Impacts of Financial Globalization on Environmental Sustainability of Economic Development Path:

A Case Study of China

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1.0 Introduction

The flow of capital into China has ranked first for four years among the developing countries since 1993 and ranked second all over the world next to the flow of capital into the United States. There are 145, 000 foreign-capital enterprises with 17.5 million employees in China in 1997 (Mr. Sun Zhenyu, Deputy Minister of Foreign Economic Cooperation and Trade, the address in a press conference for the 15th National Conference of Chinese Communist Party, September 1997). The foreign capitals into China contribute a lot to China's rapid economic growth. On the other hand, China has been undergoing a transition from planned economy to market economy and the institutional context of economic development is changing rapidly. Both economic and environmental effects of foreign capitals into China are the results of the interaction between the domestic context and the features of foreign investment in China. Thus, such issues as the domestic context, the nature of foreign capitals, and their interaction may be involved in the environmental impact assessment of foreign capitals. It is obviously difficult that a systematic and thorough analysis on all those topics is covered in a single paper. So this paper adopts such a strategy that attempts to get findings from selected cases or specific aspects. The type of foreign investors and the field of foreign investments are the two dimensions considered for the case selection.

In this paper, the World Bank and power sector are selected as the investor case and field case respectively. The World Bank's investment activities are analyzed here mainly because of the data availability and their importance in supporting environmental protection in China. On the other hand, foreign direct investments (FDIs) in China have dominated over the flow of capitals into China since 1992 and been mainly concentrated on the fields of manufacture and estate development. It is sure that FDIs' environmental impacts in China should be systematically examined first. But FDIs are not analyzed as an emphasis in this paper, because the assessment of environmental impacts derived from FDIs relies on case-by-case studies very much and the related data and information are inadequate for the overall assessment. So the intensive research on FDIs' environmental impacts in China is expected in other research project.

Power sector is chosen as an emphasis case in this paper, because it is not only environmentally sensitive, but also closely related to foreign investments. In addition, some typical changes in institutional context are happening there. An overlap of several related issues exists in power sector and makes it a good field to conduct this study.

This paper is in five sections. The next section begins with the description of the main changes of foreign capitals into China in terms of total volume, contribution to China's economic growth, and future demands for foreign capitals. Then, the rest of Section 2 explores the structure characteristics of foreign capitals into China in such aspects as foreign fund types, different sources, and the distribution by sectors and regions. The roles of the World Bank in China's economic development are discussed in Section 3. This discussion consists of three components: the priorities and trends of the World Bank's loans to China; the World Bank's technical assistance and research activities in China; and the World Bank's roles in environmental sustainability of China's economic development path. Section 4 focuses on the roles of foreign capitals in China's power sector. After a general description on the background of economic and

environmental performance in China's power sector, Section 4 reviews the contributions and channels of foreign funds to power sector. Section 4 continues to go forward with the description of China's guidelines pertaining to foreign capitals into power sector. A preliminary environmental impact assessment of foreign investments in power sector follows. The rest of Section 4 concentrates on the changes in institutional context in power sector and their environmental implications. In Section 5, with a brief summary of the whole paper and some review for specific issues, some conclusions are drawn, identifying the key targets for environmental advocacy and training, the alliance of environmental public interest groups, and the priority for researches and policy analysis.

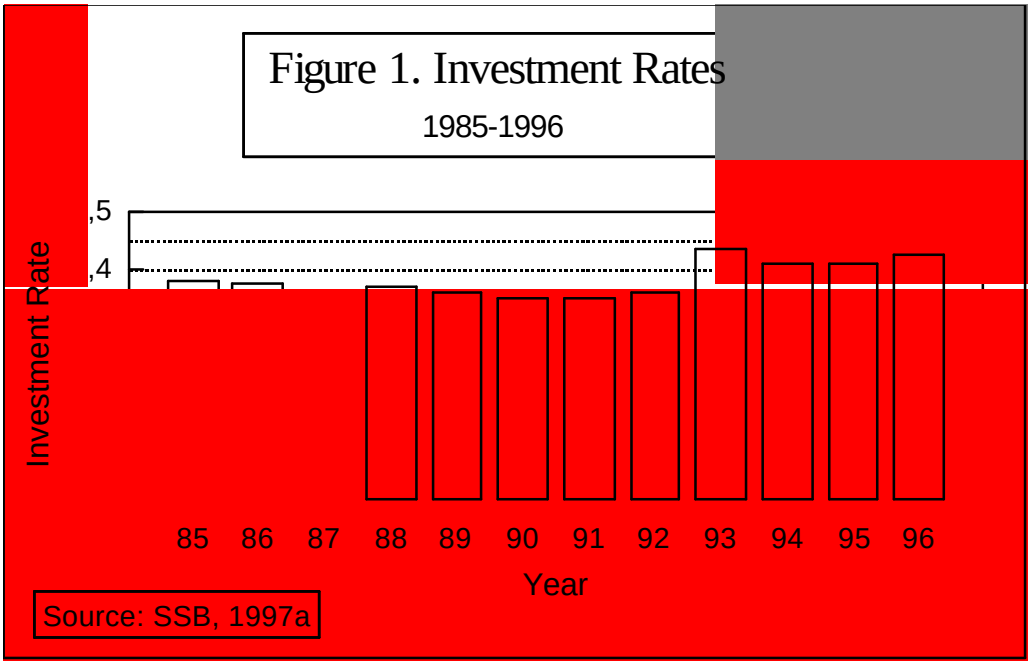
2.0 CHANGES IN INTERNATIONAL FINANCIAL FLOWS INTO CHINA

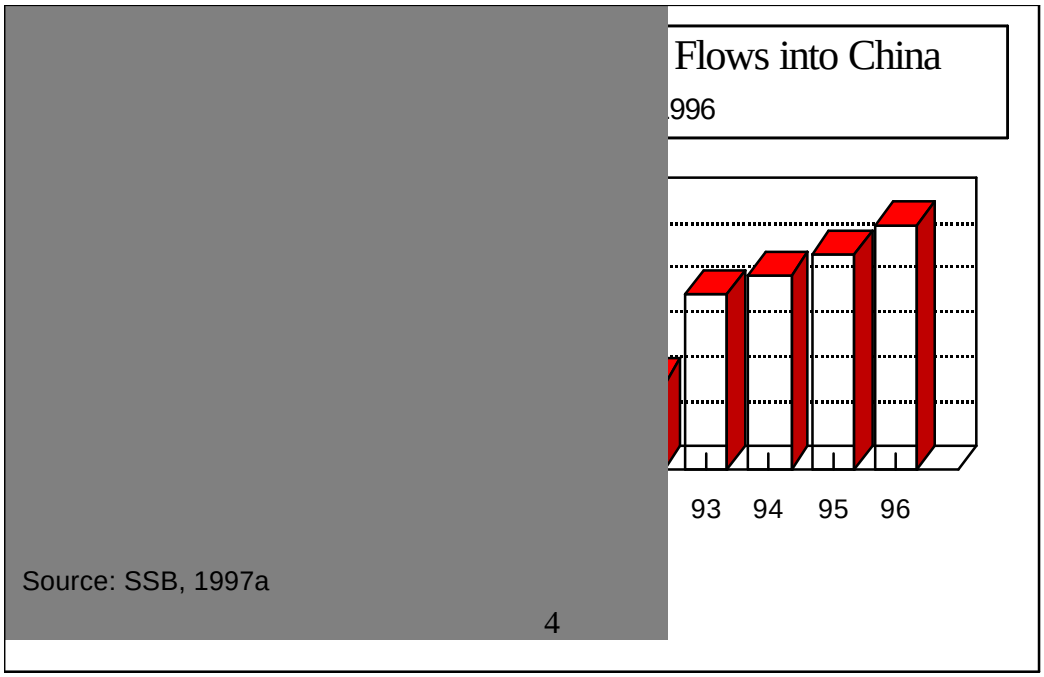
2.1 International Financial Flows into China: Changes in Total Volume, Contribution to Economic Growth, and Future Demands for Foreign Capital

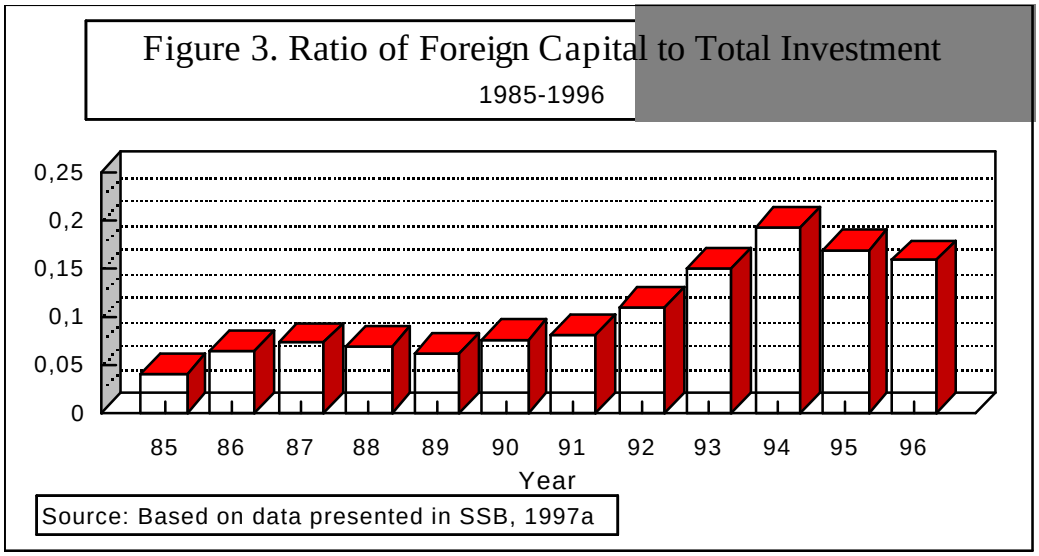
Since China started its Reform and Open process in the late 1970s, its economy has changed greatly in terms of both mechanisms and achievements. The high growth rates of Gross Domestic Product (GDP) have been based on the high investment rates in the past decades. The investment rates have remained at the level ranging from 34.7% in 1990 to 43.3% in 1993. The investment rate has been kept higher than 40% since 1993. Figure 1 shows the investment rates from 1985 through 1996. In the total investments of this period, foreign capitals have played an increasing role. As shown in Figure 2, the international financial flows into China increase from $4.647 billion in 1985 to $54.804 billion in 1996. During the second half of 1980s and the early 1990s, the international financial flows into China increased slow and kept at the level of around 10 billion dollar. The year of 1993 saw a sharp rise of foreign capital into China. The total utilization of foreign capital was up to $38.96 billion in this year, about two times as much as the one in the previous year and about three times more than the average one in the period of 1987-1991. In the following years, foreign capitals into China have remained at a high level in terms of volume. In 1996, the utilization of foreign capital in China reached $54.804 billion. Figure 3 presents the proportion changes of foreign capitals in the total investment in China from 1985 through 1996. In correspondence with the volume change of foreign capitals into China, the ratio of foreign capital to total investment has increased rapidly since 1992. During the period from 1986 through 1991, the ratio of foreign capital to the total investment ranged from 6.2% to 8.2%, with the range of 2 percent points. This ratio jumped up to 11.0% of total investment in 1992 when a new wave of market-oriented reform came to China. This was followed by a series of great annual rises in the ratio of foreign capital to total investment. Foreign capital accounted for 11%, 15%, 20%,17%, and 16% of the total investment respectively in each corresponding year of the period of 1992-96. Foreign capitals prove to be an important component in the total investment and thus, contribute a lot to the rapid growth of Chinese economy. It is estimated that foreign capitals contribute around 10% of GDP growth in 1996 (Ma, 1997).

According to the 9th Five-Year Plan approved by the National People's Congress (NPC) in 1996, the rate of investment in fixed assets, excluding investment in stock increase concerning raw materials, fuels, finished and half-finished products, and work-in-progress, will be kept at 30%. The total investment in fixed assets in the whole country is projected at the level of 13,000 billion yuan ($1,566 billion) as a sum for the five year period of 1996-2000, with an annual growth rate of 10% on the average. The priorities of the investment will be in agriculture, water conservancy, energy, transportation, telecommunication, and such industries as machinery, electronic, petroleum-chemical, automobile, and construction industries, etc. Needless to say, some gaps exist between the demands for and supply of domestic capitals for realizing the 9th five-year plan. Like other specific sectors, some environmentally sensitive sectors also have their own investment plan for the 9th five-year plan period. For instance, investments amounting to 450 billion yuan ($54.2 billion) are expected to be allocated to environmental protection sector within the period covered by the 9th Five-Year plan,

according to *The Green Engineering Investment Plan* launched by National Environmental Protection Agency (NEPA). In power sector, China will need $80-100 billion for the investment in the period of the 9th five-year plan. Domestic funds can only meet 80%. The remaining 20% must be raised from overseas. Some Chinese scholars' studies estimate that direct foreign investment (DFI) in China, the main component of foreign capital into China, will remain at the average level of 36~38 billion dollar (Guan, 1997) or 46~54 billion dollar (Qu, *et al.*, 1997) annually within the period of 1996-2000. Foreign capitals will undoubtedly continue to play an
important part in Chinese economic development and have impacts on environmental sustainability of Chinese economic development.







2.2 Structure Changes of Foreign Capitals into China

2.2.1 Types of Foreign Capitals into China

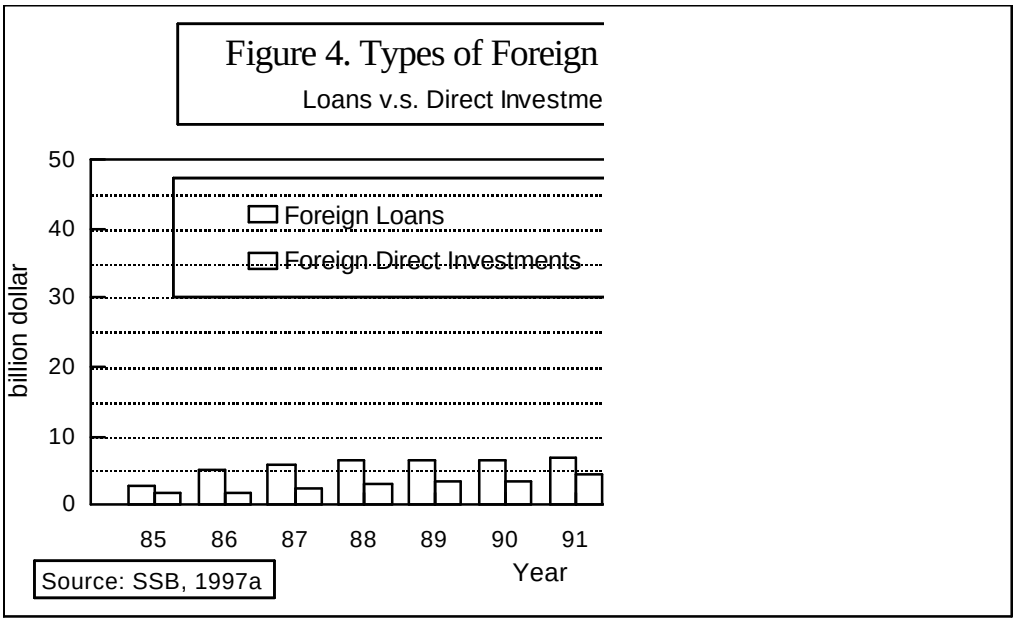
There are several types of foreign capitals into China. They are listed as follows:

Funds borrowed overseas: including loans made by bilateral official agencies and multilateral sources like the World Bank, loans lent by foreign commercial banks, export credits offered by foreign banks, and funds raised from bonds and shares issued in foreign countries;

Foreign Direct Investments (FDI): referring to the investments inside China by foreign enterprises and economic institutions or individuals (including overseas Chinese, compatriots in Hong Kong, Macao, and Taiwan, and Chinese enterprises registered abroad). Those investments may be conducted by the establishment and operation of wholly foreigner-owned enterprises, joint-venture enterprises, and contractual joint ventures.

Other types: including compensation trade, processing materials supplied by foreign clients, processing products in accordance of designs required by foreign clients, and the assemblage of parts and components supplied by foreign clients, etc..

As shown in figure 4, foreign loans was the main part of the foreign capital used in China and more than FDIs in terms of volume before 1992. The volumes of FDIs have increased rapidly and exceeded foreign loans since 1992. The volumes of FDIs were 1.4, 2.5, 3.6, 3.6, and 3.3 times as much as the ones of foreign loans in 1992, 1993, 1994, 1995, and 1996 respectively. This shows the trend that FDIs have dominated over the whole foreign capitals utilized in China since 1992 and thus, became a more and more important component of foreign capitals used in China.

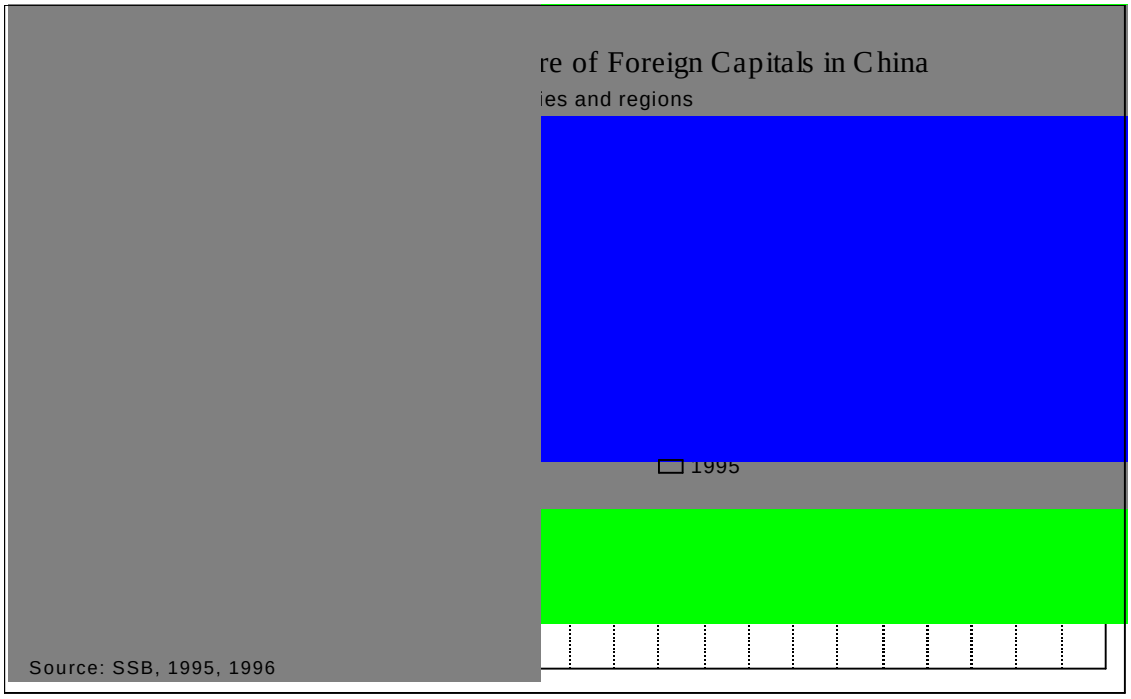


2.2.2 Source Structures of Foreign Capitals into China

Foreign capitals from around 125 countries have been under use in China. Figure 5 shows respectively the volume of international financial flows from the top ten countries or regions as international capital suppliers for China from 1993 through 1995. It is obvious that the capitals from Hong Kong played a dominative part in the whole international financial flows into China. The capitals from Hong Kong accounted for 45.4% of the whole foreign capitals into China in the period of 1993-1995. Japan, Taiwan, United States, and the World Bank followed with the corresponding proportions of 10.1%, 7.5%, 6.8%, and 4.0% respectively. These top five sources of foreign capitals into China accounted for about three-fourths of the whole foreign capitals into China from 1993 through 1995.

2.2.3 Distribution of Foreign Capitals by Sectors

The data on the actual utilization of foreign capitals by sectors are not available now. Some available sector data based on agreements or contracts of utilizing foreign capitals, however, may also reflect the distribution of foreign capitals by sectors, because the real scale of foreign capital use is generally based on the contracts or agreements and thus, closely correlated with the volume characterized by contracts or agreements. As shown in Figure 6, from 1993 through 1995, agreements relating $161.4 billion were signed for foreign capital to be used in industry sector. The volume of foreign capitals specified in agreements or contracts for the sector of real estate, public utility, and consultancy got to $86.2 billion as a total for the period of 1993-1995. These two sector groups account for 77.6% of the total with 50.6% for industry sector and 27.0% for real estate, public utility, and consultancy sector. Such sectors as agriculture, forestry, fishery, water conservancy, reconnaissance survey & geological prospecting, transportation, and post & telecommunication just attracted the rest of the total volume of foreign capitals in terms of agreements or contracts. This implies that the sectors of industry, real estate, public utility, and consultancy are the main recipients of the foreign capitals into China.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Source: SSB, 1995, 1996

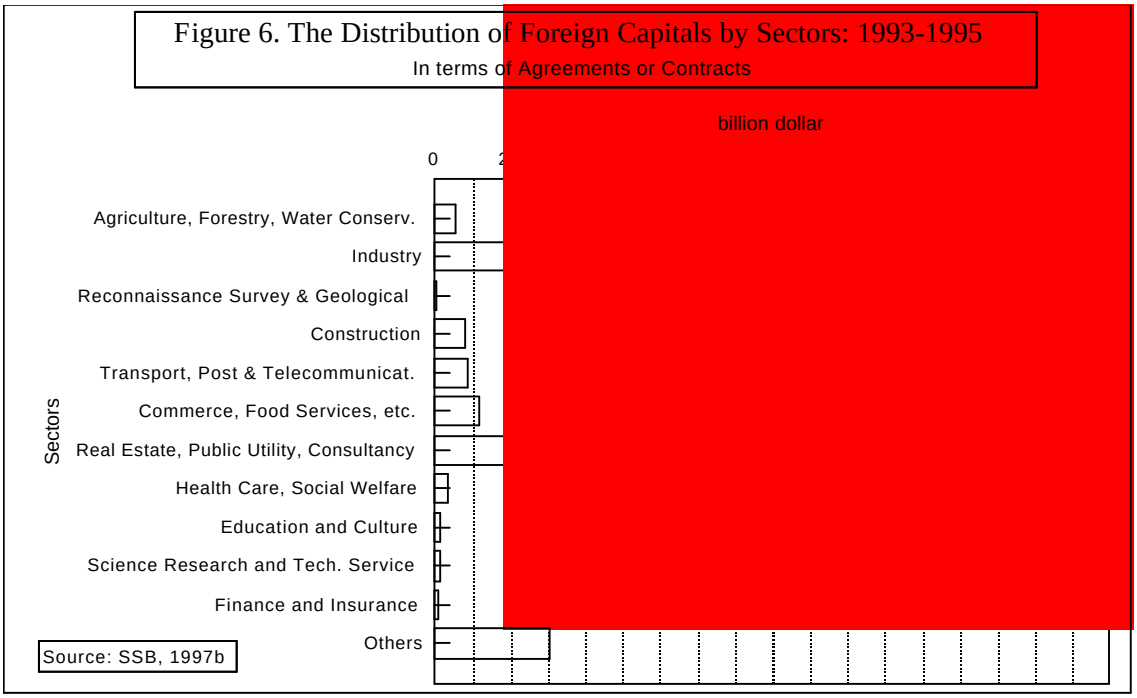


Figure 6. The Distribution of Foreign Capitals by Sectors: 1993-1995
In terms of Agreements or Contracts
billion dollar
0
Agriculture, Forestry, Water Conserv.
Industry
Reconnaissance Survey & Geological
Construction
Transport, Post & Telecommunicat.
Commerce, Food Services, etc.
Real Estate, Public Utility, Consultancy
Health Care, Social Welfare
Education and Culture
Science Research and Tech. Service
Finance and Insurance
Others
Sectors
Source: SSB, 1997b

2.2.4 Distribution of Foreign Capitals by Regions

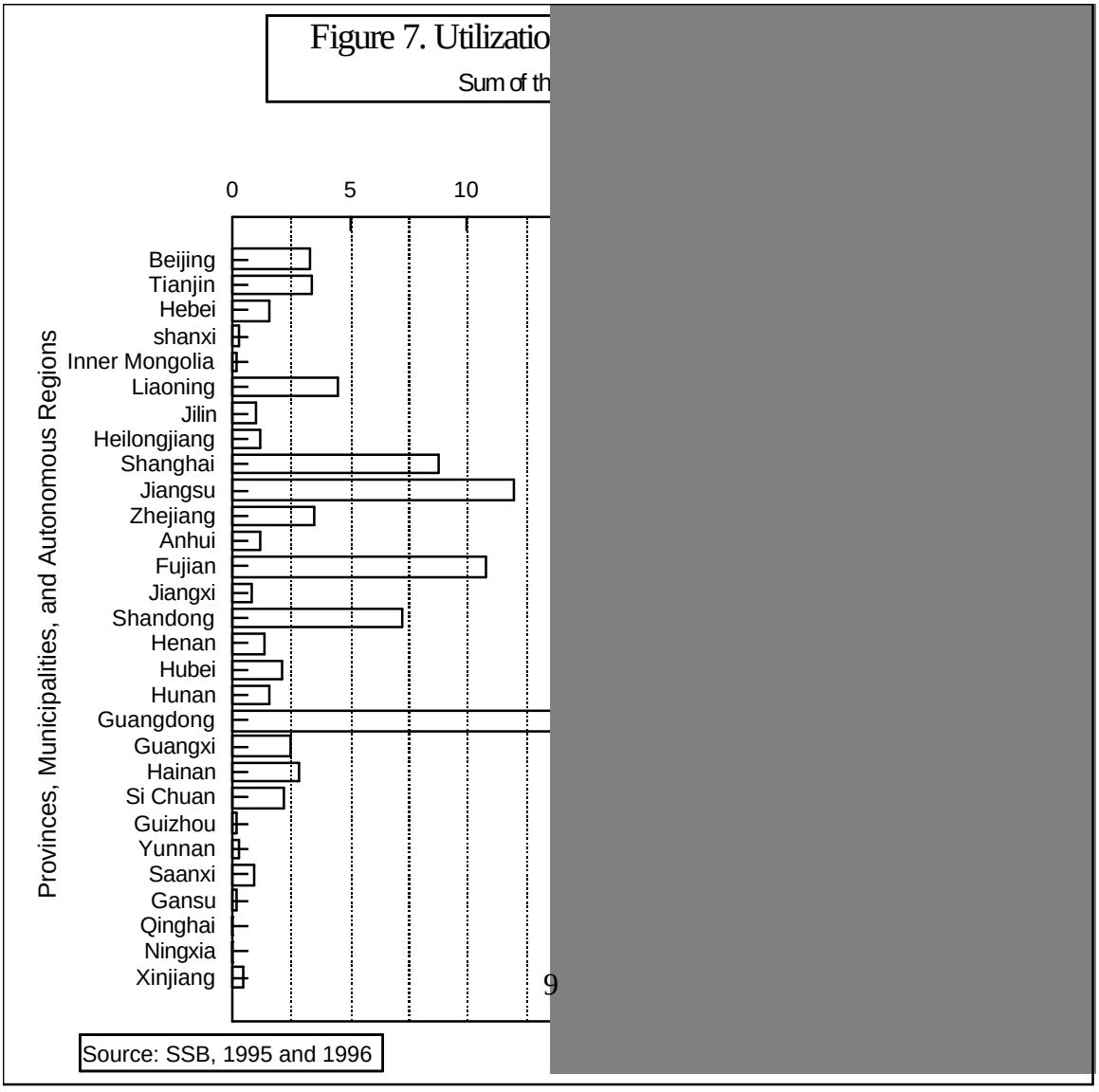
Figure 7 describes the characteristics of region distribution of foreign capitals into China . During the period of 1993-199 5, the top five provinces attracting more foreign capitals are Guangdong Province, Jiangsu Provin ce, Fujian Province, Shanghai Municipality, and Shandong Province, with the sum volume of $31.44 billion, $11.96 billion, $10.78 bi llion, $8.77 billion, and $7.25 billion in utilizing foreign capitals respectively. These top five provinces or municipality account for 53.9% of foreig n capital into China within the three yea rs and Guangdong Province itself accounts for 24.1% of the total. All the 11 provinces and municipalities located in the coastal area of eastern China, including Liaoning Province, Zhejiang Province, Tianjin Municipality, Beijing Municipality, Hainan Province, Guangx i Zhuang Nationality Autonomous Region, and the above top five provinces or municipality, attracte d 69.2% of the foreign capitals into China in the same period. The relatively underdeveloped provinces and autonomous regions, situated in middle and western areas of China, just absorbed 30%, the rest of total foreign capitals into China.

The reasons why the region distributio n of foreign capitals has been extremely uneven in China may be the differences in: (1) policy and regulatory environment; (2) infrastructure conditions; (3) location relating trans portation; (4) quality of human resources; and (5) historical overseas connection.

3.0 The Roles of the World Bank in China's Economic Development

The Mainland China assumed membership in the World Bank Group in May 1981. The World Bank's mandate in China, as in all its borrowing member countries, is to support broad-based economic development in the pursuit of poverty reduction. With this goal, World Bank lending, economic and sector work and associated technical assistance since 1981 have aimed at providing support to China's economic reform and modernization process. Operations have concentrated on removing the major constraints to development in the areas of energy, agriculture, transport infrastructure, skilled manpower, industry, urban infrastructure and the environment protection, and modern technology. The World Bank's roles in China's economic development may be reflected in two basic aspects: (1) offering lending to support infrastructure constructions and poverty alleviation; and (2) providing technical assistance integrated with either specific projects or independent researches. This section will review these two aspects respectively and explore the influences from the World Bank on environmental sustainability of China's economic development.

3.1 Loans to China: Priorities and Trends



3.1.1 Total Lending Amounts and Changes in Types of Loans

Cumulative World Bank Group lending to China as of June 30, 1996 totaled about $25.3 billion. Of this amount, approximately $16.4 billion was in the form of International Bank for Reconstruction and Development (IBRD) loans and $8.9 billion was in the form of International Development Association (IDA) credits. This means that approximately 65% of the total loans from the World Bank to China were hard loans with 15-20 year maturity, 5 year grace period, and a variable interest rate of around 10%; and another 35% of the total loans were soft loans with 50 year maturity, 10 year grace period, and annual commission of 0.75%. In addition, some private enterprises in China got some loans from International Finance Corporation (IFC) under the conditions applied to commercial loans. Lending to China totaled $2.9 billion in fiscal year 1995 (FY95), slightly down from FY94 figures of $3 billion, $2.15 billion of which was from the IBRD, i.e., 74% of the total were hard loans, 9% higher than the corresponding percentage of the cumulative figures for 1981-1996. This shows that China has been in the process of approaching graduation from soft loans for the poorest countries. According to the agreement between the World Bank and China government, IDA will stop to lend China soft loans in 1999.

In FY96, World Bank Group lending to China totaled $2.97 billion, making China the Bank's single largest borrower. On a per capita basis, however, this amounts to about $2.50 per person, the lowest proportion of lending per capita in the entire region. Of the total amount, $2.49 billion represents IBRD funding, accounting for 83.8% of the total lending; the remainder is in the form of IDA soft credits. The process of 'hardening' the World Bank's loans to China continued.

In the past years, the World Bank's lending to China remained at the level of around $3 billion annually in terms of signed agreements. As shown in section 2.2.2, the World Bank ranked fifth as one of the foreign capital sources into China in the period of 1993-95 in the sense of actually used foreign capitals in China. Table 1 presents the proportions of the World Bank's loans in the total foreign capitals into China from 1993 through 1996. This table tells that the World Bank's lending, on the average, accounted for 3.2% of the overall foreign capitals into China in terms of signed agreements or contracts during from 1994 through 1996, and 4.1% in terms of actual use from 1993 through 1995. In the sense of total volume, the World Bank's lending seems not to dominate the scale of foreign capitals into China. Besides, it will be slightly decreasing as IDA will stop to lend China soft loans in 1999. The World Bank's roles in China, however, are reflected not only by the volume of its lending, but also by the introduced ideas, concepts, management patterns, and other 'software' accompanying the lending projects.

Table 1 The Proportions of the World Bank's Loans in the Overall Foreign Capitals into China, 1993-1996

		1993	1994	1995	1996
In terms of Signed Agreements	Absolute Amount (billions of dollars)	na[a]	3.00	2.90	2.97
	Proportion in the Overall Foreign Capitals	na[a]	3.2%	2.8%	3.6%
In terms of Actual Use	Absolute Amount (billions of dollars)	1.90	1.20	2.15	na[a]
	Proportion in the Overall Foreign Capitals	4.9%	2.8%	4.5%	na[a]

Note: [a]na=not available.
Source: 1. SSB, 1995 and 1996; 2. The World Bank 1997.

3.1.2 Priorities: Loan Structure by Sectors

The World Bank's lending was allocated into several basic sectors regarded as bottlenecks of China's economic development. As shown in Figure 8a, During the period of FY1981-1994, 28% of the cumulative loans, the largest sector proportion of the total lending, went into agriculture sector, and 21% for transport, 17% for energy, 12% for industry, 11% for urban construction and environmental protection, and 9% for health and education. Telecommunication sector and Technical Assistance shared 1% of the total lending respectively.

Figure 8b presents the World Bank's lending allocation by sectors in FY96 and illustrates the recent change in loan structure in China. In FY96, the World Bank supported China's goal of alleviating major infrastructure bottlenecks by approving $1.52 billion, 52% of the FY96 lending, for five projects aimed at improving and expanding transport systems and power capacity. Also approved were loans totaling $400 million (13%) for three projects in China's agricultural sector, whose outputs contribute 20 percent of GDP. Social sector projects totaling $330 million (11%) for education, health care, labor, and the rural poor were approved for this fiscal year, demonstrating a clear commitment to poverty alleviation. FY96 lending also included $720 million (24%) in

Figure 8a. The World Bank Cumulative Lending to China: FY 1981-94
by sector

Figure 8b The World Bank Lending to China: FY 1996
by sector

Source: World Wide Webs: http://www.worldbank.org

loans for four projects addressing industrial and commercial environmental problems and reforming environmental protection policies in Shanghai, Yunnan, Chongqing, and Hubei. The proportion of loans directly focusing on environmental purposes in the total lending in FY96 was 24%, 13 percent points higher than the corresponding figures in the cumulative loans in the period of FY81-96. It is obvious that lending for environmental protection has become the fastest growing area of the World Bank's program in China.

In contrast to the feature of sector distribution of overall foreign capitals into China described in Section 2.2.3, the World Bank's loans flowed into the sectors that are

basic or essential ones for China's economic development and have attracted less foreign capitals. In this way, the lending of the World Bank complement FDI and other international commercial loans in terms of alleviating distortion in sector allocation of foreign capitals into China. In some sense, the sector structure of the World Bank lending fits China's industrial structure policies nicely. Leading more foreign capitals to the fundamental sectors as bottlenecks of economic development, such as agriculture, energy, transportation, and environmental protection, etc., has been a policy objective of Chinese government.

3.1.3 Trend of Future Lending

The World Bank Group has identified four key areas for future lending to China. These four key areas are as follows:

- Poverty reduction;
- Economic reform;
- Infrastructure support; and
- Environmental protection.

This emphasis is illustrated in breakdowns of lending by sector, both cumulatively and in FY96.

3.2 Technical Assistance and Research Activities

Although the World Bank's lending in Technical Assistance (TA) only accounted for 1% of the total loans in the period of FY 81-94, TA's roles have been unique and not replaceable. In the overall TA loans of around $224 million before FY 94, at least $50 million were directly for the purposes of environmental protection. Of which, $30 million were domestically managed under the Guidance of National Environmental Protection Agency (NEPA). This package of TA loan amounting to $30 million consists of the components as follows:

- Environmental Information System Project;
- Global Environmental Monitoring System (GEMS) Project;
- Standard Sample Development for Environmental Monitoring;
- Cleaner Production Project;
- Environmental Education Project;
- Construction of Research Center for Environmental Policies;
- Environmental Human Resources Development Project;
- Motor Pollution Control Project; and
- Several Environmental Policy Studies on Pollution Levy System (PLS), Pollution Control in Town and Village Industrial Enterprises (TVIEs), and Ecosystem Protection, etc.. (Personal Communication with a NEPA

Official, August 7, 1997)

The above environmental TA projects are obviously helpful in capacity building for environmental management at national level. Funded by these loans and accompanied by personnel exchange and information communication, those TA activities have promoted to introduce modern conceptions, ideas, and some measures related to environmental management in the context of sustainable development. Those conceptions, ideas, and measures are very crucial to rational design and effective implementation of development strategies and environmental policies. As the introduced ideas, conceptions, and measures or instruments diffuse in a wider and wider range, say, from national to local level, from developed areas to underdeveloped ones, from environmental sector to economic development sectors, from government to enterprises and consumers, it may be hopeful for policy makers, business community, environmental circles, and the public to reach a consensus in creating and implementing sustainable development strategies.

In addition to independent TA loans, most of the World Bank lending projects are integrated with TA component, especially in the stage of project preparation. Because many projects in such sectors as energy, transportation, and agriculture are environmentally sensitive or related, TA linked with those projects may include environmental components. For example, environmental impact assessment (EIA) is required for each project by both the World Bank and Chinese central and local governments; also some environmental studies, design, and plan need to be conducted for some specific projects. TA affiliated to specific projects in such sectors as energy, transportation, and agriculture may be associated with those environmental issues. This kind of TA is helpful to integrate exact environmental considerations into the investments in different development sectors (see Box 1).

The World Bank's research activities in China have been of significance not only to the Bank itself, but also to the Chinese policy makers and academic circles. Some results of macroeconomic studies have had great influence on the design of Chinese economic policies made in the past 17 years. Some empirical studies on Chinese environmental issues have been done in the past years, mostly integrated with specific environmentally related lending projects. The World Bank Group has concentrated on both macro and sector-specific aspects of China's economic and institutional reforms. The future focus of analytical work will be on the agricultural sector, state-owned enterprise (SOE), fiscal reforms, and income disparities, with the emphasis shifting to shorter studies, and improved dissemination.

3.3 Conclusion: World Bank's Roles in Environmental Sustainability of China's Economic Development Path

As mentioned previously, the World Bank's roles in China are reflected not only by the volume of its lending, but also by the introduced ideas, concepts, management

patterns, and other 'software' accompanying the lending projects. Similarly, the World Bank influences the environmental sustainability of China's economic development path not only by the projects with direct environmental targets, but also by the ones that have original purposes for economic development and are environmentally sensitive simultaneously. Because the World Bank has supported China's market-oriented economic reform, some environmental implications may exist in its efforts to promote reforms in such areas as energy and resource pricing and macroeconomic management, etc.. In short, the World Bank's roles in environmental sustainability of China's economic development path may be as follows:

- to finance updating devices and equipment, and technologies, with which the economy's environmental performance may be expected to improve by raising efficiency;
- to channel and integrate different capital sources and provide financial supports to environmental investments directly;
- to introduce 'software' like ideas and conceptions related to investment and environmental management, as well as policy design and implementation, by demonstration effects;
- to provide technical assistance to government's capacity building;
- to promote market-oriented economic reform that may lead to environmentally sound efficiency improvement.

It should be noted that the effectiveness of the World Bank's roles in China depends on not only the World Bank's regulations and policies themselves, but also on China's policy and institutional conditions. As China's economic reform goes further and the design and implementation of environmental policies improve, the World Bank may still play an active part in strengthening environmental sustainability of Chinese economic development.

4.0 International Financial Flows and the Development of Power Sector in China

Power sector is the one that attracted foreign capitals earlier than many other sectors did and is expected to rely on foreign capitals more in the near future. As a basic upstream sector in the whole economy, it has undergone rapid growth since the late 1970s. The average growth rate of total generation was up to 9.8% in the first five years of 1990s (Yang and Yu, 1996). On the other hand, power sector is an environmentally sensitive one, which is of great significance in terms of both local environmental quality and global greenhouse gas emission. Thus, power sector is a good case to illustrate the environmental implication of foreign capitals in China.

4.1 Background

Power sector has been one of the bottlenecks for China's economy. It has fallen into the priorities of China's economic development. From 1979 through 1995, around $114.54 billion were invested in power sector (*China Electric Power News*, February 6, 1996). In 1996, the investment in power sector was about 101.79 billion yuan RMB, approximately equal to $12.26 billion (MOPI, 1997). Those huge investments lead to a great growth in terms of both installed capacity and total generation. In 1996, the installed capacity reached 230 GW and total generation was up to 1,075 TWh. China's power sector is planned to remain an average annual growth of 16 GW installed capacity for supporting annual generation growth of 7% in the period of 9th five-year plan. According to the 9th five-year plan, the national total installed capacity and total generation will reach 290 GW and 1,400 TWh respectively (NPC, 1996).

Power sector has been one of the main contributors to airborne pollutant emission. In 1995, the emission of fume and dust, SO_2 and the effluent of industrial wastewater from thermal power stations all over the nation accounted for 25%, 30%, and 10% of the overall ones from industrial enterprises in the whole country respectively, while 430 Mt of raw coal was consumed as fuel for thermal power stations. It is projected that 580 Mt of raw coal will be used as fuel for thermal power stations in 2000 (Zha, 1996). In this case, the total emission of airborne pollutants may continue to increase, although the growth rate of emission may become lower and lower because of technology progress and more investment in pollution control. At present, there are few effective controls of SO_2 emission for most thermal power stations, although SO_2 control has been regarded as a priority for pollution control in the coming years and several demonstration projects of desulfurization have been done.

The shortage of pollution control facilities at 'end of pipes (EOP)' is just one of the reasons why power sector has contributed so much to air pollution in China. Another important reason is linked with the poor status of devices and equipment employed in power sector. The out-of-date technology and old devices and equipment made a low energy efficiency and serious pollution. According to the data from the third national industrial census in 1995, only 2.2% of turbogenerator units in power sector are of high quality in terms of international standard; in domestic standard, the remaining 8.5%, 49.6%, and 39.7% are excellent, ordinary, and poor respectively. For water turbogenerator units installed for power sector, only 4.1% may reach international standard; and the remaining 7.7%, 78.1%, and 10.1% rank excellent, ordinary, and poor in domestic standard respectively (OTNIC, 1997). China is lack of generators with larger capacity per single unit. In 1995, only two 900 MW generating units and seven 600 MW units existed, while there were only ninety-five 300-350 MW generating units (*Electric Power in the World*, 1997, No. 1, pp2-3). This means that the installed capacity from over-300 MW generating units accounted for only 16-18% of the total installed capacity in the country. In contrast to this, small-scale generating units for thermal power station,

i.e., the ones with the capacity of less than 100 MW, account for 20% of newly increased capacity in those years, 32% of installed capacity, and 31.8% of total generation at the end of 1996 (Xing, 1997). The above implies that there is a heavy burden to transform the poor facilities in power sector.

Based on the above description, it may be expected that a lot of investments in China's power sector will happen in the coming years for both capital construction and technological transformation, that will make it possible to strengthen generating capacity largely and to modernize the existing devices and equipment by transformation. An obvious capital gap, however, has existed. It is estimated that 690 billion yuan (around US$83 billion) are planned to be invested in the power sector in the period of 9th five-year plan. In the planned investment, 40% of the total may be paid by the central government, and another 40% may come from local governments and enterprises; the remaining 20% are expected to be covered by foreign capitals in the period from 1996 through 2000 (Shi, 1996).

4.2 Foreign Capitals into Power Sector

Power sector is one of the earliest industrial users of foreign capitals in China. At the beginning of the implementing reform and open policies, power sector started attracting foreign capitals for the investment in capital construction and device & equipment update. The first foreign capital-used project, which started in 1979, was the construction of Lubuge Hydropower Station in Yunnan Province. At that time, seldom foreign capitals flowed into China. From 1979 through 1995, $11.454 billion of foreign capitals have flowed into the power sector in China, which account for 10% of the overall investment in power sector in the same period. The volume of foreign capitals into China's power sector reaches $17.257 billion in terms of agreement or contract during this period. Up to the end of 1996, the volume of foreign capitals reached up to $20.1 billion in terms of agreement and $13.06 billion have been used in power sector. There were 87 large and medium-scale projects financed by foreign capitals and the corresponding installed capacity was 56.79 GW. Of which, 24.29 GW of installed capacity has been in operation at the end of 1995. 23% of newly increased installed capacity come from foreign capital-related investments in the period of 1979 through 1995 (*China Electric Power News*, 6 February 1996 and *International Trade News*, 21 August 1997).

In the past 18 years, China's power sector got foreign capitals mainly in the ways as follows:

- Multi-lateral lending institutions, such as the World Bank and Asian Development Bank (ADB);
- Some bilateral official development assistance, such as Japan Co-operation Fund,
- Some commercial loans from foreign commercial banks;

- Export credits provided by export countries;
- Compensation trade;
- Foreign direct investment (FDI) by establishing Sino-foreign joint venture and independent foreign enterprises in China, and conducting Sino-foreign cooperative business operation. For FDI, government concession for build-operation-transfer (BOT) is becoming an encouraged form in China.

According to the data in Section 3, around $3.3 billion of the World Bank lending went to energy sector from 1981 to 1994. Most of those lending were allocated to power sectors and became part of $11.454 billion of foreign capitals into power sector mentioned above. It may be thought that the remaining foreign capitals used in power sector came from other capital sources including ADB, bilateral official development assistance, commercial loans, export credits, compensation trade, as well as private investment. Those years have seen that more and more foreign private investments flow into power sector. Those foreign private capitals flowed into China power sector by two main ways:

The first is direct investment by establishing joint ventures and independent enterprises, e.g., independent power producers (IPPs), or conducting cooperative business operation. Recently, government concession for BOT is becoming an encouraged way for foreign private capitals to flow into power sector in China. Shajiao C coal-fired power plant, the one located in Guangdong Province and partially financed by Hong Kong investors, is reported as the first case for BOT. A recent BOT case is described in Box 2.

The second is indirect investment by buying shares and bonds issued by China power corporations in the domestic and international financial market. For example, Beijing Datang Generation Ltd. (BDGL) became public on the stock market in Hong Kong and London in March 1997. By selling its stocks in international financial market, BDGL may gather some foreign capitals for its development (*China Electric Power News*, March 27, 1997). Another example is that Huaneng International Electric Power Ltd. (HIEL) issued $200 billion of transferable bonds in Europe, North America, and Asia on 14 May 1997. The indirect investment is becoming a more and more important part of foreign investment in power sector in China.

4.3 China's Guidelines Concerning Foreign Capitals into Power Sector

'*Positive*', '*efficient*', and '*rational*' are the three words often used by Chinese officials to describe the general guidelines concerning foreign capitals into power sector. Because there is a large gap between the supply of and demand for capitals in the development of power industry, foreign capitals are really needed. According to Premier Li Peng, 'the overseas funds are welcome to invest in the construction of power plant. Various forms, such as the establishment of joint venture and cooperative enterprise and BOT

project, may be adopted. Because electric power industry is a fundamental one for national economy and the return rate in this sector is safe or reliable, Chinese side should keep necessary and dominant share of holdings in the large-scale power joint venture.' (Li, 1997)

Mr. Shi Dazhen, Minister of Electric Power Industry, summarized main points of China's policies concerning the utilization of foreign capitals in power sector as follows:

First, the choice of projects using foreign capitals must meet the requirements of the state industrial policies and be adopted to become components of the state plan for electric power development and technology update and transformation. Meanwhile, five kinds of foreign-capital-using projects are encouraged as priorities: (1) apparatus manufactured in China are adopted in the projects; (2) Chinese enterprises get the contract of construction and operation for the project; (3) the projects may directly promote the development of energy resources in middle and western regions where the local economy is underdeveloped; (4) the projects may prove to raise funds with low cost and may provide the grid with relatively low-price electricity; and (5) the projects are beneficial to the sustainable development of electric power industry.

Second, every foreign capital-using projects must be conducted by way of competitive bidding and comply with Chinese regulations on bidding in order to improve efficiency of foreign capital-using projects.

Third, the utilization of foreign capitals in power sector and the promotion of domestic or local industry should be integrated and coordinated. The introduction of foreign capitals should be beneficial to improvement of China's ability to manufacture its own electric power apparatus. Regarding the devices and equipment that China is not able to make at present, the manufacture technologies should be introduced when the apparatuses are imported into China.. For BOT concession projects approved by government, the China-made apparatus should be the first consideration in apparatus purchase process under the condition of open tender.

Fourth, more foreign capitals will be guided to flow into the middle and western regions. The favorite loans from international public lending institutions and bilateral official development assistance will be mainly used in the construction of hydropower stations and large-scale mine-mouth power plants in middle and western regions; and

Fifth, the channel for FDI in power sector will be widened further. The trials of BOT and capital stock trading for attracting FDIs will be promoted. Meanwhile, foreign favorite loans will continue to be the priority in the efforts to utilize more foreign funds. The joint ventures and Sino-foreign cooperative companies should share both benefits and risks and make benefits match risks under the *win-win* principle (*Hu Hui Hu Li*). (*China Electric Power News,* 12 June 1997)

The areas concerning the infrastructure construction in such basic industries as power sector are obviously priorities for attracting foreign funds. However, China's laws and regulations, including environmental laws and regulations, must be complied with by all foreign capital financed projects. This means that the environmental implications of foreign capitals into China depend not only on the feature of specific projects, but also on the design and implementation of Chinese environmental laws and regulations in the process of using foreign capitals.

4.4 Environmental Implications of Foreign Capitals into Power Sector in China

As mentioned above, the real impacts of foreign fund use in power sector on the

environment depend not only on the feature of the foreign capital-using projects themselves, but also on the effectiveness of environmental management by Chinese side. In general, as domestically financed projects do, foreign capital using projects must go through approvement formalities concerning environmental management. According to *The Management Measures for Environmental Protection in Power Sector* promulgated by the Ministry of Power Industry on 2 December 1996, 'China's environmental laws, regulations, and standards must be strictly complied with in the process of negotiating and signing contracts with foreign power investors' (MOPI, 1996). In accordance with Chinese environmental laws, environmental impact assessment (EIA) should be undertaken for those projects. The proposals for those projects should prove that all environmental laws and regulations, including emission or effluent standards, will not be violated in the whole project cycle, i.e., design, construction, operation, and transformation or closing.

In fact, some implementation problems have existed. Because the transition from planned economy to market economy has not completed, some government departments in charge of economic development, e.g., some industrial ministries, and local governments are linked with enterprises so closely in terms of the way to regulate economic activities. Some local governments are so urgent to get foreign capitals needed to develop local economies, that they sometimes tend to neglect the requirements of environmental laws and regulations if the capitals may bring about a short-run growth immediately. This implies that those government departments or agencies may be regarded as allies with polluting enterprises in the case that environmental goals conflict with economic growth goal. While those government departments or agencies take the same stand as the one taken by polluting enterprises, the implementation of environmental laws and regulations may be faced with obstacles from both government departments as enterprises' representative and polluting enterprises themselves. In this case, the effectiveness of environmental laws and regulations may be weakened. In addition, the capacity of the governmental environmental protection agency and bureaus is not strong enough to implement environmental laws and regulations stringently. Although there are some problems in the implementation of environmental laws and regulations in China, those laws and regulations play an increasingly important role in leading foreign investments towards meeting the requirements of sustainable development.

The utilization of foreign capitals is generally accompanied by power apparatus imports and the dissemination of know-how on technology and management. These imports of advanced apparatus and the introduction of scientific management bring about an improvement in energy efficiency to some extent and may lead to a significant reduction of fossil fuel use for electricity generation. In this way, foreign capital utilization in power sector is beneficial to environmentally sustainable development of China's economy.

Table 2 presents the size structure of imported generating units at the end of 1995.

At the end of 1995, there were 87 imported large-size[1] and fossil-generating units with single capacity of over 100 MW and the total capacity is 22,080 MW. Of them, 61 generating units have the single capacity over 200 MW and the corresponding aggregate capacity is 19,335 MW, 87.57% of the total capacity from the imported large-size generating units mentioned above. This means that 12.43% of imported large-size generating units have single capacity less than 200 MW. Table 2 also shows that the generating units with single capacity of 350 MW, 200~210MW, and 520~600MW account for 22.19%, 19.47%, and 13.22% of the imported large-size generating units in terms of aggregate capacity. It is estimated that the imported large-size generating units over 100 MW account for 21.8% of the total capacity of the existing ones over 100 MW all over the country at the end of 1995. In the case that small-scale generating units account for 32% of total installed capacity and 31.8% of total generation in China (Xing, 1997), the imported large-size generating units have played a positive role in the improvement of size structure of generating units in China.

Table 2. The Size Structure of Imported Generating Units (At the end of 1995)

Single Capacity (MW)	Aggregate Number of Imported Generating Units	Total Capacity (MW)	Percent %
≥100	87	22,080	100
100≤capacity<200	26[a]	2,745 [a]	12.43 [a]
≥200	61	19,335	87.57
200~210	21	4,300	19.47
350	14	4,900	22.19
520~600	5	2,920	13.22

Note: [a] calculated on the basis of the data from other lines
Source: Jia, 1997.

This size-structure improvement is environmentally sound, because small-size generating units are less energy-efficient and, thus more harmful to the environment. According to Xing (1997), the average coal use for the generation of 200 MW generating units is 70~80 grams/KWh more than the one for 300 MW generating units. More coal use means more CO_2 emission. In addition, SO_2 emission from small-size generating units is generally 60~100% more than the emission from large-size generating units in terms of the emission per unit generation. For most of small-size coal fired power plant, inadequate facilities for pollution control are installed and their operation efficiency is generally much poorer than the one for large-size coal fired power plant.

In principle, the imports of large-size generating units are beneficial in terms of both economic efficiency and environmental impact and should be encouraged. In contrast,

[1] Here, in Chinese standard, *Large-Size* generating unit is defined as the one with single capacity over 100 MW. In the contrast, the one with 100 MW or less capacity is regarded as small-scale generating units. This standard is raised mostly based on the consideration of management.

the imports of small-size generating units should be strictly prohibited with the consideration of both economic efficiency and the environment. In international standard or with the environmental consideration, the generating units with 100~200 MW should not be regarded as large-size ones. The data in Table 2, however, show that the imported generating units with single capacity from 100 MW (including 100 MW) through 200 MW account for 12.43% of the aggregate capacity of the imported generating units in the sample, while the corresponding percentage for the generating units with 520~600 MW capacity is just 13.22%. This implies that the proportion of imported large-size generating units is relatively low. In this sense, significant potentials exist for foreign investments in China's power sector to improve their environmental impacts by accompanying with the exports of larger size generating units and other advanced technologies.

Again, as mentioned previously, the impacts of foreign capitals on the environment depend on not only the feature of foreign capital using projects, but also the design and implementation of laws and regulations associated with foreign investment and environmental issues. One of the reasons why some relatively small-size and therefore environmentally unsound generating units have been imported into China as a result of foreign capital use is related with China's regulations concerning project approval. In general, larger-size power projects seem more difficult to go through the approval process than smaller-size projects do. They need longer time for approval and should be examined by higher authorities like Ministry of Power Industry (MPI) and State Plan Commission (SPC). In addition to more complicated administration or higher transaction cost, higher IRRs, e.g., over 15% for larger power projects, may be another invisible obstacle for larger-size and foreign invested power projects to be approved.

There are several different explanations for the difficulties linked to the attempts for foreign investors to invest in larger power projects in China. One is the different estimation in IRRs for large-size power projects. The authority believes that the demands in China's power market are huge and reliable, so that the investment in China power sector is safe and the foreign investors may get reliable long-term returns; therefore, the investment risks should not be over-estimated and IRRs should not be expected to be very high. This attitude makes high IRR power projects, most of which are large-size ones, difficult, or even unlikely to be approved by government. In contrast, since most foreign investors seek relatively higher IRRs, e.g., 'after-tax IRRs on equity in the range of 17 to 20%, they have to reduce financing and operating costs' (cited in Yang and Yu, 1996). So the difference in IRR estimation makes foreign investments in large-size power projects seem not to be feasible. Some investors, therefore, changed to focus on smaller projects. 'There are a lot of companies that are looking to the small projects to justify their presence in China doing this and getting US$100 million through five or ten projects instead of through one big project' (cited in Yang and Yu, 1996).

Another explanation to the lack of larger-size and foreigner invested projects is

government's attempt to make state-owned enterprises dominate large-size power plant. As Mr. Shi Dazhen, the Minister of Power Industry, said: 'Since power supply is of great importance to the national economy, foreign investment in it will proceed under the State's macro-control' (cited in Yang and Yu, 1996). In addition, according to Primmer Li Peng, as cited previously, 'Because electric power industry is a fundamental one for national economy and the return rate in this sector is safe or reliable, Chinese side should keep necessary and dominant share of holdings in the large-scale power joint venture' (Li, 1997).

The third explanation pertains to the foreign investors' capacity of raising funds. For most of foreign investors, it is not easy to have or raise huge amount of funds for the investment in the construction of large-size and capital intensive power plants. 'Many foreign investors are not powerful enough to invest in large-size power plants' (personal communication with an official from Ministry of Finance).

In addition to the environmental impacts indirectly derived from the accompanying imports of advanced apparatus or other power technologies, foreign capitals have contributed directly to introducing environmental technologies and facilities in power sectors. For example, in the field of flue gas desulphurization (FGD), Luohuang Power Plant (two 360 MW) in Chongqing Municipality, was equipped with Japanese made wet process FGD. MOPI cooperates with Japanese Government in doing three demonstration projects for desulphurization in coal fired power plants. All the above are financially supported by Japan. In addition, German Government offers some soft loans to support three feasibility studies on desulphurization in coal fired power plants. When foreign capital-use power projects move forward complying with *Three Synchronizations*[2], one of China environmental programs, their investments do include an environmental part for installing and operating environmental facilities.

4.5 Institutional Context Change for Sustainability of Chinese Economic Development[3]

4.5.1 General Background: the Change in Ownership and the Relationship between Government and Enterprises

It is known that all the Chinese economy has undergone a transition from planned economy to market economy. In this transition, there are two important trends in the adjustment of ownership system. The first is that the realistic forms of public ownership [4] are being diversified further by introducing corporation system. In addition to pure state or collective ownership, mixed ownership has been largely developed through holding shares

[2]Three Synchronizations refers to environmental management for construction projects. It requires that the design, construction, and operation of environmental protection facilities happen simultaneously when the design, construction, and operation of main production process are undertaken.

[3]This section draws heavily on Zou Ji (1997)

[4]In China, public ownership is traditionally understood as state and collective ownership .

respectively in the same corporation by state, collective units, and domestic or foreign individuals. In this case, the share of capitals held by state and collective units still belongs to public ownership. Joint venture is a component of the mixed ownership and has been encouraged since the late 1970s.

The second trend is that private sector has developed a lot and played an increasing important role in Chinese economy. As Figure 9 shows that the gross industrial output value (GIOV) produced by individual ownership units and foreign-capital-related units accounted for 5.4% and 4.4% respectively in 1990, and the sum, approximately equal to the proportion for private sector, was 9.8% of GIOV. These percentages increased dramatically within the following six years: 16.5% for individual ownership units, 14.3% for foreign-capital-related units, and around 30.8% for private sector in 1996. The 15th National Conference of Chinese Communist Party (CCP), held in September of 1997, called on the adjustment and improvement of ownership structure (Jiang, 1997). This implies that the proportion of state ownership in the whole economy will decrease further, while the collective and private ownership may increase in the condition that public ownership dominate the national economy. The change of GIOV structure by ownership implies that private sector, in general, may contribute to pollution more and more as the level of its production activities becomes high and high.

In the traditional planned economy in China, enterprises were subsidiary part of government and operated directly by government departments in charge of managing special industrial sectors. Within this context, enterprises have no right to make decisions independently and their performance achievements were weakly linked with benefits that they should get. For example, power plants were run directly by Ministry of Power Industry (MOPI) or Bureaus of Electric Power Management (BEPMs), the subsidiary brunches of MOPI at local level, all over the country. The important decisions for power plants concerning investment, volume of generation, wage, recruiting employees, and purchase & sale, etc., are generally made by MOPI or BEPMs. The Minister of MOPI and the heads of BEPMs behave as both a government official and an enterprise manager. For state-owned enterprises, there is no real corporation independent of government in traditional planned economy. One of the most important objectives of the market-oriented economic reform is to re-define the government's function in the operation of economic system and make enterprises independent of government and become real actors in market competition with their own clear rights, liability, and interests. Government, as the executive owner of the state property, need not necessarily run enterprises directly. In Chinese, this process is mentioned as '*Zheng Qi Fen Kai*,' i.e., separating government and enterprises in terms of function.

One of the key measures for separating government and enterprises is to introduce modern corporation system to Chinese enterprises. It is expected that more share holding enterprises will be established through re-organizing and restructuring the existing state-owned enterprises in the next several years, according to the political report of the 15th National Conference of CCP (Jiang, 1997). By replacing traditional government-enterprise relationship with modern corporation system, it may be easier to separate the right of ownership and the right of management. In this case, state-owned enterprises, that will continue to dominate Chinese economy, may make all important decisions independently and act as a market actor. While, government, as the owner of state property, does not necessarily run enterprises directly and may enjoy the benefits derived from the property rights without running state-owned enterprises directly. Here, government just behaves as a share holder. Some experiments have been conducted for the reform introducing modern corporation system in the past years. The reform process may be expected to speed up after the 15th National Conference of CCP. As enterprises become more independent of government and government's economic functions concentrate on design and implementation of macroeconomic policies, infrastructure construction, and offer of good conditions for economic development, government departments in charge of managing special industries are becoming politically weak and will finally disappear from the government when the institutional transition is completed. The original functions of those industrial departments in government may be divided into four components: (1) government's macro-management; (2) management of state property in specific industrial sector; (3) self-restraining industrial management; and (4) corporation functions. In the process of reform, those four functions will be assigned to four different actors, instead of

being only concentrated on one government department. First, the function of macro-management will be transferred from industrial management departments to such integrated department as planning commission or economic and trade commission. Second, some professional institutions or companies, as proxies for the owner of state property, will be authorized to manage state property. Third, industrial association for each special sector, e.g., China Electricity Council, will be in charge of providing such services as information and training for enterprises and self-restraining industrial management including developing norms and standards for special sector, conducting enterprise or product valuation, guiding enterprises' technology choice and strategic decision making, and linking government, public, and enterprises, etc.. Fourth, some corporation will be established based on some components of existing governmental industrial departments. Those corporations will become independent of government, although most of their staffs come from government industrial departments originally (NPC, 1996). All the above changes are expected to be completed before 2010 and some reforms have been underway.

In the context of traditional planned economy and in the early stage of economic transition from planned economy to market economy, the implementation of environmental policies relies largely on governmental industrial ministries or bureaus. Most industrial ministries or bureaus have sections responsible for environmental management in special industrial sector. For example, MOPI Those environmental sections offer strong and professional supports to NEPA and local environmental protection bureaus (EPBs) to conduct environmental monitoring, information exchange, R&D for pollution control, planning, and training. The environmental sections in some environmentally sensitive industrial sectors, such as power, chemical, iron & steel, etc., have played an important role in implementing environmental policies in specific sectors. It is not easy for NEPA and EPBs to enter a special industrial sector for implementing environmental policies with inadequate special knowledge on technologies and process in specific industrial sector. As the roles of governmental industrial departments are weakened and those departments disappear finally, the existence of these environmental sections will be challenged and an institutional vacuum may emerge for environmental protection in industrial sectors. Chinese environmental protection is being faced with this transition-caused institutional problem.

4.5.2 Institutional Change in Power Sector

Previous Institutional Pattern for Power Sector. In the context of centrally planned economy, power sector is strictly controlled by government. Ministry of Power Industry (MOPI), as a section of the central government, was responsible for administering the power industry all over the country. MOPI was in charge of planning, coordinating, supervising the investment, R&D, production, and other main activities in power sector and behaved as the representative of power industry in the interaction on other industrial sectors and interest groups in the country. Figure 10 presents the traditional organization structure of MOPI and power sector. With this structure, the circulation of plans pertaining to supply of and demand for electricity may be undertaken among actors shown in Figure 11. Figure

12 describes the process of power project approval. The main features of the previous management pattern for power sector may be seen in these three figures.

In addition, the Environmental Protection Office (EPO) was set up in MOPI to be responsible for environmental management in power sector. Its main tasks include:

- make environmental guidelines, policies, standards and norms on the basis of the national environmental laws, regulations, and guidelines;
- make out the environmental plan for power industry and lead its implementation;
- manage sub-network of environmental monitoring and environmental statistics in power industry;
- conduct environmental management for power construction projects, including environmental impact assessment (EIA) and *Three Synchronizations*;
- evaluate the environmental performance of the affiliated enterprises and other units of MOPI;
- coordinate international cooperation in environmental protection in power sector;
- conduct environmental R&D and technology diffusion in power sector, focusing on clean coal-burning technology, wind and solar energy development, and recycling use of wastewater and cinder;
- organize training and advocacy for environmental protection in power sector; and
- coordinate actions for environmental protection with other related governmental departments (MOPI, 1996).

EPO in MOPI has played a critical role in implementation of environmental policies in power sector. It has been the leader of a network consisting of environmental divisions in provincial power companies and affiliated power group companies under MOPI. In some sense, EPO is a gate for NEPA to enter the field of power sector. The environmental management network lead by EPO in power industry contributes a lot to the capacity of implementing environmental policies in power sector. Without this network for pollution control in power sector, the influences of environmental policies on power industry may be very weak. Although EPO, under auspices of MOPI, tends to take stand of power industry when the conflicts between environmental authorities and power industry occur, it is, after all, a part of government and may share the function of environmental supervision with NEPA. In some sense, EPO attempts to be more authorized in supervising power enterprises' environmental performance sometimes, excluding the direct intervention from NEPA as more as possible.

Institutional Reforms for Power Sector in Progress. Power sector has been chosen as a trial pioneer to conduct further economic reform described in Section 4.5.1.

The central objective of this institutional reform is separating state-owned enterprises from government in terms of function and introducing modern corporation system to the state-owned enterprises. In this way, state-owned enterprises are expected to become independent entities and the government function may meet the requirements of market economy better. In the MOPI's 1995 annual conference, it was announced that the State Council had decided to initiate an institutional reform for reorganizing the MOPI. The original functions of MOPI were divided into four types: (1) macro-management or supervision by government over power industry; (2) running state property in power industry; (3) offering services and conducting self-restraining industrial management; and (4) organizing production and construction in power industry. It is designed that all the four functions will be transferred to State Planning Commission (SPC) and State Economic and Trade Commission (SETC), National Power Corporation, and China Electricity Council respectively.

For governmental administration, SPC will be responsible for making the overall strategies and policies, specific regulations, and long-term plan for power industry. SETC will be in charge of leading activities concerning energy conservation all over the country (Yang and Yu, 1996).

National Power Corporation is established to take over the functions concerning state property management and the coordination of production and construction in power sector. National Power Corporation is entirely owned by State Council and authorized to be the proxy of the state's property owner for managing the state properties in power sector. With State Council's authorization, it is an entity doing investment and managing state assets independently, as well as supervising the transmission of electricity nationwide and governing the country's transregional power network (Shi, 1997).

China Electricity Council, as a non-governmental and industrial association composed of enterprises in power sector voluntarily, is expected to undertake self-restraining industrial management and offer services for enterprises in power sector. It will play a leading role in making and issuing norms and standards specially for power sector and offering services to power enterprises in information, training, and product valuation, etc.. It will have a 'bridge' function in linking power enterprises, public, and government and coordinating the relationship among power enterprises themselves (Wu, 1997).

Figure 10. Organization Chart of Ministry of Power Industry

Ministry of Power Industry (MOPI)

Minister

Vice Minister

MOPI's internal organization	Provincial companies under auspices of MOPI	Groups and provincial companies under groups	China Electricity Council

Liaoning Power Company

General Office

North-east Electric Power Group

Jilin Power Company

Provincial Companies

Heilongjiang Power Company

non-directly under MOPI

Department of General Planning

Beijing Power Company

Guangdong Power Company

Shanxi Power Company

Department of Policies and Legislation

North China Electric Power Group

Hebei Power Company

Inner Mongolia Power Company

Tianjin Power Company

Department of Economic Regulation and Control

Hainan Power Company

State Property Company

Shanghai Power Company

East China Electric Power Group

Jiangsu Power Company

Department of Personnel Company

Anhui Power Company

Tibet Industry and Power Administration

Department of Education and International Cooperation

Zhejiang Power Company

Hunan Power Company

Department of Science and Technology

Hubei Power Company

Central China Electric Power Group

Henan Power Company

Jiangxi Power Company

Department of Safety and Production Cooperation

Shaanxi Power Company

Gansu Power Company

Department of Capital Construction Coordination

North-west Electric Power Group

Qinghai Power Company

Ningxia Power Company

Xinjiang Power Company

Department of Hydropower and Rural Electrification

Huaneng Group.
Electric Power Enterprises

MOPI's affiliated enterprises and institutions

South China Electric Power Joint Venture Corporation

National Power Dispatching and Communication Center

Shandong Power Company

Information Center

Fujian Power Company

Logistics Bureau

Planning Design and Engineering Institutes

Sichuan Power Company

Research institutes

Guangxi Power Company

Universities and colleges

	Yunnan Power Company
Specialized corps	
Scholarly societies and associations	Guizhou Power Company

Source: Yang and Yu, 1996

Figure 11. The Structure of Power Plan Circulation

State Planning Commission (SPC)

Ministry of Railway Transportation, State Price Administration,
MOPI, State Energy Investment Corporation of the SPC

Department of General Planning of MOPI

Power Groups Provincial Governments

Provincial Power Companies

Power Supply Administrative Bureaus Large Enterprises

Small Enterprises Households
Others

Source: Yang and Yu, 1996.

Figure 12. Process of Power Project Approval

Application

Projects less than 50 MW or US$30 M

Projects not less than 50 MW or US$30 M

Provincial Governments

Ministry of Power Industry

State Planning Commission

State Economic and Trade Commission

Registration in Industrial and
Commercial Departments

Construction and Operation

Source: Yang and Yu, 1996.

After a preparation lasting more than one year, it was announced that the National Power Corporation was established on January 16, 1997. Based on the previous organizational structure of MOPI, the National Power Corporation adopts group pattern of organization structure. As a parent corporation, it consists of seven subsidiary groups and six provincial electric power companies directly under the auspices of National Power Corporation. All these seven groups and six provincial companies, as well as other MOPI's previously subsidiary enterprises engaged in design, construction, and repairing, are entirely owned by the National Power Corporation. In addition, the National Power Corporation may be stockholder of some non-purely state-owned enterprises and form mixed ownership in power industry.

Under the auspices of the National Power Corporation, several specialized companies have been set up to reach the parent corporation's goals. One of them is State Grid Construction Company. (SGCC) established on June 18, 1996. SGCC's main tasks are: (1) to be responsible for investment, construction, and management of transmission and substations for Three Gorges Hydropower Station; to coordinate local grids and provincial power companies to raise funds for planning, construction, and management of the projects forming transregional and nationwide grids by integrating provincial and local grids; and to be involved in the investment, construction, and management of large-size power plants and other peak-adjusting power plants. By SGCC, National Power Corporation may monopolize grids all over the country.

According to Yang and Yu (1996), the China Power Investment Corporation, established early 1995, is another important one and authorized to attract overseas investment into China's power industry.

The Steps of Institutional Reform in Power Industry. The institutional reform will go forward steadily. For the first step, MOPI will be remained to keep the governmental administrative functions while National Power Corporation is established and takes over the functions of construction, production and running state properties in power industry. After the related functions are transferred to National Power Corporation and China Electricity Council, the second step may be taken to replace MOPI with some departments under SPC and SETC. The following-up steps may be taken at provincial and local levels in order to transfer governmental administrative functions to planning commissions and economic commissions of provincial and local governments and finally separate power groups and provincial power companies from governments at provincial and local levels. This process of institutional reform may last several years.

4.5.3 Environmental Implications of Institutional Changes in Power Sector

The coming institutional changes in power sector may bring about some uncertainty to environmental management in power sector. As the MOPI's original functions are transferred to SPC, SETC, the National Power Corporation, and China Electricity Council respectively, the future arrangement of the Environmental Protection Office in MOPI is not clear now. There is a risk that the institutional change in power sector may weaken the capacity of enforcing environmental policies in power sector, if the EPO's function for environmental management in power industry cannot be taken over by an appropriate authority. There may be several options to transfer EPO's function:

First, the original EPO of MOPI becomes a department of NEPA and continues to conduct power sector-targeted environmental management outside power sector. This option may strengthen NEPA's own capacity of controlling pollution in power sector and make environmental management more independent of specific industrial sector. However, this may risk that power sector becomes passive in environmental management and sometimes behaves as an opposite of environmental authorities when its interest conflict with environmental management. Given the traditionally powerful position of MOPI, it seems not easy to move EPO of MOPI immediately into NEPA that has had a relatively weak political status.

Second, China Electricity Council (CEC) is likely to take over the responsibility for environmental management in power sector. As a self-restraining industrial association, CEC should integrate environmental consideration into its duties. For example, CEC should be engaged in developing specific environmental standards and norms applying to power sector and offering environmental information and technology services to power enterprises, simultaneously providing technical supports for NEPA and local EPBs in environmental management. It is, however, just an industrial association after all. So it may be difficult for CEC to obtain adequate legal authorization for environmental supervision, which is generally used to going to government departments.

Third, the staffs working for environmental network lead by MOPI's EPO may change to National Power Corporation and form the internal force of environmental protection inside the Corporation. Its nature, however, will be totally different from the one that governmental department has. In this case, the environmental division in the Corporation just takes the Corporation's stand and cannot have the real function to supervise the environmental performance of the Corporation and its affiliated groups and provincial power companies. On the other hand, it is supposed that National Power Corporation may inherit MOPI's traditional political influence, which has been even stronger than the one NEPA has. One of the evidences is that Mr. Shi Dazhen, Minister of MOPI, has been appointed as the Manager General of the National Power Corporation. If this is the case, it may be expected that the implementation of environmental policies in power sector may be more difficult, as the National Power Corporation behaves as a real profit-oriented entity more and more with weakening MOPI's traditional function in environmental

protection.

In the overall context of economic reform, the above institutional problem applies to not only power sector, but also other industries, such as chemical, ferrous metallurgical, construction materiel, and paper industries, etc.. The institutional reform may be faced with two problems as follows:

- To where should the function of environmental management shared by previous industrial ministries or bureaus be transferred? and

- What attitude will the corporations, that derived from the previous industrial ministries or bureaus, take regarding the implementation of environmental policies?

The above analysis implies that the future of institutional arrangement for environmental protection has not been clear yet. Which institutional pattern applies to the environmental management within the context of China's market economy? This problem is still unsolved.

5.0 Summary and Conclusions

5.1 An Increasingly Important Role of Foreign Funds in China's Economic Development

China's high rate of economic growth has relied on its high rate of investment since 1980s. Contributing a significant proportion to China's total investment, international financial flows into China have played an increasingly important role in China's economic growth since the early 1990s.

In the near future, according to the 9th Five-Year Plan for the period of 1996-2000, high investment rate will continue to be kept and focus more on infrastructure construction and other priority manufacturing sectors. Most of environmentally sensitive sectors, e.g., transportation and power, are involved in this ambitious development plan. Some gaps, however, have existed between the demands for and supply of domestic capitals for realizing this plan. This implies that foreign funds will continue to be highly demanded in the future and play a critical role in China's economic development and environmental sustainability.

5.2 Structure of Foreign Funds in China

Within the overall foreign funds into China, the amount of foreign direct investment (FDI) exceeded the one of foreign loans in 1992 and has dominated over the whole foreign capitals into China since then. The volume of FDIs was around 3.5 times as much as the ones of foreign loans during the period of 1994-1996. In other words, FDIs accounted for around 75% of the total international financial flows into China in the past three years.

The top five sources of foreign capitals to China are Hong Kong, Japan, Taiwan, the United States, and the World Bank. These top five sources accounted for about three-fourths of the whole foreign funds into China in the period of 1993-1996. The funds from Hong Kong accounted for 45.4% of the overall international financial flows into China in the same period.

Most of the foreign investments were lead to such sectors as manufacture, real estate, and other industrial sectors. In general, those sectors are environmentally sensitive and the foreign investments in them may be of dual effects on the environment. On one hand, more foreign investments may imply the heavier environmental loads through scale effects if the sector intensities of pollution are assumed constant; on the other hand, the foreign investments may accompany with the introduction of 'cleaner' devices, technologies, and better management, and thus, contribute to the improvement of environmental quality by reducing pollution intensities of different sectors.

Related to the sector distribution of foreign funds, most of foreign capitals were invested in eastern coastal regions, where manufacture sectors are relatively concentrated and the levels of economic development are higher than western regions. Chinese government has advocated that more foreign capitals should flow to western underdeveloped regions, where the regional economies have been heavily based on the exploitation of natural resources. It is expected that some environmental risks may exist if

the foreign capitals are encouraged to be invested in the exploitation of natural resources in western areas.

5.3 The Role of the World Bank as a Public Lending Institution

The World Bank's role in China may be reflected in two basic aspects: the first is to offer lending to support infrastructure constructions and poverty alleviation; and the second is to provide technical assistance integrated with either specific projects or independent researches. Regarding the World Bank's lending to China, the absolute amount has kept at the level of around three billion US dollars for several years and accounted for 3.2% of the 1994-96 overall foreign funds into China in terms of signed contracts, or 4.1% of the 1993-95 overall foreign funds in terms of actual use. Although the proportions of the World Bank's lending in the overall foreign capitals were not very high, the loans from the World Bank have been important for China's healthy economic development. This is because that most of the World Bank loans have been used in infrastructure construction and in such fields as education and environmental protection, etc., where the shortage of capitals often exists and it is generally more difficult to raise fund than in manufacture sectors. This means that the World Bank's lending has been helpful for mitigate the structure distortion in China. The recent structure change of the World Bank's lending to China shows that an increasing proportion of loans is being distributed into the field of environmental protection. The lending for the environmental protection has become the fastest growing area of the World Bank's program in China.

Although the World Bank's lending in Technical Assistance (TA) only accounted for 1% of the total loans in the period of FY 81-94, TA's roles have been unique and not replaceable. Especially more than one fifth of TA loans was used in environmental field. Those environmental TA projects are obviously helpful in capacity building for environmental management. Those TA activities have promoted to introduce modern conceptions, ideas, and some measures related to environmental management in the context of sustainable development. Those conceptions, ideas, and measures are very crucial to rational design and effective implementation of development strategies and environmental policies. As the introduced ideas, conceptions, and measures or instruments diffuse in a wider range, it may be hopeful for policy makers, business community, environmental circles, and the public to reach a consensus in creating and implementing sustainable development strategies. In addition, the TA activities affiliated to the World Bank's specific lending projects are helpful to integrate exact environmental considerations into the investments in different development sectors.

In short, as pointed out in Section 3, the World Bank's roles in environmental sustainability of China's economic development path may be summarized as follows:

- to finance updating devices and equipment, and technologies, with which the economy's environmental performance may be expected to improve by raising efficiency;

- to channel and integrate different capital sources and provide financial supports to environmental investments directly;
- to introduce 'software' like ideas and conceptions related to investment and environmental management, as well as policy design and implementation, by demonstration effects;
- to provide technical assistance to government's capacity building;
- to promote market-oriented economic reform that may lead to environmentally sound efficiency improvement.

It should be noted that some negative factors have existed, which may weaken the World Bank's roles in promoting China's environmental sustainability. The first widely criticized thing is the complicated and time-consuming procedure for project preparation and approval. This negative feature may be derived both from the huge scale of the lending project and from bureaucratic ways of doing things.

The second critique is pertaining to the qualification of some international consultants for TA projects. Although some international consultants may be qualified in terms of speciality, they are not familiar with the local situation and Chinese in the case that local situation changes rapidly and information collection is not easy. This has limited the roles of the World Bank's TA activities in China. It is expected that a more effective combination of international and local consultants may remedy this defect.

The third critique is associated with the World Bank's research activities in China. Some policy studies are so dependent on some specific departments of government or governmental research institutions, that it is sometimes difficult to avoid the influences of specific sector's self-interest on the results of those researches. In this case, those research activities risk being not objective. There are two possible ways to solve this problem. One is to make several related departments of government involved in the policy studies. It seems, however, that the practical coordination may be very complicated or difficult among different governmental departments. Another is to rely on nongovernmental or independent researchers more in institutional and policy studies. As information becomes more open and democratization process goes forward, this is becoming more and more feasible.

5.4 The Role of Foreign Funds in The Development of Power Sector

In the past two decades, foreign funds covered about 10% of overall investments in China's power sector. In the period of the 9th Five-Year Plan (1996-2000), 20% of investments in power sector are expected to come from foreign funds. Such public lending institutions as the World Bank and ADB contribute a lot to the foreign investments in power sector in China. In addition, foreign private investments, including direct and indirect ones, have been encouraged more and more to flow into power sector and some large foreign

corporations are showing their stronger interests in investment in China's power sector. As the forms of raising funds are more diversified, e.g., collecting funds from domestic and international commercial banks for BOT project, commercial banks and other private sources may have more influences on the development of power sector than they did before.

The role of foreign funds in the development of power sector should be assessed not only in terms of the capital volume, but also in terms of the accompanying introduction of advanced technologies and management pattern. This is because that there is a direct linkage between the adopted technologies and management patterns in the investments and the caused environmental impacts. The past two decades have seen that some modern management patterns and advanced technologies and apparatuses are introduced into China's power sector through foreign investments. On the other hand, some technologies and apparatus, which are not environmentally sound, have been introduced into China's power sector. The previous analysis shows that within the range of the imported generating units with the single capacity over 100 MW (including 100 MW), one third has the single capacity equal to or less than 210 MW. The imports of small-scale generating units, most of them are financed by foreign funds more or less, are negative to the improvement of energy efficiency and the pollution intensity in power sector.

5.5 The Environmental Impacts of Foreign Investments in Power Sector in China The actual environmental impacts of foreign investments in power sector are the mixed result of both specific foreign investment projects and the effectiveness of China's environmental management. China has set up a regulatory framework for environmental protection by promulgating a series of environmental laws and regulations. The environmental management of foreign investment projects is covered by those laws and regulations. In some sense, this domestic environmental regulatory framework has promoted most of foreign investment projects to comply with China's environmental standards and other requirements. Some problems, however, have existed in the implementation of domestic environmental laws and regulations. Two key problems include: (1) the attitude of governmental departments in charge of economic development and specific industries, especially at local level; and (2) the environmental authorities' capacity of implementing environmental policies. After all, those are the problems in the context of economic transition.

The environmental impacts of foreign investments also depend on the features of specific projects. Some foreign funded projects directly served introducing environmental technologies and installing facilities for pollution control in power sector. Others may indirectly have sound environmental impacts by bringing about efficient and thus, cleaner apparatus and technologies for production and management in power sector. In practice, however, some negative environmental impacts have been derived from the apparatus imports financed by foreign funds. As mentioned above, the scale of imported generating units is key problem that is of obvious environmental importance by different performance of energy efficiency. Both domestic and foreign reasons exist for the imports of small-scale generating units. On the domestic side, those reasons may be as follows:

- Chinese government's attempt to dominate power sector by avoiding more large-scale foreign invested power plants;
- Different estimation of the return rate of foreign investments in power sector;
- Time-consuming and complicated approval procedures;
- Protection for domestic manufacturers in the field of generating unit production; and
- Weak purchase power for foreign large-scale generating units.

On the foreign side, the following reasons may be included:

- Some foreign investors' weak ability to invest large-scale power plant;
- Higher cost of large-scale generating units compared with the ones domestically manufactured; and
- Different estimation of the return rate of foreign investments in power sector.

Here, it can be seen that many underlying economic and trade factors may lead to unexpected environmental effects.

5.6 Institutional Context Change for Sustainability of Chinese Economic Development

The fundamental institutional change is the one derived from the transition from planned economy to market economy. After the 15th National Conference of Chinese Communist Party held in September 1997, it may be expected that the ownership reform will speed up. The concept of public ownership has been redefined and its realistic form will be diversified further by introducing modern corporation system. Mixed ownership has been and will continue to be developed through holding shares in the same corporation respectively by state, collective units, and domestic or foreign individuals. The non-state-owned enterprises, including such collective and private ones as town and village enterprises (TVEs), have largely developed and will play an increasing important role in China's economy. The change in ownership structure implies that the target actors of environmental policies may be different from the previous ones in the context of planned economy. Some adjustments are needed for environmental policies to match the new context, because the main components of China's environmental policies were designed originally in the context of planned economy.

The reform is changing the function of government and the relationship between government and enterprises. Enterprises are becoming more independent of governmental departments' direct management and make their main decisions by themselves. As enterprises becomes independent entities in market competition, the original functions of governmental departments or agencies in charge of managing specific industries may be divided into several parts and transferred to different agents respectively, such as planning commissions and economic & trade commissions responsible for macro-management,

industrial corporations, and self-restraining industrial guilds. In this restructuring process, the governmental departments or agencies in charge of managing specific industrial sectors will be weakened and finally eliminated. In this case, the environmental sections affiliated to those industrial departments or agencies, which have been a critical force for the implementation of environmental policies, may be faced with an adjustment problem. This adjustment is likely to risk weakening environmental forces in industrial sectors.

5.7 Institutional Change in Power Sector

Within the overall context of institutional change mentioned above, power sector has been in its way to conduct institutional reform. The original functions of Ministry of Power Industry (MOPI) will be transferred to three types of different organizations respectively: such governmental departments as planning commission or economic & trade commission in charge of comprehensive macro-economic management; the National Power Corporation; and China Electricity Council. The central objective of this institutional reform is to separate state-owned enterprises from government in terms of function and introducing modern corporation system to the state-owned enterprises. This institutional change may bring about at least two kinds of problems for environmental management in power sector: the first is the future arrangement of environmental forces previously lead by the Environmental Protection Office (EPO) of MOPI; and the second is the possible roles of the National Power Corporation in implementing environmental policies. In the case that the National Power Corporation behaves as an independent and profit-oriented entity instead of a governmental department like MOPI, its powerful political influence inherited from MOPI may become an obstacle for environmental authorities to implement environmental policies in power sector. All these two problems may be related to the actual environmental impacts of foreign investments in power sector in terms of domestic institutional and policy context.

It should be noted that the above institutional context changes are mainly caused by the domestic economic reform, rather than the financial globalization. This institutional change, however, provides conditions for international financial flows to influence environmental character of China's development.

5.8 The Implications for Environmental Public Interest Groups

Although most parts of this essay have focused on the roles of the World Bank and the power sector as cases, some implications of the described changes for the advocacy targets, levels, and strategies for public interest groups seeking to influence the environmental character of China's economic development path may still be realized.

The environmental advocacy targets. Because public sectors will continue to dominate China's economy and determine the main character of China's economic development path, public sector targets should be emphasized for environmental advocacy. In addition, town and village enterprises (TVEs) developing in rural regions, most of which belong to collective ownership and perform with the similar rules followed by private

enterprises, have contributed an increasing and significant proportion to the overall China's economic development and caused serious pollution problems. In this sense, the relative emphasis should also be given to TVEs as advocacy targets.

In the context of China's political and economic structure, local governments have significant influences on both local economic development and its environmental character. All the environmental policies are implemented by local authorities. They know local situation better and have great financial potentials to improve the local environmental quality. Sometimes, some of the local governments urge to get foreign funds to develop local economy, but relatively lack environmental awareness and seem to be shortsighted; and sometimes they need more technical assistance in planning and project preparation. So it would be helpful to give advocacy emphasis to local governments.

Power sector is certainly a key advocacy target. In addition, agriculture, transport, metallurgical industries, chemical, construction materials, paper, food, and other environmentally sensitive sectors should be emphasized for environmental advocacy.

Finding the mutual interest basis for building up a wider alliance with other interest group for sustainable development. In addition to environmental circle, it is possible for the environmental public interest groups to develop alliances with other interest groups for environmentally sustainable development on the basis of mutual benefits. Industrial sectors, in which most of the foreign funds have been used, have traditionally been regarded as the opposite of the environmental public interest groups. Many mutual benefits, however, do exist between industrial sectors and environmental public interest groups. For example, power sector has pursued the improvement of energy efficiency for less cost. This pursuit is certainly beneficial to its environmental performance simultaneously. The diffusion and application of cleaner technology in many industrial sectors may be another example illustrating the possibilities for environmental public interest groups to develop allied relationship with industrial sectors.

Alliances with nongovernmental researchers. Recent years have seen that many international environmental institutions place their activity emphasis on developing the relationship between government and themselves with the consideration of collecting data and information and influencing policy-making directly. They have to find some specific governmental departments as cooperation partner. Those actions are necessary for policy analysis and some basic researches needing a lot of internal and systematic data and information. Some shortcomings, however, exist obviously for those environmental institutions to conduct policy analysis with the collaboration with specific governmental departments or their subsidiary research institutions. This is because that specific governmental departments are generally limited by their own department or sector interests and are not easy to take objective stand for the policy analysis. In order to remedy this shortcoming caused by the over-reliance on the specific governmental departments, it is needed to make more nongovernmental or independent researchers involved in policy and institutional analysis. Within the context of China's political and social system, there are little

NGOs in terms of western definition. However, the scholars from the universities, which are not affiliated to specific governmental departments related to specific policy analysis, seem to be less influenced by sector or department interests than the governmental researchers do. So the university researchers may be expected to play a complementary and more positive role in environmental policy analysis. The development of alliance relationship with them should be emphasized more for better environmental policy analysis.

Priorities of research and policy analysis related to the environmental impacts of financial globalization. The dramatic changes in institutional and policy context raise some new problems and requirements for the research and policy analysis related to financial globalization. If it is consumed that the environmental consequences of international financial flows result from the interaction of both domestic context and the features of international financial flow, it makes sense for international public interest groups to conduct studies on the topics as flows:

- The interaction of international financial flows and domestic context. The domestic context may be related to the institutional and policy environment, local culture features, as well as other 'hardware' conditions. Well, international side variables may include foreign investor's strategies, requirements, and self-conditions, etc..

- The assessment of actual environmental and economic impacts resulting from financial globalization on China. The roles of FDIs should especially been carefully examined within a sample large enough to get convincing conclusions. The methodological development and case studies at local and project levels may be included.

- The possibilities to integrate different domestic policies, which are related to investment, trade, technology transfer, environmental protection,structure adjustment, and fiscal issues, in order to strengthen the sustainability of China's economic development. And,

- The reform of bilateral or multilateral regime for coordinating international financial flows with the environmental considerations.

Priority of training targets. Regarding the emphasis of training, it seems, in a short term, more urgent to conduct environmental education among economic officials in charge of making development plan, managing investment projects, and implementing economic policies. At the national level, the main training targets should be the officials from State Planning Commission (SPC), State Economic and Trade Commission (SETC), Ministry of Finance (MOF), Foreign Economic Cooperation and Trade Ministry (FECTM), State Taxation Administration (STA), China People's Bank as a central bank, and other ministries or agencies responsible for economic development. In addition, because all the environmental policies should be realized at local level after all and both environmental

awareness and capacities of implementing environmental policies are relatively weak at the grass-roots level, the training at the local level should be emphasized. Within China's administrative context, the training at the county level is most needed. There are more than 2, 100 counties in China. This means that there is a huge demand for environmental training.

From a long-term view of points, the training emphasis should be placed on environmental education for young students in business school, who are expected to become decision-makers in government and corporations and lead China's economic development in the near future. Integrating environmental education with wider business education is of a great importance to sustainable development in China.

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