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Insights to Chinese Environmental Policy

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INTERACTION OF GLOBAL AGENDAS AND CHINA'S NATIONAL ENVIRONMENTAL AND ENERGY POLICY ISSUES - GLOBAL ENVIRONMENTAL GOVERNANCE IN CHINA

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Interaction of global agendas and China's national environmental and energy policy issues

- Global environmental governance in China*

Andreas Oberheitmann⁺

To mitigate global climate change, on the Third Conference of the Parties (COP-3) of the United Nations Framework Convention on Climate Change (UNFCCC) in Kyoto, Japan between 1 and 10 December 1997, the OECD-countries and East and Central European countries in transition agreed to reduce their greenhouse gas emissions (GHGs) by 5.2% between 2008 and 2012 compared to the year 1990 (Kyoto Protocol).

In 2007, the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report states that world temperatures according to the scenario assumptions set could rise by between 1.1 and 6.4 °C during the 21st century leading to sea level rises, more frequent warm spells, heat waves and heavy rainfall, and an increase in droughts, tropical cyclones and extreme high tides (IPCC, 2007). To keep the increase of global mean temperature on a 2 °C level and not to risk extensive negative impacts of climate change, CO₂-concentration in the Earth's atmosphere should be stabilised at least on a 400-450 parts per million (ppm) level. In 2007, the European Commission obliged itself to this 2 °C target. In 2007, the European Commission obliged itself to this 2 °C target (EUROPEAN COMMISSION, 2007). In June 2009, on their summit in L'Aquila, the G8 countries agreed to this target, followed later by China, India, Indonesia, Mexico, South Korea and South Africa on the Major Economies Forum (MEF) (RAHMSTORF, 2009).

As a Non-Annex-I country, China does not have quantitative emission reduction obligations towards the Kyoto Protocol, they only have to report their emissions in a national communication describing the steps they are taking or envisage undertaking to implement the Convention (Articles 4.1 and 12). In accordance with the principle of "common but differentiated responsibilities" enshrined in the Convention, the required contents of these national communications and the timetable for their submission is different for Annex I and non-Annex I Parties (all other than Annex-I countries). Each non-Annex I Party shall submit its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources.

On 10 December 2004, China submitted its initial National Communication to the Conference of the Parties. It covers the following issues: (a) National circumstances; (b) National

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greenhouse gas inventory; (c) Impacts of climate change and adaptation; (d) Policies and measures related to climate change mitigation; (e) Research and systematic observation; (f) Education, training and public awareness, and (g) Needs for funds, technologies and capacity building (THE PEOPLE'S REPUBLIC OF CHINA, 2004).

The institutional setting in China is as such: In 1990, a Coordination Committee for climate change issues was established under the Environmental Protection Committee of the State Council being the institution in charge of environmental policy at that time. In 1998, when central government organizations were streamlined, the National Coordination Committee on Climate Change (NCCCC)¹ was set up. The National Coordination Committee on Climate Change is an inter-ministerial body and is responsible for deliberation and coordination on climate related policy issues and activities, negotiations with foreign parties. Major issues are submitted to the State Council for directions and guidance. In the past few years, the National Coordination Committee on Climate Change provided guidance to central government departments and local governments for their addressing climate change issues. Currently, the division of work of the National Coordination Group is as follows:

- The National Development and Reform Commission (NDRC) coordinates climate change policies and actions adopted by various departments;
- The Ministry of Foreign Affairs takes the lead for participating in international climate change negotiations;
- The State Meteorological Administration takes the lead for participating in the work of Intergovernmental Panel on Climate Change.

The Office of the National Coordination Committee on Climate Change is located in Department of Regional Economy of NDRC and responsible for the routine work of the Committee. The Ministry of Environmental Protection (MOEP) is not a formal member of the NCCCC, However, a representative of MOEP is one of the Vice Chairmen (CHINA CLIMATE CHANGE INFO-NET, 2009). The division of political responsibility is as such: the MOEP is responsible for the local and regional emissions. Greenhouse gas emissions are basically dealt with by NDRC and the Ministry of Science and Technology (MOST).

As a developing country, according to Article 12 of the Kyoto Protocol, China and other developing countries (Non-Annex I countries) can host projects under the Clean Development Mechanism (CDM) which aims at supporting the developing to achieve a sustainable development through environmentally friendly technology transfer and at the same time help the industrialised countries via these investments in greenhouse gas mitigation technology to fulfil their quantitative obligations more flexible². Preconditions for the participation on CDM

¹ Members of the Committee are Ministry of Finance, Ministry of Commerce, Ministry of Agriculture, Ministry of Construction, Ministry of Communications, Ministry of Water Resources, State Forestry Administration, Chinese Academy of Science, State Ocean Administration, Civil Aviation Administration.

² An Annex-I country (i.e., an OECD country or an East or Central European country in transition) wishing to get credits from a CDM project must obtain the consent of the developing country hosting the project that the project will contribute to its sustainable development. Then, in a Project Design Document (PDD),

projects (Art, 12,5) are: (a) voluntary participation approved by each Party involved, (b) real, measurable, and long-term benefits related to the mitigation of climate change; and (c) reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

The question arising here is, how China is undertaking environmental governance in the field of climate change. Following up, there is an analysis of global climate change mitigation efforts in China proposed on the 15th Conference of the Parties (COP 15) to the United Nations Framework Conference on Climate Change (UNFCCC) in Copenhagen (Section 1). In China, global environmental governance is implemented through regulation and planning. Against this Section 2 is giving an overview of the most important environmental regulation and strategies concerning climate change in China. Section 3 provides for an insight into the interaction of global agendas and national environmental/energy policy issues in the 11th Five Year Plan, section 5 for the 12th Five Year Plan. Section 5 concludes this paper.

1. Global climate change mitigation efforts in China

Over the last ten years, economic development – and the emission of greenhouse gases that accompanied it – has taken place much faster than people expected when negotiations concerning the Kyoto Protocol were being held. In 1998 it was still assumed that China would overtake the USA as the nation with the highest CO₂ emissions around the year 2030, but this actually occurred in 2007 (BP, 2008). On the one hand, as China became the World's largest emitter of CO₂ in 2007, it is expected to take a more prominent role in global environmental governance. On the other hand, the average level of per-capita emissions is currently around 4 tonnes of CO₂, which is still considerably below the western European average (approx. 8 tonnes per capita) and well below that of the USA (approx. 19 tonnes per capita). China (7.5 t) is going to catch up with Europe (8.5 t) and Japan (9.5 t) even more by 2030.

COP 15 in Kopenhagen in December 2009 to a large extent failed to reach an agreement on a post-Kyoto system because the US and China did not come forward with a substantial climate change mitigation commitment. The US only proposed a reduction of greenhouse gas emissions by 4% in 2020 compared to 1990, this is not even that amount, the country proposed in Kyoto in 1997 (-7%).

This made it extremely difficult for China to come up with a substantial contribution by itself. In his speech on the UN climate change summit in New York on 22 September 2009, the

using baseline and monitoring methodologies approved by the CDM Executive Board (CDM EB), the Annex-I country has to prove that the project activity and the incurring greenhouse gas emission reductions would not have happened anyway (establishing additionality), and must establish a baseline (the business as usual case) enabling him to estimate the future emissions in absence of the registered project. The project is then validated by a third party agency, called Designated Operational Entity (DOE). The function of the DOE is to ensure and certify that the project results in real, measurable, and long-term emission reductions. The EB then decides whether or not to register (approve) the project. If a project is registered and implemented, the CDM EB issues credits, Certified Emission Reductions (CERs), each unit equivalent to the reduction of one metric tonne of CO₂. These CERs are issued to the project participants based on the monitored difference between the baseline and the actually monitored emissions, verified by the DOE.

Chinese President Hu Jintao declared that China will spare no effort in ensuring a deal is reached at the UN climate change meeting in Copenhagen. The following four goals will be endeavoured:

1. A reduction of carbon intensity by a notable margin by 2020 against 2005. On COP 15 in Kopenhagen in December 2009, this notable margin was made clear: 40-45%.
2. An increase of non-fossil fuel share (in primary energy supply) to 15% by 2020 against 2005.
3. An increase of forest coverage of 40mill. ha and of forest stock volume of 1.3bn m³ by 2020 against 2005.
4. The promotion of Green Economy, Low Carbon Economy, Circular Economy and technology development.

Obviously, the Chinese government did not come up with an absolute emission reduction target. However, China is now turning away from the old energy intensity to carbon intensity targets. Nevertheless, taking the current goals for economic growth (quadrupling GDP per capita in 2020 compared to 2000), a 45% reduction of carbon intensity still mean an increase of Chinese CO₂-emissions in 2020 by 54.2%.

As for the increase of non-fossil fuel share, China has to enlarge their current development programme by up to 50%. In 2007, the share of hydro and nuclear energy to primary energy supply was 7.3%, up 0.2% from 2005. Due to the current plans, 86GW nuclear power will be installed by 2020 (2005: 7 GW), 300 GW hydro power (2005: 115 GW), 30 GW wind energy (2005: 1.3GW) and 40bn m³ biogas will be produced by 2020 (2005: 8 bn m³). Together, this makes about 400mill. tsce non-fossil energy production by 2020. Compared to the 2007 World Energy Outlook forecast of the International Energy Agency (IEA, 2007), in 2020 will have a primary energy supply of 4bn. tsce in the reference scenario and 3.6 bn. tsce in the alternative scenario. Compared to these figures, the share of non-fossil fuels only reach about 10-11% of total primary energy supply in 2020.

As for afforestation, China set out ambitious goals. According to the current “Report on the State of the Environment in China” issued by the Ministry for Environmental Protection, in 2003, China’s forest area was 174.9mill. ha, forest stock about 12.5bn. m³. The envisaged growth of forest is 22.9% against 2005, growth of forest stock 10.4%.

The promotion of Green Economy, Low Carbon Economy, Circular Economy and technology development cannot be quantified. However, following these concepts is a promising way to achieve the goals of a substantive reduction of carbon intensity and to achieve a sustainable development in China.

2. Environmental regulation

To cope with climate change, during the recent years, the Chinese government issued several actions plans and legislation. The most important are:

- The Renewable Energy Law of the People's Republic of China (STANDING COMMITTEE OF THE NATIONAL PEOPLE'S CONGRESS (NPC) OF THE PEOPLE'S REPUBLIC OF CHINA, 2005).
- China's Scientific and Technological Actions on Climate Change (MINISTRY OF SCIENCE AND TECHNOLOGY OF THE PEOPLE'S REPUBLIC OF CHINA et al., 2007).
- China's National Climate Change Programme (NATIONAL DEVELOPMENT AND REFORM COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA, 2007).
- China's Medium and Long-term Development plan for China (NATIONAL DEVELOPMENT AND REFORM COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA, 2007a)
- China's Policies and Actions for Addressing Climate Change. White Paper by the State Council (STATE COUNCIL OF THE PEOPLE'S REPUBLIC OF CHINA, 2008).
- Implementation of the Bali Roadmap – China's Position on the Copenhagen Climate Change Conference (NATIONAL DEVELOPMENT AND REFORM COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA, 2009).

All these plans and legislation both serve environmental protection goals as well as energy security issues. The 11th Five Year plan especially aims at contributing to climate change mitigation by accelerating the building of a resource-conserving society. E.g., the White Paper by the State Council (STATE COUNCIL OF THE PEOPLE'S REPUBLIC OF CHINA, 2008) states that the Control of Greenhouse Gas Emissions shall be achieved by *“striving to mitigate greenhouse gas emissions through accelerating the transformation of the country's economic development pattern, strengthening policy guidance concerning energy conservation and efficient utilization, intensifying administration of energy conservation in accordance with the law, speeding up development, demonstration and application of energy conservation technologies, giving full play to the role of new market-based mechanisms for energy conservation, enhancing public awareness of the importance of energy conservation, and accelerating the building of a resource-conserving society. Through these measures, the energy consumption per-unit GDP is expected to drop by about 20 percent by 2010 compared to that of 2005, and carbon dioxide emissions will consequently be reduced”*.

3. Global environmental governance and interaction of global agendas and national environmental/energy policy issues in the 11th Five Year Plan

Global environmental governance in China is also implemented in the 11th Five Year Plan. However, it still has its weaknesses. The following observations can be made:

- A too weak interaction of global agendas and national environmental/energy policy issues, but

- A strong influence of resource economic factors exercise on national climate policy.

There is a too weak interaction of global environmental agendas and national environmental/energy policy issues. As developing country, China does not have a quantitative GHG emission reduction obligation towards the Kyoto protocol. Currently, this principle is still holding as every country should have their economic development in equal terms. Under the current Kyoto regime, China has to report their national circumstances and policies on climate change policy in national communications to the UNFCCC climate secretariat and has to pursue its own national policies taking global climate change issues into account. However, as China is to a large extent responsible for 48% of the incremental CO₂-emissions worldwide in the past ten years (BP, 2008), medium term, the country should give up its reluctance to take such obligations.

In China resource economic factors exercise a strong influence on domestic climate policy. During the past 25-30 years, Chinese environmental policy developed thematically, instrumentally, institutionally and regionally:

- The political field of environmental policy broadened according to growing environmental problems in various sectors (urban pollution, nuclear safety etc.).
- The degree of institutionalisation increased. This lead to competition and conflicts with other policy fields, especially economic development policy. Environmental NGOs start to play a role besides the Ministry of Environmental Protection.
- The instruments of environmental policy are economising, i.e. they are turning away from command and control measures to economic instruments giving incentives to the economic entities to change their behaviour.
- Environmental policy internationalised. This is resulting from Chinas increasing role in the world and the growing international responsibility attached to this role (OBERHEITMANN, 2008).

As for the interaction of global agendas and national environmental/energy policy issues, against the background of the tremendous economic growth and the related increase of resource utilisation, since the beginning of the current 11th Five Year Plan, environmental policy, especially climate change mitigation policy, has a new additional task: resource saving, especially fossil energy sources for energy security reasons. Currently, more than 50% of crude oil has to be imported.

The current 11th Five-Year Plan (2006–2010) and the “Medium and Long-term Development Plan for Renewable. Energy” presented by the NDRC in September 2007 both aim at reducing the energy intensity of the entire economy and increasing the use of renewable sources of energy. On the one hand, this serves to increase the country’s energy security, while on the other, it promotes global environmental protection (OBERHEITMANN AND STERNFELD, 2009).

The 11th Five-Year Plan envisages reducing the energy consumed per unit of GDP by 20 per cent in 2010 as compared with 2005. This is equivalent to reducing the volume of CO₂ emissions by approximately 1.5 billion tonnes relative to the “business as usual” scenario while experiencing an 8 per-cent increase in economic growth. The “Medium and Long-term Development Plan for Renewable Energy” envisages increasing the proportion of renewable sources of energy among the sources of primary energy we use from 7.5 per cent (2005) to 10 per cent by 2010 and 15 per cent in the long term (2020). In 2020, using eight per cent more energy from renewable sources would be equivalent to saving approximately 0.8-1.3 billion tonnes of CO₂, depending on what suppositions are made about economic growth. 0.8 billion tonnes is roughly equivalent to the entire volume of genuine CO₂ emissions caused by Germany in 2007 (0.857 bn t CO₂) (WELT ONLINE, 2008).

Table 1:
Current situation, government targets and estimated share in reducing CO₂ emissions by using renewable sources of energy in China (2005-2020)

	<i>Status quo</i>	<i>Reductions in CO₂ emissions (mill. tonnes) 2005</i>	<i>NDRC goals</i>	<i>Reductions in CO₂ emissions (mill. tonnes) 2010</i>	<i>NDRC goals</i>	<i>Reductions in CO₂ emissions (mill. tonnes) 2020</i>
Large-scale hydroelectric power plants (GW)	80	186	120	278	225	522
Small-scale hydroelectric power plants (GW)	35	81	60	139	75	174
Solar power (GW)	0.07	0	0.3	0	2	1
Solar power systems for water purification (mill. m ²)	80	5	150	9	300	18
Wind power (GW)	1.3	1	5	4	30	23
Electricity from biomass (GW)	2.3	2	no data	no data	20	15
Biogas (bill. m ³)	8	17	19	39	40	83
Solid biomass fuel (pellets) (mill. tonnes)	No data	no data	1	1	50	68
Bioethanol (bill. litres)	1.4	3	2	5	17.8	42
Biodiesel (bill. Litres)	0.05	0	0.2	1	6	16
Geothermal power generation (GW)	0.045	0	no data	no data	0.25	1
Direct use of geothermal energy (mill. TCE)	1.1	3	no data	no data	8	23
Tidal power plants (GW)	0.001	0	no data	no data	up to 5	up to 4
Sum total	-	298	-	477	-	990

Source: OBERHEITMANN AND STERNFELD (2009).

Planners are aiming to generate up to 20 per cent of the country’s power from renewable sources of energy by 2020. China is particularly keen on developing hydroelectric power (225 GW generated by large dams and 75 GW by small hydroelectric power stations), wind power (30-50 GW), biomass (30 GW) and solar power (1-2 GW). The NDRC has estimated that investments will be needed to the order of US\$180 billion to expand the renewable energy sector in the future.

If these figures are employed to calculate the potential that these measures have to mitigate CO₂ emissions, a value of approximately 480 million tonnes is obtained for 2010 and around

1 billion tonnes for 2020 (Table 1). In terms of improving energy security of supply, the saving of 1 billion tons of CO₂ is equivalent to a saving of fossil fuel of about 350 Mill. t of coal or 400 Mill. t of crude oil.

4. Socio-economic development targets and global environmental governance in the 12th Five Year Plan

4.1 Urbanization and population transformation

According to the 12th Five-Year Plan, China should continue to promote urbanization, constantly improving the level and quality of urbanization, and enhancing the carrying capacity of cities and towns. And at the same time, "urban disease" should be under close guard and some work should be done to put it in prevention and treatment.

Figure 1:
The strategy setup of urbanization process in 12th Five-Year Plan



Source: Xinhua (2011).

Based on the estimation, by 2014, urban population will exceeded rural population for the first time in China. This will be a historic change for a nation with a population of almost 1.4 billion. No doubt, the period in 12th Five-Year Plan is a critical period for China to build a comprehensive well-off society. The life style of most Chinese will change continuously and

more cities and towns will be built. Hence, more steel products, cement, electric power, petroleum, non-ferrous metals, chemicals and manpower will be needed.

With the urbanization process being accelerated, the total economic volume will increase by 40% or above by 2014 (Figure 1). The demand for land, energy, water and many other resources will keep increasing and the contradiction between social and economic development and restrictions from resources and environment will become more and more prominent. China has to search for more resources to sustain its development and do more research to resolve the problems aroused by the lack of reserves. Meanwhile, the pressure exerted by the international society on environmental protection will also increase and China's environmental protection will face more and more stringent challenges.

We can predict that the challenges and problems in the fields of climate change, energy and the environment in China will be more and some of them may be absolutely new to human societies in the world. Society, economy, science, technology and culture will be cooperating with each other to cope with this massive transformation needed in China.

4.2 Transformation of economic development patterns

In the last three decades, China's has achieved a rapid economic development. But due to the its huge dependence on the consumption of resource and energy, this has exerted heavy influence in the environment and natural resources. Now, China's merchandise export has been ranked first in the world, but these are mainly exports of labor-intensive products. As for the export of electromechanical products and high-tech products, as most of it is low-end product assembly, domestic value added is not high. Additionally, prices of resources in the international market have been growing, increasing the manufacturing costs in China and partly weakening the competitiveness of China's industry. Severe industrial and agricultural pollution is already taking a toll on public welfare and economic development. In the 12th Five-Year Plan, transformation of economic development pattern has been brought forward to decrease the dependence on resources and increase the dependence on innovation. Meanwhile, climate change also exposes China to an increasing international pressure. To maintain a sustainable development, China has to restructure its economic goals and to transform its economic growth patterns.

According to the 12th Five-Year Plan, China expects that local governments and more industries will be far-sighted enough to place new technology and new industries to promote the depth of transformation of economic development pattern. Here, the transformation must be based on actual conditions and the actual situation.

In the Plan, some new strategic industries will be developed first. Considering the aspects of climate change, environment and energy, more attention is paid on the following fields: efficient energy-saving and environmental protection industry, key technologies and equipment for recycling of resources, new generation of nuclear power, solar thermal, concentrated solar power and photovoltaic solar power generation, wind power technology and equipment, smart grid, biomass energy; new energy automotive industry; plug-in hybrid

electric vehicles, pure electric vehicles and fuel cell vehicle technology. The share of added value of these new strategic industries shall account for 8% of GDP in 2015.

With urgent response to climate change, the demand for low-carbon technologies will increase intensively in 2011-2015. This will promote low-carbon technology innovation and industrial development, such as ultra-low energy consumption buildings, waste heat recovery, clean coal technologies, bio-fuels, advanced nuclear energy, hydrogen energy technologies, carbon capture and storage (CCS) etc.

If China could seize the opportunity of this “green transformation” and make efforts to reverse the trend of environmental destruction and degradation, high-tech industry would be continuing to be strengthened and expanded, and the sustainable and healthy economic development in China could be realized. In this process, lots of research opportunities can be found in the field of environment and energy, and more public-private partnerships and corporation between research institutions and universities will come forth.

4.3 Energy security concerns and plans

China is the world's largest energy producer and consumer. The sustained growth of energy supply has provided an important support for the country's economic growth and social progress, while the rapid expansion of energy consumption has raised energy security concerns. In the previous 11th Five-Year Plan, some energy issues had been already included. Here, we show some issues which were observed and discussed:

- (1) The increase of energy demand is accelerating year after year;
- (2) Energy supply increasingly depends on imports; especially China's oil imports increased rapidly, and more uncertainties of energy security emerged.

In 2009, China's total energy consumption was equal to 3 bn. tons of standard coal equivalents (sce). Experts predicted that by 2020, total energy demand will be up to 4.5 bn t sce, which means that China have to increase investment in new energy fields in order to ensure that the a stable, economical, clean and safe energy supply system can prevail. The major issues in the 12th Five-Year Plan referring to energy planning are:

- Non-fossil fuel to account for 11.4 percent of primary energy consumption; and
- Energy consumption per unit of GDP to be cut by 16 percent;

Based on the 12th Five-Year Plan and the outcome of preliminary analysis, to achieve the goal of “non-fossil fuel to account for 11.4 percent of primary energy consumption”, China's hydropower capacity installed will reach to 300 million kW or more by 2020, and the sum of wind power, solar energy and other renewable energy will equal to 1.5 million tons of standard coal equivalents.

China continues to exceed earlier targets in non-fossil development. For example, the five-year target for wind is 70 GW of additional installation, which exceeds the 2020 target of just a few years ago. As for nuclear energy, the plan is to install 40 GW of additional capacity by

2015. China currently has around 10 GW of installed nuclear capacity, which means that if this five-year target is achieved, China is likely to exceed even the expectation of 70 GW by 2020 and would have the world's largest installed capacity of nuclear energy by this time.

Energy supply security is becoming a "rigid" constraint to sustainable economic and social development in China. Energy security has been seen as equal to economic security, military security and national security. To get rid of energy constraints, the Chinese government is planning to accelerate its development of a modern energy industry, and to give priority to build a resource-conserving and environment-friendly society in the course of its industrialization and modernization, and striving to enhance its capability for sustainable development and make China as an innovative country. China strives to build a stable, economical, clean and safe energy supply system and has made resource-conservation a basic state policy: This would facilitate the changing of economic growth patterns. Along with the change and development, more research and studies related to

- energy-saving technologies,
- popularizing energy-saving products,
- improving energy management expertise,
- improving energy-saving legislation and standards, and
- enhancing energy efficiency

are needed and encouraged to be carried out.

In a word, energy supply security is an issue regarding a long-term strategy, not of a short-term balance in China. Keeping energy supply in security is vital to the resolution of a series of problems.

4.4 Challenges of climate change and global environmental governance

4.4.1 Challenges of climate change

During the past 100 years, the Earth's climate is experiencing significant changes characterized by global warming. This trend is also happening in China. The impact of climate change on China's agriculture and livestock breeding, forestry, water resources, coastal zones and many other natural eco-systems is evident, such as sea level rise in the coastal areas, glacial retreat in Northwest area, and the earlier arrival of the spring phenophase. More weather events caused by drought, rainstorm and frost happened in recent years. In 2008, frost in Central and South China has disrupted the beginning of the annual Spring Festival travel rush, with temperatures reaching their lowest since 1961 in Guizhou, Hunan and Hubei provinces. Millions of passengers got stuck in railways, buses, or stations for several weeks during an extreme snow and frost disaster. From October in 2010 to January in 2011, a historical period of drought had been seen by Beijing's 20 million inhabitants. The capital city did not receive any rainfall in nearly four months. North China and the Yellow-

Huaihe River valley have seen continuously less rainfall up to 90% below average which led to drought in China's eight important areas in Shandong, Henan, Hebei, Shanxi, Anhui and Jiangsu, Shaanxi and Gansu and left some 7 million hectares or farmland short of water supply. East China's Shandong Province, one of the country's major grain producers, recorded the worst drought in 200 years.

Meanwhile, as a developing country with a huge population, a coal-dominant energy mix and relatively low capacity to tackle climate change, China will surely face more severe challenges coping with climate change along with the acceleration of urbanization, industrialization and the increase of residential energy consumption.

4.4.2 Chinese climate change policy in the 12th Five-Year Plan

Climate change is projected to increase the frequency and intensity of climate and weather-related hazards in China, imposing more risks to a society that has been emerging on its path to a sustainable development. In the 12th Five-Year Plan, China attaches great importance to the issue of climate change, and a series of policies and measures to address climate change has been formulated in the overall context of the Plan. The outlining objectives, basic principles, key areas of actions, as well as policies and measures to address climate change has been put forward. Here, four areas should be emphasized:

(1) Low carbon city pilot approaches

The National Development and Reform Commission (NDRC) launched a national low-carbon province and city experimental project already in 2010. The project will be implemented in five provinces, namely Guangdong, Liaoning, Hubei, Shaanxi and Yunnan, and in eight cities, namely Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang and Baoding. According to the project, these 13 pilot areas will include the work on climate change into the local "12th Five-Year Plans" and formulate the low-carbon development plan. The government officials of those provinces and cities should develop a low-carbon development plan to accelerate the establishment of an industry structure featuring low carbon emissions and actively promote low-carbon lifestyles and consumption patterns in order to tackle global climate change. The targets for the project are characterized by the establishment of low-carbon emissions industrial systems, the establishment of greenhouse gas emissions data statistics and management systems, the promotion of a low carbon green lifestyle and consumption patterns.

(2) Developing a circular economy to reduce greenhouse gas emissions

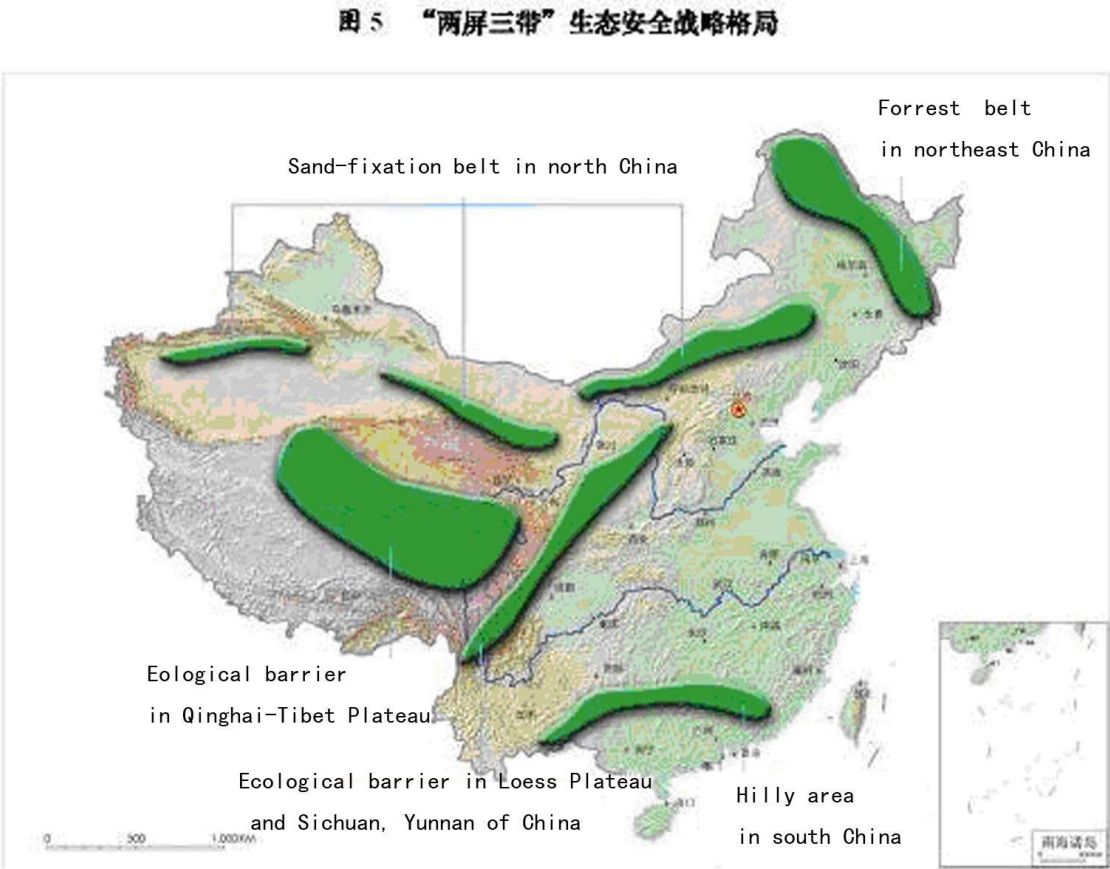
The Chinese government is doing its best to reduce resources consumption, adjusting industrial structure and increasing energy conservation and energy efficiency to control greenhouse gas emissions. China is expediting the transformation of its economic development mode, developing a recycling economy and endeavoring to cut fossil energy consumption. For this, the research on coal gas, coal to liquid fuel and mine-mouth electricity generation has been put forward. In the Plan, a clear goal of total control of the total energy consumption, management of energy utilization and low-carbon technology application are

promoted. The greenhouse gas emissions in the fields of industrial, construction, transportation and agriculture will be strictly controlled and a carbon trading market and labeling and certification system of low-carbon product standards will be established.

(3) Launching afforestation campaigns and enhancing ecology restoration and protection

In the recent decades, China government has been continuously investing in tree planting and forest protection, about four million ha of trees have been planted every year. In recent years, through the reform of the collective forest right system, farmers' enthusiasm for tree planting and forest protection has been aroused.

Figure 2:
The strategy setup of ecological safety in 12th Five-Year Plan



Source: XINHUA (2011).

The country's rate of forest coverage is going up from 12.0 percent in the early 1980s to 18.2 percent by now. In the 12th Five-Year Plan, to enhance capacities for carbon sequestration, 1250 hectares of forest will be planted. To enhance capacities for climate change adaptation, forest and wetland restoration will be strengthened (Figure 2).

(4) Enhancing the adaptive capacity to climate change

To cope with the weather-related hazards in China, the government will establish an overall strategy of strengthening the adaptability to climate change. For this, the research, observation and impact assessment of climate change will be reinforced. In the design and construction of

major projects and infrastructure, climate change should be fully taken into consideration. To deal with extreme weather events, monitoring, early warning and prevention and extensive international cooperation will be improved. In the ecologically fragile areas like agriculture, forestry, water resources and coastal areas, more new technologies will be applied and developed to improve prevention and mitigation of natural disasters.

5. Conclusions

Global climate change is one of the most important challenges in the 21st century. By 2007, China got the biggest CO₂-emitter worldwide. Against this background, international pressure on China is increasing to take larger environmental responsibility. As for subsequent environmental responsibility, the following observations can be made:

- A too weak interaction of global agendas and national environmental/energy policy issues; and
- A strong influence of resource economic factors exercise on national climate policy.

COP 15 in Copenhagen in December 2009 to a large extent failed to reach an agreement on a post-Kyoto system because the US and China did not come forward with a substantial climate change mitigation commitment. The US only proposed a reduction of greenhouse gas emissions by 4% in 2020 compared to 1990, this is not even that amount, the country proposed in Kyoto in 1997 (-7%). This made it extremely difficult for China to come up with a substantial contribution by itself. As long as these two countries together counting for more than 40% of world's CO₂-emissions do not come along with a joint commitment, it will be hard for the other 188 signatory states of the Kyoto Protocol to follow. However, as in China climate change mitigation policy to a large extent can be connected to energy security, there is a big chance that a successful international environmental governance can be implemented.

As the biggest CO₂-emitter worldwide, China is under increasing pressure to reduce CO₂ and other greenhouse gas emissions. In the 12th Five Year Plan and the time up to 2020, global environmental governance in China is becoming more climate protection orientated as the goals have shifted away from pure energy intensity targets which had been the main focus in the 11th Five Year Plan (20% reduction of energy intensity of GDP in 2010 vs 2005) to real climate change related targets to reduce CO₂-intensity of GDP by 17% up to 2015 against 2010 in the 11th Five Year Plan and by 40-45% in 2020 compared to 2005.

As the end of the commitment period under the Kyoto Protocol (2008-2012) is approaching its end and it is possible that there will be no international post Kyoto agreement if there will be no consensus reached by 2012, China is already preparing for a pure domestic climate protection policy. In 13 regions, low carbon city approaches are tested and emission trading schemes for emission rights in a cap-and-trade system or emission reductions in a baseline-and-credit system on the city level in different sectors of the economy such as energy intensive industries, the building sector etc are being prepared. For this, different environmental exchanges already had been established such as in Beijing, Shanghai and Tianjin.

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