Economic Instruments for Energy Efficiency and the Environment

CCICED Policy Research Report 2009

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1. Background and Objectives

1.1 Interaction between Energy and Environment in China

While the fast economic growth over the past 30 years in China has significantly increased living standards, this has also brought huge pressures on the environment. Despite improvements in the environmental conditions of many cities and regions across the country, the deteriorating trends in the nation's environmental quality has not yet been curbed, and many citizens are subject to poor quality water, air, and soil as well as a more fragile ecological system. Risks of environmental accidents are mounting due to a range of environmental problems, including accumulated pollution from industrial and civil sources as well as emerging new problems and pressing global environmental challenges. Such risks have become a bottleneck on China's sustainable economic growth and social progress. The causes for China's environmental problems are complicated, relating to fragile natural conditions, the boom of heavy and chemical industry, extensive economic growth, energy consumption patterns, and poor environmental management. Among these causes, the rapid growth of total energy consumption, coal-centered energy structures, and low energy-efficiency largely leads to China's serious environmental pollution. (Fig.1)

Total energy consumption amounted to 2.85 billion tons of coal equivalent (tce) in 2008, while primary energy production was 2.6 billion tons -- both doubled of the year 2000 figures. The explosive growth of total energy production and consumption directly caused massive emission of pollutants, such as SO_2, smog, dust, NO_x and CO_2.

In terms of energy structure, coal remains China's main component of energy supply and consumption, accounting for 70% of total primary energy, which is 40% higher than the global average. 80% of the country's electricity is generated by thermal power. Coal is by far the most popular fuel in use. Such a coal-based energy structure has resulted in SO_2-centered pollution in China.

In terms of energy efficiency, although remarkable progress has been achieved over the past 20 years -- with a 4% average annual rate of energy conservation, the comprehensive efficiency of energy consumption in China is a mere 30% -- about 10% lower than in the developed world. Moreover, China's economic growth has been increasingly relying on the volume of energy consumption since 2002. In 2002, 2003, and 2004, the elasticity of energy consumption in China was 0.66, 1.53 and 1.59 respectively. Fortunately, the figure had dropped to 0.97 in 2005 and 0.7 in 2007, but is still 7 times that of Japan. While the energy intensity of China has decreased from 11.9 tce for 10,000 US Dollars of GDP in 2005 to 10.48 tce in 2007, it is still 5-7 times that of the developed world. Needless to say, China's low energy efficiency is a major feature of its extensive economic growth pattern, and results in intensive pollution. It is estimated that China's SO_2 and NO_x emission per unit of GDP is 8-9 times that of OECD countries.

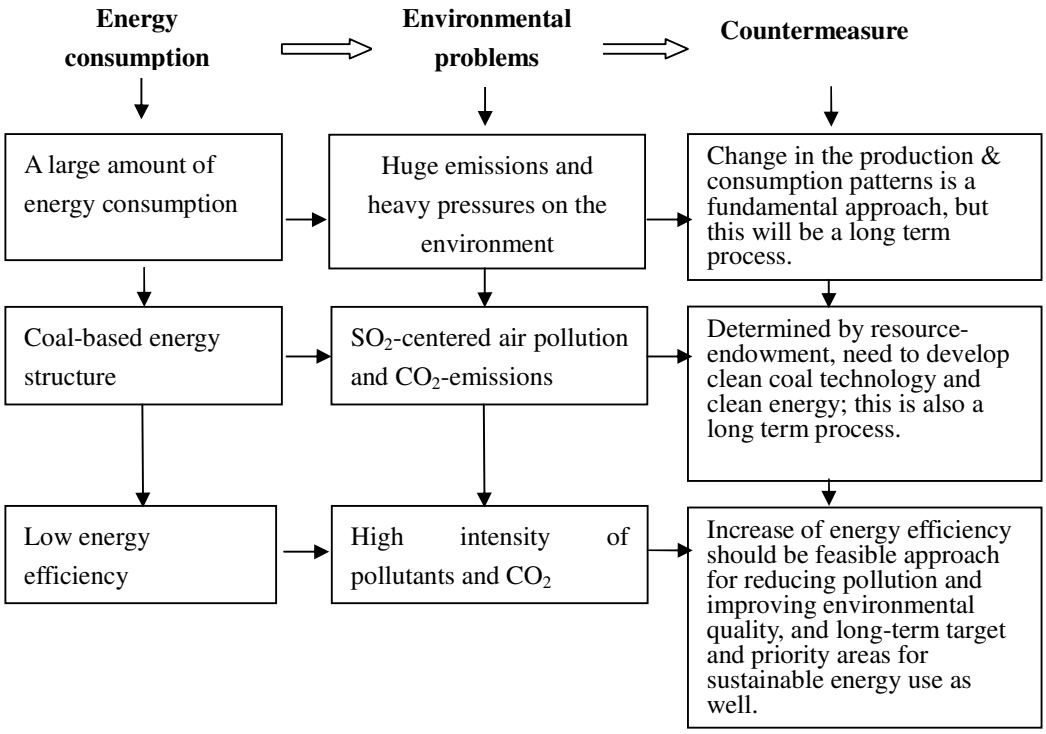

Figure 1. Interaction between energy and environment

Reducing total energy consumption, improving energy structure, and raising energy efficiency are three approaches that can help resolve China's environmental problems and balance economic growth and environmental impact. But China is currently at the middle stage of industrialization, with a relatively low level of economic development and rapid urbanization. Energy demand will undoubtedly continue to grow for a very long period of time still to come. A fundamental change in the country's economic development pattern is a prerequisite for decoupling energy demand and economic growth. Since China's natural endowment has resulted in a coal-based energy structure, improving such a structure requires clean coal technology and the development of renewable energy, such as wind energy, hydropower, solar energy, and bio-energy. Obviously, changing the country's economic development pattern or energy restructuring will take a long time. Raising energy efficiency is, comparatively, the most feasible solution to reduce the intensity of pollution, and should therefore be the long-term target and a priority area for sustainable energy use.

1.2 Challenges in Energy and Environment Management and New Initiatives in Economic Instruments

China has long relied on a command-and-control approach for managing energy and the environment. However, such an approach is confronted with many challenges as a market economy takes roots and keeps developing in China, bringing with it high administrative costs, non-lasting effects, ineffective implementation, and impaired

social justice. To meet these challenges, the Chinese government has explicitly voiced the need to establish a system of economic instruments. During the 6th National Conference on Environmental Protection in 2006, Premier Wen Jiabao pointed out that China should no longer only rely on the command-and-control approach but rather, take an integrated approach including legal, economic, technical, and necessary administrative measures to protect the environment and improve environmental management by following economic and natural rules. The report of the 17th Party Congress of the Communist Party of China (CPC) in 2007 stated that reform of fiscal and taxation policies should help to promote sustainable development by incorporating environmental considerations. The Comprehensive Work Plan on Energy Conservation and Pollution Abatement issued by the State Council in 2007 has as well detailed the requirements for market-based instruments (MBI). Raising energy efficiency and developing economic instruments constitute pressing objective demands and a strong desire on the part of the Chinese government.

Drawing upon the practices and experiences over the past decade, since 2005, the Chinese government has made great efforts in developing environmentally-sound economic instruments, which target different stages of the whole spectrum of economic activities (Fig. 2).

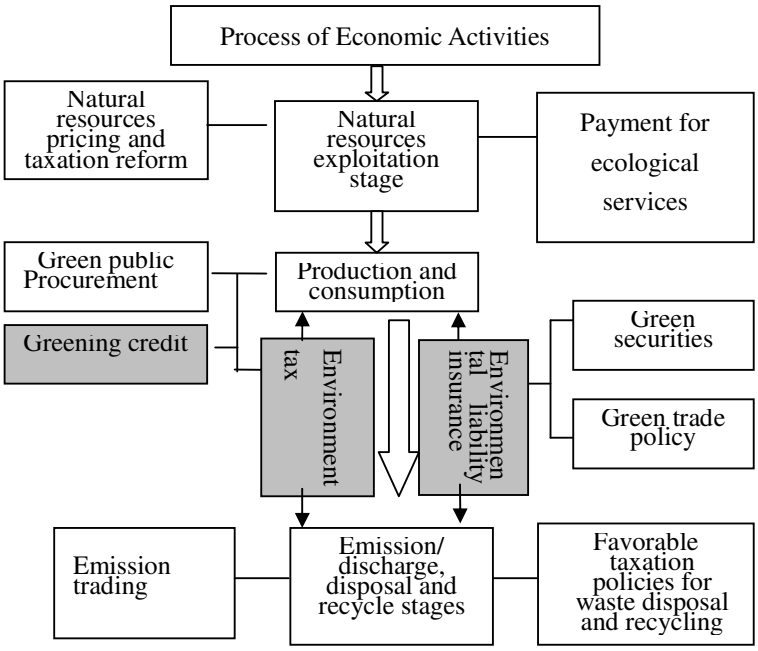

Figure 2. The system of environmental economic instruments in China

As shown in Fig. 2, China has developed a clear structure of environmental economic instruments. Resources and energy pricing and taxation policies are following a fast track of reform with more relevant support from available research work. Discharge/emission fees and preferential taxation policies for waste recycling have been in place for many years and are being continuously improved. Other new

instruments, such as ecological compensation (payment for ecological services), emission trading, green trade policies, green public procurement, environmental performance evaluation and information disclosure of stock market listed companies, have started pilot programs or even nationwide implementation. In contrast, instruments such as environmental taxation, greening credit and environmental liability insurance, are in the early stages of policymaking and implementation and relevant studies are too weak to provide support for policymaking.

1.3 Research Targets and Methodologies

In the light of the above-mentioned situation, CCICED set up the Task Force on Economic Instruments for Energy Efficiency and the Environment in 2008. The overall goal of the Task Force is to make strategic and policy recommendations to the Chinese government on specific economic instruments based on the research, with the target of raising energy efficiency and improving environmental management. The Task Force is comprised of two research groups. The first task of Research Group 1 was to study the system of environmental and energy-related taxation and develop a roadmap for strengthening the environmental taxation system that includes taxation system, which is an effective measure to increase energy prices, and provide incentives to raise energy productivity and reduce pollution intensity. Considering the pressing needs for raising energy efficiency, responding to climate change, reducing pollution and developing a low carbon economy, the second task of Research Group 1 is to design a scheme for a carbon tax in China. Bearing in mind the need to improve China's environmental management and existing economic instruments, the scope of Research Group 2 focuses on a green credit policy and on an environmental pollution liability insurance system. Green credit policy reforms traditional credit policy by incorporating environmental considerations so that, on the one hand, restrictions may be imposed upon the financing of companies who are non-compliant with environmental requirements as well as energy inefficient, energy-and-pollution intensive and natural resource-based industrial sectors. On the other hand, companies with desirable environmental performance and environment-friendly industries may enjoy preferential financing policies. Such incentives will help regulate the environmental behavior of enterprises and reduce credit risks for financial institutions. China is currently faced with frequent environmental pollution accidents, while the necessary liability and compensation schemes are not in place. Therefore it is a significant step to carry out studies on the environmental pollution liability insurance system (Fig. 3)

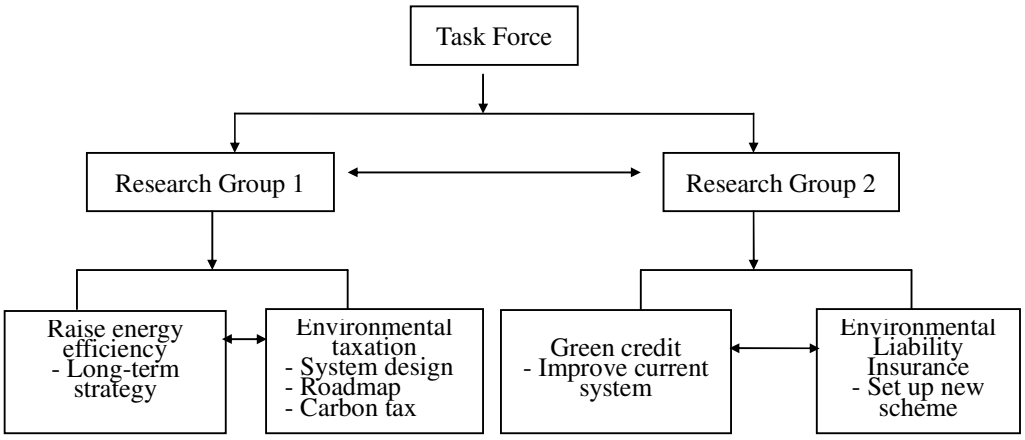

Figure 3. Scope and research tasks of the Task Force

The Task Force has made great efforts to achieve the set targets, such as: conducting desk studies on the relevant current situation in and challenges to China and on international experiences and the implications within the context of economic instruments for environmental and energy efficiency management; organizing a study tour in Germany, Sweden and localities within China on environmental and energy taxation, green credit, and environmental liability insurance; holding various meetings like a kick-off workshop, four Task Force working meetings and more than ten internal seminars. Based on the results of these efforts, the Task Force has reached significant conclusions and has formulated policy recommendations to the Chinese Government in areas of energy productivity, environmental taxation, green credit policy, and environmental liability insurance (Fig. 4)

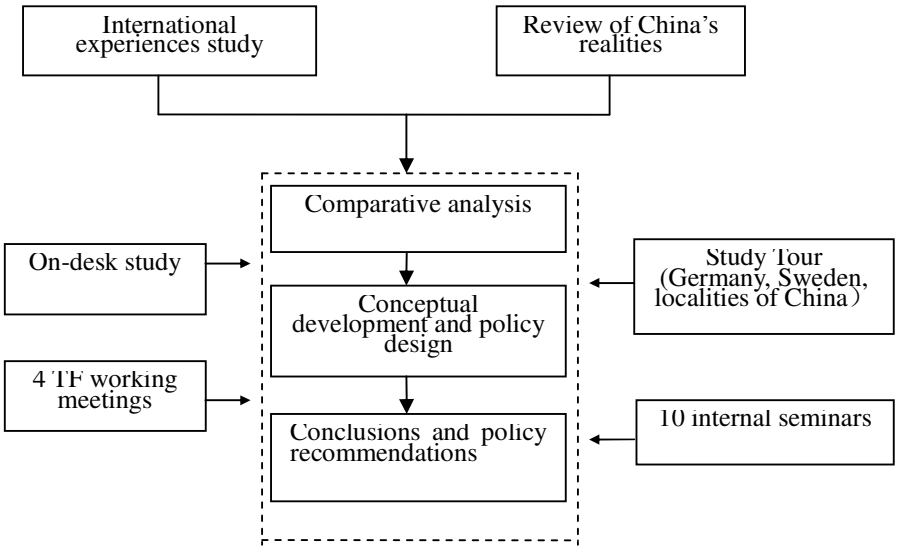

Figure 4. Methodology of the Task Force study

2. Environmental Taxation and Energy Efficiency

2.1 Current Situation and Challenges in China

As explained earlier, improved energy efficiency is the most feasible solution to the problems of intensive pollution, environmental degradation and the negative impacts of climate change, as well as the long-term target and priority area for sustainable energy use. In fact, the Chinese government has attached great importance to raising energy efficiency and has set detailed and stringent targets in this regard. According to the 11th Five-Year-Plan, China should reduce its energy intensity per 10,000 RMB of GDP from 1.22 tce in 2005 to lower than 1 tce by 2010, or a 20% drop; and decrease water consumption per unit of industrial added value by 30% and SO_2-emission and COD-discharge by 10%.

Taking a holistic view of energy and economic systems, the core objective of higher energy efficiency is to increase energy productivity. Energy productivity can be defined as the quantity and quality of goods and services produced by input of a given composition of energy; this is relevant not only to the energy efficiency of one of the links, but also to the whole chain of economic activities. In other words, the concept of energy productivity has the connotation of energy optimization and high level of efficiency of the economic system, and thus may help gain a complete picture of the relationship between energy consumption and economic expansion. There are two ways to demonstrate an increase in energy productivity; providing the same quantity and quality of goods and services with less energy consumption, or generating more and better economic output with unchanged energy inputs. Therefore the key to raising energy productivity is to increase efficiency and optimize the entire energy and economic system.

As proven by international experiences, energy and environment related taxes serve as an effective tool for inducing higher energy prices, which further help raise energy productivity. Therefore such taxes may serve as a long-term incentive that helps curb energy demand, promote technological innovation and raise energy efficiency. The present reality in China is that the dominant policy and related measures targeting the raising of energy productivity remain administrative regulations, such as energy development plans, energy sector planning and policies, catalogues for industrial restructuring, laws and regulations on energy efficiency and pollution reduction, etc. Remarkable progress has been made in pricing reform for electricity, coal, natural gas, crude oil, refined oil and renewable energy, as well as resource taxes, preferential policies for energy conservation and pollution reductions. However, such measures could not serve as long-term incentives and there is much room for improvement. In particular, the most effective tools, namely energy and environment related taxes are still in the pipeline or even non-existent.

In light of the direction for fiscal and taxation reform in China, it may be an irreversible trend to introduce environmental tax. The “Circular of Comprehensive

Work Plan on Energy Efficiency and Pollution Reduction of the State Council" issued in June 2007 stated that taxation policies that help promote energy efficiency and pollution reduction, including the levying of environmental tax, should be introduced and improved. The opinions on deepening economic institutional reform by the central government in 2008 and 2009 also pointed out that studies on environmental taxes should be carried out.

China has not yet introduced environment-targeted taxes such as an energy tax, sulphur tax or carbon tax. Therefore the pricing leverage is not effective in improving energy efficiency and pollution treatment. Current environment related taxes in China, such as consumption tax and resource tax, were not specifically geared to meet environmental challenges, but rather to regulate consumption behavior and resource use. One can tell that there is not a complete environment-related tax framework in place in China, and this partly accounts for the impotency of the current tax system to address energy and environmental issues. In addition, the fiscal difficulties in the localities of China are partially attributed to the tax sharing system, which somewhat leads to local protectionism of polluting companies and environmental non-compliance.

Therefore China has an urgent task to develop a roadmap for the introduction of a comprehensive environmental tax system, so as to establish long-term incentives for raising energy efficiency and improving the environment.

2.2 International Experiences and Implications for China

In the early 1990s, some OECD and EU countries started comprehensive green tax reforms in a phased manner. These policies comprised three complementary approaches: 1) streamlining or abolition of environmentally harmful subsidies, including direct public expenditure, "market price support" and/or environmental tax reductions and exemptions; 2) restructuring of existing relevant taxes by taking into account of environmental standards, and 3) the introduction of new environmental taxes.

Revenue neutrality has been an overarching principle of environmental tax reforms (ETR) in EU countries, e.g. the introduction of an energy or carbon tax was offset by reducing, the rates of other taxes, such as social security contributions and personal income tax, in order to keep a constant tax burden. Such tax optimization could generate a "double dividend": the tax system would be green and effectively protecting the environment, while helping to minimize other distorting taxes, cut the welfare cost of taxation and increase employment (by reducing the tax wedge on labour). This double dividend and revenue neutrality approach reduced resistance and facilitated smooth tax reform.

Two decades of experiences in OECD and EU countries proved that environmental taxes are an effective tool. In 2006, 375 kinds of energy and environmentally related taxes were applied in OECD countries, including 150 energy

related taxes, 125 transportation related taxes, some water and air pollution targeted taxes and a few other taxes on certain products like packaging, batteries, pesticides, chemical fertilizers, lubricants and household appliances. Most of these taxes played a significant role in raising energy efficiency and reducing pollution.

International experiences also show that, as part of the environmental tax system, carbon taxes are an effective tool to reduce pollutants and CO_2 emission and to improve energy efficiency. The countries that applied carbon tax witnessed large scale expansion of bio-fuel and a remarkable drop of fossil fuel consumption, which significantly adjusted their energy supply structures. In the meantime, carbon taxes also helped reduce CO_2 emissions. During 1990 and 2006, the CO_2 emission of Sweden dropped by 9% while its GDP grew by 44%. Research shows that if the Swedish tax system in 1990 had remained unchanged, Sweden would have produced 20% more CO_2 than the current level. Similar proof can be found in Germany, whose ecological tax reform helped reduce its CO_2-emission by 2-3% from 1999 to 2003. Thanks to environmental tax reform, the demand for oil in some European countries showed signs of decline. The demand dropped by 1.5%-5% on the basis of figures available in 2004. The scale of falling demand is attributable to the tax rate as well as the magnitude of its subsequent secondary effect.

The sulphur tax of Sweden introduced in 1991 resulted in a significant drop of sulphur content in oil-based fuel, or at least 50% lower than the mandatory standard. The sulphur tax also helped to reduce SO_2, NO_x and CO_2 emissions by 94%, 20% and 54% respectively, compared with the year 1970. The sulphur tax of Belgium led to a considerable fall of high-sulphur-content fuel consumption from 20% of the market share in 1994 to less than 1% in 1998. Sulphur tax helped Denmark achieve an 84% decrease of sulphur emissions within a ten year period from 1995 to 2004.

Environmental tax reform is a win-win strategy for both the environment and the economy. Not only did such tax reforms in OECD countries not bring about negative impacts on economic growth (GDP), but in some cases, even positive effects were measured. In addition, the introduction of environmental taxes helped create considerable job opportunities. For instance in Germany, 250,000 more jobs were created during 1999-2003, representing an increase of 0.5%. The tax did not negatively affect the international competitiveness of industries either. In OECD countries, the revenue of environmental tax accounts for 6%-7% of the total, or 2%-2.5% of GDP.

It should be noted that the economic and social backdrop of OECD countries and EU states were different when they carried out their respective environmental tax reforms, their policy targets also varied. For example, when Sweden introduced a carbon tax in 1991, environmental pollution was no longer a big problem in that country, and the main purpose was rather to further reduce fossil fuel consumption, improve energy efficiency, and decrease greenhouse gas (GHG) emissions. While, when Germany introduced ecological taxes, it had multiple goals: to cut labor cost, raise energy efficiency, reduce the social welfare burden and promote economic

growth. These environmental taxes were designed according to the realities of different countries and did not exert negative impact on GDP growth, but rather contributed to strengthening economic development.

The experiences of OECD and EU countries demonstrate that, firstly, as long as the energy price rise keeps pace with increased average energy productivity, on average, environmental/energy taxes will neither bring about negative impact on social welfare nor result in economic losses for citizens and industries. The precondition is that the additional revenue of environmental/energy taxes can offset the losses caused by distorting taxes or the abolition of such taxes. Secondly, both theory and practical experience show that higher energy prices, even simply the announcement of the introduction and increase of such environmental taxation, can send a strong signal to consumers and companies, , and help curb their energy demand, propel technological innovation and in the end improve energy productivity. Thirdly, the introduction of environmental/energy taxes such as fuel tax, carbon tax or pollutant tax is a valid approach to help establish a long-term escalator mechanism for energy prices, while environmentally harmful subsidies and tax policies should first be eliminated.

2.3 Main Conclusions and Policy Recommendations

2.3.1 Main Conclusions

Drawing upon international experiences on environmental tax reform and taking into account the current challenges China is facing in the field of environment and development, the realities and trends for energy consumption and tax reform as well as the result of carbon tax simulation studies, the Task Force reached the following conclusions on how China could raise energy efficiency and improve environmental quality through environmental tax reform.

(1) Raising energy prices is an effective long-term incentive to improve energy productivity.

In light of the current economic development trends and mounting energy and environmental pressures, China should set higher long-term energy productivity as a national target. Attention should be paid not only to the production/supply links of energy systems, but also to energy demand/consumption. Raising energy prices is the most appropriate pathway to curb energy demand, to encourage technological innovation and in the end to optimize energy use and to improve energy productivity. Considering the complexity of energy pricing issues, China may consider adopting a long-term “escalator strategy”, namely to raise energy prices progressively by small increments over a fairly long period of time. Meanwhile, the public should be informed of such price rises, in advance, so as to avoid social and economic turbulence.

(2) Environmental taxation is a key tool to help set up a long-term "escalator" energy price mechanism.

The essence of environmental taxation is to raise the cost of the environmental and resources. OECD and EU experiences demonstrate that environmental taxes such as energy tax, carbon tax, and sulphur tax are effective economic tools to help improving energy efficiency, reducing pollution and cutting CO_2-emission. By removing environmentally harmful subsidies and tax policies, an environmental tax reform could help establish a long-term "escalator" pricing mechanism.

(3) Environmental taxation will not bring about negative impact on economic growth but rather may even favor economic development.

The main target of launching environmental tax reforms is to improve energy efficiency and thereby reduce environmental impact by raising the cost of energy, natural resources and pollution. OECD and EU experiences show that as an important cost factor, if the energy price rise keeps pace with average energy productivity improvement, environmental/energy tax will, on average, neither give rise to negative implications on social welfare nor bring about economic losses for people and industries. According to the carbon tax simulation studies of the Task Force, the short-term negative impacts will soon be offset by the long-term positive effects of the carbon tax, including a boost in economic output and corporate investment, higher employment, an increase in exports and imports, growth in fiscal revenues and so on. A carbon tax will help to promote effective regulation of energy-intensive sectors, improve energy efficiency, reduce environmental pollution, and maintain stable and rapid economic growth.

(4) The environment for introducing environmental taxation is maturing in China and a relevant tax reform should be carried out at the appropriate time.

Firstly, academics and relevant government agencies have carried out theoretical studies on environmental taxes for a long while. Such research provides solid foundations for environmental tax reform. Secondly, as China has gained very positive experience in developing energy and resource pricing mechanisms and fuel tax reform, psychologically, the general public will be in a favorable position to accept environmental taxes. Thirdly, the environmental tax will serve as an important green incentive to improve environmental quality, and help to build a resource-efficient and environment-friendly society. Therefore the introduction of environmental taxation is in accordance with the political will of China. What is more, relevant ministries have also completed a large amount of research and policy studies on environmental taxes. In this way China is a mature environment for the introduction of environmental taxes. However, given the more general context of increasing pressure from the current financial, energy and food crises around the world, it may not be the best time to introduce environmental taxes right now; that said, China should remain well prepared to launch reform in its taxation system at a more appropriate right time in the future.

2.3.2 Policy Recommendations

Based on the above conclusions, the Task Force puts forward the following policy recommendations on China's environmental tax reform, including the roadmap and action plan for carbon tax reform.

(1) Introducing environmental taxes is an important component of China's tax reform.

There are some major problems in China's existing environmental taxes. For instance, the proportion of environmentally-related taxes compared to total tax revenue and to GDP remains relatively low compared to developed countries; China has not levied any pollution targeted tax yet and there is no complete or effective environmental tax system. At the same time, the rates of pollutant emission/discharge fees remain low and regulators lack mandatory power when collecting such fees. Among these problems, lack of pollution targeted taxes and a complete and effective system of environmental taxes comes to the fore. What's more, the tax sharing system has resulted in fiscal difficulties in Governments at the sub-provincial level, and this has somewhat given rise to a "protectionism" of polluting companies upon which local government has relied for revenue. Environmental policies will understandably not be implemented effectively in such circumstances.

Environmental taxes are a significant economic tool and long-term incentive to protect the environment. Therefore, launching an environmental tax oriented reform at the current stage will not only help to meet the daunting environmental challenges but also help to better cope with climate change, to develop a low carbon economy, and to improve the quality of China's economic growth.

(2) An environmental taxation system in China should be established step by step, by announcing and subsequently introducing new environmental taxes, restructuring existing taxation with environmental consideration and improving related environmental tax policies.

Taking into account international experiences and China's realities, the main approaches for establishing and improving an environmental tax system in China are: 1. introduce new taxes; 2. restructure existing taxes; 3. improve existing environment-related tax policies. Therefore, China's environmental tax system should be composed of three parts: environmental tax, other environment related taxes, and environmental tax policies. The three parts are inter-connected and complementary to one another and, as a complete system, play a role in environmental protection (fig 5).

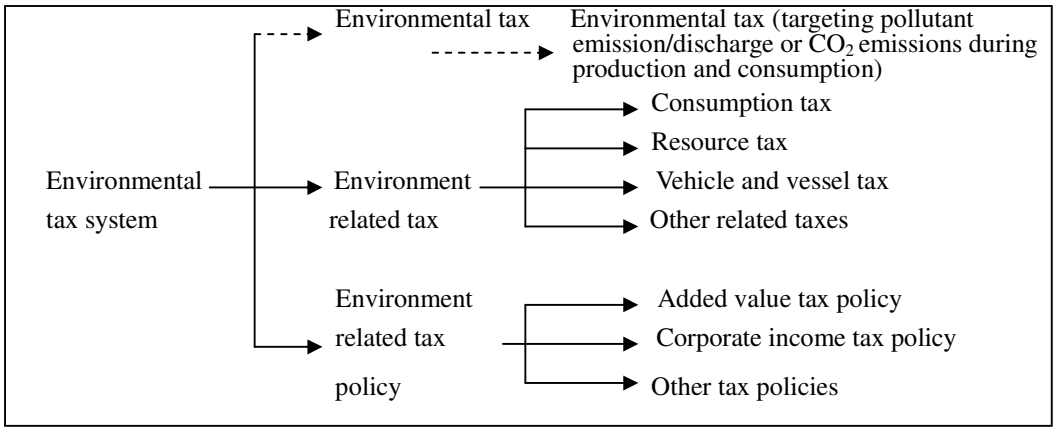

Figure 5. Composition of environmental tax system

According to China's priorities for environmental protection, namely water, air, prevention and treatment of solid waste pollution as well as the need for CO_2-reduction, China's environmental tax system may initially cover these items. With regard to carbon tax, which has become a hot issue lately, it can be introduced as one variety of environmental tax.

Table 1. Scope of environmental tax

Scope and object		Content
Pollution emission/discharge	Waste gases	Including SO_2, NO_x etc.
	Waste water	Including industrial waste water, etc.
	Solid waste	Including coal ash, metallurgical and chemical waste, construction waste, etc.
CO_2-emission	CO_2	Including CO_2 produced by the burning of coal, natural gas, oil and other fossil fuels.

(3) Environmental tax reform should take into consideration the realities of China's economic and social development levels, and adopt a gradualist and "easy ones first, hard nuts last" approach.

Despite the maturing environment for environmental tax reform in China, the Government should nevertheless take a gradualist and "easy ones first, hard nuts last" approach. The reform may be carried out in three phases: phase 1, improve existing environment related taxes such as resource tax, consumption tax, vehicle and vessel tax etc., and introduce stand-alone environmental taxes as soon as possible; phase 2, further improve environmentally-related taxes and relevant tax policies, and expand the scope of environmental taxes; phase 3, further expand the scope of environmental taxes and optimize the overall environmental tax system.

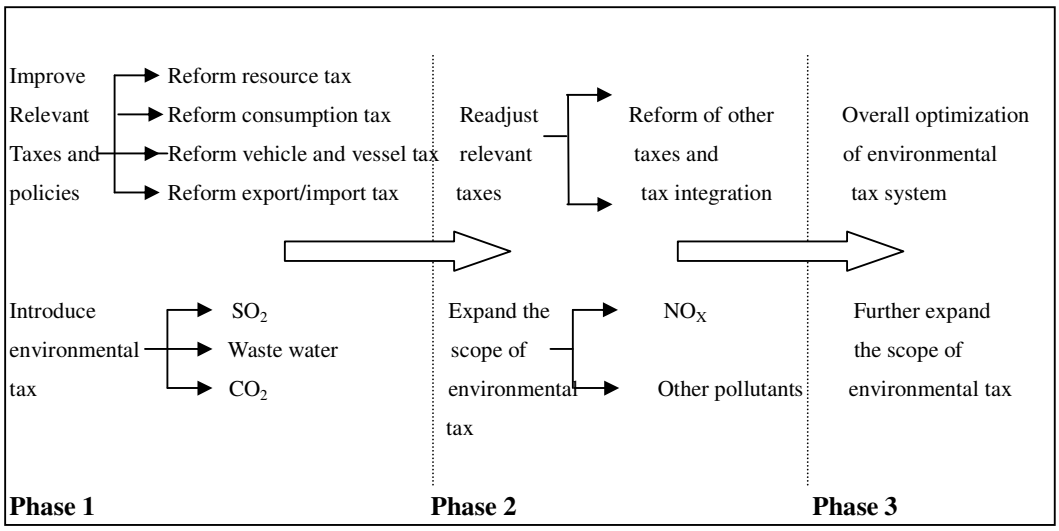

Figure 6. Roadmap of environmental tax reform

(4) A carbon tax is an important option for China to cope with climate change, promote energy efficiency and pollution reduction, and develop a low carbon economy as well.

The experiences of developed countries have proved that carbon tax/energy tax is an effective economic tool that helped considerably to cut CO_2-emissions, reduced environmental pollution and improved energy efficiency. Countries that imposed carbon taxes witnessed a significant drop of fossil fuel consumption and an optimized energy structure. Therefore, a carbon tax may also be an effective economic tool for China.

To introduce carbon taxation in China can be a good choice, since it's in line with the trends of tackling climate change and developing a low carbon economy; it has a low levying threshold and encounters no legal or administrative hurdles. Yet, there are also certain obstacles and challenges, such as the relationship between carbon, resource and consumption taxes, the effect on energy price and energy demand/supply, and the negative impact on economic growth and sector competitiveness in the short run.

(5) Develop a suitable carbon tax scheme for China based on international experiences.

According to the experiences of developed countries, careful analysis should be carried out before the introduction and designing of carbon taxation so as to minimize resistance. During the designing period, various factors should be considered, including coordination between the carbon tax and other taxes, as well as other economic tools, and international taxation coordination and collaboration, etc. The suggested factors of China's carbon tax are listed in Table 2.

Table 2. Carbon tax factors

Tax factors	Terms
Taxpayers	The entities and individuals consuming fossil fuels and directly emitting CO_2 into the natural environment are obliged to pay carbon tax.
Tax scope	Carbon tax shall be levied upon CO_2 that is directly emitted into the natural environment from fossil fuel consumption during production, operation and consumption activities.
Tax calculation	Emission amount is calculated by the fossil fuel consumption amount of taxpayers. CO_2 emission amount = fossil fuel consumption amount × CO_2 emission coefficient. Fossil fuel consumption amount refers to the total amount of fossil fuel that enterprises consume during production and operation activities producing CO_2; fossil fuel includes coal, crude oil, gasoline, diesel oil and natural gas, etc.
Tax rate	Carbon tax shall be levied at norm quota tax rate and calculated in accordance with different emission quantities.
Preferential tax policies	A. tax reduction for certain energy intensive sectors according to the needs for economic and social development; B. tax reduction or exemption for enterprises that reduce and recycle CO_2 through advanced technology and meet certain standards; C. exemption for individuals whose CO_2 emissions result from coal and natural gas consumption that are meeting the needs of their daily lives.
Others	Collection mode, payment deadline, payment location, etc.

(6) Choose the right timing for introducing the carbon tax and the reasonable tax rate based on the impact analysis of carbon taxation on the environment, the economy and the social situation.

The design of a carbon tax rate shall take into account the following important factors: (a) marginal cost of CO_2 reduction; (b) impact on macro-economic development and industrial competitiveness; (c) differences among various fuels and industries; (d) gradual rise of tax rate; (e) balance between carbon tax and other fossil fuel targeted taxes. Considering the economic and social realities of China, the carbon tax rate should be low in the short term and gradually rise to higher levels. By taking these factors into account, carbon tax can be effective in regulating human behaviour resulting in CO_2 emissions, while avoiding negative effects on the international competitiveness of Chinese industry and on the daily lives of low-income groups.

Based on estimations using carbon tax modelling, it is suggested that a lower rate be chosen when initially implementing a carbon tax, in order to alleviate the negative influence of the tax on the economy and the resistance of the relevant stakeholders. For instance, the maximum rate of the carbon tax rate might not be more than RMB 15 per ton CO_2 in the beginning and this will still allow for different options and designs there under. Meanwhile, the dynamic adjustment mechanism of the carbon

tax rate should be established, and the tax rate could be changed according to the fluctuation of the social and economic situation.

The timing for introducing a carbon tax is subject to having a favourable external environment, including a sound domestic and global economy, and a moderate tax burden. With the Chinese economy still recovering from the repercussions of the global financial crisis and resource tax reform in the pipeline, the best time might be to introduce the carbon tax when the Chinese economy has fully recovered and resource taxes are well established. However, such an environmental tax reform can already contribute to the recovery process: it spurs innovation and triggers cost reduction. The development of international climate negotiations and domestic priorities for environmental protection/climate change should also be seriously taken into account for the decision as to when to introduce a carbon tax. A suggested timetable for the introduction of a carbon tax is as follows:

Table 3. Suggested timetable for the introduction of a carbon tax

	Timing	Remarks
The first best case: "fast scenario"	12th Five-Year-Plan period (2011-2015)	On the basis of resource tax reform, to find the right timing to introduce a carbon tax as a part of environmental taxation.
The second best case: "Slow scenario"	13th Five-Year-Plan period (2016-2020)	China cannot effectively reach its domestic target of coping with climate change if carbon tax has not been introduced by 2020.

(7) Improve supporting systems and create a favorable external environment for the carbon tax.

It is suggested that the carbon tax should be a central tax and aimed at supporting the development of energy efficiency and new and renewable energy. The carbon tax revenue should be incorporated into the regular Government budgets and be managed together with other taxes while maintaining an emphasis on energy efficiency and environmental protection.

It is also important to promote the publicity of the carbon tax, establish a regular rate adjustment and notification mechanisms, strengthen the supporting capacity of the carbon tax collection and management, and coordinate the relationship between the carbon tax and other energy related policy measures on energy efficiency, renewable energy and efficiency standards.

3. Green Credit

3.1 Current Situation and Challenges in China

3.1.1 Background

Achievements in social and economic development over the past three decades, since the country's reform and opening-up, have made China the most exciting story in the world. China's global GDP ranking has risen from 15th in 1978 to 4th in 2008. Per-capita GDP grew by an average of 9.1% every year, from USD 190 in 1978 to USD 2,360 in 2008[1]. Rapid economic growth and urbanization have put the environment under tremendous pressure. Environmental issues and pollution problems pose serious challenges. As such, despite a host of state-driven initiatives, China has missed its environmental goals set in the tenth Five-Year-Plan.

The Chinese government has attached great importance to challenges in environment and resources and has adopted a series of policies and taken respective actions. In the 17th CPC National Congress Report, President Hu Jintao pointed out, "The cost of resources and environment brought by economic growth is too great." Meanwhile, Premier Wen Jiabao stressed many times that the objective of energy saving and emission reduction as specified in *the Eleventh Five-Year-Plan* is obligatory. Furthermore, the State Council promulgated *Opinions on Strengthening Environmental Protection by Implementing Scientific Outlook on Development* in 2005 and issued the *Comprehensive Work Plan for Energy Saving and Emission Reduction* in 2007. Both are the programmatic documents by which the Chinese government has carried out environmental protection and promoted energy saving and emission reduction in recent years. In these documents, an overall plan has been made for the implementation of environmental protection and energy efficiency.

According to statistics, the energy consumed and pollutants discharged in the so-called "double-high" industries (petroleum processing, coking and nuclear fuel processing, manufacturing of raw materials and chemicals, manufacturing of nonmetallic mineral products, ferrous metal smelting and rolling, non-ferrous metal smelting and rolling as well as the production and supply of electricity and heat)[2] account for approximately 70 percent of total generated across all industrial activities. In non-industrial activities, construction and road traffic are recognized as the two major sectors with respect to energy consumption and pollutant emission. While people's living standards are improving, domestic refuse and sewage discharge are

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[1] National Statistics Bureau of China, 2008. "Part 16 of the Series of Report on Achievements in China's Economic and Social Development During the 30 Years since Reform and Opening-up". http://www.stats.gov.cn/tjfx/ztfx/jnggkf30n/t20081117_402517351.htm (accessed on April 6, 2009).

[2] These six industries are referred to as "high energy-consuming and high polluting" industries or, in short, "double-high" industries.

increasingly becoming the leading sources of pollution.

Due to the underdevelopment of China's capital market, banks have always been the most dominant institutions for enterprises, governmental agencies and individuals to acquire external financing. On average, about 80 percent of external financing for these said entities is provided through banks. According to statistics, as of the end of 2008, the outstanding medium- & long-term loan from banks stood at RMB 2.6226 trillion in "double-high" industries, RMB 1.5843 trillion in water conservancy, environment and public utilities management, and RMB 2.3594 trillion in traffic and transportation, warehouse and postal service, while the outstanding loan in real property was RMB 5.2818 trillion and RMB 114.8 billion in automobile consumption. The sum of these balances amounted to 39.8 percent of GDP. Financing activities conducted by the banking sector have an extremely significant impact on the development of these industries and departments.

Therefore, the banking sector plays an irreplaceable role in effectively implementing environmental protection and energy efficiency, and striking a balance among economic growth, investment return and environmental protection. By incorporating "green" factors such as environment protection and energy efficiency into the banks' financing activities (namely, implementation of green credit), the environment protection sector may obtain effective support to solve environmental problems of environmental pollution and ecology degradation caused by "double-high" industries, traffic and transportation, real estate construction and consumption as well as people's daily life.

Meanwhile, the Chinese government has stepped up efforts for energy efficiency and pollution reduction in recent years, including stricter environmental regulation. Numerous seriously polluting factories were closed down or ordered to restrict production, resulting in increasing bad loans for banks. Such negative impact propelled financial institutions including banks to seriously consider environment-induced financial risks and adopted relevant preventative measures. According to the statistics of the China Banking Regulatory Commission, by the end of March 2007, the total non-performing loans of the five major banks in energy intensive and heavily polluting industries stood at 43.709 billion RMB, representing a bad loan ratio of 3.28%. The calcium carbide, iron alloy and cement industries topped the list with a bad loan ratio of 28.8%, 27.6% and 20% respectively.

In order to exert efficiently the function of banking sector in facilitating environment protection and energy efficiency and to reduce the credit risks caused by environmental and social risks practically, the banking regulatory authorities, environment protection authorities and other relevant departments have consolidated their cooperation to promote banks and other financial institutions in implementing the scientific outlook on development and have issued Green Credit-oriented documents such as *Opinions on Implementing Environmental Protection Policies and Regulations and Preventing Credit Risks* and *the Guiding Opinions on Credit Granting for Promoting Energy Efficiency and Pollution Reduction,* which put

forward an overall requirement for implementation of green credit in the banking sector. The banking sector is thus eager to cooperate with the environmental authority and competent departments to gain a better understanding of environmental policies development and get access to corporate environmental information, both of which can play an important role in better controlling credit risks, ensuring banking assets safety and reducing non performing loans.

Against such a political, economic, and environmental background, amid close collaboration between the Ministry of Environmental Protection and China Banking Regulatory Commission, the country witnessed a rapid development of green credit policy and its far-reaching implications.

3.1.2 Policy Implementation Content

Green credit is an economic tool that has been implemented with distinct Chinese characteristics, including a set of financial credit-centered policies and mechanisms and practices for promoting energy efficiency and pollution reduction. China's green credit policy has four aspects. First, green projects or companies are supported by appropriate credit policies and measures (related to loan term, interest rate, and loan limit). Second, non-compliant projects or companies are discouraged by punitive credit measures, such as loan suspension and withdrawal. Third, banks are able to reduce their credit risk in lending activities by supervising and urging their customers to strengthen management of environmental risks and improve resource efficiency. Forth, banks are required to seek new business opportunities for advancing environmental protection and energy efficiency and to develop new financial products to expand credit and related services. Through green credit activities, banks can facilitate sustainable development and achieve a win-win for themselves, their customers, and the whole society through collaboration with enterprises and other stakeholders.

China has a long history of green credit policy. In 1995, the People's Bank of China issued the Circular on Implementing Credit Policy and Strengthening Environmental Protection, which required banks to consider resource protection and pollution control in lending policies. In 2004, the National Development and Reform Commission, People's Bank of China and China Banking Regulatory Commission jointly issued the Circular on Strengthening Coordination between Industrial and Credit Policies and Controlling Credit Risks, which denied credit support for all new projects related to restricted or obsolete industries.

Since 2006, China's green credit policy has advanced even further. The former State Environmental Protection Administration, China Banking Regulatory Commission, and People's Bank of China carried out consultations and joint studies as the basis for issuing a variety of documents around 2007 to enhance green credit policies. These documents include: The Guiding Opinions on Improving and Strengthening Financial Services for Energy Efficiency and Environmental Protection by PBOC, Opinions on Implementing Environmental Regulations and Policies and

Preventing Credit Risks by SEPA, CBRC and PBOC, Circular on Preventing and Controlling Credit Risks of Energy Intensive and Heavily Polluting Industries and The Guiding Opinions on Credit Granting for Promoting Energy Efficiency and Pollution Reduction by CBRC, and so on. In addition, SEPA, CBRC and PBOC signed a working agreement to incorporate environmental information into the credit reporting system and strengthen information-sharing and exchange. Amongst the above-mentioned documents, the Opinions on Implementing Environmental Regulations and Policies and Preventing Credit Risks and The Guiding Opinions on Credit Granting for Promoting Energy Efficiency and Pollution Reduction comprise the core of China's green credit policy.

According to the Opinions on Implementing Environmental Regulations and Policies and Preventing Credit Risks, financial institutions and environmental regulators should abide by the requirement of environmental laws and regulations and impose stricter environmental supervision and credit management on new projects. Financial institutions should implement more stringent loan review, granting, and management policies. On the one hand, no additional loans should be approved for projects that seriously breach environmental laws and regulations while on the other hand, preferential lending policies should be applied to green projects. The Guiding Opinions on Credit Granting for Promoting Energy Efficiency and Pollution Reduction requires banks to adopt the principle of "differentiated treatment, supporting some sectors while restraining others" and to strengthen management with respect to due diligence, examination on lending, post-lending supervision, compliance, loan contract, authority of credit granting, policies of industrial credit granting, process of risk management, risk pricing, internal audit control, personnel assignment and training, information disclosure, and stakeholders with the aims of promoting the sustainable development of the banking business, China's economy and society while also efficiently preventing various risks incurred by the banks' customers due to high energy consumption, high emissions and heavy pollution.

3.1.3 Progress to Date

In the wake of the introduction of China's national green credit policies, the subordinate environmental and banking authorities at all levels have put forward local policies. According to incomplete statistics, more than 20 localities, including Fujian Province, have developed local policies. Recently, Hebei Province has developed a performance evaluation system for green credit implementation.

In the meantime, green credit policies were also well-received by commercial banks. According to the requirement of The Guiding Opinions on Credit Granting for Promoting Energy Efficiency and Pollution Reduction, commercial banks have developed internal management systems for controlling environmental risk within the credit system. Many banks, such as Industrial and Commercial Bank of China, China Construction Bank and China Development Bank, not only introduced a strict environmental review mechanism, but have also implemented an "environmental veto" mechanism within the credit approval process. The active involvement of banks

has been critical to ensuring the effectiveness of green credit policies and making this a high-profile economic tool that attracts substantial popular attention. In China, green credit is an important and successful measure for promoting energy efficiency and pollution reduction.

By June 2008, the five major commercial banks, namely Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank and Bank of Communications, had lent a total of 377.952 billion RMB to support 595 key green projects and 110.529 billion to 1619 projects related to green technology and product dissemination. This represents an increase of 50.694 billion and 15.965 billion, respectively, since January 2008. Policy banks (non-commercial banks) loaned 224.058 billion RMB to support green projects including clean energy, waste water treatment, and so on. The National Development Bank lent 30 billion RMB through the Special Fund for Energy Efficiency and Pollution Reduction, of which, 4.5 billion RMB was invested in Taihu Lake treatment. Over the same period, the five commercial banks approved facility and loans of 14.905 billion RMB and 12.767 billion RMB, respectively, for the restricted industries. This was 1.022 billion RMB and 0.508 billion RMB less, respectively, compared to the beginning of the year, and 364 million RMB and 358 million, respectively, for industries that will be gradually phased out (this represents a 141 million RMB and 124 million RMB drop, respectively, for such industries).

3.1.4 Problems and Challenges

Despite the early progress that has been achieved, China needs to be clear that the development of green credit policy is still in the initial stage, there is much room for improvement in terms of policy content and technical support. China is faced with quite a few problems and challenges in this regard.

The main problems are: First, an incomplete policy system and inefficient implementation; second, lack of diversity and effectiveness of available tools for implementation; third, insufficient information exchange; fourth, lack of supervision, evaluation, and regulation of banks and their reluctance for voluntary action; and fifth, the low capacity of banks and financial institutions for policy implementation.

China is also confronted with many challenges. First, due to fierce competition among commercial banks the implementation of the green credit policy is facing a great challenge; second, protectionism in the localities obstructs the implementation of green credit policy; third, private capital is not well regulated and non-compliant small and medium sized enterprises may still get funding support through this channel; fourth, small and medium sized banks and financial institutions are both most affected by environmental regulations and most resistant to green credit policy.

3.2 International Experiences and Implications to China

3.2.1 Relevant Exercises and Main Practices

There is no explicit "green credit policy" in other countries, though similar sustainable banking concepts and initiatives are plenty in the international community, such as the principle of self-discipline in environmental governance, and state promoted green financial products. These practices can be classified in four categories.

(1) Green financial initiatives of the international community and multinational organizations

The UN Conference on Environment and Development, in 1992, put forward the Declaration on Environment and Sustainable Development of the Banking Sector, which was a great contribution of the banking sector in the area of environmental protection. So far, 272 institutions and organizations around the world have signed the declaration. Bank of Shanghai was the first Chinese bank that signed on the document; it demonstrated that Chinese banks were trying to become greener by doing their part in promoting environmental protection and sustainable development.

OECD countries have agreed on a Revised Recommendation on Common Approaches to the Environment and Officially Supported Export Credits, which sets out strengthened environment-related requirements for export deals to qualify for support from OECD Members' Export Credit Agencies. The Revised Recommendation calls on the OECD Members to evaluate carefully any export credit applications with a loan period over two years that are officially supported and make sure their potential environmental impact meets the standards of relevant international organizations, in particular the World Bank and the IFC.

(2) Self-disciplinary principles of green financing

Faced with widespread criticism for their poor environmental, social and human rights performance, a number of international banks have initiated and advocated the Equator Principles, which helped internalize environmental, social and human rights risks, and improve the image of the banks. The Equator Principles are a set of self-disciplinary benchmarks for the banking sector to shoulder more social and environmental responsibilities. They include 10 basic principles, 8 environmental and social performance standards of the IFC, and 62 Environmental, Health and Safety Guidelines of the World Bank and the IFC, which should be complied with during financing activities. The Equator Principles enjoy growing influence with more than 60 international banks which have signed up to them, including a few from developing countries like Brazil and China. The capital raised by these banks accounts for about 90% of the global total.

(3) State-promoted subsidies to green credit

In order to support green projects, which often show low returns and are of a public and long-term nature, it is a common practice for many countries to grant low rate loans to these projects through policy banks or commercial banks. The experience of the UK, Japan and Germany are of particular interest to China.

The Household Energy Efficiency Law of the UK in 1995 required a 30% drop of household energy consumption within 10 years on the basis of 1996 or 1997 figures. In order to achieve this goal, the UK government introduced a set of policies and measures to improve energy efficiency, including discount loans, low rate loans or interest free loans for equipment investment and technological development projects to improve energy efficiency. Within the 200 million pound Energy Efficiency Fund in 2002, 25% was used for discount loans, of which 10 million pounds were granted as interest free loans.

In order to propel enterprises to maintain a balance between environmental and economic interests during production activities, the Development Bank of Japan put forward a financing policy based on an "environmental rating". The rating result would determine who could access loans and at what rate. Driven by the need for tackling climate change and CO_2 reduction, the Bank again introduced an environmental-rating-based discounted loan in 2007. Those rated companies who commit to reduce CO_2 emission per unit of production by more than 5% in 5 years will enjoy an additional rate discount of 1% when applying for CO_2 treatment loans.

In Germany, the policy bank KFW Bankengruppe raises money in the capital market while financial subsidy policies for environmental projects are channeled through commercial banks. In this way, government subsidies can be exploited to their fullest extent. This is how Germany does it: First, the KFW Bankengruppe raises money in the capital market with the support of a government subsidy, and then the KFW Bankengruppe will use the capital raised to develop long-term and low-rate financial products and sell them to commercial banks, finally, after adjusting the rate, the commercial banks will sell the green financial products and services to end clients with very preferential rates and loan periods. This practice can also contribute to energy efficiency improvement and GHG emission reduction.

(4) Innovation on green financial products

The international obligation for GHG emission reduction has not only created an active carbon trading market, but has also impelled financial institutions, including banks, to innovate on new green financial products, such as carbon financing and energy efficiency financing. Many banks have started to develop products that are oriented to a low carbon economy and CO_2 emission reduction. Green financial products and services for individuals and small and medium sized enterprises have covered such business as loan, deposit, credit card and lease.

3.2.2 Experiences and Implications to China

Comparing Chinese and international policies and green credit practices, one can discover that China has some successful experience and some shortcomings as well. The banking regulatory authorities, environment protection authorities the other competent departments have done a good job in taking joint actions and working out relevant policies, thereby providing a good platform for fair competition among banks. Meanwhile, banking regulatory authorities and environment protection authorities have provided the banking sector with a relatively complete and timely service of environmental information via regulatory information sharing, thus facilitating the banks' capacity to manage environmental risks, and materialize the joint oversight on enterprises with high environmental risks. However, one can also identify several shortcomings. Firstly, the green credit policy is largely government-led in China, while international practice emphasizes joint promotion by government, market, and the banking sector. Secondly, China's green credit policy system is incomplete and less practicable compared with those in foreign countries. Thirdly, policy tools and insufficiently diversified and innovation in green financial products is lacking. Fourthly, Chinese banks are required to promote energy efficiency and pollution reduction, and shoulder more social and environmental responsibilities, potentially neglecting their legitimate need for reasonable profit in implementing green credit policy.

Developed countries, including the US, Japan, and European nations, have actively promoted the development of diversified green financial products, such as green credit and financial subsidies, which play a positive role in environmental protection and GHG emission reduction. China could learn a lot from the experiences of these countries.

First, the role of the market should be stressed in promoting green credit policy. Green credit policy contains two core aspects: preferential credit policy for green projects, and restricting or denying lending support for projects with negative environmental and social impacts. International experience, particularly the German experience, shows that the market plays an essential role in both aspects. State support for the policy banks may be channeled through the capital market and the direct involvement of commercial banks can help move the green credit policy closer to end clients in order to maximize efficiency. Ultimately, the green credit policy should not only bring about more environmental and social responsibilities for banks but new business and profit opportunities as well.

Second, green credit benchmarks are widely accepted and advocated by the international community and the banking sector. However, there is much room for improvement in terms of policy completeness and practicability in China. The 8 Social and Environmental Performance Standards of the IFC and the EHS Guidelines referenced in the Equator Principles may serve as effective tools that help the banks to accurately rate the risk of a project and assist the client to improve project design for reduced operational risks.

Third, clearly defined environmental liability is the basis for implementing green credit policy. Only by clearly stipulating environmental liability, rights and obligations in the law, can the government, enterprises and the banks be propelled to protect the environment and reduce pollution.

Fourth, environmental review is critical for promoting green credit policy. Due to the complexity of environmental issues and diversity of technological processes, it is often difficult for banks alone to identify the environmental implications of a certain project, and the support of the environmental agencies in terms of environmental assessment is particularly necessary. The Japanese and German experiences show that environmental review is not only beneficial for the banks but can also help reward the green companies and punish the dirty ones.

3.3 Conclusions and Policy Recommendations

3.3.1 Main Conclusions

(1) A green credit policy with Chinese characteristics has been well-established

A Green credit policy with Chinese characteristics is well established. The core content of the policy is preferential lending support for green projects, and strict review and loan restrictions for energy intensive and heavily polluting projects. The close collaboration between environmental agencies and the banking sector, in policy development, information sharing and personnel training, has pushed forward the development of green credit policy in China. Under government regulation and the guidance of a scientific approach to development, more and more banks have set up internal mechanisms and procedures for green credit and voluntarily shoulder more social and environmental responsibilities. A top-down system of green credit policy has been well established in China. With expanding content, the green credit policy has become an important and successful economic tool for promoting energy efficiency and pollution reduction.

(2) There is much room for improvement in China's green credit policy

Compared with advanced international practices, there is still much room for improvement in China's green credit policy. Only by resolving the problems can the policy better meet the domestic need. The most prominent problem of China's green credit policy is reliance on administrative measures and not market mechanisms, which has so far resulted in inefficiency. In the future, China should strengthen the role of market forces in developing more green financial products. Sector-oriented green credit policies also need to be developed so as to ensure efficient implementation.

(3) The green credit policy is an important tool for modulating and regulating macro-economic activities

Against the background of financial crisis, lending support is often the decisive factor for the subsistence and development of enterprises. As China introduced its economic stimulus package, a large amount of capital is pouring into the market and the lending scale is sharply expanding. In the first half of this year alone, the total loans granted exceeded 7 trillion RMB. This has given rise to concerns over lax implementation of the green credit policy, repetitive construction, excessive production capacity and new bad loans. As a matter of fact, the green credit policy should play an important role in encouraging lending support for projects with attractive economic, social and environmental returns while discouraging credit loans for projects that seriously pollute and damage the environment. It should thereby help achieve the overall goal of "sustained economic growth, improved industrial structure and better development". In the recently introduced set of policies for regulating industries with excessive production capacities, including iron, steel, cement etc., the State Council has clearly identified strengthened environmental supervision and stricter credit management as macro regulatory measures. Therefore it can be said that the green credit policy not only helps promote energy efficiency and pollution reduction, but also serves as an important tool to achieve macro regulatory goals.

3.3.2 Policy Recommendations

(1) Clarify and stress the supportive aspects of the green credit policy

There is currently a misconception that the green credit policy is basically a punitive tool. But, in fact, the green credit policy includes not only punitive and restrictive measures, but also positive measures, such as subsidies and loan preferences for green projects by means of credit instruments. Such supportive measures are also very important for achieving the goal of improved energy efficiency and pollution reduction. Because of the misconception, the supportive side of the green credit policy has not been stressed. The policy has centered upon the punitive aspect while very few supportive tools were developed. This has resulted in a lack of innovation and a weak structure of the green credit policy, which hampers the effectiveness of the policy in supporting the energy efficiency and pollution reduction program.

Therefore China should put more weight on the supportive and regulatory aspect of the green credit policy. It remains important to further strengthen the social and environmental responsibility of banks, and curb the development of energy intensive and heavily polluting industries by credit restrictions. However, it is also essential to encourage the innovation of supportive green policies and credit products, such as loan preferences and subsidies. Meanwhile, it is necessary to reform existing financial and taxation policies for energy efficiency improvement and pollution reduction so as to raise capital efficiency and ensure the policies are fair and widely applicable.

(2) Improve the enabling policies for energy efficiency and pollution reduction through market-based reform in the financing area

The Chinese government has attached great importance to the energy efficiency and pollution reduction program. China has not only established the Special Fund for Energy Efficiency and Pollution Reduction, but also provided capital support for green projects through the National Development Reform Commission and China Development Bank. Within the 4 trillion RMB stimulus package, a considerable sum of 400 billion will be used to support green projects. The absence of a market-based mechanism has resulted in low capital efficiency, and the administrative approval procedures will also easily breed corruption.

In order to make the use of capital more effective, transparent and fair, market-based reform shall be introduced, mainly through the leverage exerted by financial institutions to expand the effect of energy efficiency and environmental protection.

(a) Establish a national guarantee fund for energy efficiency and emission reduction, and offer credit guarantees for eligible credit capital by sharing risks with financial institutions in the banking sector.

(b) Offer interest subsidies to key energy efficiency and emission reduction projects. The government may confirm the range of subsidies for loan interest through invitation to bidding and tender towards financial institutions and the banking sector.

(3) Improve the existing green credit policy and strengthen its practicability and effectiveness

(a) Accelerate the introduction of industrial policies related to green credit; require banks to clarify the policy boundary and scope in reviewing the credit grant; restrict higher energy consumption and pollution projects in order to adjust the industrial structure and promote sustainable development, (b) The collaboration among environmental agencies, competent industrial authorities and banks, should be further strengthened. The environmental agencies should establish close collaboration with competent industrial authorities, provide timely corporate environmental information by developing sector guidelines for implementation of green credit policy, carry out “green project” verification, and establish an integrated environmental risk rating system for enterprises and projects. These measures will help improve the practicability and effectiveness of the green credit policy. The banks should create more green financial products, conduct strict credit management and review, acquire timely green credit information, and provide green loans for green projects. By doing this, the banks and environmental agencies can together support the work of energy efficiency and environmental protection projects, and further facilitate sustainable development.

(c) A supervision and information disclosure mechanism for green credit

implementation should be established as soon as possible. Disclosure of information about non-compliant companies, as well as the banks' implementation of green credit policy will help the banks to shoulder their social and environmental responsibilities.

(4) Guide and regulate overseas investment by Chinese financing institutions and strengthen their social and environmental responsibilities

China should also strengthen its regulation and management of its overseas investment and develop relevant policies in this area. Large companies and banks should be encouraged to manage their investment or credit granting process by adopting international benchmarks. Additionally, with regard to the large amount of private investment by small and medium sized enterprises, targeted polices are also needed for greening such investment.

(5) Develop a special green credit policy to support the healthy development of small and medium sized enterprises (SMEs)

Affected by the financial crisis, access to loans has become difficult for SMEs which is a prominent problem for their development. The situation of SMEs needing renovation or development of environmental facilities is particularly severe.

Therefore, when developing financial policies for supporting SMEs, the Chinese government should work on the introduction of a special policy and develop special green financial products for SMEs. Loans should be provided to support the development of green SMEs that enjoy healthy prospects and are in compliance with national industrial policies and the policy of energy saving and pollution reduction. At the same time, the Chinese government should impose on SMEs a strict review of energy saving, pollution reduction and credit granting processes, and reject lending support for heavily polluting and high energy consuming SMEs.

(6) Strengthen supervision and education, and better regulate private capital flow

The lack of effective regulation on private capital has incapacitated China's macro-regulatory policies, while the expansion of the sector and its neglect of social and environmental interests continued. Therefore, in addition to introducing green credit within public financial institutions, it is also important to strengthen the supervision and regulation of the private capital lending sector.

Supervision should be strengthened on heavily polluting and energy intensive companies, and severe punitive measures should be imposed on non-compliant activities. Thus, the investor will learn a lesson from the punishment and realize the high financial and environmental costs if social and environmental interests are neglected. What's more, the government should strengthen education on financial and environmental issues and the related costs of irrational investment. Such education will help investors to develop awareness of the risks involved in funding industries with high energy consumption and pollution.

4. Environmental Pollution Liability Insurance

4.1 Current Situation and Challenges in China

Over the past 30 years, China has achieved amazing economic success but at the same time, large-scale environmental problems and conflicts have accelerated due to a tremendous expansion of economic aggregates, irrational industrial structure, and poor factory location. China has hence entered an era characterized by frequent environmental accidents. According to statistics, from 1998 to 2005, the annual direct loss caused by pollution accidents in China reached i140 million RMB, on average. Between 2003 and 2006, there were a total of 5,532 environmental pollution/destruction accidents, resulting in a direct economic loss of 637.267 million RMB and a total compensation/fines of 178.534 million RMB, while seriously impairing the health, life, and property of local residents. An environmental risk survey of China's petro-chemical industry carried out by the former State Environmental Protection Administration in 2006 showed that 81% of the 7,555 surveyed petro-chemical projects are located in environmentally-sensitive areas, such as river valleys and highly populated regions. 45% of these projects are associated with high environmental risk and those located in major river basins pose threats to the local environment, with no preventive mechanism in place.

Against this background, administrative regulation alone is not enough to prevent environmental emergencies. Therefore, it is absolutely imperative to establish a long-term mechanism for environmental risk management, especially environmental pollution liability insurance. Environmental pollution liability insurance requires the insurer to bear the responsibility of economic compensation and pollution treatment in case the insured party accidentally causes environmental pollution so that any victims are compensated on a timely basis, even if the insured is not solvent. Environmental pollution liability insurance has only been developed over a few decades in some developed countries. Such insurance has become the main financial instrument to prevent environmental risk and resolve the problem of environmental damage compensation. For this reason, many companies have used environmental pollution liability insurance to better manage their environmental risks. The introduction of environmental pollution liability insurance in China will help improve pollution compensation mechanisms, strengthen preventive management of environmental accidents, reduce the cost for the government in the wake of environmental emergencies, safeguard the legitimate rights of the victims, maintain social stability, reduce bankruptcy cases, and ensure sustained corporate development.

In recent years, China has made some progress with respect to environmental pollution liability insurance. In 2007, the former State Environmental Protection Administration and China Insurance Regulatory Commission jointly issued the Regulatory Opinions on Environmental Pollution Liability Insurance. The Regulatory Opinions state the principle, target, implementation, and supporting mechanisms of environmental pollution liability insurance and serve as the most important guideline

at the national level. In the meantime, some provinces, like Jiangsu and Liaoning, have already initiated legislation in this field.

Since the promulgation of the Regulatory Opinions in 2007, many insurance companies (including PICC, Ping An Insurance, and Pacific Insurance) have developed environmental pollution liability insurance products and gained approval from the China Insurance Regulatory Commission. In 2008, the Ministry of Environmental Protection and the China Insurance Regulatory Commission co-hosted the National Working Meeting on Environmental Pollution Liability Insurance Pilot Programs, marking the formal launch of pilot programs across the country. Provinces and municipalities, including Jiangsu, Chongqing, Hubei, Hunan, Henan, Ningbo, Shenyang, Shenzhen and Suzhou, were identified as regions where pilot programs could be carried out with enterprises that produce, operate, store, transport, and/or consume hazardous chemicals, and specifically with the petro-chemical industry, which is prone to pollution accidents and with hazardous waste disposal enterprises, waste landfills, waste water treatment plants, and industrial parks. In July 2008, the Hunan branch of Ping An Insurance Company compensated the victims of pollution accidents caused by Hao Hua Chemical Company. This was the first case of environmental pollution liability insurance reimbursement in China, signaling a new age for environmental pollution liability insurance.

Generally speaking, environmental pollution liability insurance is still in an initial stage of development in China, and there are many problems that need to be addressed: First, due to cost considerations and lack of awareness, few companies are interested in buying environmental pollution liability insurance. Second, the underwriting ability of Chinese insurance companies needs to be improved to manage profitability uncertainty and the higher operational risk of environmental pollution liability insurance. Third, too much government intervention will not help to establish a long-term mechanism for pollution compensation and may, in fact, undermine the credibility of environmental pollution liability insurance. Fourth, because the environmental pollution liability insurance is a new development in China, many people are not yet aware of its role, nor the needed policies, operation, and management of such insurance. Fifth, the current global financial crisis exerts considerable negative impact on the popularization of environmental pollution liability insurance in China.

Additional factors constrain the popularity of environmental pollution liability insurance in China. First, legal support is lacking. No national law or regulation on environmental pollution liability insurance currently exists in China. Second, liabilities can be obscure and there is a lack of internal push for environmental pollution liability insurance. Third, standards for insurance product pricing and reimbursement are lacking. China has neither developed an environmental risk assessment methodology nor pollution damage verifications and compensation standards. These technical obstacles need to be resolved to facilitate a broader acceptance of environmental pollution liability insurance. Fourth, incentives are lacking for both the insured and insurer, and there is a high operational risk for

insurance companies. Fifth, there is a lack of policy and financial support from the central government to the pilot regions. As no special funds have been provided at the national level, the programs are currently mainly supported by local governments.

4.2 International Experiences and Implications to China

At present, there are two advanced models of environmental pollution liability insurance in foreign countries; namely, *mandatory* environmental pollution liability insurance (which has been adopted by the US, Germany, Russia, and Argentina) and *voluntary* environmental pollution liability insurance (which has been adopted by France and the UK). Mandatory environmental pollution liability insurance focuses on mandatory insurance complemented by voluntary insurance. In this model, mandatory environmental pollution liability insurance is imposed on risky firms while most others can buy the insurance on a voluntary basis. The mandatory model involves insurance as well as other financial guarantees by law (e.g. financial guarantees and fund). Such financial guarantees make the insurance more flexible.

Countries that have adopted the voluntary model differ in their approaches, priority areas, operational models, and insurance products, but there are also some similarities amongst them with respect to the overall trends of Environmental Pollution Liability Insurance. First, legislation serves as the basis and a precondition for introducing Environmental Pollution Liability Insurance. In this respect, laws set the legal status and provide for an operation model, an underwriting approach, managing institutions, compensation liabilities, and priority areas. The law endows the insurance with more mandatory power. Legislation is also a benchmark of the development level of environmental pollution liability insurance. Second, mandatory insurance is a general trend of environmental pollution liability insurance development. All countries with the mandatory approach have developed catalogues to better manage environmental pollution liability insurance. The catalogues are developed in accordance with the management needs of different countries and normally include an equipment catalogue, a product catalogue, and a risk assessment based catalogue. Third, compensation liability for pollution damage is specified and increasing weight is given to environmental restoration. There are clear provisions in the laws of these countries regarding the compensation liability of pollution damage. Such provisions play a vital role in regulating insurance policies and pay-outs. The insurer must bear compensation liability as stipulated by law and pay more attention to its responsibility for environmental restoration. Relevant provisions can be found in the laws of the US and Germany, and the environmental pollution liability insurance of Argentina is even purely restoration-oriented. Fourth, the establishment of an environmental aid fund is an important supplement to the compensation mechanism. When pollution damage exceeds the cap of insurance reimbursement and the insurer is insolvent for extra loss, some countries have established environmental aid funds to help control operational risks of insurance companies. Every environmental pollution liability insurance policy sets a cap on single reimbursement and total pay-out within certain insurance periods;

in other words, insurance companies underwrite a limited liability. The environmental aid fund therefore plays a very important supplementary role to improve the environmental pollution liability insurance, preventing possible social conflicts and safeguarding the environmental rights of the people.

In the long run, the environmental pollution liability insurance products of different countries are becoming increasingly less profit-centered. The following are some prominent features: First, the scope of coverage is gradually expanding. Initially environmental pollution liability insurance only covered environmental emergencies and incidental accidents, but the scope of coverage has gradually expanded to environmental damage caused by accumulative pollution. Second, a pay-out cap was set to reduce the operational risk of insurers. Third, the time limit of claims was extended. Because of the invisibility of damage caused by environmental pollution, people began to pay attention to the accumulative and long-term nature of such damage, and the time limit for claims was extended. The US applies the "sunset clause" for environmental pollution liability insurance where both parties of the insurance contract agree that the insured may make a claim against the insurer up to 30 years after the insurance's expiry date. The Environmental Liability Insurance Law of Germany sets the time limit for a claim at 10 years, there have been several developments with respect to product diversification. In addition to environmental damage liability insurance, in the US, many other products can be found, including Underwriter Environmental Damage Liability Insurance, Errors and Omissions Insurance of Professional Environmental Risks, and Asbestos and Lead Abatement Contractors General Liability Insurance, etc. Fifth, there has been a professionalization in the way such insurance is managed. Considering the complexity of environmental issues, many countries have set up specialized agencies to manage relevant business. For instance, Argentina established an Advisory Committee on Environmental Risk Assessment and Fiscal Guarantee, whose responsibility covers environmental standards and guidelines, and general regulations on contract clauses of Environmental Damage Risk Insurance. India has also set up an Environmental Court and an Advisory Committee on Public Liability Insurance, which are mainly responsible for dispute settlements relating to public liability insurances.

4.3 Conclusions and Policy Recommendations

4.3.1 Main Conclusions

(1) Environmental pollution liability insurance has been widely-adopted as an advanced market-based instrument

Environmental pollution liability insurance is a widely-adopted management tool for environment protection in the world. As currently a prominent way for enterprises to fulfill their environmental responsibility, environmental pollution liability insurance has a good performance in terms of preventing environment risk and compensating pollution damage. After several decades of development, many counties have already built relatively complete systems for environmental pollution liability insurance (including the refinement of legal and regulatory systems, diversified insurance products, etc.), and enterprises recognize its value in fulfilling environmental responsibility. With such a market operation, government help with no longer be required. In these countries, Environmental pollution liability insurance is on a positive trend and can play an important role in enhancing enterprises' environment protection and safeguarding victims' rights. According to international experiences, it is necessary and feasible to promote environmental pollution liability insurance in China, and the experiences relating to laws and market run are particularly worth further study.

(2) Environmental pollution liability insurance is a challenge to implement in China and there are opportunities for improvement; it is critical to respond to the challenge and take the opportunities to improve relevant laws, regulations, policies, and standards

With both increasing environmental requirements and more frequent environmental accidents, there is great market potential for environmental pollution liability insurance. Still, considering the imperfection of the socialist market economic system of China at the current stage, the inadequate incorporation of environmental cost into products and services as well as the severe lack of experience with employing market-based approaches to resolve environmental problems, the wider uptake of environmental pollution liability insurance confronts strong challenges. In general, Environmental Pollution Liability Insurance is at an early stage in China, and the market remains rather small. Compared with the US and Germany, supporting laws, regulations, policies and standard are still very weak, and the necessary guidance to spur further development of Environmental Pollution Liability Insurance is weak. Therefore, establishing and improving relevant laws, policies, and standards are key for the development of environmental pollution liability insurance in China.

(3) Duly adjust the strategy for environmental pollution liability insurance to reflect the realities of the current financial crisis

The influence of the financial crisis on the national macro-economy has not yet come to an end, and it does not favor the promotion of environmental pollution liability insurance. Hence, appropriate adjustment to the development strategy for environmental pollution liability insurance is needed to respond to changes in the economic situation and in the priority of the nation's economic development. While the scale of existing experiments with environmental pollution liability insurance can be maintained, the pilot exploration should focus more on certain areas and industries with high environmental risks and high frequency of accidents. More efforts in the form of pilots to solve technical problems, enhance the technical properties, and gradually improve the related mechanisms and policies, while accumulating experiences and lessons with an aim to lay a foundation for a more comprehensive implementation of environmental pollution liability insurance in the future.

4.3.2 Policy Recommendations

(1) Establish a legal and regulatory framework to enable environmental pollution liability insurance

(a) To improve related laws and regulations for the identification and division of responsibility for environmental damage, strengthen environmental responsibility and accountability, implement the "responsible-party pays" principle to create a real binding force for environmental liability on enterprises that can generate market demand and create the motivation for enabling effective environmental pollution liability insurance. First, it is necessary to improve the content of the identification and division of responsibility for environmental damage, enshrine in relevant laws the liability of those who create environmental accidents makers to provide compensation. In international practice, compensation relates to casualties, property damage, and ecological environment recovery (or remediation) expenses. The liability provisions can be specified in one special law or within a number of laws. Second, efforts are needed to strengthen investigation of criminal and civil liability of those who create environmental incidents, and various approaches should be explored to reduce reliance on the current method of mainly administrative punishment. Finally, efforts are needed to enhance and implement liability investigation, so that those who create environmental incidents will conscientiously realize the serious legal implications regarding compensation and the significance of environmental risk prevention, which is of great importance to promoting environmental pollution liability insurance.

(b) Legislation is the primary tool for building an environmental pollution liability insurance system in China, at the current stage. It is extremely difficult to promote environmental pollution liability insurance without a legal basis. Efforts should be made to expedite the legal construction of environmental pollution liability

insurance, and to establish a legal system that favors the promotion of such insurance. First, it is necessary to implement legislation primarily at the national level. The contents of pollution liability insurance should be appended into the special laws concerning environmental protection during their amendment, such as Environmental Protection Law of PRC, or Law of PRC on Prevention and Control of Water Pollution, Law of PRC on Prevention and Control of Atmospheric Pollution, Law of PRC on Prevention of Environmental Pollution Caused by Solid Waste, and so forth. Second, efforts should be made to work out detailed rules or administration measures for the implementation of the environmental pollution liability insurance, which explicitly stipulate the relation between environmental pollution liability insurance and the civil liability system, the scope of application of liability insurance and the limits to the subject matter, the status of a third party under the liability insurance, liability for payment by the liable insurer, the plea and reconciliation on a claim of a third party under the liability insurance, and other issues. In addition, it is necessary to encourage the regions with legislative rights to take the initiative to carry out the legislation work of environmental pollution liability insurance, map out supporting regulations, policies, and measures, and launch experiments in order to accumulate experience for the formulation of relevant national laws.

(c) Thirdly, clear channels for third party compensation must be made available for those who have been damaged by environmental pollution. At present, third parties have an arduous task to receive compensation, even if liability is clear.

(2) Establish a policy framework to enforce environmental pollution liability insurance

(a) The MEP should work to develop the standards and guidelines for environmental pollution liability insurance. This includes developing a compensation standard for pollution damage, environmental risk assessment standard, clean-up standards for contaminated sites, and so on so that the relevant activities can be implemented in accordance with certain criteria with the aim of regulating related market subjects' behavior vis-à-vis environmental pollution liability insurance and ensuring that environmental pollution liability insurance functions according to policy objectives.

(b) By combining international development trends regarding environmental pollution liability insurance with the actual situation in China, it is necessary to adopt a model in which both mandatory and voluntary insurance are combined, and encourage the majority of enterprises to purchase environmental pollution liability insurance on a voluntary basis. First, efforts should be made to fully analyze the economic contribution, pollution discharge, frequency of pollution accidents, technological progress, social influence and other factors of industries with high pollution and high environmental risks. This involves studying and proposing a directory of industrial technology for mandatory environmental pollution liability insurance, and determining the methods for industries that need to purchase mandatory environmental pollution liability insurance. According to China's

industrial environmental risks and the conditions of accidents, enterprises that produce, transport, store, and use dangerous chemicals and petrochemicals, those that carry out hazardous waste disposal, and other industries should be included within the scope of management under the mandatory environmental pollution liability insurance. Second, it is necessary to study and propose technical guidelines on the establishment of the directory. In this respect, the basic requirements for methods under the mandatory insurance must be specified, and indicators and parameters regarding procedures to establishment the directory and perform technical selection should be standardized. In addition, the directory of industrial techniques under the mandatory environmental pollution liability insurance should be subject to dynamic and timely adjustment; techniques included in the directory should reflect actual management needs, with the aim of deliberately including techniques with higher environmental risks and greater harms within the scope of management under the mandatory environmental pollution liability insurance.

(c) Environmental pollution liability insurance is in the public interest. Policy support from the central government is needed for the initial implementation of such insurance. Internationally, the provision of proper tax abatement and exemption is a common practice. The launch of appropriate preferential policies at the initial stage in China's implementation of environmental pollution liability insurance will not only encourage a greater number of pollution-discharging enterprises to purchase the insurance, but it will also diminish the operating risks of insurance companies. Thus, the benefits of both insurers and insured enterprises are guaranteed, which complies with the State's policy orientation of energy conservation and emission reduction. Therefore, MEP should join hands actively with financial, taxation, and banking management authorities to speed up the favorable and incentive policies which support the environmental pollution liability insurance, such as reimbursing companies with a certain proportion of their discharge fees as their premium paid to the insurers, connecting the insurance with the green credit system, tax reduction and exemption for insurances companies and so forth. In addition, it is recommended to establish a special fiscal fund to subsidize insurers and insurants in pilot areas to put forward the environmental pollution liability insurance on a voluntary basis.

(d) It is necessary for the country to establish an environmental relief fund as early as possible, which can be used for compensation where indemnity exceeds the limit of the environmental liability insurance and policy holders are unable to bear indemnity liability, in order to alleviate the financial impact of major environmental accidents and even environmental disasters. The environmental relief fund is chiefly aimed at safeguarding the rights and interests of victims and dissolving social contradictions caused by accidents. As a result, society assumes part of victims' losses. Such funding is a major supplement to the environmental pollution liability insurance, and an important part of the national compensation and relief mechanism. The environmental relief fund can be established by referring to overseas countries' experience, with a wide variety of fund sources, including: part of the funds transferred by the government through national finance appropriation, pollution

discharge fees, funds raised through social organizations, and private donations, etc.

(3) Improve the supervision and management mechanism and establish an environmental pollution liability insurance guidance center

(a) It is important to strengthen collaboration between environmental and insurance authorities, with clear-cut distribution of labor to establish jointly the mechanism for investigation, loss adjustment, claims auditing and liability verification of environmental pollution accidents. It will be necessary to strengthen routine supervision and administration, conduct information exchange and communication in a timely manner, and establish an approval and solicitation system for environmental pollution liability insurance products to tackle problems arising from implementation of the insurance, and ensure the development of environmental pollution liability insurance in conformity with the established policy objectives.

(b) Establish an Environmental Pollution Liability Insurance Guidance Center under the administration of the MEP. The major responsibilities of this center would be to formulate industrial environmental risk assessment guidelines and compensation standards for damages from pollution, to develop and refine an industrial process directory for compulsory environmental pollution liability insurance, to conduct studies on financial and taxation policies conducive to environmental pollution liability insurance, etc.

(4) Strengthening efforts in relevant education and capacity building

(a) The MEP and CIRC should actively carry out nationwide training on the subject ofn environmental pollution liability insurance for relevant personnel to improve their understanding of its importance so as to gain in-depth understanding of the requirements, goals, and methods of environmental pollution liability insurance and grasp the basic management skills and technical approaches.

(b) It is necessary to strengthen actively the fundamental research on environmental pollution liability insurance, which includes the accumulation of relevant data, research on environmental standards and so forth. It is also necessary to increase investment in the study gradually, to enhance the R&D of relevant insurance products, and to promote the technical support system of the environmental pollution liability insurance.

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