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Strategic Transformation of Environment and Development in China: Global Experience and China's Solutions

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Strategic Transformation of Environment and Development in China: Global Experience and China's Solutions

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Context

1. Introduction

In recent years, China has embarked on a strategic transformation of its approach to environment and development, representing the start of new efforts by the central government to integrate environmental protection and socio-economic development in a mutually productive way. Two significant characteristics mark this change: First, environmental issues are being placed at the center of the national agenda, with environmental protection starting to enter into the mainstream of national development. Second, economic and social policies are starting to incorporate environmental considerations in a substantive way. Such changes are motivated by the interactions among environment, economy, society and politics in China and accelerated by globalization.

Strategic transformation of China's environment and development agenda implies that China will seriously engage in the mitigation of its severe pollution and ecological degradation, and will have to reconcile environment with socio-economic development. A series of creative strategic thoughts and policies on environment and development were presented at the 17th National Congress of China Communist Party (CPC) which concluded on 21 October, 2007. Internationally, a similar strategic transformation occurred in Japan in the late 1960s and the early 1970s, Korea since the mid-1980s, Germany since the mid-1970s and quite radically in the mid-1980s, and Los Angeles and the USA since the late 1960s. However, each of these transformations occurred at an earlier era of technology and policy development, and China now has the chance to benefit from the lessons of those countries that have gone before—and to emphasize, among other things, pollution prevention as well as pollution control.

The objective of this report is to provide an overall framework for strategic transformation of the environment-development relationship in China. To this end, Section Two elaborates and explains the strategic transformation taking place in China, based on both Chinese domestic evidence and comparison with past international experiences. Section Three analyzes the domestic background and motivation for the strategic transformation now underway, including the relationships among the environment, economy, society and politics in China. Section Four elaborates the motivation for strategic transformation from the perspective of globalization—mutual environmental impacts on, and responsibilities of China and the world in the context of environment and development. Section Five makes policy recommendations to the Chinese Government on how to accelerate strategic transformation towards sustainable development.

2. Strategic Transformation: The Chinese and International Context

Recognition of the need for strategic transformation of China's approach to the environment and economic development can be seen in several government pronouncements and policy initiatives that have occurred in the early years of the new century. Taken together, they appear to signal fundamental changes, reflecting growing understanding of the importance of environmental sustainability by the Chinese people and their leaders.

2.1 Leadership Signals

Signal 1: The Scientific Outlook on Development / Building a Harmonious Socialist Society

In 2003, the Chinese Government announced its intent to "stick to the principle of people first, adopt the concept of comprehensive, coordinated and sustainable development, promoting integrated development of economy, society and people", also known as "the Scientific Outlook on Development" The Scientific Outlook on Development takes development as its essence, putting people first as its core, comprehensive, balanced and sustainable development as its basic requirement, and overall consideration as its fundamental approach, which has been addressed in the President Hu Jintao's report at the 17th CPC Congress and now formally written into the amended Constitution of CPC.

In 2006, the Government announced the goal of achieving a "harmonious socialist society". Among the eight objectives and tasks to build a harmonious socialist society, the important one in the context of environment reads that "resource utilization efficiency should be greatly increased, the environmental quality should be sharply improved, and the building of a resource-conserving and environmental-friendly society should be accelerated." This signifies that the Government has started on a new pathway for strategic transformation of environment and development.

Signal 2: New Path of Industrialization and the Path of Peaceful Development

To take the new path of industrialization, as presented at the 16th Party Congress, there are five criteria to meet: high scientific and technological content, good economic effects, low resource consumption, less environmental pollution, and full use of human resource advantages.

Environment has become an important component factor for China's effort to follow the Path of Peaceful Development. The President of China announced the country's desire to "assist and cooperate with each other in conservation efforts to take good care of the Earth, the only home of human beings" in 2007.

Signal 3: "Three Transitions" in Managing Environmental Protection and Economic Development

The "Three Transitions" formulated at the 6th National Conference on Environmental Protection in 2006 are the guidelines for environmental protection in the new era. "Equal Attention" requests governments, enterprises, and relevant stakeholders to give equal attention to environmental protection and economic growth. "Synchronization" suggests keeping environmental protection abreast of economic development. "Integration" indicates that to settle environmental problems, legal, economic, technological and administrative measures shall be used in an integrated manner.

Generally, specifying step by step from strategy to tactics and supplementing each other, the "three transitions" constitute the guidelines for the undertakings of environmental protection in the new era.

Signal 4: Sound and Rapid Economic Development

In recent decades, the Government has advocated “rapid and sound” economic development. This motto was changed to “sound and rapid” at the 5th Session of the 10th National People’s Congress this year. This change indicates that economic development must be coordinated with social needs within the context of resource and environmental limits and capacity. The most immediate implication is that the target economic growth rate is no longer subordinated to the need to improve efficiency, reduce consumption of resources, and protect the environment.

Signal 5: Mandatory Targets for Population, Resources, and Environment

In 2006, the Chinese Government for the first time set up systematic quantitative targets for population, resources, and environment within the 11th Five-Year National Economic and Social Development Plan Outline. Some of the targets are mandatory indicators, including reduction of 20% of energy consumption per unit of GDP and 10% of emission volume of SO2 and COD against 2005. In June 2007, the State Council set up a Leading Group for Energy Conservation and Pollution Abatement led by Premier Wen Jiabao, and published the “Scheme of Energy Conservation and Pollution Abatement” that includes 45 concrete measures and actions in 10 groups.

Signal 6: Circular Economy Law and Other New Policies

According to the legislation plan, the National People’s Congress will discuss and approve within this year the first law in the world entitled “Circular Economy”, which will promote the economic mode to improve eco-efficiency through waste reduction, reuse and recycling. The government is also considering reforms in national economic instruments in order to provide strong incentives to energy-conservation and pollution abatement. The reform of resource taxation also has entered a fast track mode and an approach is expected to be released soon. The state has invested in building capacity for creating emission-reduction indicators, monitoring, and performance review.

All these signals have been amplified and integrated in the most important documents for the country and the Party. Taking into account of the significant signals above, the report at the 17th CPC Congress notes seven innovations and progresses: first, when reviewing the work of past five years, “our economic growth is made at an excessively high cost of resources and the environment” is listed as the first outstanding problem on the country’s way forward; second, the Scientific Outlook of Development has become a component of a system of theories of socialism with Chinese characteristics and a general outline to balance environment and economy development; third, Conservation Culture has been put forward for the first time; fourth, it’s confirmed that the development pattern must be transformed through optimizing the economic structure and improving efficiency while reducing consumption of resources and protecting the environment; fifth, the principle for international cooperation of environmental protection is clearly defined in the statement of the Path of Peaceful Development; sixth, the consideration of environmental requirements are incorporated in the improvement of the basic economic system and macroeconomic regulation; seventh, building a resource-conserving and environment-friendly society has been put highly on the agenda in China’s strategy for industrialization and modernization, and it also demands each organization and family to act accordingly. Environmental issues have

been lifted to a higher level than before with the greatest importance attached to them since China's founding.

2.2 International Experiences

This section of the report explores for instances of strategic environmental transformation over the past half-century: industrial pollution and energy efficiency in post World War II Japan; industrial pollution in Korea following democratization in 1987; acid rain in the 1980s and recycling in the 1990's in Germany; and air pollution in Los Angeles, especially following the 1977 amendment of the Federal Clean Air Act.

2.2.1 Japan

Extremely rapid economic growth in the post-WW II years, carried out with little or no concern for the environment, led Japan to severe public health problems, first manifested in the 1950's, including mercury poisoning (Minamata disease), cadmium poisoning (Itai-Itai disease) and inhalation of sulfur oxides (Yokkaichi asthma). These generated tremendous public concern, and citizens' movements (often in spontaneous reaction to specific pollution-related incidents), stimulated by the mass media, put pressure on elected officials to take action. This created a watershed in Japanese social, economic and industrial policy, in effect placing the environment at center stage, and initiating a series of measures that led in a relatively short time to major improvements in public health and the quality of urban life.

Critical to the rapid success Japan achieved in reacting to the public health catastrophes of the 1950's and 1960's was political equality and freedom of speech. Educational policy, particularly in technical fields, has played a key role in the development of Japan's environmental movement. Establishment of a partnership between the public and private sectors has also been a uniquely Japanese characteristic and an effective means of reconciling pollution abatement and economic growth objectives. Another Japanese characteristic is the extreme concern on the part of individuals and enterprises to avoid public criticism for anti-social behavior, particularly within their local community. The structure of government in Japan has also been conducive to sound environmental management at the local level. National-local government relations with regard to environment follow the conventional pattern, with actual implementation of pollution control, including establishment of local standards and regional pollution control plans, being entrusted to local governments.

These factors resulted in major environmental improvements in the 1960s and 1970s, which took place in parallel with a sustained period of rapid economic growth. Japan still faces important environmental issues, but, it can now be seen clearly in retrospect that the country experienced a strategic transformation in environmental policy and practice in the 1960s.

2.2.2 Republic of Korea

The Republic of Korea experienced a dramatic decline in environmental quality as the economy developed rapidly in the 1970s and 1980s. Rising living standards and the emergence of a democratic system in 1987 dramatically created the opportunity

for a new look at environment and development relationships. Korean citizens expressed their unhappiness about environmental conditions, as seen by citizen action in response to the incidents of Onsan industrial complex, of nuclear facility construction projects in Anmyon Island and Gulup Island in 1990, and the phenol contamination of the Nakdong River by the Doo-San industrial conglomerate in 1991. While severe environmental problems remain in Korea today, the decade after 1987 was a period in which environmental issues began to take center stage, laying the foundation for continued improvement in environmental performance in the country.

The new priority given to environment by the Korean government in the late 1980's and early 1990's is illustrated by the rapidity with which new environmental legislation and policies were introduced. In 1996, the government established "Green Vision 21" the blueprint for period from 1995 through 2005 that was designed to raise Korea's environmental standards over the long-term to match those of the industrialized countries. While tightening these regulations, the government also skillfully redirected public environmental concern towards the environmental problems caused by consumption. The institutional and legal frameworks to ensure environmental protection were firmly in place.

The local self-government system was introduced in 1995 and this decentralization has changed the dynamics of environmental decision-making in Korea. However, the transfer of all enforcement duties in the areas of air, water quality and municipal waste management to local authorities since 2002 has led in some cases to a general weakening of the permitting and enforcement systems.

As in Japan, the basic enabling factors for the development of more effective environmental governance in the time period considered here included education, public awareness about the environment, and the ability of people damaged by environmental pollution to influence political decision-makers. But the route was slightly different, using environment as part of a general platform for political and social change,with NGOs rather than spontaneous citizens' movements, being the driving force. Public participation in policy making has been improved through an amendment to the Act on Administrative Procedures that protects the rights and interests of citizens. In addition to such critical internal forces, Korea has been influenced by external pressures, including its entry into the OECD, which placed assessment of its environmental performance closer to that of the industrialized nations.

Despite the dramatic improvement in environmental awareness and policy that took place after democratization, the overall environmental record of Korea is mixed and the longer-term sustainability of the changes remains to be seen.

2.2.3 Germany

Germany has not always been an environmental pioneer. As in other European nations, after World War II, both East and West Germany's main goals were promoting economic development although under different political- economic models. Environmental protection was not yet a major public concern before 1972, when United Nations Conference on the Human Environment (UNCHE) was held in Stockholm.

Initial changes to Germany's environmental laws were made primarily as top-down decisions (as opposed to a response to public opinion). Internationally, environmental problems, such as acid rain, were starting to attract more attention and other countries. Domestically, a change in government proved critical in the timing of West Germany's initiation of a national environmental program. The formation of a coalition government between the Social Democratic and the Free Democratic (Liberal) Parties in 1969, just as environmental policy changes were beginning in other Western countries provided a window of opportunity for change. In the following years there was a transfer of control over measures to combat pollution from the Ministry of Health to the Ministry of the Interior, which was eventually, in 1986, named the Ministry of the Environment, Nature Conservation, and Nuclear Safety. In 1972 an amendment to the Constitution conferred on the federal government the power to enact legislation that, in effect, overrode the states in areas such as air and noise pollution and waste management. In addition, the federal government was able to issue guidelines on the enactment of state legislation on matters such as water quality and planning as well as the preservation and conservation of nature. Another significant action was the formation in 1974 of the Federal Environmental Agency.

Despite the important changes that took place during the 1960s and early 1970's, the government's decision to expand massively the system of nuclear power plants in the wake of the 1973 Organization for Petroleum Exporting Countries (OPEC)'s oil embargo brought a powerful counter response. This came in the form of citizens' initiatives for environmental protection, antinuclear protests, and the formation of a green political organization, Die Grünen (the Green Party). Green lists and parties were increasingly successful in elections at the local and Länder levels during the 1970s. The German Green Party's performance in federal elections improved progressively in the 1980s. This shift in Germany's political culture began West Germany's transition towards international environmental leadership. In the past two decade German major political parties have all greened considerably.

Germany's public and its leaders have come to the conclusion that pollution and energy inefficiency come with unacceptably high costs to the economy, society, and the environment. This was the result of a number of factors including learning from abroad (the case of the early 1970s), value change, the electoral successes of the Green Party, and acceptance by German political leaders and industry of the need to find new approaches to economic development.

Germany's current Chancellor Angela Merkel, was head of the German Environment Ministry at the time of the Kyoto Protocol negotiations. Germany's political and economic leaders also appear to believe that if Germany can succeed in the areas of environmental protection, energy conservation, and clean energy development, its industries will have a stronger chance of remaining internationally competitive.

German policies are especially noteworthy because of the international impact they have had. Because Germany's economy is so large, changes in German environmental policies tend to reverberate internationally. To give just a few examples, Germany's 1983 Large Combustion Plant Ordinance became the basis of the European Union's 1988 Large Combustion Plant Directive, its 1991 Ordinance on the Avoidance of Packaging Waste helped shape the EU's 1994 Directive on

Packaging and Packaging Waste, and its national greenhouse gas mitigation policies account for close to three-quarter's of the entire EU's emission reduction pledge under the Kyoto Protocol. In many environmental areas, Germany is setting international environmental benchmarks and shaping European approaches to environmental protection.

2.2.4 Los Angeles

Strategic transformation of environmental policy in Los Angeles stems mainly from citizen concern about dramatic increases air pollution caused by industrial and automotive emissions after World War II, compounded by temperature inversions in the greater Los Angeles area, and evidenced by significant adverse impacts on public health. The transformation has evolved gradually over the last fifty years, with a succession of legislative and regulatory measures enacted at the Federal, State, County and City levels of government. However, environmental awareness and policy in California has typically led the rest of the United States towards ever higher environmental standards..

Indeed, concern for the natural environment had for a long time been a particular concern of Californian residents, and evidence about the public health impacts of air pollution had been well documented. Highly educated in these matters and led by a number of national NGOs (Sierra Club, Environmental Defense Fund etc), the issue confronting Californian residents by the mid-1970's was not awareness, but frustration with the inability of public agencies to address their problems. The amendment to the Federal Clean Air Act in 1977 permitted democratic processes to become more effective at the local level, and in the case of the Los Angeles area, public pressures contributed to the creation, in 1978, of the South Coast Air Quality Management District (AQMD).

The release by AQMD of its 1989 and the slightly modified 1991 regional air quality plan was the toughest, most intrusive set of air emission regulations ever in Los Angeles, or anywhere else. AQMD proposed 130 measures that could in principle be adopted in the short term, using current technology and existing regulatory authority.

Overall, the combined federal-state-local government regulatory approach has been successful in reducing emission of pollutants in the USA. Furthermore, California standards not only for auto emissions, but emissions from paint, small engines, etc., have influenced products used in many parts of the world. As in the case of Japan and Korea, basic enabling factors included education, public awareness about environment, and the ability of people damaged by environment to influence political decision makers. Such forces have been mobilized in various ways in California, including some spontaneous citizens' protests against specific projects or policies, as well as the on-going role of specifically environment-oriented NGOs in putting pressure on elected representatives. Combined, when the overall national legislative structure permitted it, they became effective in influencing local policies, with the creation of AQMD being a major contribution.

2.2.5 Implications for China

The cases briefly described in this paper show that the process of integrating environment into the mainstream of economic and social decision making has taken many forms. It may take place rapidly, in response to specific environmental

problems, or may evolve gradually, based upon growing understanding of the issues and changes in governance that permit such awareness to lead to action. In this regard it may be said that China is already on the path to such a transformation, with rising living standards and public awareness, combined with increased technical efficiency and the international requirements associated with its export-led economy and membership of the WTO all contributing to this. Progress is exemplified by legislative measures and specific examples such as the solar powered city of Rizhao in Shandong Province, where many of the enabling factors seem to have come together. Nevertheless, China has a long way to go before transformation becomes a reality on a national scale, with implementation and enforcement of legislation and standards being of central concern. Some of the lessons from the case studies about the requirements for successful transformation to take place are summarized below.

Growth vs. Environment

China has already experienced several serious environmental crises and should not wait, for additional public health catastrophes to further galvanize public action. China has made strenuous efforts to improve environmental quality in the country, but the severe pollution problems now facing China's cities and some parts of the countryside require more dramatic action including the integration of environment into the mainstream of economic decision making rather than as an add-on.

Enabling Factors

As illustrated by each of the cases, a significant effort at reducing environmental pollution at the city or regional level in the face of the imperatives of growth and development in any society requires a combination of public awareness and participation and a responsive political and administrative system. Emergence of a strong system of environmental governance will typically require a major driving force.

Holistic View

A key issue in environmental management concerns the role played by agencies other than those with specific environmental mandates. Sectoral policies, which, often designed with no environmental objective in mind, may in fact be of critical importance in influencing environmental behavior.

Maintaining the Momentum

Achievement of standards in the short term should not encourage a government to rest on its laurels; continued improvement will doubtless be required as living standards continue to increase. The societies that have successfully achieved strategic environmental transformation have realized on-going economic benefits arising from commitment to innovation, tightening of standards, and increased competitiveness.

3. Domestic Motivation and Foundation for Strategic Transformation

3.1 Dilemma of Environment and Economy

3.1.1 China's Economic Growth, Industrialization, and Environmental Quality

In the years since economic reforms began in 1978, China's aggregated GDP has expanded by 58 times, increasing by an average of 9.78% annually, to become the 4th largest economy in the world. The industrial sector has always been the major driving force during this time of rapid economic growth. Since 1978, the aggregate industrial output has generally sustained the double-digit rate of growth. Since 1991, the contribution rate of the secondary industry to GDP has been basically over 60%, with two peaks of 70.5% and 69.8% appearing respectively in 1994 and 2003. In terms of the industrialization process, China has experienced four stages after 1978 (Figure 1).

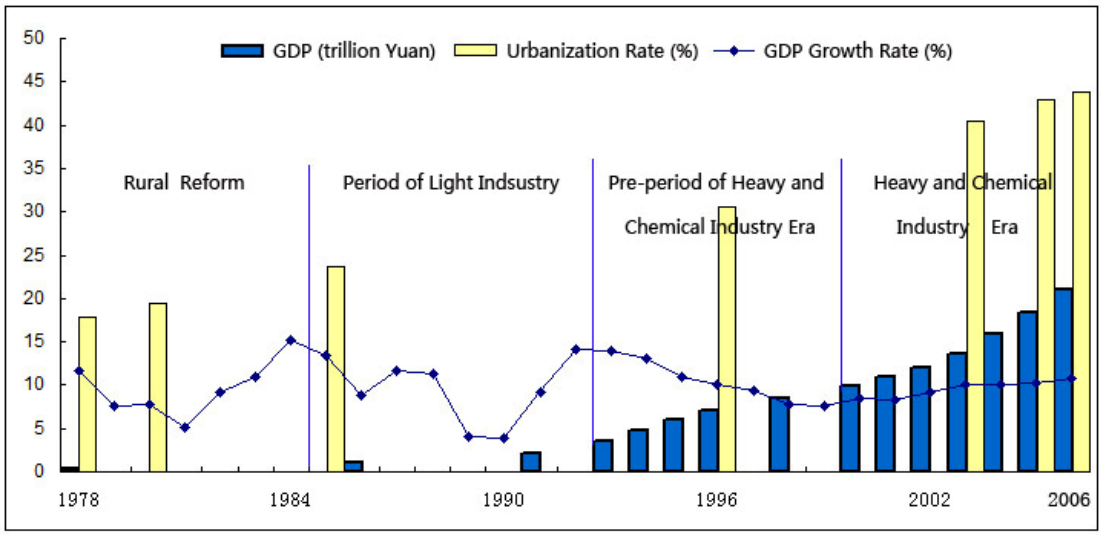

Figure 1 China's Economic Growth and Its Stages (1978-2006)
Data source：China Statistical Yearbook，1990-2007.

The first stage is from 1978 to 1984, a period of economic recovery, featuring rural reform and booming in agriculture. In that period, the proportion of the agricultural output to GPD had been over that of the tertiary industry till 1985, in which the two industrial sectors became equal in output, both accounting for 28.5% of GDP. The second stage is from 1985 to 1992, when non-agricultural industries developed at relatively high speeds, characterized remarkably by the growth of light industries and textile industries and catering mainly to the needs of feeding and clothing of the residents. The third stage is from 1993 to 1999, a pre-period of the heavy- and chemical-industry era, when the output of the heavy- and chemical-industry began to apparently surpass that of light industry. High growth industries included energy and raw materials, like petroleum and natural gas exploitation, infrastructure and basic public facilities, like road, harbor, and electricity, and household electric appliance like color TVs, refrigerators, washing machines, and air conditioners.

The fourth stage is 2000 to date, when China has entered the heavy- and chemical-industry era. Electrical power generation, steel, machinery equipment, vehicles, ship building, chemical industry, electronics, construction materials have become the major driving forces for economic growth to meet the residents' consumption needs of durable goods like private residences and vehicles.

The acceleration of urbanization has become another key driving force for the development of the Chinese economy. China's urbanization rate in 1999 doubled the rate of 17.92% in 1978. By 2005, the rate had reached 43%.

The economic growth and industrialization process noted above has determined four features of the environment problems in China:

(1) The types of environmental problems and the degree of their deterioration are closely connected with economic growth and industrialization process.

In the late 1970s, pollution from industrial point-sources mostly located in urban areas appeared in China. By the late 1980s, air pollution and river pollution in urban areas were becoming serious. In general the environment during that time was being polluted and damaged even though environmental protection activities were taking place, because the protection activities lagged much behind the pollution and damage activities. As a result, the environmental situation worsened rapidly in the 1990s. In particular, the large-scale pollution accident of the Huaihe River in 1994, and the floods of the Yangtze River, the Songhua River, and the Nenjiang River in 1998 warned China that its environment and ecological conditions were badly deteriorated. During the mid-1990s, the scenario was "partial deterioration and general development towards worsening", and thereafter the scenario changed to "partial improvement, general deterioration or the deterioration trends still unchanged". The previous "partial deterioration" was an outcome of the initial period of industrialization. The "general deterioration" thereafter represents the cumulative effect of partial deteriorations, a result of the mid-term of industrialization of heavy-industries oriented, while "partial improvement" was the major achievements of environmental protection endeavors.

(2) A compressed industrialization process brings about multiple and interactive environmental problems**.**

In developed countries, different stages of the century-long industrialization process have experienced different environmental problems, on the contrary all environmental problems that have been recognized up to now have their presence in the past two decades in China. When its per capita GDP reached US$ 1000 at the turn of this century, China at the same time was faced with a complex of environmental problems, including industrial pollution, household pollution, acid rain, ecological degradation, global environmental problems, and persistent organic pollution (POPs), and so on. Thanks to the structural, compound and compressed nature of the environment problems, environment protection in China is destined to be a complex, arduous and protracted undertaking.

(3) Rapid economic expansion leads to enormous pollutant emissions.

Since entering the era of heavy- and chemical-industry in 1999, China has reached a fast growing stage of pollutant emissions, for example, the volume of industrial

waste gas, waste water and solid waste have increased by 22%, 8.5% and 17% annually respectively. The rapid expansion of economic size has created an enormous amount of pollutant emissions. It is estimated that currently China ranks the first in the world in terms of SO_2 and ODS (ozone-depleting substances), and the second in CO_2 emissions. China is also among the world top emitters in terms of COD and NO_x emissions.

(4) The dual structure of economic development has led to the "dualization" tendency of environmental problems.

China started and strengthened its industrialization in urban areas and in the coastal areas of the East. Therefore, environmental pollution appeared and deteriorated first in these areas, while pollution in the West and the rural areas was less serious before the 1990s. A new dualization tendency is being created in environmental quality and capacity of environmental protection between urban and rural areas, as well as the East and the West Region. The dualization of environmental-related matters is also reflected in the imbalanced distribution of environmental benefits and its relevant economic benefits between natural resource exploitation regions and other regions: the upper and lower reaches of river basins, and the key ecological function conservation zones and others.

3.1.2 China's Economic Growth Pattern and Its Eco-efficiency

Generally speaking, China's economy is still in the extensive pattern heavily sacrificing resources and environment, with features such as high capital input, intensive resource consumption, heavy pollutant emissions, and low-efficiency output. If China's development pattern was still maintained as before, it would be unsustainable with its limited capacity of resource and environment.

The Chinese Academy of Sciences projected three scenarios of the impacts of China's socio-economic development on resources and environment in 2020[4], given the situation of 2000 as the base point.

- Scenario 1, if the current resource and energy efficiency and the pollutant emission level were retained, by 2020, the impacts of socio-economic development on resources and environment would be four to five times the level of 2000;
- Scenario 2, if the environmental quality of 2000 is to be maintained, the resource productivity (resources consumed per unit of GDP) or eco-efficiency (GDP per unit of pollutant emissions) must be improved by four to five times;
- Scenario 3, If the environmental quality is to be improved by a very big margin by 2020, in other words, the impacts on resources and environment is halved against that of 2000, the resource efficiency or eco-efficiency must be improved by eight to ten times.

In a word, China's pattern of economy growth with high costs of resources and environment has run its course. The only options are the above-mentioned scenarios 2 and 3. That is to say, the paradigm changes in relationship between environment and economic growth must take place. There are no other ways out for China.

3.2 Conflicts and Cooperation among Relevant Stakeholders

The essential manifestation of the environment-society relationship is the influence of environment on the public life and the degree of concern of the public about environmental quality and their attitude to environmental protection. These criteria can be employed to judge whether the environment-society relationship has changed in fundamental ways. Many factors influence the environment-society relationship, including the amount of damage caused by pollution and ecological degradation, the standard of living and environmental consciousness of the public, access to information, and the rights of the people.

The environment-society relationship in China has experienced three stages by and large.

(1) Before the 1990s, most of the public had little understanding of environmental risks, and seldom participated in environmental activities. The mainstream appeal of the society at that time was to shake off poverty and get rich. This retrospective judgment will not necessarily be totally accurate. However, at least there is currently not any literature that can repudiate it.

(2) In the 1990s, especially in the latter half of the decade, environmental pollution raised the level of public concern and attracted growing media attention. Starting with the 9th Five-Year Plan, China launched the large scale Comprehensive Program of Regional Pollution Control, implemented the massive “Zero O’Clock Action” for industrial enterprises in the Huaihe River basin to comply with emission standards, and the total pollution control plan. The Chinese Government gradually attached greater importance to environmental protection, and rules on disclosure of environmental information were introduced.

(3) At the beginning of this century, as China’s living standards continued to improve, the environment-society relationship reached a new stage. Currently the environment-society relationship in China presents four major features:

- The environmental consciousness of the people has been generally enhanced;
- The public demand for environmental improvement is constantly rising;
- A more open, transparent and interactive exchange mechanism is starting to come into being between the environmental protection authorities and the public; and
- The era of frequent environmental accidents has increased public concern and led to a growing number of protests as citizens seek to protect their environmental rights.

The environment-society relationship in China appears to be reaching a strategic transformation point. Conflicts between the government bodies responsible for environmental problems and the affected public are increasingly common. If handled properly, the “conflicts” can turn into social cooperation as public consciousness and capacity increase.

3.3 Pressures on Governance and Political Willingness

The environmental issue is also an economic issue, a social issue, and a cultural issue. Hence, it is necessarily a political issue. The domestic and international experience has shown that the success of the environmental endeavors depends more often than not on the strategic positioning of environmental issues in the political and governmental agenda of a country.

In 1972, the Chinese Government sent delegates to attend the United Nations Conference on Human Environment held in Stockholm. Subsequently, in 1973, the Chinese Government held the first National Conference on Environmental Protection, initiating the process of environmental protection in China.

China's first Environmental Protection Law came into force on September 13th, 1979, and was formally promulgated and implemented in 1989. At the second National Conference on Environmental Protection held at the end of 1983, it was for the first time stipulated that protecting the environment was a basic national policy, and the environmental protection guidelines of "Three Synchronizations for the Integration of Three Aspects"[1] was established. In the same period, three basic policies for environmental protection were formulated: "application of comprehensive measures with the first priority of prevention and combination with treatment", "the polluter is obliged to treat the pollution," and "reinforcing administration". In order to strengthen environmental protection, the Chinese Government promulgated two "State Council Decisions" in 1981 and 1984.

In the 1990s, the Chinese Government accomplished five major changes in the strategies of environmental protection: First, starting from 1997, the Government has held an annual "Central Government Meeting on the Population, Resources and Environmental Protection" that sets the year's agenda for environmental protection. At the same time, the Chinese Government also promulgated two "State Council Decisions" on strengthening environmental protection in 1990 and 1996 respectively. Second, the Chinese Government released the first independent five-year plan for environmental protection with definite quantitative objectives (such as the total volume control of pollutants) in 1996, namely the National 9th Five-Year Plan on Environmental Protection and the Long-Range Objectives for 2010; Third, at the macro-economic level, the Chinese Government took measures such as economic structural adjustment to reduce pollution burdens from industrial sectors, and enhanced investment in environmental protection through pro-active fiscal policies; Fourth, against the backdrop of thinning the central government organizations, the former State Environmental Protection Agency was upgraded to the SEPA in 1998 with position promoted from the vice-ministry to ministry level and jurisdiction expanded and strengthened. Fifth, in 2000, the Chinese Government included the environmental protection capacity and the sustainable development capacity in the objectives of strategies for building a moderately prosperous society in an all-round way in the coming 20 years.

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[1] This means to synchronize the planning, implementation, and development in economic construction, urban and rural construction, and environmental protection in purpose of reconciling environment, economy and social development.

In the new century, the Government went further to raise three significantly strategies: The Scientific Outlook on Development, Harmonious Society, and Peaceful Development. These strategies accommodate environmental protection and social-economic development in one organic and integrated system, where environmental protection is enshrined in a more important strategic position. Gradually, China's Government has begun to understand the profound and difficult relationship between environmental and socio-economic development, and has lifted environmental protection to an unprecedented level of priority. In recent months, the Government has signaled that it is prepared to promote the strategic transformation of environment and development. However it is also clear that translating these ideas into effective action will be a difficult task.

4. Globalization Forces Affecting the Strategic Transformation

4.1 Opportunities and Challenges through Globalization

4.1.1 Impacts of International Trade on China's Environment and Development

Since its reform and opening up at the beginning of the 1980s, China has been experiencing continuous opening up at an increasing scale; China's entry to the WTO in 2001 indicates that Chinese economy is even further interlocked with the world economy. At present, China already ranks third in the world in terms of export and import of goods; China is not only a main supplier of manufactured goods for the world, but also an important market for goods from many countries. According to statistics from WTO, for year 2005, China's export and import of goods accounted for 7.5% and 6.3% respectively of the world total, ranking the third in the world. And for 2005, the contribution rate of China's export and import of goods to the world total is 14.3% and 8.3% respectively.

Impacts of international trade on China's environment and development are relatively complicated. The impacts can be positive or negative. Potential positive influences refer to the expectation that China can improve its resource allocation efficiency through international trade, because it can seek resources from sources throughout the world; and at the same time drive forward the sustainable development of Chinese economy by way of introducing advanced technology and equipment from outside in order to improve the utilization efficiency of resources and the environmental treatment level.

Negative influences refer to the greater environmental pressure brought about by the growth of production, and other negative influences on the environment arising from the increases of domestic consumption accompanying rising income standards and the growth of transportation.

(1) Positive influences of international trade on China's environment and development.

International trade makes it possible for China to solve the problem of supply shortage by way of importing natural resources and taking advantage of the ecological goods and services from other countries. Therefore it makes it possible for China to produce and export by making use of resources where it does not have enough domestic sources or comparative advantages, and thus to still develop its

economy. Generally speaking, because of the optimization of its resources, international trade has played an important and obvious role on promoting Chinese economy; it is mainly demonstrated through improving China's industrial structure and employment structure, promoting scale operation and specialized production, and alleviating scarce restrictions on Chinese economic development for the shortage of resources.

Conflicts between the shortage of resources and unbalanced energy supply and demand are alleviated through the import of raw materials and energy.

Because of its increasing need for resources and energy, China's import of raw materials and energy has been accelerating and China has become a main importer for raw materials and energy in the world.

Import of materials has expanded the supply base and alleviated the conflict between market demand and supply. For instance, China's import of cotton increased by five times between 1999 and 2005; in recent years, the fast growing Chinese economy and the rapid development of the transportation sector led to the accelerated growth of energy import, such as import of petroleum; China turned from petroleum net exporter to net importer since 1993 and became a net importer for crude oil since 1996 with net import of crude oil reaching 148 million tons in 2006. From 2001 to 2006, China's import of petroleum increased by 122.4%, with an annual increase averaging 17.3%; its dependence on petroleum imports increased from 29.1% in 2001 to 47.3% in 2006.

In addition, because resources are embodied in the imported products, China can realize benefits from the indirect import of natural resources. From 1996 to 2001, China's import of agricultural products equals a saving of 186 billion cubic meters of water resources.. Because China's import of crops is in accordance with comparative advantage for utilization of water resources, the trade would therefore alleviate to a certain degree the endangered water shortage situation in China and improve global utilization efficiency of water resources.

China reduces its direct import of resources through the import of recyclable and waste materials.

China has become the largest importer for waste materials in the world. In recent years, driven by the potential economic benefits, imports of wastes into China increased at quite a fast speed. From an objective point of view, the import of waste materials replaces part of the direct import of raw resources, and can play a positive role for the recycle and reuse of resources in China and throughout the world. Also, disposal costs for wastes are quite high in developed countries, while the relative cost in China is cheaper. Therefore, China enjoys a certain degree of comparative advantage in the trade for waste goods and resources;

Recycling and reuse of those imported wastes which contain relatively little toxic substances and comparatively higher content of reclaimable resources present overall advantages. Examples include scrap iron and steel, paper, wood, second-hand mechanical and electronic products. When compared with mining of mineral products and other resources, the import is conducive because the recycling of wasted resources can improve smelting and processing efficiency, lower resource consumption and reduce direct import of resources. In 2006, China imported a total

of 38.95 million tons of waste materials worth US$13.347 billion; and for some categories, import of wasted resources has accounted for a quite high proportion.

For instance, in 2006, China imported a total of 4.188 million tons of wasted steel, which equals to 1/5 of total import that year for iron and steel; a total of 19.62 million tons of waste paper, about twice as much as imported that year for paper pulp (7.96 million tons). According to a report issued in July 13, 2007 by *Forest Trend*, an organization headquartered in Washington D.C., the flourishing waste paper recycling industry in China has saved a large area of forest in the world. And for 2006 alone, China avoided cutting a total of 54 million tons of lumber by way of waste paper recycling.

Through international trade, China has introduced foreign advanced technology and equipment, improved its utilization efficiency of domestic natural resources, and upgraded its environmental treatment standard.

Active international trade activities provided China with optimized resource allocation, technological bases and management experiences for solving problems concerning environment and development. Under the current situation that developed countries far exceed China in terms of resources utilization efficiency and environment treatment standard, China can greatly improve its resources utilization efficiency and upgrade its environment treatment standard by carrying out international trade for technology and goods, and introducing advanced technology and equipment directly from developed countries.

By introducing advanced production technology and pollution treatment technology, China would be able to produce more environment-friendly products, carry out more efficient means of production and obtain foreign advanced management experience more easily, and discharge less pollution. In recent years, trade for services has grown quite fast in China. From 1982 to 2005, import and export of trade for services increased from US$4.34 billion to US$157.08 billion, an increase of 35.5 times within slightly more than 20 years time. At the same time, China has already become an important importer for high-tech products in the world; the import of high-tech products even exceeds the import of resources which are in short in China, such as energy. Taking the figure in 2005 as an example, the import of computer chips amounted to US$81 billion, 1.6 times the import volume of crude oil for that year.

(2) Negative influences of international trade on China's environment and development.

With China's increasing contribution to world trade, including the large quantity of manufactured goods to the world and China's role as an important processing base for the world, the global resources consumption and environment pollution also is becoming more concentrated on China, and further aggravates the damage to China's ecological environment. In fact, while China rapidly has accumulated a trade surplus, it is accumulating an environmental trade deficit, also at fast speed. However, because current Chinese statistics for trade balance are calculated by volume, the trade surplus figures neglect the hidden resource consumption and environmental pollution costs. It behooves us to calculate embodied energy, as well as environment pollution and carbon dioxide discharge problems associated with trade.

Negative influences of international trade on China's environment are mainly reflected in three aspects. First, the export of goods, especially those goods whose production requires high consumption of energy and causes severe pollution further aggravates pressure on China's environment and resources, accelerates the over-consumption of non-renewable resources and the degradation of ecological environment in some areas. Secondly, in recent years, the import of waste to China has been accelerating, and in particular the illegal import of electronic waste goods has led to serious environmental problems. Some 80% of the exported electronic wastes in the world are exported to Asian countries, of which 90% was exported to China. Thirdly, China imported a large number of luxury goods. These imports tend to bring several negative influences:

- Luxury goods such as cars consume large amount of petroleum and resources and therefore will cause severe pollution;
- Import of luxury goods consumes large amount of capital, and has a high opportunity cost; their import would make less capital available for investment for environment improvement;
- Consumption of luxury goods motivates the social drive for luxurious means of consumption, and from an objective point of view, it will intensify the domestic pressure on environment.

Costs have been paid on resources and environment to fulfill fast growth of foreign trade

Since its reform and opening up, China's total import and export of foreign trade increased by 45 times, and its ranking in the world increased from 26th in 1980 to 3rd place in 2005. In recent years, total foreign trade of China has become huge and continues to be at surplus, with import and export of goods totaling US$1760.69 billion in 2006, a surplus of US$175.5 billion, the balance for current account reaching around 9% of China's GDP. The excessive trade surplus has not only resulted in serious imbalance of BOP (Balance-of-payments), causing trade conflicts, but also forced China pay high prices on resources and environment.

First of all, because the national tax on resources and the compensation charge for resources are quite low in China, environment pollution cost is not listed in the enterprises' books as a cost. This phenomenon leads to the excessive supply of resource-intensive products and stimulates the over-investment in heavy industry. Moreover it has resulted in the export of a great number of resource-intensive products with high consumption of energy and high pollution to the environment. The export of such products utilizes China's resources and raw materials to subsidize foreign consumers, meanwhile keep the great amount of pollution in China, causing net loss of welfare to Chinese citizens. For example, through the assessment on environmental influences by export of goods of textile industry from 1999-2004, it was found that pollutants and energy consumption increased as textile exports scaled up.

Secondly, research on trade for waste materials has shown that many renewable metals were shipped back to some developed countries after their treatment and recovery in China. Therefore the import of wastes did not always play its role to supplement for domestic shortage of resources. Instead sometimes it is merely a

means to earn scanty profits in return for pollution to the environment, and further consumption of energy and resources.

Evaluating China's core resource and environment issue from the perspective of net export of embodied energy

Although China continues to upgrade its import and export structure, it is still operates mainly at a relatively lower end in the supply chain of goods. Compared with imports from developed countries, exports from China have low added-value, while consuming more resource and energy per unit of export trade volume. According to some research, the embodied energy implied behind import and export of foreign trade is huge, either in its absolute value or in its speed of growth. In recent years, China has already become a net exporter for embodied energy. It is estimated that, from 2001 to 2006, China's net export of embodied energy increased from 210 million tce to 630 million tce, and it is growing at a relatively stable speed. The net export for embodied energy totals 240 million tce in 2002, around 16% of primary energy consumption for that year. It is mainly exported to countries such as the U.S. and Japan, with net export above 75.24 million tce and 48.94 million tce respectively, some 50% of the export total for embodied energy.

Some traditional export industries are leaders in terms of export of embodied energy because of their large export quantity. The top three are garments and other fiber products, instruments, meters,cultural and office machineryfacilities, and electric equipment and machinery. In 2002 for example, the three industries accounted for 13.4%, 12.3% and 12.5% respectively of total embodied energy export. Industries engaged in raw chemical materials and chemical products manufacturing, and smelting and pressing of ferrous metals, account for little in total export trade (3.5% and 1% respectively) However, because these are typical energy intensive products, they account for 7.1% and 2.3% in embodied energy export respectively, far exceeding their proportion in trade volume. After deducting the influence of semi-finished goods, the ratio increases even further, accounts for 8.0% and 2.8% respectively. This phenomenon indicates that the processing of energy intensive goods for export would consume great amount of domestic raw materials and intensify negative influences on domestic energy and environment.

China's consumption of energy would at the same time lead to discharge of pollutants and carbon in large quantities. At the time when China exported net embodied energy, it also net discharged a large amount of carbon dioxide and sulfur dioxide. According to investigations, the embodied energy export in 2002 equals to 238 million tons of carbon, while the embodied energy import equals to 70 million tons of carbon, therefore resulting in a net discharge of 168 million tons of carbon. In 2004, the embodied energy export is 462 million tons of carbon, while the embodied energy import is 140 million tons of carbon, resulting in a net discharge of 322 million tons of carbon.[2]

[2] The Tyndall Centre for Climate Change Research （Tao Wang, Jim Watson，2007）has just published a new briefing. It suggests that 23% of China's carbon emissions are due to the manufacture of goods that are exported to industrialised countries; which has a similar result with our result on the net value of net emission.

Besides, equilibrium assessment for trade and environment reveals that of the discharge of SO_2 during China's 10th Five-Year Plan period (2001-2005), foreign trade resulted in a SO_2 deficit of around 1.5 million tons, which accounts for around 6% of the annual total discharge of SO_2. When considering the differences between production structure and trade structure, because trade growth far exceeds the growth of production, the SO_2 deficit caused by foreign trade would be much higher.

It is obvious that the research on embodied energy demonstrates the unique role which China plays as 'the world manufacturer' in international trade, and reveals that China's fast growth of energy consumption, major pollutants and discharge of carbon dioxide results not only from expansion of its domestic investment and demand-stimulated consumption, but also from the accelerated export of goods driven by consumption demand from other foreign markets. Developed countries import goods from China to replace their own production. Thus at the time when China increases its energy consumption and waste discharge, these developed countries actually decrease their own need for energy and discharge and were the main beneficiaries. Especially for the U.S., which accounts for 31% of China's net export embodied energy, followed next by Japan and then the countries of the European Union.

In sum, it is not a complete consideration of impacts if merely the wealth accumulation effect of trade is taken into account. Although international trade can promote economic growth and provide economic and technological bases for environment treatment, China should at the same time take into consideration the negative influences of the fast growth of international trade on the environment. With the deepened globalization of the world economy and the accelerated growth of Chinese foreign trade, it would be difficult for China to avoid in the near future, negative situations such as high energy consumption, aggravated pollution and increased carbon dioxide emission, which is caused by trade for waste materials, net export of embodied energy, etc. In fact, China's current growth mode of trade has brought about great pressure on its resources and environment at the time it stimulates economic growth. Considering its limited resources and environment, the Chinese government should pay high attention to the environmental price that China has been paying for its trade growth, and drive forward with the adjustment on its domestic industry structure and optimization of the trade development mode.

4.1.2 Impacts of FDI on China's Environment and Development

Since the 1990s, China has been a major destination for global foreign direct investment and in the leading position among developing countries. Especially since 2001, despite periods when global flow of FDI decreased sharply, FDI entering China continued to increase at high speed. According to statistics from the UN Conference on Trade and Development, global FDI totaled US$916 billion for 2005, an increase of 29% from 2004, in which FDI to developing countries totaled US$334 billion, which is a record high in history. Although China adjusted its foreign investment policy since 2005, the FDI to China still totaled US$72.4 billion in 2005, and China became the third largest FDI recipient in the world, accounted for 22% of total FDI to developing countries. At present, countries and region which have investment in China exceed 190. Over 450 of the Fortune 500 companies invest in China.

Influences of FDI on China's environment and development can be positive or negative.. In terms of its positive influences, with the expansion of the scale and the improvement of its utilization in China, FDI speeds up China's technological improvement and industrial structure upgrading; FDI can improve the resource utilization efficiency as well as China's capability for treatment of environmental pollution. Some companies making FDI set an example in terms of environmental protection and play an active role with the environment protection industry and environment protection technology development, and contribute in other ways to the improvement of China's environmental situation. FDI actively contributes to China's economic and social development.

On the other hand, FDI brings about great negative influences on China's environment and development. The negative influences mainly reflected in issues such as international trade conflicts, unbalanced economic development, technological lock-in effect, and the outstanding problem of achieving harmonious development between local and foreign invested companies. Meanwhile the transfer in larger scales of industries with high energy consumption and high pollution to China also aggravates the pressure on China's resource and environment.

(1) Contribution of FDI to China's environment and development

The contribution of FDI to China's environment and development is reflected in promoting China's technological improvement and industrial structure upgrade; at the time it improves China's resource utilization efficiency, it also upgrade China's capability for treatment of environmental pollution. FDI speeds up China's economic growth and technological improvement, accelerates domestic industrial structure upgrade, promotes fast growth of foreign trade (import and export from foreign invested companies accounts for around 60% of China's total import and export volume of foreign trade), and drives forward labor flow and transfer among regions and industries, and improves Chinese labor qualification structure.

In particular, since the 1990s, under the guidance of Chinese policy for utilization of foreign capital, many global companies invested a lot on research and development and technological transfer activities in China at the time of their expansion of investment in China. For relevant industries, the 'spillover-effect' caused by this type of technological transfer has introduced not only advanced technological products and equipment, but also improved the managerial level of local companies. Regionally, eastern coastal areas are foreign investment intensive, and while the concentrated foreign investment improves the industrial development level nearby, it also sets up an example. The experience is radiating outwards and stimulates labor transfer and technology upgrade into the middle and western parts of China.

Moreover, because many global companies attaches great importance on social responsibilities such as environmental protection, at the time of their investment, they also brought with them advanced pollution prevention and treatment technology, environment management ideas and measures, carried out clean production actively, and set up a good example in terms of environmental protection within China. Many international companies saw the great market opportunities for development of the environmental protection industry and environmental protection technology in China, and therefore promoted actively to introduce their environment industry, technology and equipment into China.

(2) FDI's negative influences on China's environment and development

With the accelerated growth of FDI inflow, its negative influences on China's environment and development have become obvious. First, the great scale of export by foreign invested companies leads to a rising trade deficit for other countries and the aggravation of unbalanced BOP, which causes great pressure on RMB appreciation.

Secondly, China's preferential policies to foreign invested companies lead to the 'squeezing-out-effect' on domestic companies, and curbs the development and expansion of local companies. A survey report by the Development and Research Center of the State Council pointed out that, of all the industries which have been opened up to foreign investment, the largest five companies in each industry are almost all controlled by foreign investment. Of the 28 main industries in China, foreign investment owns majority control in 21 industries. Meanwhile, Chinese national brands are repeatedly threatened by foreign global brands.

Thirdly, because of drawbacks in China's policy for foreign capital introduction and the unbalanced structure of these investments, FDI aggravates the unbalanced nature of China's industrial structure, regional structure and enterprises structure. In recent years, the actual foreign capital which was used in manufacturing industries accounts for around 70% of the total, in which agriculture and service industry takes much less. In regional distribution, 85% of FDI concentrates in the eastern area, and only 15% are in the middle and western area, and this pattern results in the weak position which middle and western regions have in terms of sharing capital and technological advantages of FDI.

It is worthwhile to mention that, even though technology which FDI employs is more advanced than the average domestic level, it is far from the internationally recognized advanced technology, and the related resource utilization efficiency and environmental performance are lower than the advanced technology applied in their home country. Because of the lock-in effect of these technologies, it is difficult to implement more advanced technology in China, and therefore delaying technological upgrade and innovation of Chinese industries. Besides, due to factors such as the technological barrier and privacy of global companies, in recent years, more and more companies with foreign investment have begun to turn to solely owned operations and therefore it is impossible for China to fully utilize their advanced technology and experience.

With the deepening of economic globalization and the expansion of the introduction of FDI to China, the negative influence of FDI on China's resource and environment has been increasing. Statistics shows that foreign invested companies come to concentrate on industries with high consumption of resources and produce high pollution. In 1995, foreign invested companies engaging in pollution-intensive industry accounted for 30% of the total, and this figure rose to 84.19% in 2005. High polluting and high resource consumption industries became the major investment directions for FDI, with industries such as chemical, petroleum, leather, dying and printing, electroplate, pesticide, paper making, mining and metallurgy, rubber, plastics, construction material and pharmaceuticals.

Foreign investment which played a more direct role in environment protection amounted to less than US$100 million, less than 0.2% of the total. Furthermore,

there is also research which indicates that FDI is the main driving factor for environmental pollution and resource exhaustion in eastern regions. Because of the increasing requirement on environmental standards in eastern regions, foreign companies, driven by China's strategy for developing the middle and western regions, will possibly engage in mining industry and manufacturing industry in the middle and western part of China, and transfer the backward and eliminated industries from eastern region to the western. The final result would be 'pollution transfer' to the middle and western regions of China.

When consider fully the influences of FDI on China's environment and development, FDI brings more obvious economic benefits to enterprises and the local level. However, when considered from a macro level, we should pay high attention to the negative influences of FDI on China's environment and development.

There is a big divergence of the influences seen from a micro and macro level. Reasons for the divergence are quite complicated: there is no clear-cut policy dealing with foreign capital introduction in China and no mature mechanism for the assessment to the local government. Therefore local governments tend to exchange environmental quality for access to foreign capital, and local officials use the amount of capital investment introduction as the means to fulfill their political careers. Meanwhile, the current regulatory situation in China also causes the divergence, including low prices for resources, some low standards for environment, unhealthy environmental rules and regulations, and lax enforcement of environment rules.

All these problems related to FDI should be adjusted and solved through policy adjustment, and therefore further explore the positive aspects of FDI on China's environment and development and reduce or avoid its negative influences.

4.2 Global Impact of Transformation of China's Development Mode

4.2.1 China's Economic Growth and its Global Impacts

The fast growth of the Chinese economy has both positive and negative influences on global environment and development. Globalization creates a platform for win-win positions between China and the world. China's active participation in economic globalization strengthens its own comprehensive national power base and also creates active influences for the world economy. On the other hand, the fast growth of the Chinese economy creates large demand for energy and resources. It brings pressure not only on domestic resources and environment, but also has a certain degree of influence on the world environment and development.

(1) China's contribution to the world's economic and trade growth

Thinking globally, China can fully make use of 'two resources, two markets' by developing international trade and global investment, and thus promote the sustainable development of China's economy. Since its reform and opening up, especially after China's entry to the WTO in year 2001, China has made active contribution to the world economy and international trade at the time when it benefits from economic globalization.

The influences are firstly reflected in its role as a new driver for the world economic

growth and the engine for the growth of the world economy and international trade. According to statistics provided by IMF, in calculation with purchasing power parity, China's GDP in 2005 accounted for 15.4% of the world GDP total; and according to statistics from the World Bank, since its entry to the WTO, the contribution rate of China's economic growth to economic growth rate of the world averages 13%, and in 2005, the figure is close to 29%.

Secondly, by leading the change of global industrial structure, China upgraded the position of some countries for export of their primary products, and these developing countries thus benefited from this change. Due to the growing demand from China for petroleum and raw materials and the rising international market price, some developing countries thus improved their BOP situation, and more developing countries realized fast economic growth.

Thirdly, China's economic and trade growth improves the global resource allocation efficiency, provides the international market with large amount of cheap goods, drives forward the structural adjustment of developed countries and holds down inflation. For instance, following the five years after China's entry to the WTO, European Union countries benefited from their investment in China. Their import from China doubled, and cheap Chinese products helped them to offset inflation and interest concerns.

Fourthly, with the fast growth of China's foreign investment and through aid programs, the Chinese government and enterprises helped to build a lot of infrastructure, and to conduct personnel training and technological transfer to other developing countries. These activities have greatly improved the local economic development and employment in developing countries and regions, such as countries and regions in Africa.

Furthermore, China also has promoted the recycling and reuse of waste materials at a global level through trade and investment, and this activity has not only alleviated shortage of domestic resources, but also drove forward the effective allocation and utilization of global resources.

(2) China's ever-increasing development need brings pressure on the world environment and development

At a time when China's economic development brings about active influences on world development, it also creates a certain degree of pressure on the world's resources and environment. The pressure is reflected in two aspects.

First, the fast growth of the Chinese economy and large production and consumption activities following this growth have brought great pressure on global resources and environment. Besides huge demand for petroleum and other raw materials, the growth ultimately is limited because the energy structure relies mainly on coal. China's ever increasing energy consumption results in the acceleration of carbon dioxide discharge, and the discharge would create a certain degree of effect on the global climate change. From 1973 to 2004, CO_2 emission in China increased from 5.7% to 17.9% of the world discharge total. In 2004, China's GDP accounted for around 5% of the world total; however, according to calculations by the World Bank, during 1994 to 2004, China's energy consumption accounted for around 30% of the world newly increased consumption, in which coal 59%, petroleum 28%, and iron

consumption accounted for more than half of the world newly increased total.

Secondly, Chinese companies, in the process of obtaining outside resources and exploring foreign markets, because of the lack of advanced technology and experiences, also brought about some negative influences on the local environment of other countries and regions. In essence these problems came into being not only because of the great economic and social development needs in China, they are also driven by international market needs under the economic globalization.

Energy consumption and carbon emission are the main factors which influence world climate change. From the perspective of world climate change, the concern is how to assure future self-development room for developing countries, including China Because its initial human development needs have not yet been satisfied, carbon emission in China will continue to increase. However, with the fast growth of the Chinese economy, consumption needs and structural needs of China's residents have already taken tremendous change. Taking into consideration the development needs brought about by the large population scale of China, and the economic benefits brought by China to other countries in the world, it is a topic facing all countries in the world—how to share the world climate resources equally, and at the same time cause no damage to security of the world environment.

4.2.2. China's Overseas Development Investment (ODI) and its global impact

China's accelerated economic growth has created huge demand on natural resources. It also is bringing about a wave of investment by Chinese enterprises in other countries.

Driven by the needs for resources and market power, in recent years, investment by Chinese companies overseas is growing quite fast. From 1990 to 2006, investment by Chinese companies overseas increased by 23.5 times. From 2002 to 2006, investment overseas increased at an annual average rate of 60%, forming a leading position in the world. To the end of 2006, more than 5000 Chinese enterprises set up around 10,000 overseas enterprises in 172 countries, with net foreign direct investment accumulated at around US$90.63 billion. In 2006, direct investment by Chinese company overseas accounted for 2.7% of the world total, and China ranks the first among developing countries, and ranks 13th in the world.

Accompanying investment by Chinese companies overseas, the export of services by Chinese companies also has grown quite fast. The proportion of export of service by Chinese companies increased from 0.7% of the world total in 1982 to 3.3% in 2005, and the ranking also upgraded from 28th to 8th place. As one important point of China's opening up policy, the development of investment overseas and service trade all promoted the prosperity and stable development of the world economy.

In terms of regional distribution, the main investment destinations for Chinese companies are South America, Asia, Europe and Africa. Besides, because of its abundant labor resources, China has provided through service trade a large number of technology-oriented labor resources to developed and developing countries; for instance, China has provided many construction and designing engineers through ODI mode to countries such as Japan, South Korea, Singapore, Algeria, Sudan, etc. For these countries and regions, growth of China's investment overseas and service trade is a win-win choice. Developed countries can obtain cheap commodities and

service, and developing countries such as African countries can get more development opportunities by attracting Chinese companies to explore their local resources, which results in investment growth, more employment opportunities and improvement of their infrastructure conditions.

The development history of Chinese investment overseas reveals that it has already experienced the process of going from government-oriented to market oriented investment. At present, policy for Chinese investment overseas has entered a deep transformation stage that is mainly reflected in three aspects:

- A transformation from political objective oriented to business benefit oriented investment;
- A transformation from unified adjustment by the central government to self management by local government and enterprises; and
- A transformation from single objective for resources to multi-objectives combined by seeking for resources, technology and market.

Driven by their own interests, as well as poor supervision and management, some Chinese enterprises have created pollution and damage to the local environment during their investment overseas and have caused some degree of negative influences in the world. These companies should start from a position of developing the corporate environmental responsibilities of their relevant enterprises, and embrace 'Corporate Social Responsibility', a voluntary measure internationally. These concepts should be brought into national trade policy, investment policy, financial policy and credit policy, and therefore promote the continuous and healthy development of Chinese companies.

4.2.3. China's choice of different development modes and the impact on the global environment

From the history of industrialization of countries in the world, energy consumption intensity curve of leading industrialized countries appears as an upside down 'U', corresponding with different stages for industrial structure. At present, China is at a stage of capital-intensive industrialization, which is a stage when energy consumption and pollutants discharge are accelerating. From statistics, in 2006, China's energy consumption strength and unit GDP pollutant discharge began to appear at a point of inflection. From the latter half of 2006 to the first half of 2007, the energy consumption intensity has been decreasing continuously for four quarters, and discharge of SO_2 also started to decrease; growth of total discharge of nitrogen oxide substances became stable, while manufacturing industries with high added-value and high processing degree became the leading industry for growth.

However, China's great industrial scale could lead to further increase of energy consumption and CO2 emission. With the limited capacity of global environment and the obvious impact by climate change, China should prepare for further energy saving and less discharge of pollutants.

A different industrialization mode would result in different impacts on energy and environment. To differentiate from its traditional industrialization mode, Chinese government is setting up a new path for industrialization. The so called 'new type of industrialization' is the type of industrialization which bases its foundation on being

resource-saving and environment-friendly, and it not only has some of the features of traditional industrialization, but also follows up and utilizes the newest achievements from the world's scientific and technological reform; it is in accordance with the industrial development of leading industrialized countries, and enables modern service industry to develop at a fast speed also.

Based on the relationship between the mode for economic development and energy consumption and pollutants discharge, three scenarios for China's future development might be considered:

- The new type of industrialization mode with a high objective to achieve; this mode can realize discharge reduction objective of all stages;
- To continue the traditional industrialization mode with high energy consumption and environmental pollution;
- The medium mode with a lesser objective for the new type of industrialization; under this mode, discharge reduction objectives for all stages would not be achieved.

The above three scenarios differ a lot in terms of their support of energy and environment to China's economic and social development. When considering fully the relationship between China's economic and social development, its energy and environmental carrying capacity, and its influence to the world, China should try its best to realize the new type of industrialization mode and to avoid the continuation of the traditional industrialization mode.

From a general point of view, China carried out compressed industrialization, a type of industrialization which could greatly shorten the process for industrialization comparing with that of those pre-industrialized nations. However, as the process is carried out in a short period of time, energy and resources consumption strength grows quite obviously. Because of its large population and great economic scale, China would possibly consume tremendous amount of energy and resources during its industrialization process, and it would bring severe impact on the world. Thus in reference to China's industrialization road, the relationship between industrialization, resources and energy, and its impact on the world energy and environment situation, there are five considerations:

First, restrictions facing industrialization in China is different from that facing other pre-industrialized countries; the restrictions are more reflected on population, resources and environment, although there also exist restrictions by capital and technology. Secondly, destination for China's industrialization is different from other pre- industrialized countries, and the difference is in particular reflected in per capita occupancy of resource consumption and material wealth. Thirdly, China will carry out industrialization under a context of peace and development and under the current international law and organizational framework. Fourthly, there is no clear cut line for China's industrialization; industries with all types of production factors exist at the same time. Fifthly, China's industrialization is being carried out under the background of continuing development of economic globalization and China's deeper involvement in the world globalization. The resource sourcing issue for China therefore should not only be solved at the level of country's in the world but should also take into consideration its negative impact on the world environment. And it is

an important issue which must be solved properly in China's process of industrialization.

5. Conclusions and Policy Recommendations

China is entering a period in which strategic transformation of its environment and development has become an urgent priority. The experiences of other countries suggest that such a transformation could have great benefits for human health and natural systems, and that the economy will in the end benefit from the transition. A growing number of stakeholders at the national, provincial, and local level recognize the historic opportunity to become an environmentally friendly society while improving economic qualities and developing a harmonious society.

Evidence from other countries also suggests that significant environment and development transformation can take 15 years or more, and needs an integrative approach of public support, enlightened political leadership nationally and locally, and participation by business and industry. While much can be accomplished immediately through better implementation of proven environmental technology and management, environment and development strategic transformation is most successful when it proceeds beyond end-of-pipe pollution control, to build new approaches based on the social and economic strengths of the nation; to create new products and services that lead to improved international competitiveness; and to implement responsible environmental action internationally.

Taking these observations into account, China will need to frame its environment and development strategic transformation in a way that maximizes opportunity, especially during the coming 15 to 20 years. In this time frame, China needs to establish a practical pathway that fully reflects scientific-based development, the "Three Transitions" principles for reconciling environment with economy, and other guidance that has set in motion the strategic transformation. Such a practical pathway shall lead to systematic actions in all dimensions of political, economic and social as well as environmental factors and conditions in order to move strategic transformation forward.

In the political dimension, good environmental governance needs to be established for the purpose of mobilizing governments at all levels and inter-agencies, enterprise, the public and other stakeholders. In the economic dimension, sustainable consumption and production is the right way for China to attack the conflicts among sustained growth of the economy, natural resource shortages and environmental pollution. In the social dimension, encouraging public and NGO participation in environmental affairs through establishment of concrete mechanisms is a pressing issue, while also cultivating an environmentally-friendly culture including consciousness and life-style.

And in the environmental management field, efforts need to be concentrated on resolving key problems such as inadequate legal authorities for environmental policy enforcement, a still weak environmental voice in decision making for national development, poor capacities, and loose enforcement of environmental laws and policies. In so doing, strategic transformation on environment and development in China will be distinctive, carried out more quickly than in any other society, and lead to benefits that will far outweigh costs.

The following seven policy recommendations are proposed for consideration by the Chinese Government to accelerate its strategic transformation.

(1) Accelerate improvement of China's existing environmental protection system to take maximum advantage of the latest environmental technology, management techniques, and legal frameworks.

To accelerate the pace in the strategic transformation period, the Chinese Government should attack three pressing and interactive problems in the existing environmental protection system: loose enforcement of environmental laws and policies, poor capacities of environmental agencies for fulfillment of their responsibilities, and a weak environmental voice in the process of decision-making for national development, Three solutions to those three problems are needed:

- Revise the existing environmental laws to adapt to new requirements of strategic transformation, including the 1989 Environmental Protection Law, the Water Pollution Prevention and Control Law, the Air Pollution Prevention and Control Law and others as soon as possible. Among a number of new requirements for revising the existing environmental laws, it is critical to set up increasingly stringent environmental standards and rigorous punishment for non-compliant environmental behaviors, with the aim of changing the existing locked-in situation in China where the costs of non-compliant environmental behaviors are much lower than those of compliant ones.

- Install sufficient human resources and allocate sufficient funding to environmental agencies at all levels to ensure good capacities for fulfillment of their environmental responsibilities. As compared with the situations in other countries with success in environmental protection, poor capacities of environmental agencies at all levels in China, including human resources, know-how, funding and equipment such as monitoring, have become a bottleneck to improvement of Chinese environmental performance.

- Upgrade the status of environment agencies at all levels in order to increase the environmental voice in the decision making process of socio-economic development. This is of critical important for socio-economic decisions and policies to take environment into consideration, which is beneficial both for strengthening environmental protection and for facilitating changes of economic growth pattern. Upgrading the SEPA to become a ministry of environment and improving coordination among different ministries in environmental affairs are good starting points.

(2) In the process of accelerating strategic transformation, China should rely more on the application of market-based policies, including environmental cost internalization via pollution taxes, energy, and fuel taxes.

OECD country experiences have demonstrated for many years that market-based policies, such as natural resources pricing reform, environmental taxes and fees, emissions trading systems, and green financing, are the most cost-effective measures for both environmental and economic purposes. The application of market-based policies has been discussed for a decade or more in China. For the purposes of both structural adjustment of "sound and fast economic growth" and achievement of

energy-saving and pollution abatement targets, China should immediately start an intensive process to introduce more environmental economic instruments for internalizing environmental costs of economic activities. This is actually particularly well addressed in the "Three Transitions Principles" for reconciling environment and economy raised by the Chinese Government in 2006. The immediate actions in this regard should be enhanced with joint efforts among economic, financial and environmental agencies of China.

(3) Build public awareness and participation so that the entire society plays a role in the strategic transformation, including household and workplace consumption and environmental health, monitoring of local development, and direct participation in environmental improvements.

Three reasons why China needs to build public awareness of strategic transformation and public participation are: 1) strategic transformation is still at an early phase in China, relevant stakeholders including local governments, enterprisers and citizens are less aware of the arrival of the strategic transformation and its implications; 2) as compared with the governmental and enterprises' efforts in environmental protection, the role of the public has been weak for a long time in China; international experiences show that the public plays a critical role in not only motivating but also accelerating the strategic transformation; and 3) in terms of awareness and know-how, strategic transformation of environment and development has a broader context than normal environmental education and communication in China. Therefore, China should strengthen and renew the public awareness education and communication activities for strategic transformation and establish formal mechanisms for the public and NGO participation.

(4). Accelerate eco-innovation in all key sectors, based increasingly on Chinese endogenous technologies and approaches, placing particular attention on how accelerated adoption can take place.

China has set up new ambitious and detailed strategies and planning for science and technology innovation. From the perspective of accelerating strategic transformation, science and technology innovation in China needs to draw more attention to four points: 1) innovation should be environmentally-friendly, i.e., eco-innovation; 2) emphasis of innovation should be on all key sectors such as environmental industrial sector, energy sector, building and infrastructural sectors, transportation sector and those industrial sectors with intensive energy consumption and heavy pollution; 3) make full use of Chinese endogenous technologies and approaches while introducing advanced technologies from abroad; and 4) provide more financial supports for dissemination of better technologies.

In accordance with the transformation of China's environment strategy, changing the current growth mode of trade is necessary in order to adjust the relationship between trade, resources and environment.

Fast growth of China's foreign trade is closely related to its position in international distribution. China has become an important importer for energy, raw materials and high-tech products and a net exporter for textile products, machinery, heavy industry materials and equipment. Research on embodied energy has revealed that the fast growth of energy consumption and pollutant discharge in China is not only a result of meeting its domestic investment and expansion of consumption needs. Fast

growth of exports led by external demand is also a very important driving force. Initial research suggests that at the same time as China is accumulating its trade surplus, its 'deficit' for environment and resources is also expanding.

In order to turn around this situation, China should not only adjust import and export structure of foreign trade, but also turn around the current extensive mode of trade which has been carried out for a long period of time. The following proposals are suggested:

- Make full use of China's trade surplus to import products and technology with high embodied energy; reduce unbalanced trade of goods and reduce problems concerning imbalances created by net export growth of embodied energy. Owing to the tremendous domestic need, it is not possible for China to avoid importing large amounts of oil and gas resources. But at the time when China imports such energy products as petroleum, natural gas, etc., it should also find and expand substitutes for goods that require high energy consumption in their production, or sometimes, import them; and restrict the export of such goods.

- Speed up transformation of the current foreign trade growth mode, moving from the traditional growth mode relying mainly on price competition, quantity expansion and seeking very high growth rates, to a mode relying on improvement of quality, increase of profit and optimization of structure.

- Reduce the resource and energy deficit at the same time as reducing China's trade surplus; levy an environmental pollution tax on enterprises with high energy consumption and high pollution; and increase the current low price of some resource products and assign costs for environmental damage to the responsible enterprises.

- Restructure the current processing trade mode, to further develop trade for service industry and continue to optimize domestic industrial structure. Optimize regional structure for manufacturing goods for export, including promoting the upgrade of processing trade in eastern areas, making full use of the local abundant human resources in the middle and west of China, and introducing environment-friendly processing trade to these areas. To expand the export of services, strengthen international competitiveness of Chinese commodities and services. At the same time, introduce advanced foreign technology and equipment, and promote energy saving and emission reduction activities in order to improve domestic environmental quality.

- Strengthen environmental monitoring of trade for recyclable and wasted goods; conduct regional planning for environmental management of trade for recyclable and waste materials, and maintain the environment for sustainable development. Conduct life cycle analysis for imported recyclable and wastes that could be used as raw materials, and enforce strict environmental entry standards into China of such materials. Have comprehensive assessment on environmental impacts on the origin countries for import of raw materials such as cotton, wood, ore, etc., and take steps to prevent negative influences on the environment in the countries of origin.

- Strengthen the honoring of international agreements, domestic policy and

legal monitoring in order to curb illegal trade in toxic wastes. Restrict processing enterprises that import recyclable and wastes from exporting the resulting raw materials, in order to ensure that it is used for meeting domestic needs, or for producing high value export products, not merely for getting foreign exchange, while leaving behind pollution.

(5) Strengthen management of global enterprises and Chinese companies that invest overseas, and improve the Corporate Social Responsibility awareness of these enterprises on environmental protection

In essence, ODI and FDI both refer to the home country attaining capital, technology and resources from other countries. It is an effective means to expand markets. From the point of process and usual patterns of globalization, gradient transfer of industries has some common features, and investment activities from developed countries to developing countries would provide meaningful experiences for China's investment abroad.

Under the current situation of globalization, as a developing country, China can make use of FDI in its industrialization process, and introduce advanced production technology, operation principles, environmental protection awareness and social responsibility from industrialized countries, and coordinate these with independent innovation, and removing constraints from resources and technology. At the same time, in order to break through restrictions on industrialization from its own resource and environmental capacity, it is also an effective solution for China to make use of global resources through the implementation of ODI. In order to make full use of the advantages of ODI and FDI and to avoid problems related to environment pollution and sustainable development at home and abroad, policy monitoring should be strengthened in the following aspects:

- Strengthen enterprises through institutional restrictions; raise environmental and technological standards for investment; and set up green principles for investment. On the one side, conduct Environment Impact Assessment of programs for foreign investment and encourage the entry of enterprises and industries which are environment-friendly. On the other side, promote the active cooperation between governmental departments and enterprises. By setting up guidance for green investment, urge enterprises to carry out their social responsibility by means of setting up environment terms in foreign investment programs, and in particular by realizing green investment and clean production in natural resource exploration fields, and lower the environmental and social impact to the host country.

- Enact policy directives for foreign invested industries, and carry out assorted guiding policy for FDI. Put into practice market entry policies in categories of restricted, limited and permitted enterprises based on their technological level, pollution level and environmental capacity of relevant invested regions. With the help of government policy, coordinate and strengthen the close relationship between economic development and environment, and promote orderly development of FDI and ODI with overall consideration for the national sustainable development strategy.

- Encourage Chinese enterprises to obtain international advanced managerial

experiences and environment-friendly technologies through their investment overseas or establishment of joint ventures in other countries. Such investment will strengthen the long term competitiveness of Chinese companies in the international market. International organizations, NGOs and private companies should be encouraged to get involved in investment activities in the field of environmental protection; to strengthen the management and monitoring of FDI so as to avoid erosion of natural resources and deterioration of the environment.

(6) Strengthen China's participation in bilateral or multilateral environmental cooperation, and therefore impelling the successful transformation of China's environmental strategy.

The exploration and utilization of resources by China is inevitably having a great impact on the world's environment. As the largest developing country, it is both a requirement for economic and social development for China and a contribution to the world to solve well the issue of China's environment and development. Being a responsible nation in international affairs it is important for the Chinese government to strengthen its international dialogue and cooperation in the following aspects:

- Promote the implementation of international environmental conventions through active participation in all types of implementation activities, learning from advanced implementation experience, and setting up complete implementation mechanism, management system and framework of policies and regulations; and make use of these conventions to protect China's resource and environmental interests.

- Participate actively in the construction of the global environmental regime; adhere to the principle of common but differentiated responsibilities; maintain the right for development of all developing countries including China; set up the international image of China as an active and responsible nation; shoulder international obligations within its capability; explore technological cooperation opportunities such as South-North Cooperation, and carry out effective cooperation activities between South-South countries.

- Strengthen environmental governance from the perspective of production and consumption. Regulate market behavior of Chinese enterprises which have investments abroad; upgrade environmental standards for investment; improve environmental awareness of policy-makers and the public.

(Text version is provided by Special Policy Study)