coal in China will continue to hold its basic position in future energy structure and energy security guarantee. In the meantime, China shall combine its clean coal technology with CCS and achieve a leadership position in global clean coal technology application.
4. Exploration of a best model when renewable energy will be most effectively used in the nation's whole energy system in accordance with China's current and future trend of clean energy and renewable energy development. A better and diverse energy supply system shall be established to gradually change the energy structure, improve energy service, continuously increase the proportion of commercial energy that is needed by the wide-spread rural areas, and promote the equity principle in basic public energy services.
5. Combined technologies to reduce regional pollutants shall be adopted in the process of China's eco-civilization construction. In-depth studies of how to achieve the carbon sink benefits from forest and land use shall be conducted, in order to achieve the co-benefits in structuring favourable environment and responding to climate change, while continuously reducing the costs of pollution control.
6. Studies on adaptation strategy shall be conducted and strengthened. Sectors and product design shall be the focuses, to improve adaptation capability and capacity in response to global warming and reduce the potential losses from extreme weather and climate events.

Strategic Measures

On the basis of the above-mentioned analysis, the low carbon path with Chinese characteristics shall also focus on gradually setting up "resource-efficient, environment-friendly and low-carbon oriented" society. Guided by low carbon development strategy and its targets, efforts shall be made to develop relevant institutional arrangements, improve management system, stipulate development plan, accumulate experience from

demonstrations and pilots, and push forward low carbon economic development in an orderly manner, so that a sustainable and low carbon future can be shaped for China.

Four major aspects are the key starting points to structure a low carbon social and economy system (refer to Chapters 4 and 8 for details):

1. Establish a legal and regulatory framework addressing climate change and improving the macro management system

The legislative feasibility and legal model of “Law to Address Climate Change” shall be debated and articulated. Also in the legislation process of other laws and regulations, articles related to response to climate change shall be included. For instance, a technical guideline of strategic environmental assessment shall include articles related to climate change impact assessment. A legal and regulatory framework of responding to climate change will gradually emerge.

Due to the fact that China’s administrative authority in charge of climate change remains weak and lacking capability, firstly, the Leading Group of the State’s Response to Climate Change and Energy Saving and Pollution Reduction Work shall play its full roles when more flexible and diverse departmental coordination mechanism is established; and the group shall put forward strategic measure recommendations in response to climate change; and secondly, capacity building shall be strengthened and more administrative resources shall be allocated, so that better preparation is made for the next round government restructuring to further improve the administrative level of the government department in charge of climate change.

2. Establish **Long-acting Mechanism framework** of low carbon development and stipulate related low carbon development policies in an orderly manner

Institutional innovation is the key to embarking on a low carbon development path. China shall become more pragmatic in developing long-term incentive mechanism and policy measures that are in favour of energy saving, environmental protection and climate protection, guided by the balanced development framework, and achieve the low carbon transition at government and business levels. At this moment, many regions and cities have expressed their interest and enthusiasm toward low carbon development, as well as the complexity of low carbon economy and the diversity of models, related guidelines shall be rolled out to guide the macro policy, and regulate the content, model, direction of development and assessment indicator system of low carbon economy. Experiences and lessons from other countries can be examined and learned in order to move forward low carbon development in an orderly and healthy manner. Special planning and program shall be developed at national level, and then some representative regions and cities, as well as some key sectors can be selected for low carbon piloting purpose. When the

market matures, low carbon markets shall be set up through regulating the pricing mechanism and stipulating fiscal and incentive policies.

3. Strengthen collaboration and establish a healthy low carbon technology system

Technological innovation is the core element in low carbon development. Government shall adopt integrated measures to offer relaxed and favourable policy environment for businesses to develop, create and provide better institutional guarantee for technological innovation. As a result, the R&D and diffusion of high energy efficiency and low carbon emissions technologies can be strengthened in both production and consumption. And a diverse low carbon technology system will be gradually built for energy saving and energy efficiency, clean coal and clean energy, renewable energy and new energy, as well as carbon sinks. The level of commercialization will be improved. Thus a strong technological foundation will be provided for low carbon transition and shift of the ways of economic growth. China shall also further strengthen international collaboration, not only through the climate-related international cooperation mechanism to import, absorb and adopt advanced technologies from other countries, but more importantly, through participating in the stipulation of related international sectoral energy efficiency standards and standard of carbon intensity, as well as benchmarking. China could consider voluntary or mandatory benchmarking management to elevate some key low carbon technologies, equipment and products to international leadership level.

4. Establish collaboration mechanism with all stakeholders' participation

Low carbon development is not the thing just for government or business; instead, it requires all related stakeholders' as well as the whole society's participation. Due to the fact that there exist some inadequacies in the general public's awareness on climate change, publicity, education and training are required in combination with policy incentives to transform the public's perception and thinking, increase the public's awareness on response to climate change, and gradually reach consensus on focusing on low carbon consumption behaviours and models. Joint actions with all the stakeholders are needed to resist the potential risks from climate change.

(See References in Chinese version)

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