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Research Paper No.1 [China: 1]

Evaluation of JICA's Cooperation of Sino-Japan Friendship Center for Environmental Protection: A View of Social Environmental Management System

January 20, 2003

Policy Research Center for Environment and Economy,

State Environmental Protection Administration of China

Executive Summary

In order to improve the social environmental management capacity of developing countries, Japan has established Environment Centers in six countries in the past twelve years, including Thailand, China, Indonesia, Mexico, Chile and Egypt.

In order to examine the roles and contributions of this Environment Center approach in/to Social Environmental Management System in the recipient country with a view to improve its planning and management and to enhance the effectiveness of Japan International Cooperation Agency (JICA)'s related projects in the future, Japan Society for International Development (JASIC) is undertaking a Third Party Evaluation and selected Thailand, China, Indonesia and Mexico as four target countries.

The Sino-Japan Friendship Center for Environmental Protection is one of these environmental centers operated since 1996. The objective of this report is to evaluate JICA's cooperation of Sino-Japan Friendship Center with an analysis of roles plays by the Center in Social Environmental Management System (SEMS) in China with a view to improving its planning and management and to enhance effectiveness of JICA's related projects in the future.

Enlightened by the program evaluation approach developed by Prof. Matsuoka from IDEC, we try to analyze the contributions of the environmental center project to the development of China's SEMS, which basically consists of three major actors, i.e. the government, the firms and the citizens, and interactions among them in addressing environmental issues at both national level and local level. Besides an internal evaluation (self-evaluation) based on a well organized evaluation system consisting of various departments and divisions of the Center and organized by the Policy Research Center for Environment and Economy (also as the Dept. of Environmental Strategy and Policy Research), an external evaluation is adopted by means of questionnaire to local environmental protection bureaus (EPBs) and local environmental officers.

Followed by this concept, this report first gives a review of the development of the Sino-Japan Friendship Center for Environmental Protection. The report then elaborates on China's SEMS, focusing on the evolution of China's environmental management capacity, environmental governance with three actors (the government, the firm and the citizen), framework and development of Chinese environmental policy, as well as the ninth and tenth five-year national environmental master plans. In the end, the contributions of the Center to the building-up and operation of SEMS in China are analyzed.

1. Review of the Sino-Japan Friendship Center for Environmental Protection

The Sino-Japan Friendship Center for Environmental Protection (briefly called as “Sino-Japan Center”) was a fruit of Sino-Japan bilateral environmental cooperation. The Sino-Japan Center was constructed with the grant aid of 10.5 billion Japanese yen provided by the Japanese Government and a funding of 66.3 million RMB raised by the Chinese Government. The construction work started in 1992 and put into operation on May 5, 1996.

The Center is a comprehensive research, management and executive institute directly affiliated to the State Environmental Protection Administration (SEPA) of China, and serves as a platform for international exchange and technological cooperation in the area of environmental protection. It consists of 11 departments, 5 administrative divisions and 2 service organizations. By the end of 2001, it has 214 employees, of which 7% obtained Ph.D Degree, 18% obtained Master Degree and another 35% obtained Bachelor Degree.

By the end of 2000, the Center implemented Phase I (1992-1995) and Phase II (1996-2000) technical cooperation between Chinese Government and Japanese Government and now it is continuing Phase III (2002-2005) cooperation. Apart from the enhanced cooperation with Japan, the Center has also built up ties with other countries and regions as well as international organizations.

Since its construction in 1992, the Sino-Japan Center has experienced three-stage development characterized by hardware construction (1992-1996), institutional construction (1997-1998) and overall capacity enhancement. After its official operation in 1996, the Sino-Japan Center adopted more than 60 internal rules and regulations, such as the implementation of the target-responsibility system, the system of recruiting staff through strict exam and open election to posts on a basis of competition, etc. in order to strengthen administrative management, to enhance personal qualification and to build up capacity. After six years of development, five major technical departments of the Sino-Japan Center, i.e. Department of Environmental Strategy and Policy Research, Department of Environment Technology Exchange and Public Education, Department of Environmental Information, Open Laboratory and Institute of Reference materials of SEPA have made rapid progress in environmental policy research, environmental education and training, environmental information network construction, environmental analysis and testing and environmental reference materials research and production, which contributes greatly to China’s environmental management.

The Department of Environmental Strategy and Policy Research of the Center also functions as the Policy Research Center for Environment and Economy (PRCEE) of SEPA. PRCEE was established in early 1990s and was merged into the Sino-Japan Center in May 1996. It is a governmental consulting agency for macro environmental policy-making. It also carries out

policy research on environmental as well as economic issues. It has four research divisions, namely Division of Environmental Economics Research, Division of Environmental Policy Research, the division of information research and the division of environmental law and regulation research.

The Department of Environment Technology Exchange and Public Education, which also serves as the Center for Environmental Education and Communications (CEEC) of SEPA, is the center of national environmental education network and the platform of international cooperation on environmental education and communications. It consists of a communication and advocacy office, an education office and an audio-video office. It has advanced photographic and film-developing apparatus, equipment for tape and video production, and well-equiped conference training facilities. Since its foundation, it has made significant achievements in the implementation of the GLOBE plan, international exchange in environmental technologies, training, and the production of TV programs on environmental protection.

Consisting of five main divisions, including Division of Office Automation, Division of Network Operation, Division of Application Development, Division of Information Management and Division for the Northwest Pacific Action Plan, the Department of Environment Information of the Sion-Japan Center also functions as the Environmental Information Center (EIC) of SEPA. Providing environmental information management and technological assistance, its major tasks are to effectively function as the center of the national environment information network and the hub of data communication, information exchange and technological service and to provide information technological support and service for SEPA

The Open Laboratory of the Sino-Japan Center also serves as the National Research Center for Environmental Analysis and Measurement (NRCEAM). Combining research, training and consultation for the analysis and measurement methods and technologies, NRCEAM has been the base for joint research domestically and oversea and for international exchange. Its work include conducting research in new technologies of environmental analysis and measurement, solving the key problems in the field of environmental analysis and measurement of China, developing new methods and technologies of environmental analysis and measurement, providing analysis and measurement report for the judgement of pollution disputes, and providing analysis and measurement service, environment consulting and training for communities and enterprises.

The Institute of Reference Materials of SEPA is the only professional research institute appointed by SEPA in the research and production of environmental reference materials. It provides reference materials and technological support to environmental monitoring, scientific research and assessment, technological arbitration and equipment gauging.

2. China's Social Environmental Management System

Before the elaboration on China's Social Environmental Management System, the report first gives an overview on the evolution of China's environmental management, followed by the introduction of environmental situation in China.

2.1 Evolution of China's environmental management

As in the industrialized countries, environmental protection in China has been growing with the arising of enormous environmental problems and evidence of their damages to our habitat and to the public health. The causes of environmental problems have much correlation with social and economic development. first and a Time-Situation-pressure-response Matrix, developed by PRCEE, is applied reflecting the following aspects:

domestic social and economic situation;

major environmental pressures; and

responses, including regulatory arrangement (RA), institutional arrangement (IA) and significant environmental programs and actions (SEP&A).

The evolution of China's environmental management from 1949 till 2000 is officially categorized into 5 stages. In Stage 1 (1949-1972), pollution problems just began and associated environmental deterioration was not evident in this period. The concept of environmental management was not formed. Neither independent regulatory construction nor institutional construction started.

The ten-year period in Stage 2 (1973-1982), can be regarded as the fundamental stage, when environmental regulations, laws, standards, organizations were started to establish and legal systems of both regulatory and economic instruments began to implement for the enforcement of environmental management. Three fundamental principles aiming at strengthening China's environmental governance were formed Environmental protection has been put onto the political agenda since this period.

China's environmental protection achieved significant development in Stage 3 (1983-1988) and the capacity of environmental management was greatly strengthened. Environmental protection was defined as a fundamental state policy. A framework of environmental policies focusing on strengthening environmental governance was set up. A systematic framework of

environmental laws and regulations was formed. Eight environmental legal systems were implemented as basic instruments for the enforcement of environmental policies.

In Stage 4 (1989-1995), environmental deterioration became more evident. The basic Environmental Protection Law was issued and implemented and environmental protection gained highly regards by the Central Government. Sustainable development was defined as a national strategy for social and economic development.

Environmental management shifted from concentration control over pollutant to total pollution load control in Stage 5 (1996-2000), which was regarded as a fundamental change of environmental management. In addition to the capacity building of environmental management in terms of regulatory construction, a number of great environmental programs and actions focusing on industrial pollution control and urban environmental management were implemented to intensify environmental enforcement. Not only the instrument of command & control which is dominantly employed, but also a mix of market-based instrument, public participation and information disclosure was applied.

2.2 Environmental situation in China

With great efforts made on environmental protection in the past 20 years, China has generally controlled the trend of environmental deterioration and improved environmental quality in some cities and regions at a certain degree. However, the environmental situation is still very serious. The pollution emissions are still very high in China and the environmental quality in some regions is still declining.

Though China has invested intensively in pollution abatement and in the improvement of environmental quality for recent years, e.g. the average annual total environmental investment in last five years reached 0.93% of GDP, the growth of such an investment is lower than the economic growth.

China is challenged not only by the existing environmental problems, but also by the emerging environmental problems, such as air pollution from the crowding vehicles in cities and water pollution discharged from intensive breeding of livestock and poultry around cities.

For air pollution, major air pollutants include SO_2, soot, industrial dust and NO_x. Most SO_2 emissions, industrial dust and more than half of the suspended particulate are caused by energy consumption, especially coal consumption, which shares around 70% of the total energy consumption. The NO_x emissions are increasing quickly with the growth of vehicles, which makes air pollution caused by tail gas from vehicles become more serious, especially in mega-cities.

Usually, the air pollution in northern cities is more severe than that in southern cities. In 2000, among 338 monitored cities, 36.5 % of them have met the national standard of Grade II and 63.5% worse than Grade II. 112 cities have the air quality beyond Grade III standard, accounting for 33.1% of the total monitored cites. The trend of urban air quality deterioration is somewhat turning around. Air quality in some cities has been improved, while others still suffer severe air pollution**.**

The problem of acid rain is severe in China, covering 30% of China's land territory. In 2000, among 254 monitored cities, the pH value of the precipitation ranged from 3.98 to 7.70. Acid rain occurred in 157 cities, accounting for 61.8%. The average annual pH value of 92 cities was smaller than 5.6, accounting for 36.2%.

For water pollution, in early 1990s, China's main water pollution source is industrial wastewater. With a series of measures including command and control, economic instruments and public participation, the increase trend of wastewater discharge was curbed and began to decline in the mid of 1990s. However, the water pollution prevention and control is become more complicated and the water quality in many rivers and lakes will be continuously worse.

According to the water quality report of seven main river systems in China, Liaohe River, Haihe River and Huaihe River are polluted the most seriously with about 50% of the river sections are worse than Grade V water quality criteria. Yellow River and Song Huajiang River are polluted with more than 50% of the river sections are worse than Grade III water quality criteria, while Pearl River and Yangtze River are slightly polluted with more than 50% of the river sections better than Grade III water quality criteria.

In 2000, the areas of marine environment with the water quality of Grades II, III and IV and IV above were 102,000 square kilometers, 54000 square kilometers, 21,000 square kilometers and 29,000 square kilometers respectively. The pollution was serious in the offshore and coastal areas. The main pollutants in the marine waters are inorganic nitrogen, phosphate, petroleum, mercury and lead.

2.3 China's Social Environmental Management System

China's SEMS is the interations among goernment, the firm and the citizen and the roles played by each actor in addressing environmental problems and improving the environemntal situations at both national level and the local level.

- **Government and its role**

China structures its environmental governance in three organizational systems: legislative bodies, judicial bodies, and administrative bodies.

Environmental legislative bodies

In China, environmental legislation at national level is under the authority of the National People's Congress (NPC) and the Standing Committee of NPC acts as a regular body under the NPC to deal with general affairs. For environmental purposes, the Standing Committee established a sub-committee on environment and natural resource conservation, which has mandates both to make preparations for environmental legislation and to supervise over the implementation of environmental laws and regulations by the Government.

At the local level, a similar process is employed in local environmental legislation. But local process usually takes shorter time because of a smaller jurisdiction and less coordination, compared to the national process.

In addition to environmental laws and regulations stipulated by the NPC, the State Council at the national level has an authority to issue national ordinances, decisions and rules as necessary, which also have legal force. Likewise, the SEPA can, independently or jointly with other relevant ministries, issue ministerial level decisions, rules, standards and administrative systems. For local level, provincial and municipal governments have a same authority in their jurisdictions. But the local environmental protection bureaus (EPBs) have rather a mandate to implement environmental policy than to formulate policy, not like the authorities and missions their governments and the SEPA share.

Environmental administrative bodies

At the national level, the State Environmental Protection Administration, is mandated as an overseeing body under the State Council, with general missions and responsibilities for formulating environmental policies, plans and standards and supervising implementation of policies nationwide. However, environmental management involves so many aspects of the socioeconomic system that it is beyond the capacity of one or even a few organizations to address all of them. Therefore, other relevant ministries are necessarily and naturally involved in environmental management. They mainly include economic and industrial sectors and resources and public sectors.

The local environmental administration in China is structured in three levels as general administrative hierarchy: provincial/metropolitan/autonomous region, municipal, and district

and county. Each local government installs its own EPB, and in many cases, EPBs in districts under municipal jurisdiction are built as branches of municipal EPBs. The structures of local EPBs including their affiliated organizations are, to some extent, similar to the SEPA but simplified in smaller size based on local necessities, and normally the lower, the smaller, from province to county. It is also true, the lower the EPB is from province to county, the more missions and responsibilities for implementation of policies and plans as well as programs the EPB takes on, and the less mandate of policymaking the EPB has.

Environmental judicial organs

Environmental judicature is one of important approaches to protecting environmental rights of social members and interested groups. The people's courts at all levels from the national to the local take on this responsibility. They deal with civil, administrative and criminal lawsuits concerning environmental issues and make final adjudication for the cases. In reality, the most of cases of environmental disputes and administrative disputes with regulated parties are resolved through administrative procedures of mediation, and only a few cases are filed to the courts.

- **Corporate environmental management**

China's environmental management in the past 30 years developed with the emergence of industrial pollution and associated environmental damages. The priority of environmental management, especially in 1970s and 1980s is industrial pollution prevention and control and until 1990s, integrated urban environmental management and ecological protection have been put onto the agenda.

In order to ensure environmental compliance and abide by the liabilities prescribed by the environmental laws and regulations, corporate environmental management has been carried out on both mandatory basis and voluntary basis.

Corporate environmental management organization

Large and medium scale enterprises have special environmental management organization named as environmental protection section (division) or as safety and environmental protection section (division). This kind of organization, usually under the leadership of a vice manager who is in charge of production/technology, or under the leadership of other divisions, such as production and technique division or manufacture division, have full-time staff to help the

enterprise achieve environmental compliance by formulating corporate environmental management regulations, providing technical support, supervising the enforcement of internal regulations, conducting self monitoring and reporting. Environmental management network (system) is established in most large and medium sized enterprises.

However, small enterprises usually do not have special environmental management organizations. The environmental management in these enterprises is often conducted by other section (division), such as production/technology section, equipment section or administrative section, etc. A couple of full-time or part-time staffs take the responsibilities of corporate environmental management.

Qualification of corporate environmental management personnel

The qualification of corporate environmental management personnel varies greatly. In some enterprises, engineer or senior engineer with three-year or four-year higher education of environmental engineering is employed as corporate environmental management staff. For the operation of abatement facilities, technical workers are required by some enterprises. However, in some other enterprises, corporate environmental management staff, who is not educated in environmental engineering or relevant subjects, may be only high-school graduate or even lower educated. These staffs are not qualified for corporate environmental management.

Corporate environmental monitoring

Prescribed by relevant environmental regulations, as well as required by local environmental protection bureaus, corporate environmental monitoring is often conducted either by enterprise themselves or entrusted qualified organizations. The frequency of corporate environmental monitoring varies greatly. Some may conduct environmental monitoring once a month, while others may conduct twice a year. Some enterprises even formulate adequate corporate environmental monitoring regulations, defining the responsibilities of monitoring staff, items of monitoring, the frequency and procedure of monitoring, technical specifications and norms, recording, management of documents, and verification of monitoring results, etc.

Installation and operation of abatement facilities

Most of industrial enterprises installed abatement facilities required by the System of “Three-synchronous Requirements” for new and expansion construction projects and the System

of Deadline Setting for Pollution Abatement of existing enterprises. Though most of major industrial enterprises achieved environmental compliance in 2000 after the national action plan of environmental compliance of all industrial enterprises was carried out in the period of the Ninth Five-year Plan, the efficiency of abatement varies from one enterprise to another.

The cost of the operation of abatement facilities is usually affordable by enterprises, however, the investment needed for the installation and construction work, usually not capable of getting financial assistance from commercial banks, is a great challenge to enterprises.

Corporate environmental management regulations

In order to achieve environmental compliance and make regular corporate environmental management possible, enterprises usually formulate various regulations, including goal-responsibility system for environmental protection, post-responsibility system, integration of abatement facility into equipment management, corporate environmental management criteria, maintenance of abatement facility, environmental monitoring, environmental statistics, management of document, and award and punishment, etc.

- **The roles of citizens, media and NGO's in environmental governance**

The public, civil societies, NGOs and representatives of special groups such as the NPC and the National People's Political Consulting Congress (NPPCC) are exerting an increasingly influence on Chinese agenda of environmental governance. Nowadays China sees the roles of the public and civil societies as well as NGOs in environmental governance in several aspects: voluntarily actions to protection of environment, monitoring and publicizing the behaviors polluting and damaging environment, protection of their environmental interests deprived by polluters, participation in policymaking.

The media is another important actor to monitor environmental performances of industries and governments. The publicizing environmental problems and no-compliance of industries as well as the lack of or inappropriate administration can help attract or push governments and industries to respond the problems. And the same time, the mass media is right venue to educate the public.

3. The Sino-Japan Center: A Case of Sino-Japan Bilateral Cooperation

The Sino-Japan Center has played a positive role in building up China's SEMS in various ways sicne its establishment (see Table S1). In addition, the Sino-Japan Center has also accumulated a bundle of experiences in bilateral cooperation and international cooperation through 10-year practices.

Demand-oriented cooperation

All projects in Sino-Japan technical cooperation (Phase I, II, and III) are selected according to the demand of Chinese side. After Chinese researchers raised project proposals for technical cooperation, environmental experts from both countries discussed carefully and screened out appropriate projects. 128 sub-projects supported by the Japanese-yen loan were also determined according to Chinese situation and demands from Chinese side.

Mutually promoted cooperation

The Sino-Japan environmental cooperation has continued on a friendly and sincerely partnership basis. In the process of project screening, experts from both countries provided their own ideas and suggestions based on China's environmental policies and environmental issues, as well as major environmental programs initiated by the Chinese Government.

Comprehensive and all-sided function

The institutional composition of the Sino-Japan Center indicates that its function is not positioned to just one aspect of environmental protection but to comprehensive functions including scientific research, publicity and education, information network, supervisory service, international exchange and so on. As a result, its functions in the SEMS are also comprehensive and so is its influence, which extends to the government, enterprises and the public.

Such comprehensiveness and all-sidedness are manifested not only by its effective support to the decision-making, technical and information service, and capability building of the State Environmental Protection Administration, but also by its promotion to the work of the local environmental protection bureaus, its positive influence on the awareness of the public and the enterprises for environmental protection.

Adoption of a proper operation mechanism

The establishment of the Sino-Japan Center coincided with the start of the structural reorganization of science and technology institutions in China and faced the approaching reform of state-funded research institutes.

Under these circumstances, the Center adopted the internal incentive mechanism by implementing the target responsibility system. It distributed the annual targets to each unit which was tested for its performance in accordance with the fulfillment of these targets at the end of the year, thus greatly stimulating the enthusiasm of each unit.

Opening cooperation

In terms of the Sino-Japan environmental cooperation, the Sion-Japan Center has established partnerships and carried out various cooperative activities with the Japanese government, non-governmental organizations, many universities, research institutions and civil groups in Japan. In addition, the Sino-Japan Center has also developed extensive cooperations with other countries besides Japan.

Table S1 Roles of the Sion-Japan Center in China's Social Environmental Management System

Target Actor	Roles of the Sino-Japan Center	Different Aspect	Example
The Government	Support to the SEPA	(1) directly participation in SEPA's important work	Provision of technical support to the negotiations of MEA; organizer of important conference and activities for SEPA; participation in the deseminating and reporting of significant activities
		(2) promotion role in the improvement of state laws, regulations and standards	The Institute of Reference Materials has completed 227 national reference materials which widely applied in the environmental monitoring and enforcement.
		(3) provision of technical support to environmental policy making	Research on the indicators of sustainable development; research on the integration of environmental concerns into the economic decision making process; research on environmental strategy; research on yellow sands and sandstorm; national dioxin laboratory
		(4) promotion to the SEMS	Construction of LAN for the Information Center of SEPA; satellite communication private network for the SEPA; email system for the national environmental information intranet and the environmental information network of China
	Support to local environmental management	(1) strengthening the capacity of local government	Environmental information network construction in 100 Chinese urbans; training courses for directors of urban EPBs; training courses for directors of provincial EPBs; training courses on environmental information system
		(2) technical support to local EPBs	Information technical support; monitoring technical support
		(3) joint research with local EPBs	PM10 source identification for Guangzhou City
		(4) promotion the international cooperation for local EPBs	Overseas training and investigation; bilateral or international cooperation project; coordination of Sion-Japan model city project
The Public		(1) construction and maintenance of environmental websits	www.zhb.gov.cn
		(2) information disclosure via the media, TV and broadcasting	TV programme production; radio programme production; establishment of the Environmental Educational TV and Programme Center open to the public
		(3) Promotion public environmental education	Promotion of the Green School activity; publishing the book "Green Cradle"
		(4) promotion the increase of public environmental awareness	Organizing the activity such as waste paper and waste plastic package collection and recycling; promotion of "green office"
The Firm		(1) promotion training of personnel	Corporate environmental personnel training
		(2) technical consultation	
		(3) EMS consultation	ISO 14000 certification and personnel accredidation; ISO 14000 enforcement training

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1. Background

For the past twelve years, Japan has established environmental centers in Thailand, China, Indonesia, Mexico, Chile and Egypt in order to improve the social environmental management capacity in these developing countries. In order to examine the progress of this environment center approach and its influences on the development of the social environmental management systems of the ODA's receipt countries, Japan Association for International Development (JASID) is conducting a third-party evaluation at the request of JICA. Four target countries were selected, including Thailand, China, Indonesia and Mexico. The results of the study will be utilized for the improvement of planning and management of related JICA's future projects.

The Sino-Japan Friendship Center for Environmental Protection, operated since 1996, is one of these environmental centers established in China. The Policy Research Center for Environment and Economy of SEPA, one of departments of Sino-Japan Friendship Center for Environmental Protection, is working as an organizer and analyzer for the contract evaluation study between IDED, Hiroshima University and the Sino-Japan Friendship Center for Environmental Protection.

The objective of this contract study is to evaluate the JICA's cooperation of Sino-Japan Friendship Center for Environmental Protection with an analysis of roles plays by the Center in social environmental management system in China with a view to improving its planning and management and to enhance effectiveness of JICA's related projects in the future.

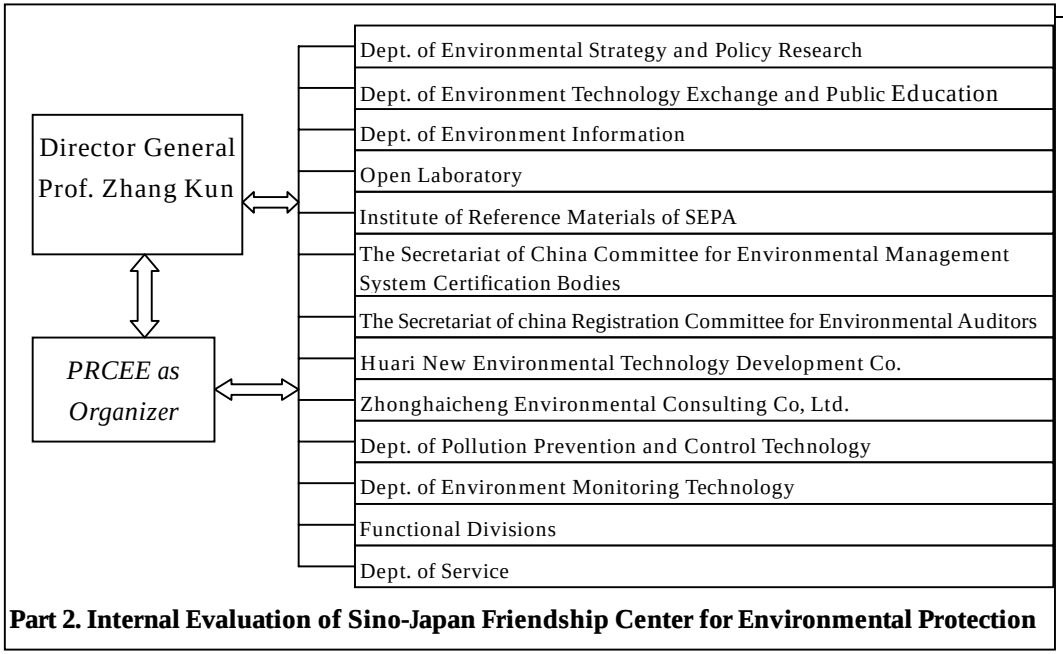
In order to fulfill the task, each department and administrative divisions contributed to this report in various ways, especially the Department of Information and the Department of Environment Technology and Public Education, both devoted to designing the questionnaire for external evaluation and implementing the survey.

This report is benefited greatly from General Director of the Sino-Japan Friendship Center for Environmental Protection, Prof. Zhang Kun, who provided administrative assistance and facilitated the coordination among different departments and administrative divisions.

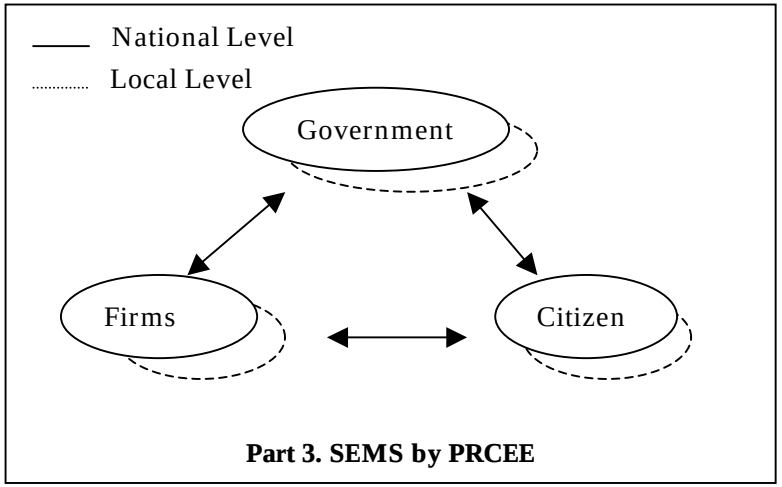
Enlightened by the program evaluation approach developed by Prof. Matsuoka from IDEC, we try to analyze how environmental center project contributed to the development of China's social environmental management system (SEMS), which basically consists of three major actors, i.e. the government, the firms and the citizens, and interactions among them in addressing environmental issues at both national level and local level. Besides an internal evaluation (self-evaluation) based on a well organized evaluation system consisting of various departments and divisions of the Center, an external evaluation is adopted by means of questionnaire to local

environmental protection bureaus (EPBs) and local environmental officers. Figure 1.1 is the concept diagram of the evaluation process.

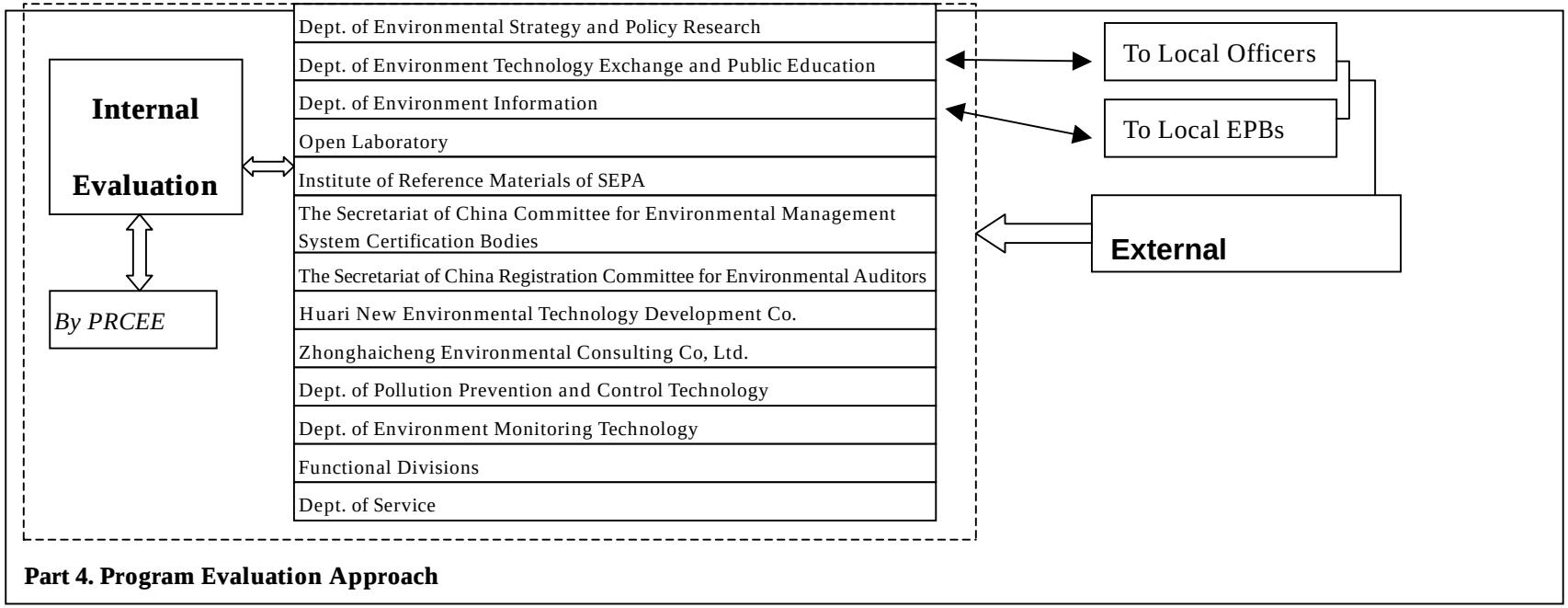
Followed by this concept, this report will include four parts. Part 1 introduces the background of this evaluation study, including the objectives, the methodologies and approaches, and contents of this report. Part 2 gives a detailed introduction and an internal evaluation of the Sino-Japan Friendship Center for Environmental Protection with a viewpoint of self-development, capacity building and sustainability of the Center. Part 3 tries to provide an in-depth review and analysis over China's social environmental management system, with special emphasis on the capacity development in environment. Part 4 links the Sino-Japan Friendship Center for Environmental Protection with China's social environmental management system by evaluating the contributions of the Center to the development of SEMS both internally and externally, and draws some conclusions.



Part 2. Internal Evaluation of Sino-Japan Friendship Center for Environmental Protection



Part 3. SEMS by PRCEE



Part 4. Program Evaluation Approach

2. The Sino-Japan Friendship Center for Environmental Protection: Review and Internal Evaluation

Sino-Japan Friendship Center for Environmental Protection (hereafter referred to as "the Center") is a key environmental protection project of China jointly established with Ja¥10.5 billion of ODA loans from the Japanese government and RMB663 million from the Chinese government. The Center, put into operation on March 5th 1996, covers an area of 2.9 hectares. It is located 1.9 km east of Anhuiqiao, North Fourth Ring road and is 23km away from the Capital Airport. The headquarters of the Center, which covers a floor space of 31000 square meters, consists of a lab building for scientific research, an international conference hall, an apartment building for experts, a dorm building for trainees, a canteen and an energy building and other offices. The Department of Pollution Prevention and Control Technology is located in China Research Academy of Environmental Science. It has an area of 1.4 hectares and boasts a simulation lab tower and a precision equipment tower, which cover a floor space of 3000 square meters. The Center has over 3000 pieces of research and experiment facility, including first-class equipment for environmental analysis and testing, computer system for the collection of environmental data, simulation apparatus for the prevention and control of air, water and solid waste pollution, and audio-visual and training facilities for environmental education and awareness raising.

The Center is a comprehensive research, management and executive institution directly under the State Environmental Protection Administration of China, which also serves as a platform for international exchange and technological cooperation in environmental protection. It consists of 11 departments, 5 functional divisions and 2 service institutions (see Figure 2.1). Presently, it has 214 employees (year 2001). After five years of development, the Center has made rapid progress in environmental policy research, environmental education and training, environmental information network construction, environmental analysis and testing, environmental reference materials research and development, and environmental management system certification, which contributes greatly to environmental management of the country. Since 1996, the Center has implemented the second phase of the Sino-Japan environmental technological cooperation project. Japanese experts have been sent to the Center, while the Center has sent people to Japan for training and study. In addition, the Japanese side has provided equipment for environmental research and protection. Apart from the enhanced cooperation with Japan, the Center has also built up ties with other countries and regions as well as international organizations. As an important component of the APEC Environmental

Protection Center of China, the Center has carried out various forms of exchange and cooperation.

2.1 Personnel

Ever since its establishment, the Center has attached great importance to the profile of its personnel. It has done a great deal to improve the quality of the staff, in particular, the research force. On the one hand, the Center, through strict exams and through other channels, selects qualified people from graduates; on the other hand, it puts its staff on various training programs as part of the Sino-Japan cooperation and other cooperative activities so as to enhance the personnel quality internally. Six years of development have seen an increase of the work force from 168 people in May 1996, when the Center was first established, to 220 at present, representing a growth rate of 30%. Moreover, the quality of the staff has been greatly improved. (Figure 2.2, 2.3) The Center had 32 senior technological experts by 1997; by 2001, the number had increased to 61, almost twice that of year 1997. The number of people with master's or doctor's degree was 32 in 1997 while by 2001, it had increased by 70% to 55, which accounted for one fourth of the total staff.

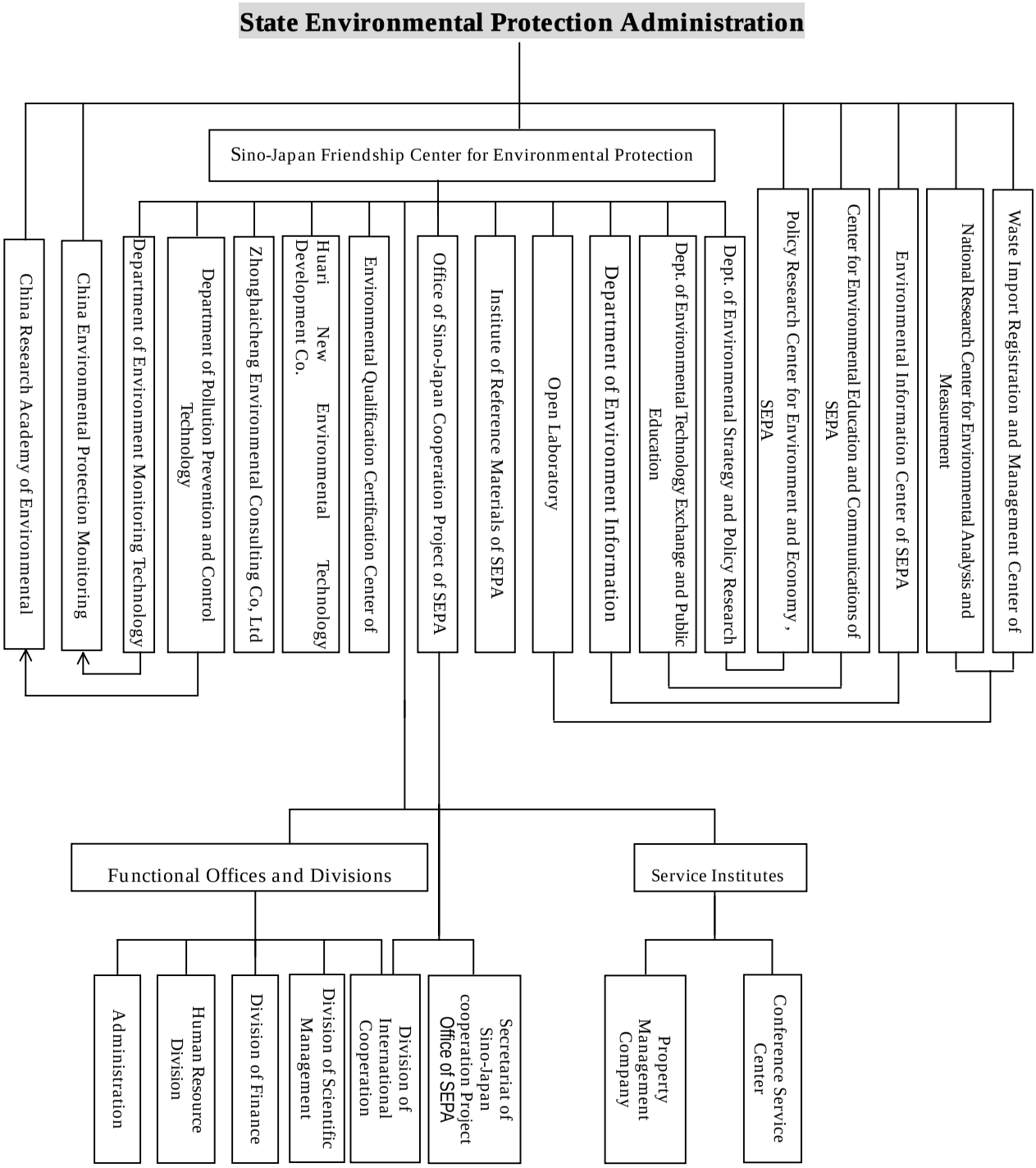


Figure 2. 1 Organizational structure of the Sino-Japan Center (2001)

The composition of the personnel indicates that the number of employees with high expertise titles has risen considerably while the percentage of administrative and other employees has dropped significantly. This manifests a sounder structure of the Center's personnel, with fewer people in administrative departments and more staff engaged in scientific research and management service, which is conducive to its long-term development. In terms of educational

background of the personnel, the percentage of employees with master's degree has increased greatly; that of those with doctor's and bachelor's degrees has also risen slightly while the proportion of three-year major undergraduates and people with lower education has declined substantially. This is attributable to the fact that the Center attaches great importance to the quality of the job applicants when it employs people and to the practice of encouraging on-job training and further study, which has helped create an atmosphere of dedication to work.

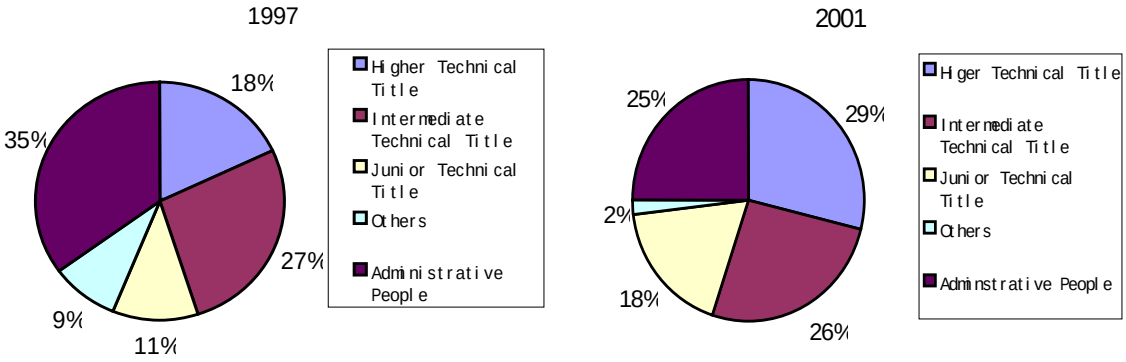


Figure 2. 2 Change in the composition of the Center's personnel with different titles

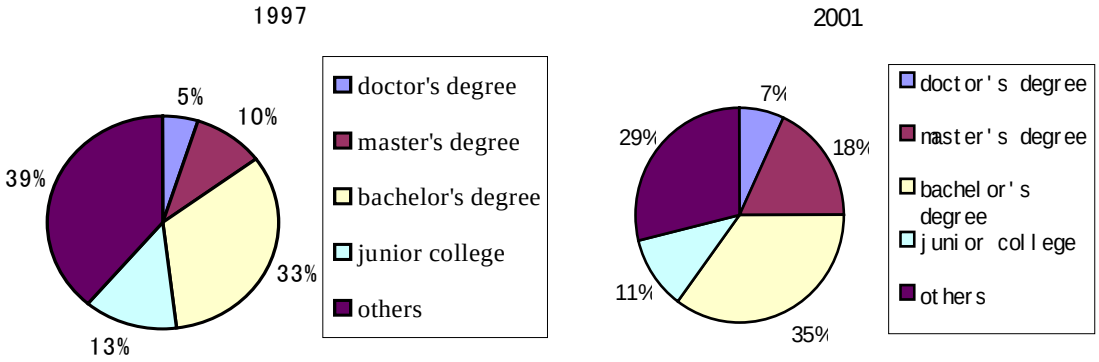


Figure 2. 3 Change in the educational background of the Center's personnel

2.2 Major departments

Department of Environmental Strategy and Policy Research

The Department Environmental Strategy and Policy Research of the Center also functions as the Policy Research Center for Environment and Economy (PRCEE) of SEPA. PRCEE was

established in early 1990s and was incorporated into the Center in May 1996. It is a support provider for macro policy-making for environmental protection。It carries out policy research for environmental and economic issues and provides consulting for environmental protection policy-making in accordance with the requirements and strategic planning of SEPA. Its main fields include research in environmental and economic policy theories and in important environmental issues, service for medium- and long-term policy making, follow-up policy research, information research and international cooperation in environmental protection. It has four research divisions, namely the division for environmental economics research, the division for environmental policy research, the division for intelligence information research and that for environmental rules and laws research, manned by experienced researchers. PRCEE also serves as the Chinese liaison office for the Environmental Information Inquiry System of the UN Environment Program and provides domestic and foreign information service in such areas as environmental policymaking, pollution control and technological development. It has established cooperative relationship with more than 30 countries and regions. Over the years, it has made great achievements in research and has applied the research findings to practice.

Department of Environmental Technology Exchange and Public Education

The Department of Environmental Technology Exchange and Public Education, which also serves as the Center for Environmental Education and Communications (CEEC) of SEPA, is the center of the country's environmental education and promotion network and the platform of international cooperation in environmental education and communications. In addition, it assumes the role of the training center for environment management certification of SEPA. Its main functions indlude: making and implementing plans for important commemorating occasions such as the World Environment Day and for national environmental advocacy campaigns; compiling books and teaching materials and making audio video products for environmental education and building a relevant data base; entrusted by SEPA, making plans for the training of directors of local Environmental Protection Bureaus, compiling teaching materials for the training and setting up a trainers network and a bank of training exam questions; as the training center for environmental management certification of SEPA, carrying out training for ISO14000 environmental management system auditors and environmental management certification, related teaching and research activities, and other environmental protection training; participating in international exchange and cooperation in environmental protection education and training; helping SEPA with the standardization of the environmental education and communication divisions of China's environmental protection agencies at different levels

and instruction in the work of local environmental protection education; organizing and sponsoring national environmental protection advocacy campaigns and managing the public inquiry system of environmental education information; compiling teaching materials for environmental protection; producing special TV features for environmental protection and carrying out environmental protection training.

CEEC has a communication and advocacy office, an education office and an audio-video office. It boasts sophisticated photographic and film-developing apparatus, equipment for tape and video production, and advanced conference training facilities, which can meet the requirements for the production, storage, retrieval and duplication of audio-video materials for environmental protection and holding small and medium scale international conferences. Ever since its foundation, it has made significant achievements in the implementation of the GLOBE plan, international exchange in environmental technologies, training, and the production of TV programs about environmental protection.

Department of Environmental Information

The Department of Environmental Information of the Sino-Japan Center also functions as the Environmental Information Center (EIC) of SEPA. Providing environmental information management and technological assistance, its major tasks are to effectively function as the center of the national environment information network and the hub of data communication, information exchange and technological service and to provide information technological support and service for SEPA

The major roles of the EIC include:

- participating in national environment information development planning and drafting environment information standards and technological norms;
- supporting relevant agencies under SEPA in the construction of the national environment information network and computer application system; managing and maintaining the national environment information network, the satellite communication system and the national environment information website;
- collecting, processing, transmitting, storing and distributing information and data of the national environmental protection sector; constructing and managing the national environment data base; developing, maintaining and promoting relevant applied software;
- constructing, maintaining and managing the office automation network of SEPA;

collecting office information and maintaining the data base for SEPA; providing technological support for the office automation of the national environmental protection system;

- operating as the Regional Activity Center for Data and Information Network of the Northwest Pacific Action Plan;
- carrying out national environment information personnel training and technological exchange and international cooperation and exchange in environment information; and
- supporting SEPA in the standardization of the environment information sector of the national environmental protection system and instruction in the work of local environment information centers.

The Environmental Information Center consists of five main components: Division of Office Automation, Division of Network Operation, Division of Application Development, Division of Information Management, and Division for the Northwest Pacific Action Plan. At the same time, it has administrative and executive secretaries responsible for daily routines.

Open Laboratory

The Open Laboratory of the Sino-Japan Center is also the National Research Center for Environmental Analysis and Measurement (NRCEAM). NRCEAM was established in 1984 as one of the 13 national-level analysis and measurement centers under the direction of the Ministry of Science and Technology. It is a research, training and service center for the analysis and measurement methods and technologies of the environmental science and the environmental protection industry. Since its incorporation into the Sino-Japan Friendship Center in 1996, NRCEAM has assumed the role of the Open Laboratory of the Sino-Japan Center and the base for joint research domestically and internationally and for international exchange. Its work includes carrying out research in new technologies of environmental analysis and measurement, solving the key problems in the field of environmental analysis and measurement of China, developing new methods and technologies of environmental analysis and measurement, undertaking analysis and measurement assisting arbitration in pollution disputes, and providing analysis and measurement service, environment consulting and training for communities and enterprises.

NRCEAM currently has 24 employees and three research divisions for environmental analysis and measurement. And it boasts a great number of sophisticated equipment, including gas chromatograph/ mass spectrometer, gas chromatograph-infrared spectrometer, inductively

coupled plasma spectrometer, X-ray scanning electroscope, X-ray fluorescent analyzer, gas chromatograph, liquid spectrograph, atomic absorption prismatic photometer and ultraviolet prismatic photometer.

As the Open Laboratory, NRCEAM is a platform for domestic and international exchange and joint research in environmental problems. Its objective is to carry out high profile cooperative research focused on regional and global environmental issues, based on research in environmental analysis and measurement. The international joint researches that have been carried out include: " East Asia Environmental Monitoring and Analytical Technology" with United Nations University, " Study of Atmospheric Particulate and Yellow Sand Aerosol" with the National Institute for Environmental Studies of the Japan Ministry of Environment; Sino-Belgium bilateral project "Analysis of Particulate Forms and Impact on Climate"; Sino-France advanced research plan cooperation project "Carbon Particulate Measurement and Air Quality". Key projects under way include the key project of SEPA's "Research on the Impact of Sand Storm and Sand Aerosol on Particulate in Beijing", another SEPA project "Pattern of and Solution to Control Dioxin Emissions from Municipal Solid Waste Incinerators"; a special research project of the Ministry of Science and Technology "Methods of Analyzing Undegradable Organic Pollutant Multi-chloric Benzene"; In order to make full use of its large and medium sized analysis and measurement equipment, NRCEAM also provides analysis and measurement services for external organizations and companies in the sector of chemical industry, petrol-chemical industry, medicine, light industry, food, rubber and metallurgy.

Institute of Reference Materials of SEPA

The Institute of Reference Materials (IRM) of SEPA is the only professional research institute appointed by SEPA in the research and production of environmental reference materials. It is responsible for the technology management of the Environmental Reference Materials Technology Sub-committee of the National Reference Materials Technology Committee. It was established in 1980 and was originally part of the China Environmental Protection Monitoring Center. In early 1996, in order to improve the development and management of environmental reference materials, IRM was incorporated into the Sino-Japan Center when the Center was set up. In 1998, when the former State Environmental Protection Bureau was promoted to "the State Environmental Protection Administration", the Institute was officially renamed as "the Institute of Reference Materials of SEPA".

IRM provides reference materials and technological support to environmental monitoring, scientific research and assessment, technological arbitration and equipment gauging. Its main

jobs include: i）researching, preparing, producing and selling environmental reference materials; ii）supporting and undertaking SEPA's environmental reference materials identification project and related environmental reference technological support, making and implementing research and development plan for environmental reference materials, evaluating the research results and promoting their application; iii）taking charge of the Environmental Reference Materials Technology Sub-committee and its Secretariat of the National Reference Materials Technology Committee; iv）supporting SEPA, China Environmental Protection Monitoring Center and government agencies responsible for reference and standardization, in the appraisal of lab quality control and accreditation and certification of labs in the country's environmental monitoring sector and other sectors related to environmental protection; v） carrying out technological support, technological development, training and exchange in environmental reference materials.

IRM has two research offices: the first research office of reference materials and the second research office of reference materials, and the office of repertoire services management. It owns three assembly lines for the production of various liquid, gaseous and solid reference materials, and about one hundred pieces of apparatus for environmental analysis. And it boasts many experienced senior researchers in environmental reference materials, whose research results have won numerous prizes and awards. It now has over sixty kinds of state-level reference substances of different concentration levels, such as water, air, organic, biological, soil and solid waste reference and more than one hundred types of reference solutions. Every year, it provides over ten thousand reference materials and reference solutions for quality control and assessment over the country and to some foreign countries and regions. It also offers courses and seminars on reference materials application and quality control nationwide.

The Secretariat of China's Accreditation Committee for ISO14000 Environmental Management System Certification Bodies and The Secretariat of China Registration Committee for Environmental Auditor

The China Accreditation Committee for Environmental Management System Certification Bodies（hereafter referred to as "the Accreditation Committee"）and the China Registration Committee for Environmental Auditors (hereafter referred to as "the Registration Committee") were approved by the State Council and established in August 1997. They are respectively responsible for the accreditation and management of the environmental management system certification bodies and the registration of the environmental management system auditors and their training courses.

As early as September 1996, when ISO issued the first series of ISO14000 standards, the State Environmental Protection Administration started to conduct ISO14000 environmental management system certification on a trial basis, which contributes greatly to the application of ISO14000 environmental management standards in China. In order to safeguard the equity and authority of ISO14000 environmental management system certification and to ensure the quality of such certification, China, apart from the pilot certification, established a standard national accreditation system for environmental management system certification. The establishment of the Accreditation Committee and the Registration Committee laid the institutional foundation for the national accreditation system for environmental management system certification. The secretariats of the two committees are set up in the Sino-Japan Friendship Center. The practice of a national accreditation system prevents such problems as confusion of responsibility among government agencies, mismanagement, formalism and declining quality of certification from happening. This has helped the effective application of ISO14000 standards in China.

2.3 Development of the Sino-Japan Friendship Center

The Sino-Japan Center has undergone the following stages of development (see Figure 2.4) since its establishment:

Comprehensive Development Capacity

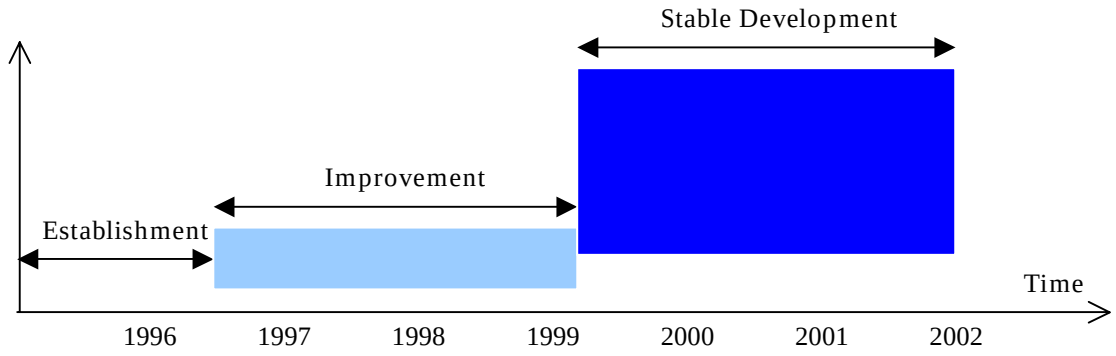


Figure 2. 4 Development of the Sino-Japan Center

Establishment stage（1988 - 1996.5）

The Sino-Japan Friendship Center is a joint project resulting from the discussion and consultation between the leaders of the Chinese government and the Japanese government. In August 1988, the former Japanese Prime Minister visited China and met with the former Chinese

Premier Li Peng. In commemoration of the 10th anniversary of the signing of the Sino-Japan Friendship Treaty, the Japanese government donated 10.5 billion yen for the construction of an environmental protection project in China. In November, 1988, the State Council set up the Directing Preparatory Team for the Sino-Japan Friendship Center headed by Mr. Song Jian and manned by officials from related ministries. On May 8th, 1992, the founding ceremony of the Sino-Japan Center was held in the main building of the Center. The former Chinese vice-Premier Wu Xueqian and the Japanese Prime Minister attended the ceremony and both made speeches, which expressed the hope that the Sino-Japan Center would become the central institution for environmental protection management and technological research in China and would help promote the friendly cooperation between the two countries.

After the preparation and early construction, the hardware facilities and the internal institutions of the Sino-Japan Center were set up and the Sino-Japan Center was officially put to operation in May 1996. The Center for Environmental Education and Communications and the Policy Research Center for Environment and Economy of the former State Environmental Protection Bureau, and the National Research Center for Environmental Analysis and Measurement were incorporated into the Sino-Japan Center. In addition, the Institute of Reference Materials and the Open Laboratory were established. Shortly after, the Department of Environmental Information was set up, which also assumed the role of the Environmental Information Centerof the former State Environmental Protection Bureau. At the same time, the Sino-Japan Center established the General Office, the Party Committee Office, the Division of Personnel, the Division of Finance, the Division of International Cooperation, the Division of Technological Management, the Division of Property Management and the Office of Capital Construction.

With the institutional foundation, the Sino-Japan Center established itself as a comprehensive non-business organization which combines scientific research and management. However, it was then still a new organization with little experience in the field. Therefore, it has encountered many difficulties and problems in its development, such as:

- re-positioning of the sub-centers
- formulation of the internal regulations and rules of its divisions and offices
- how to strengthen its human resource and enhance its capacity
- how to build up its own characteristics and comparative advantages, and to produce positive effects
- how to adapt to the trend of reform and the market development in China

During this period, in order to foster qualified technical personnel and provide technical support to the Sino-Japan Center which was under construction, Japan International Cooperation Agency (JICA) initiated Phase I Technical Cooperation in collaboration with the State Environmental Protection Administration of China (SEPA) which had started in 1992. Three long-term dispatched Japanese experts worked in the Sino-Japan Center and another eleven Japanese experts were invited to the Sino-Japan Center for various short-term technical exchanges. During the period of construction, twelve cooperative activities focusing on technical personnel training were implemented and twenty-four Chinese technical staffs were dispatched to Japan for training. The Sino-Japan Center also received equipment worth of 75 million yen aided by the Japanese Government. Both sides agreed upon that scientific researches should be also conducted during the process of construction of the Sino-Japan Center. Several cooperative research works were started, including the research of yellow sandstorm. Meanwhile, the Sino-Japan Center implemented the programme, “Japanese Overseas Training Courses on Air Pollution Abatement Technology”, signed between JICA and SEPA. In this five-year programme, around 50 persons serving in air pollution control management and technical research would receive a 45-day training each year.

The technical cooperation in Phase I achieved expected results in that qualified staff were in place through the implementation of many cooperative projects, which formed a solid basis for future operation of the Sino-Japan Center. The leader of the Japanese expert team, Mr. Yashima , was awarded the honorable “Friendship Award” by the Chinese Government in 1994.

Improvement stage (1997 - 1998)

The period from 1997 to 1998 saw great improvement in every aspect of the Sino-Japan Center. The improvement began with the deepening of reform and the strengthening of management. The Sino-Japan Center conducted internal adjustment, making the rules and regulations sounder, the institutional function more efficient and the composition of its personnel more rational. Consequently, the capacity of scientific research and management of the Sino-Japan Center was immensely enhanced and every sector began operating effectively. Its pivot role of facilitating and expediting environmental management in China started to materialize.

During this period, the internal rules and regulations of the Sino-Japan Center were established, amended and improved. The Sino-Japan Center formulated over 60 rules and regulations concerning administration, logistics, research and international exchange and cooperation. In order to tighten its internal management, the Sino-Japan Center adopted the objective-responsibility system in 1997. The general principles of this system are as follows: with

regard to personnel management, the incentive mechanism was employed, by which the good win and the bad lose; as to property management, the Sino-Japan Center adopted the practice of "who uses, who pays" to effectuate a virtuous cycle of property maintenance and utilization. The indicators for assessment used in the objective-responsibility system include economic objective, task objective, management objective, and morality objective. The heads of each department and division have to sign the objective-responsibility agreement with the central leaders of the Sino-Japan Center, which renders them responsible for the accomplishment of the objectives. The performance of each division and department will be assessed in the light of the objectives at the end of the year. The most important indicator for the departments is the economic objective, which emphasizes the economic benefits achieved, while for the functional divisions, the most relevant indicator is the task objective, which focuses on good management and service. Awards will then be granted to good performers and punishments inflicted on bad performers based on the results of the assessment. At the beginning of use of this system, some employees felt very much pressured and were not prepared to accept it. After one to two years of practice, however, all agreed that this system was a success because it made them more active in work and brought about more efficiency and economic benefits. Now it has become one of the basic management systems of the Sino-Japan Center.

On order to ensure the quality of its staff, the Sino-Japan Center began to recruit people through exams. At the beginning of every year, the Sino-Japan Center holds recruitment exams to select excellent graduates from universities. The main contents of the exams encompass two parts: basic knowledge of environment and English. The English exam, in turn, consists of two sections: listening and written English. Those who have passed the exams also have to pass the following interview before they can be recruited by the departments and divisions of the Sino-Japan Center. The strict recruitment system ensures the high quality of the personnel, which paves the way for long term development of the Sino-Japan Center.

In 1997, the Sino-Japan Center helped establish the China Accreditation Committee for Environmental Management System Certification Bodies and the China Registration Committee for Environmental Auditors so as to better conduct the management of the ISO14000 environmental management system certification. The two secretariats of the two committees were also established, which made good preparations for the certification. These two secretariats have been playing very important roles in the Sino-Japan Center ever since.

With the concerted efforts of the staff of the Sino-Japan Center, the capacity of the Sino-Japan Center was greatly promoted after a period of time:

- stronger support for policy making. The Policy Research Center for Environment and Economy, while carrying out theme researches of its own, provides technical support for the

State Environmental Protection Administration in policy making through its cooperation with the various departments of SEPA in emergency researches.

- better web system. An environmental information network was established connecting twenty-four provinces (autonomous regions, municipalities) and 90% of the agencies under the SEPA, which centered round the homepage of SEPA.

- higher operational capacity of the lab. The staff working in the Open Lab received training in the operation of large-scale equipments and instruments so that they could conduct analysis experiments independently.

- stronger research and development in reference materials. The Institute of Reference Materials started to develop gaseous reference materials apart from making the old reference materials and gradually enhanced its R&D capacity.

To support the implementation of many tasks of the Sino-Japan Center after its foundation in 1996, SEPA and JICA signed an agreement on Phase II Technical Cooperation. The cooperation in this phase was even strengthened and extended. The Japanese Government dispatched more Japanese experts were to work in the Sino-Japan Center for long-term. In summary, the technical cooperation in Phase II played an important role in building up the capacities of the Sino-Japan Center in many fields, while each sub-division of the Sino-Japan Center developed rapidly through a variety of cooperative projects.

At the same time, the Sino-Japan Center, as a platform for international exchange and cooperation in environmental protection, began to play an active role in this respect. For instance, it successfully completed the second phase of the cooperation project with JICA; it attended the signing ceremony of the Institute of Global Environmental Strategies (IGES) and became one of its member; it also held the APEC Seminar on Sustainable Urbanization and Economic Policies, which was attended by over 60 representatives from thirteen members of APEC.

Stable Development Stage (1999 till now)

The Sino-Japan Center experiences stable development from 1999 till now. At the beginning of 1999, the Sino-Japan Center initiated an institutional reform in response to the call for reform by SEPA. Institutional adjustment was made in the functional divisions and the logistic divisions. The number of functional divisions was decreased from 8 to 5 and the number of employees in these divisions also dropped to 17, compared to 39 originally. Two new institutions were set up, namely the property management company and the conference service center. After the adjustment, the posts are open for election. Those qualified for the positions are elected. Six won the election for the divisional directorship and another five were elected for the posts in the

logistic divisions. Through the reform, the logistics and service sector was separated from the main operation, which reduced redundancy in the administrative departments and clarified the responsibilities of the respective divisions. This in turn improved the management and service quality and the economic return. Some of the administrative staff were relocated to other operational departments, which reinforced those departments. The reform, in summary, re-identified the roles and responsibilities of different divisions, promoted efficiency and enabled the Sino-Japan Center to develop more rapidly and stably.

Progress has been made in every aspect of the Sino-Japan Center:

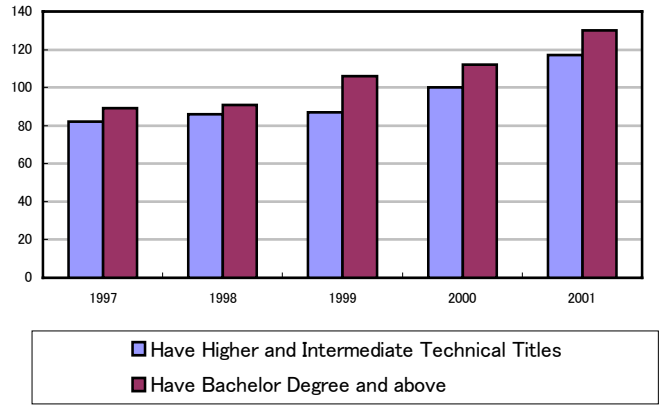


Figure 2. 5 Increase in the personnel quality of the Sino-Japan Center, 1997—2001

- the composition of its personnel is more rational and educational level of the staff has increased greatly. The proportion of employees with intermediate and senior technical titles and with education higher than bachelor's degree is much bigger now, which indicates the increased quality of the staff. Further more, the distribution of the personnel has become more rational. That is to say, most of the high quality people work in the main operations departments (Figure 2.5 and 2.6).

- the economic situation of the Sino-Japan Center has also been improved. The total revenue of the Sino-Japan Center has been on the increase steadily. All the departments and divisions have been operating smoothly. The salaries of the employees have been raised substantially. The Sino-Japan Center has grown to a stage of sustainable development.

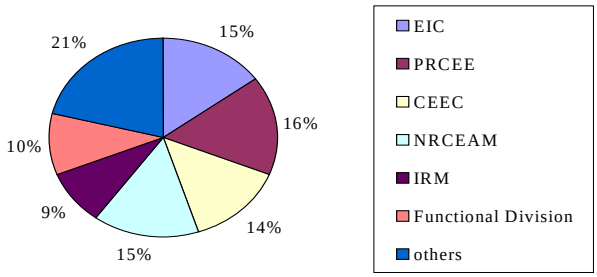


Figure 2. 6 Distribution of employees with intermediate and higher technical titles in 2000

- with regard to the development of the individual departments and divisions, each has conducted its job vigorously and has acquired its own unique features, which in turn has contributed to the development of the environmental management system.

The Policy Research Center for Environment and Economy (PRCEE) has focused its work on providing support for policy making in SEPA. On the one hand, it serves the SEPA directly by drafting conference speeches for the leaders of SEPA and preparing documents and materials for important conferences. At the same time, PRCEE set up several journals, such as *International Environment Reference*, *Policy Research Recommendations*, to provide fast, timely service for SEPA. On the other hand, it has actively conducted many researches in important domestic as well as international environmental issues, which has resulted in substantial technical support for policy making in SEPA. Such researches include Research in Sustainable Development Indicator System of China, China's Foreign Policy on Environment, Impact of Green Barriers on China's Foreign Trade, Implementation of the Convention on Bio-diversity and the Montreal Protocol on Substance that Depletes the Ozone Layer and Negotiation Strategy in Formulating the Convention on Persistent Organic Pollutants. Through such researches, the Policy Research Center has been able to present many important policy recommendations and provide theoretic and technical support for policy making in SEPA. More over, PRCEE has conducted many joint researches with the international organizations, for instance, the World Bank, the Asian Development Bank and the UN Environment Program. Such cooperation is conducive to following the development trend of the international environmental problems, thus helping to work out countermeasures to these problems in China. PRCEE also attaches great importance to the environmental problems in China and has presented a large number of insightful research reports, for instance, the report on digging *Facai*, the report on excessive plucking of herbs for

medical use and the report on the causes of sandstorm, all of which attracted much attention from the State Council and SEPA. Since 1997, PRCEE has conducted a total of over 50 research projects, published dozens of books and more than one hundred research papers. This period also witnessed the fastest development in the research capacity of PRCEE. It now has ten doctors and Ph.D candidates, which account for half of the total staff of PRCEE.

The National Research Center for Environmental Analysis and Measurement (NRCEAM), after years of construction and development, has gradually acquired professional excellency in such areas as solid and liquid waste control technology, organic pollutants analysis and atmospheric particulate analysis. In particular, particulate analysis and related research are cutting-edge staff in the environmental science. NRCEAM used this advantage to conduct technological research in measurement of organic carbon and element carbon particulate and has scored preliminary achievement in this field. NRCEAM has kept to the path of resource sharing, actively cooperating with other related institutions. Its capacity of conducting large-scale research project has been enhanced greatly. Key projects under way include the key project of SEPA “Research on the Impact of Sand Storm and Sand Aerosol on Particulate in Beijing”, another SEPA project “Pattern of and Solution to Control Dioxin Emissions from Municipal Solid Waste Incinerators”; a special research project of the Ministry of Science and Technology “Methods of Analyzing Undegradable Organic Pollutant Multi-chloric Benzene”; The international joint researches that have been carried out include: “ East Asia Environmental Monitoring and Analytical Technology” with the United Nations University, “ Study of Atmospheric Particulate and Yellow Sand Aerosol” with the National Institute for Environmental Studies of the Japan Ministry of Environment, etc.

The Center for Environmental Education and Communications (CEEC) has moved to a cross-disciplinary, multi-level, all-directional development pattern. And its performance has become more standardized and more efficient. It has not only successfully completed many significant tasks, such as the preparation for the Yangtze River Source Monument, the Exhibition of Achievements in Environmental Protection at the 50th Anniversary of the Founding of PRC, but has made considerable progress in environmental training, video production and environmental education. It has also constructed a big environmental education network, advocating environmental protection with the help of radio broadcasting, TV program and holding competitions. Such publicity activities have received good responses from the public. In addition, CEEC has organized various forms of training courses, which has greatly improved the professional quality of the personnel. It has become the major force of environmental education and communications in China and the base for environmental management training.

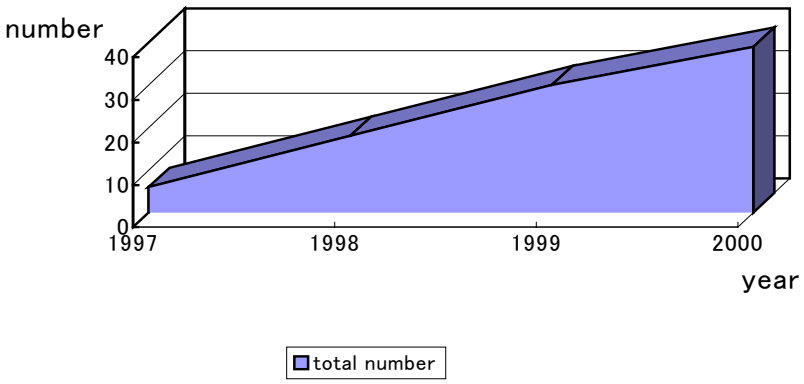
The development of the Environmental Information Center has focused on providing

information service in accordance with the requirements of SEPA. The main task has been the construction, management, development and operation of the national information network. During this period, the Environmental Information Center has developed rapidly. The office automation network system of SEPA has been put to use and the office network has been physically separated from the Internet. The computer network system of the Information Center, SEPA has been completed, which established the national environmental information network system as the hub of the net. The completion of the UNEP satellite earth station has made possible the international exchange and cooperation in environmental information. The first and second phases of the national environmental information satellite communications network have basically been completed, which means the environmental protection sector is now able to communicate via the network internally. In the field of applied R&D, the Environmental Information Centerin accordance with the demand of SEPA in environmental management, has developed a good number of software packages, such as the GIS system for environmental management in the key river basins. Such work has provided technical support and service for environmental management of SEPA. It has also established the official website on China's environmental protection, which is accessible to the public and thus provides a technical platform for open government, distribution of environmental information and environmental education. The computer rooms and the offices have been renovated, equipped with broadband and reinforced with new hardware and relevant software products. All these have greatly improved the working conditions and have paved the way for better environmental information management. At the same time, the Environmental Information Center has taken on several important projects, for instance, the construction of the satellite communications network, the construction of the 100-city information system, the multi-media demonstration system for the eco-environment in China, the development project of multi-media demonstration for the "Three Rivers" and "Three Lakes" and the remote research in west China eco-environmental situations. These undertakings have produced strong technical support for SEPA.

The development objective of the Institute of Reference Materials has been to provide service for environmental monitoring and researches and the focus has been on the development, production and management of reference materials. In addition to the normal target production and sale of reference materials every year, it has conducted researched in reference materials and has developed many new reference materials. It has successfully developed and used five gaseous reference materials: SO_2 reference material、NO_X、CO、non-methane alkyne, and benzene reference materials，and has developed the CO_2 reference material, which bridged the gap between China and some other countries in terms of environmental gaseous reference materials. To cater for the market demand, IRM has initiated several researches ahead of others. 221 of its

reference materials have been selected as national level environmental reference materials. IRM is developing into an important service base providing reference materials for national environmental monitoring and researches.

Since 1999, the Sino-Japan Center has participated in more international exchanges and activities in environmental protection. Not only has Sino-Japan bilateral environmental cooperation been strengthened, various forms of bilateral and regional cooperation with other countries and regions have also been conducted. The Sino-Japan Center has been playing an increasingly important role in international cooperation and exchange in environmental technologies. Its cooperation with Japan takes three major forms: i) environmental cooperation in various fields with Japanese assistance. In Phase II technical cooperation, the Japanese side provided technical equipment worth of 125 million yen. 74 cooperative projects were initiated and gained good research results. ii）Japan sending experts to China on long- and short-term bases. By 2001, 19 Japanese experts of long-term and 52 experts for short-term had done researches in the departments of the Sino-Japan Center. Those experts have not only presented good advice and suggestions on environmental protection to China, but have brought many advanced experiences too. They have made significant contribution to environmental protection in China. Their achievements have been acknowledged and prized by the Chinese government. Two long-term experts from the Japanese expert term in the Sino-Japan Center were given the “Friendship Award” by the Chinese government in 1999 and 2000 respectively. This award is granted to those foreign experts who have made great contribution to China. iii) The Sino-Japan Center sending personnel to Japan for training. People chosen for such purposes are mainly from the four departments and the two secretariats of the two committees. By the end of 2002, more than fifty people have been sent to Japan for training by the Sino-Japan Center (see Figure 2.7).



3. China's Social Environmental Management System

In this part, the development of management capacity in environment is described followed by the state of the environment in China. China's Social Environmental Management System, including three major actors, the government, the firm and the citizen and two levels, the national level and the local level, is then analyzed.

3.1 China's environmental management capacity: a view of development

As in the industrialized countries, environmental protection in China has been growing with the arising of enormous environmental problems and evidence of their damages to our habitat and to the public health. The causes of environmental problems have much correlation with social and economic development. Before we step into the details of China's Social Environmental Management System, an overview of the capacity development in environmental management in the light of time frame and under the broader background of social and economic development will be introduced. The evolution of China's environmental management can be summarized into several stages and each stage is represented by strategic transformation in ideology or significant event. To do this, a Time-Situation-pressure-response Matrix, developed by PRCEE, is applied reflecting the following aspects:

- domestic social and economic situation;
- major environmental pressures; and
- responses, including regulatory arrangement (RA), institutional arrangement (IA) and significant environmental programs and actions (SEP&A).

In the end, major events paving the path of China's environmental management will be listed.

Stage I: 1949-1972

The Time-Situation-pressure-response Matrix for Stage 1 is described in Table 3.1.

Table 3.1 Time-Situation-Pressure-Response Matrix for Stage 1

Factor	Time	Description
Social & Economic Situation	1949-1958	In this period, China experienced rehabilitation of the national economy and the first-five-year-plan after the civil war. The scale of the national economy increased under the system of planned economy.
	1958-1965	This is China's "Great Leap Forward" period and the number of industrial enterprises, especially small- scale steel and iron plants, increased sharply. The size of urban population grew rapidly.
	1966-1972	The well-known "Great Cultural Revolution" began in this period. The industrial construction devoted to quantitative development rather than qualitative development. The layout of industry adopted a strategy of "on the mountains, decentralization and in deep valleys". The urban construction directed to shifting from consuming-type to producing-type.
Environmental Pressure		Industrial pollution without proper abatement facilities, especially air emissions, wastewater discharges and industrial solid waste generation resulted in environmental pollution. Inappropriate layout of both industrial development and urban construction disturbed the eco-system and led to environmental damage. High consumption of materials and energy as a result of low productivity and low efficiency contributed to the depletion of natural resources.

Table 3.1 Time-Situation-Pressure-Response Matrix for Stage 1 (continued)

Factor		Time	Description
Response	RA	1956 1957 1963	No environmental laws, nor specific environmental regulations existed. The content of environmental protection was included in other administrative regulations, represented by *Hygiene Criterion for Industrial Enterprise Designing, Program on the Conservancy of Water and Soil* and *Regulations on Forest Protection.*
	IA		There was no independent environmental institution, except for "three-wastes" [1] management division or office of comprehensive utilization established in some regions or in other state departments.

To sum up, pollution problems just began and associated environmental deterioration was not evident in this period. Environmental problems emerged gradually and were regarded only as "three-wastes", which were not linked with economic development nor put onto the political agenda. The concept of environmental management was not formed. Neither independent regulatory construction nor institutional construction started.

Stage 2:1973-1982

[1] "Three-wastes" refers to air emissions, wastewater discharges and solid wastes generated from industrial

The Time-Situation-pressure-response Matrix for Stage 2 is described in Table 3.2.

Table 3.2 Time-Situation-Pressure-Response Matrix for Stage 2

Factor		Time	Description
Social & Economic Situation		1973-1982	The ten-year "Great Cultural Revolution" made China's economy badly decline. In December of 1978, strategic decision of shifting priorities to the construction of socialist modernization was made by the Third Plenary Session of the Eleventh Central Committee. China has implemented reform and opening-up policy and started transition from planned economy to market economy since 1978.
Environmental Pressure			Regional pollution and environmental damage extended and in some cities with concentrated industries, environmental deterioration occurred.
Response	RA	1973	The guiding principle for national environmental protection work stipulated as 32 Chinese Characters, i.e. "o*verall planning, rational layout, comprehensive utilization, recycling, public participation, taking initiative actions, environmental protection and benefiting the whole society"*, was proposed by the First National Conference on Environmental Protection.
		1973	The State Council transmitted the *Several Resolutions on the Protection and Improvement of the Environment*, formulated by the State Planning Committee. The scope of environmental protection work, regulatory instruments such as System of "Three-Simultaneity", and institutional arrangement were stipulated by the Resolution, which was regarded as the first comprehensive regulation on environmental protection.
		1973	*Industrial "Three-Wastes" Discharge Standard (Trial Version)* was enacted and implemented with regulatory force. This Standard, focusing on the limits of industrial discharges, was an important supplement to previous criterion, which emphasized on the environmental quality.
		1978	*The Constitution of the People's Republic of China* was enacted and environmental protection was defined in this state fundamental law for the first time.
		Sep., 1979	*The Environmental Protection Law (Trial Version)* was enacted by the Eleventh Meeting of the Standing Committee of the Fifth People's Congress and implemented. Three legal systems, i.e. System of Environmental Impact Assessment, System of "Three-Synchronous Requirements" and Pollution Levy System were defined by the Law. From then on, China's environmental protection has been enforced on a sound legal basis.

sector.

Table 3.2 Time-Situation-Pressure-Response Matrix for Stage 2 (continued)

Factor		Time	Description
Response	RA	1981	*The Environmental Management of Construction Project*, a regulatory document issued jointly by the State Planning Committee, the State Construction Committee, the State Economy Committee and the Leading Group on Environmental Protection of the State Council, was implemented as an enforcement basis for the Environmental Impact Reporting System.
		1982	The State Council issued *The Measures on Pollution Levy Collection* and The Pollution Levy System started to implement in the whole country. This is a major economic instrument in the promotion of environmental management and pollution control.
		1982	Environmental quality standards were issued, including *Atmospheric Environmental Quality Standard* and *Marine Water Quality Standard*, etc.
		1973	The guiding principle for national environmental protection work stipulated as 32 Chinese Characters, i.e. "o*verall planning, rational layout, comprehensive utilization, recycling, public participation, taking initiative actions, environmental protection and benefiting the whole society",* was proposed by the First National Conference on Environmental Protection.
		1973	The State Council transmitted the *Several Resolutions on the Protection and Improvement of the Environment*, formulated by the State Planning Committee. The scope of environmental protection work, regulatory instruments such as System of "Three-Simultaneity", and institutional arrangement were stipulated by the Resolution, which was regarded as the first comprehensive regulation on environmental protection.
		1973	*Industrial "Three-Wastes" Discharge Standard (Trial Version)* was enacted and implemented with regulatory force. This Standard, focusing on the limits of industrial discharges, was an important supplement to previous criterion, which emphasized on the environmental quality.
		1978	*The Constitution of the People's Republic of China* was enacted and environmental protection was defined in this state fundamental law for the first time.
		Sep., 1979	*The Environmental Protection Law (Trial Version)* was enacted by the Eleventh Meeting of the Standing Committee of the Fifth People's Congress and implemented. Three legal systems, i.e. System of Environmental Impact Assessment, System of "Three-Synchronous Requirements" and Pollution Levy System were defined by the Law. From then on, China's environmental protection has been enforced on a sound legal basis.
		1981	*The Environmental Management of Construction Project*, a regulatory document issued jointly by the State Planning Committee, the State Construction Committee, the State Economy Committee and the Leading Group on Environmental Protection of the State Council, was implemented as an enforcement basis for the Environmental Impact Reporting System.
		1982	The State Council issued *The Measures on Pollution Levy Collection* and The Pollution Levy System started to implement in the whole country. This is a major economic instrument in the promotion of environmental management and pollution control.
		1982	Environmental quality standards were issued, including *Atmospheric Environmental Quality Standard* and *Marine Water Quality Standard*, etc.

	IA	Dec. 1974	The Leading Group on Environmental Protection of the State Council, consisting members from 20 state departments, such as the State Planning Committee, the Ministry of Urban Construction, the Ministry of Industry, the Ministry of Agriculture, the Ministry of Transportation, the Ministry of Water Conservancy and the Ministry of Public Health, etc., was founded. This was the beginning of China's institutional construction. Local environmental organizations in the light of model of the Central Government were established gradually.
		1979-1981	Local governments established environmental protection bureau or relatively independent environmental protection office. In addition, sectoral environmental protection organizations were set up in such ministries as the Ministry of Metallurgical Industry, the Ministry of Chemical Industry, the Ministry of Light Industry, the Ministry of Textile Industry and the Ministry of Petroleum Industry. *The Environmental Protection Law (Trial Version)* contributed greatly to the development of environmental institutional construction.
		Dec., 1982	The Leading Group on Environmental Protection of the State Council was rescinded and its jobs were shifted to the Environmental Protection Bureau, a new organization formed under the Ministry of Urban Construction and Environmental Protection. Local governments also merged environmental protection organizations with urban construction sector, forming the integration pattern of urban construction and environmental protection.

In summary, environmental protection from ideology point of view was correlated with the social and economic development rather than simply regarded as "three-wastes" in this stage. The concept of environmental management was formed and has developed to the direction of strengthening environmental governance. This ten-year period can be regarded as the fundamental stage, when environmental regulations, laws, standards, organizations were started to establish and legal systems of both regulatory and economic instruments began to implement for the enforcement of environmental management. Three fundamental principles of China's environmental governance were also formed, i.e. i) the principle of coordinated development of economic construction and environmental protection; ii) the principle of emphasizing prevention, integrating both prevention and control and comprehensive abatement, and iii) the principle of polluter pays. Environmental protection has been put onto the political agenda since this period. However, the capacity of environmental management and supervision was still weak which required further strengthening.

Stage 3: 1983-1988

The Time-Situation-pressure-response Matrix for Stage 3 is described in Table3.3.

Table 3.3 Time-Situation-Pressure-Response Matrix for Stage 3

Factor		Time	Description
Social & Economic Situation		1983-1988	China's economy increased rapidly with an average annual growth rate of 10% and was characterized by fast urbanization and industrialization. The pattern of economic growth was extensive rather than intensive. Township and village enterprises (TVEs) grew vigorously.
Environmental Pressure			High energy consumption and high material consumption resulted in high emission level. The total load of emissions increased continuously, which led to the degradation of environmental quality and the deterioration of ecological environment.
Response	RA	Dec., 1983	Environmental protection was defined as a Fundamental State Policy in the Second National Conference on Environmental Protection. The strategic principle, i.e. synchronizing the planning, implementation and development of economic construction, urban construction and environmental construction to facilitate the coordination of economic benefit, social benefit and environmental benefit, was formed. Strengthening environmental governance became the focus of environmental protection work.
		1983-1989	An environmental policy framework with special emphasis on strengthening environmental protection was set up, including three major policies, i.e. "prevention first and an integration of prevention and abatement", "polluter pay, polluter control" and "enhancement of environmental governance".
		1983-1988	The legal institution was strengthened. A systematic framework of environmental laws and regulations was established, consisting of i) environmental laws such as *Water Pollution Prevention and Control Law* (1984) and *Air Pollution Prevention and Control Law* (1987), ii) resource conservation laws such as *Forest Law* (1984), *Fishery Law* (1986), *Mineral Resource Law* (1986) and *Water Law* (1988); iii) environmental regulations including *The State Counci's Resolutions on Environmental Protection* (1984), *State Council's Regulations on Strengthening environmental governance of Township and Village Enterprises* (1984), and *Regulation on the Supervision of Water Pollutant Discharge Permit* (1988), etc.
		1983-1988	The system of national environmental standards was preliminarily established. Standards issued in this stage include *Management of Environmental Protection Standards, Regulations on Ambient Radioactivity Protection of Nuclear Power Plant* (1986) and *Comprehensive Standard of Wastewater Discharge* (1988), etc.
		1983-1988	Five new environmental systems are defined and enforced in this stage, including System of Deadline Setting for Pollution Control, System of Water Pollutant Discharge Permit, System of Goal-Responsibility for Environmental Protection, System of Quantitative Examination of Integrated Urban Environmental Management and System of Centralized Pollution Abatement, etc.

	IA	May, 1984	Environmental Protection Committee was established by the State Council to strengthen the state leadership over environmental protection. The Committee was chaired by a Vice Premier and composed of ministers from relevant state sectors.
		Dec., 1984	The Environmental Protection Bureau of the Ministry of Urban Construction and Environmental Protection was changed the name as National Environmental Protection Agency by the State Council. However, it was also under the leadership of the Ministry.
		March, 1988	The National Environmental Protection Agency was separated from the Ministry of Urban Construction and Environmental Protection and became an organization directly affiliated to the State Council.

Generally speaking, China's environmental protection achieved significant development in this stage and the capacity of environmental management was greatly strengthened in terms of both regulatory construction and institutional construction. From policy point of view, environmental protection was attached great importance by the State and was defined as a fundamental state policy. A framework of environmental policies focusing on strengthening environmental governance was set up consisting of three major policies. A systematic framework of environmental laws and regulations was formed. The system of environmental standards was preliminarily established. Eight environmental legal systems, including three old legal systems defined in stage 2 and five new systems stipulated in this stage, were implemented as basic instruments for the enforcement of environmental policies.

Stage 4: 1989-1995

The Time-Situation-pressure-response Matrix for Stage 4 is described in Table 3.4.

Table 3. 4 Time-Situation-pressure-response Matrix for Stage 4

Factor		Time	Description
Social & Economic Situation		1989-1995	The national economy kept high growth rate. Vigorous socialist market-based economic system has been established. The income level and consumption level gained rapid increase. However, the economic structure as well as industrial structure was not rational.
Environmental Pressure			Generally speaking, environmental damages especially in urban areas became more and more evident and extended to the rural areas rapidly. Both the scope and the degree of ecological deterioration were aggravated. In more specific, i) the quality of most waters worsened, especially of some major rivers and lakes, such as Huaihe River, Haihe River, Liaohe Rive, Chaohu Lake, Dianchi Lake and Taihu Lake; ii) air pollution was very serious in terms of fine particulate pollution in urban areas, acid rain and tail gas exhausted from vehicles; iii) ecological degradation, characterized by forest depletion, desertification and loss of biodiversity, badly developed
Response	RA	Dec., 1989	The revised Environmental Protection Law was issued. In this basic environmental protection law, legal systems and principles for the exploration and utilization of natural resource as well as the protection of ecological environment are well defined.
		1993	The strategic ideology of sustainable development was established and ten policies on environment and development were proposed after the 1992 United Nations Conference on Environment and Development.
		1994	China's Agenda 21 was issued and implemented.
		1989-1995	By the end of 1995, China issued 5 specific environmental protection laws, 8 resource conservation laws, over 20 environmental regulations and 364 national environmental standards. In addition, there were 600 environmental regulations issued by local governments.
		1989-1995	Five new environmental management systems focusing on the System of Environmental Protection Target-Responsibility were enforced.
		1989-1995	Environmental management shifted from end-of-pipe control to the life-cycle management. Cleaner production and eco-labeling were then promoted.
	SEP&A	1989-1995	Industrial pollution prevention and control and integrated urban environmental management were implemented.
		1989-1995	Plantation program, anti-desertification program and ecological agriculture promotion program were implemented.

In this stage, environmental deterioration became more evident. Environmental protection gained highly regards by the Central Government. Sustainable development was defined as a national strategy for social and economic development. Environmental regulatory system as well as environmental management instruments were strengthened.

Stage 5: 1996-2000

The Time-Situation-pressure-response Matrix for Stage 5 is described in Table 3.5.

Table 3.5 Time-Situation-Pressure-Response Matrix for Stage 5

Factor	Time	Description
Social & Economic Situation	1996-2000	China's social and economic development realized great achievement. The productivity upgraded and buyer's market has been formed instead of commodity shortage. The socialist market economy was established. An opening-up economy developed rapidly. The comprehensive national power was greatly consolidated. The living standard reached well-off level. Aimed at increasing the efficiency of energy consumption and material consumption, structural adjustment and transforming the patter of growth were enforced. In this stage, the strategy of "The Great Development of West China" was implemented by the Central Government.
Environmental Pressure		The trend of ecological degradation has not been controlled effectively. Urban environmental pollution and non-point source pollution in the rural areas are still developing. Though the targets of Total Pollution Load Control of Major Pollutants and environmental compliance of major industrial enterprises were achieved, the level of total emission load is still at a high level. Industrial pollution, urban environmental problems together with global environmental issues emerged in the same period of time.

Table 3.5 Time-Situation-Pressure-Response Matrix for Stage 5 (continued)

Factor		Time	Description
Response	RA	Sep., 1996	*The Ninth Five-Year National Master Plan on Environmental Protection and Long-term Targets in 2010* was issued and implemented, in which the Program of Total Volume of Pollution Control and China's Green Project Program were proposed.
		1996-2000	The *Air Pollution Prevention and Control Law*, the *Water Pollution Prevention and Control Law*, the *Marine Environmental Protection Law* were revised and issued.
		1996-2000	New laws and regulations, including *Ambient Noise Pollution Prevention and Control Law, Enforcement Regulations on Water Pollution Prevention and Control, Regulation of Water Pollution Prevention and Control of Huaihe Rive*r and *Regulation of Environmental Management of Construction Project* were formulated and implemented. By the end of 2000, there were 6 environmental protection laws, 10 resource conservation laws, 34 environmental regulations and 427 national environmental standards. 90 administrative rules were issued by the state environmental sector.
		1996-2000	Environmental management shifted from concentration control over pollutant to total pollution load control.
	RA	1996-2000	The integrated environmental management strategy emphasizing on both pollution control and protection of ecological environmental was implemented.
		1996-2000	Ecological conservation has been put onto the agenda of the Great Development of West China.
		1996-2000	A mix of instruments including command & control instrument, market-based instrument, public participation and information disclosure was enforced.
	IA	March ,1998	The National Environmental Protection Bureau was upgraded as the State Environmental Protection Administration, a ministerial level organization.
	SEP & A	1996-2000	The Program of Total Volume of Pollution Control was implemented for 12 major pollutants, including smoke, industrial dust, SO_2, COD, oil, cyanide, arsenic, mercury, lead, cadmium and Cr^{6+}.
		1996-2000	China's Green Project Program (Phase I) was implemented, including 1053 environmental improvement projects.
		1996-2000	The Program of SO_2 and Acid Rain Control in the Two Designated Control Zones, i.e. SO_2 control zone and acid rain control zone, was implemented nation wide.
		1996-2000	In the light of the state policy on structural adjustment, a shut-down policy and the System of Deadline Setting for Pollution Control were implemented to enforce environmental compliance of all industrial enterprises.
		1996-2000	The construction of natural reserves developed rapidly.
		1996-2000	The Project "33211" was implemented, including intensive pollution control over three rivers (Huaihe River, Haihe River and Liaohe River), three lakes (Taihu Lake, Dianchi Lake and Chaohu Lake), two designated control zones (SO_2 control zone and acid rain control zone); one city (Beijing) and one sea (Bohai Sea).
		1996-2000	Environmental infrastructure was constructed intensively.
		1996-2000	The construction of Model City of Environmental Protection was initiated.

To summarize briefly, environmental management shifted from concentration control over pollutant to total pollution load control in this stage, which was regarded as a fundamental change of environmental management. In addition to the capacity building of environmental management in terms of regulatory construction, a number of great environmental programs and actions focusing on industrial pollution control and urban environmental management were implemented to intensify environmental management. Not only the instrument of command & control which is dominantly employed, but also a mix of market-based instrument, public participation and information disclosure was enforced. The average annual total environmental investment in this stage reached 0.93% of GDP. The environmental awareness of the public increased greatly.

Major events paving the path of China's environmental management are listed in the following Table 3.6.

Table 3.6 Major events

Major Events	Time	Note
Chinese governmental delegation attended the United Nations Conference on Human and the Environment.	1972	The Stockholm Conference exerted great influences on China's environmental management.
The First National Conference on Environmental Protection was held in Beijing.	August, 1973	This Conference marked the turning point of China's environmental protection and was regarded as the starting point of environmental policy evolution.
Several Resolutions on the Protection and Improvement of the Environment, an administrative regulation was issued.	1973	This was regarded as China's first comprehensive regulation on environmental protection.
The Leading Group on Environmental Protection of the State Council was founded.	Dec. 1974	This was the beginning of China's environmental institutional construction.
The Constitution of the People's Republic of China was enacted and environmental protection was defined in this state fundamental law.	1978	Environmental protection was defined in this state fundamental law for the first time.
The Environmental Protection Law (Trial Version) was enacted by the Eleventh Meeting of the Standing Committee of the Fifth People's Congress and implemented.	Sep., 1979	This is China's first comprehensive law on environmental protection.
The Second National Conference on Environmental Protection was held in Beijing.	Dec., 1983	This Second Conference was regarded as a milestone of China's environmental protection.
Environmental Protection was defined as a fundamental state policy.	1983	This is the highest level in China's environmental policy framework and strengthening environmental protection became the focus of environmental protection work.
Environmental Protection Committee was established by the State Council.	May, 1984	
The National Environmental Protection Agency was separated from the Ministry of Urban Construction and Environmental Protection and	Dec., 1984	Independent organization was established.

became an organization directly affiliated to the State Council.		
The Third National Conference on Environmental Protection was held.	April, 1989	
The revised Environmental Protection Law was issued.	Dec., 1989	
The strategy of sustainable development was implemented.	1993	
China's Agenda 21 was issued and implemented.	1994	
The Ninth-Five-Year National Master Plan on Environmental Protection and Long-term Targets in 2010 was issued.	Sep., 1996	Two programs, i.e. the Program of Total Pollution Load Control and China's Green Project Program were proposed
The National Environmental Protection Bureau was upgraded as the State Environmental Protection Administration.	March, 1998	SEPA is a ministerial level organization.

Source: the authors.

The development of China's environmental management capacity is shown in Figure 3.1.

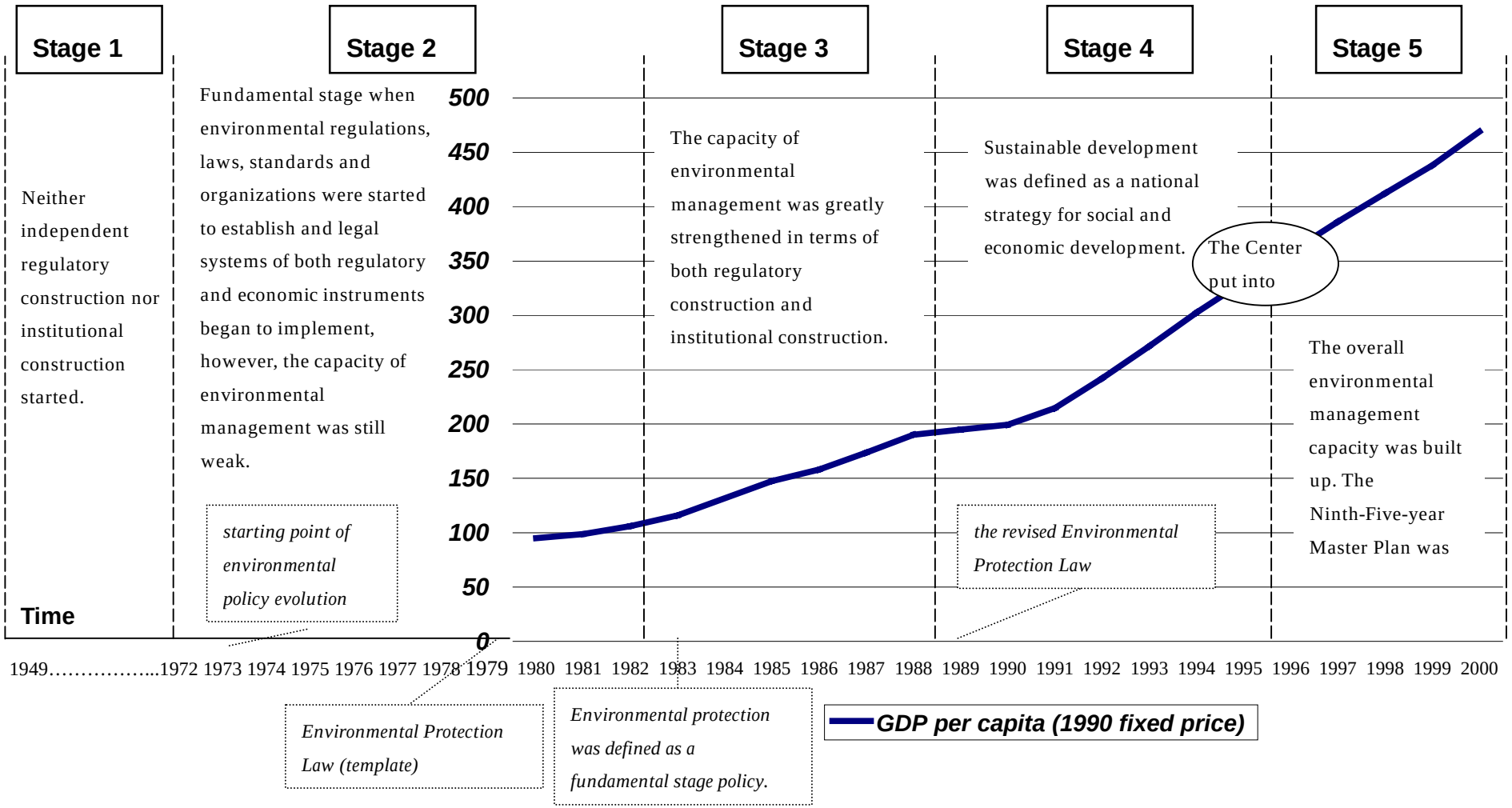


Figure 3.1 Development of China's Environmental Management Capacity

3.2 Environmental situation in China

With great efforts made on environmental protection in the past 20 years, China has generally controlled the trend of environmental deterioration and improved environmental quality in some cities and regions at a certain degree. However, the environmental situation is still very serious. The pollution emissions are still very high in China and the environmental quality in some regions is still declining.

China has invested intensively in pollution abatement and in the improvement of environmental quality for recent years, however the growth of such an investment is far lower than the economic growth.

Therefore, China is challenged not only by the existing environmental problems, but also by the emerging environmental problems, such as air pollution from the crowding vehicles in cities and water pollution discharged from intensive breeding of livestock and poultry around cities.

This section will analyze both existing and emerging environmental problems from views of pollutant emissions and environmental quality, including pressures and states of air pollution, water pollution, and solid waste.

3.2.1 Air pollution

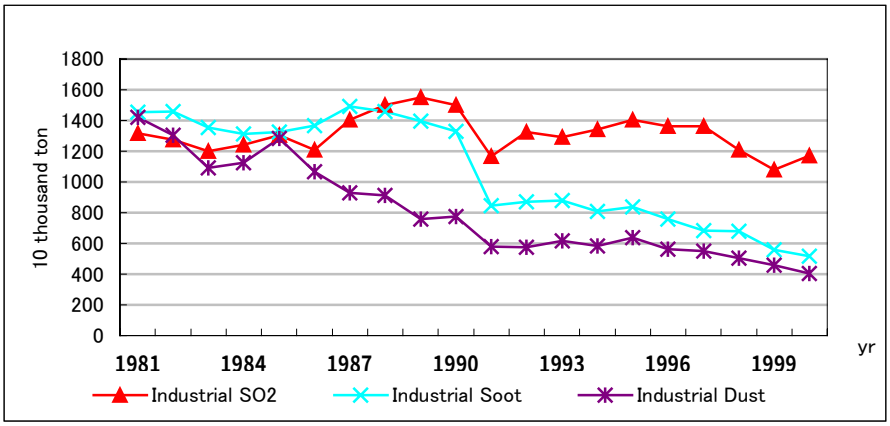
Air pollution emissions

Major air pollutants include SO_2, soot, industrial dust and NO_X. Most SO_2emissions, industrial dust and more than half of the suspended particulate are caused by energy consumption, especially coal consumption. The NO_X emissions are increasing quickly with the growth of vehicles, which makes air pollution caused by tail gas from vehicles become more serious, especially in mega-cities.

From Figure 3.2, one can find that the total emissions of industrial SO_2 reached the peak in 1989 and then decreased since 1990. It rose again in mid 1990s and declined once again in 1998 after the government shut down some industrial enterprises with heavy pollution. From 1995 to 1998, the SO_2 emissions decreased 10%, due to the reduction of coal consumption. In 2000, the SO_2 emission increased a bit again. The fluctuation of SO_2 emissions shows great difficulties in fully controlling over the SO_2 emissions in China although a bundle of policies and measures have been adopted.

The emissions of industrial soot in China had been very high in 1980s and then began to

decline sharply since 1990. The emissions of industrial dust have declined since the beginning of 1980s. The two emissions have a similar declining trend in 1990s, which is the effect of stricter command and control measures.



Source: China Environment Yearbook, 1990-2000

Figure 3. 2 Air pollution emissions

The tail gas from vehicles is quickly becoming one major air pollutant in urban areas, but it was not realized in early 1990s. However, the number of private vehicles has increased very fast since 1990 (see Table 3.7), and the average emissions of vehicles in China are much higher than that in other developed countries. For example, the NOx emission of each vehicle is 7 times of that in Tokyo.

Table 3.7 Average growth rate of registered private vehicles in 1990-1999

Category of Vehicles	Average Annual Growth Rate (%)
Cars:	19
Private ownership	33
Others	14
Trucks:	7
Private ownership	17
Others	4
Special type	7
Cars and trucks	12
Motorcycles	26

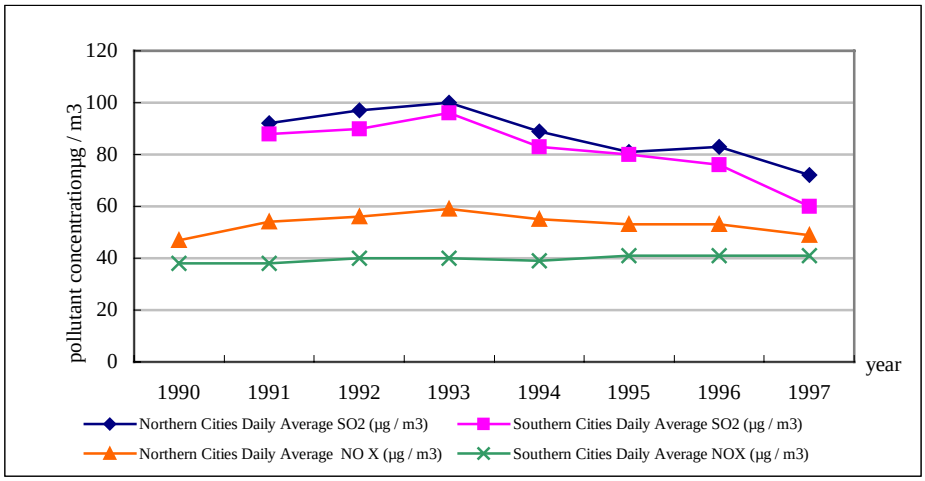
Source: ZTN (2000)

In briefly, coal burning will continue to be the dominant source of air pollution. But the air pollution caused by tail gases from vehicles have increased so rapidly that tail gases from

vehicles will become the dominant and widespread pollution source in urban areas next 10 years.

Air quality in urban areas

With the rapid urbanization process and the increase in population and vehicles, some of the large and middle cities begin to show mixed pollution due to both coal soot and vehicle exhaust gases. Usually, the air pollution in northern cities is more severe than that in southern cities. The total suspended particle (TSP) concentration in northern cities is higher than that in the southern cities. On average, the concentration of TSP in the North is nearly twice of that in the South. The concentration of SO_2 and TSP both in northern and southern cities are presenting a decreasing trend, which shows the effectiveness of measures to control urban air pollution. The NO_X concentration in southern cities is basically stable, excepting a slight increase. As for northern cities, NO_X concentration began to decrease year by year after reaching a peak in 1993 (Figure 3.3). In 2000, among 338 monitored cities, 36.5 % of then have met the national standard of Grade II and 63.5% worse than Grade II. 112 cities have the air quality beyond Grade III standard, accounting for 33.1% of the total monitored cites. In general, the urban air quality in 2000 was better than in 1999, which is indicated by the rising percentage of the cities having compiled with the air quality standard and the reduced number of the cites with the air quality worse than Grade III. The trend of urban air quality deterioration is somewhat turning around. Air quality in some cities has been improved, while others still suffer severe air pollution.



Source: China Environment Yearbook, 1991-1998

Figure 3. 3 Urban SO_2 and NO_X

TSP pollution is prevalent in all cities in China. With the reduction of SO_2, TSP will be paid more attentions, especially by big cities. During 1990s, the population exposed in TSP pollution above Grade II has increased 2% because the growth of the population in cities is higher than the reduction rate of pollutants.

The air quality in small towns are not better than that in big and medium cities, because residents and business sectors in small cities are more dependent on coal consumption. The statistics show that the air pollution in small cities has become slightly serious (see Table 3.8).

Table 3. 8 Changes of air quality in small cities

Year	SO_2	TSP	NO_X
1990	65	327	26
1998	71	330	33

Source: China Environment Yearbook, 1991, 1999

Acid rain

The problem of acid rain is severe in China. In the late 1980's, acid rain only occurred in a few regions. Now it has expanded to most of the areas on the south of Yangtze River and on the east of Tibet, covering 30% of China's land territory.

In 2000, among 254 monitored cities, the pH value of the precipitation ranged from 3.98 to 7.70. Acid rain occurred in 157 cities, accounting for 61.8%. The average annual pH value of 92 cities was smaller than 5.6, accounting for 36.2%.

The average annual pH value of 102 cities and regions within the acid-rain-control zone ranged from 3.98 to 6.90. Acid rain occurred in 95 cities, accounting for 93.1%. The average annual pH value of 72 cities was smaller than 5.6, accounting for 70.6%. Acid rain was not found in Shanwei, Chaohu, Qujing, Ma'anshan, Chibi, Qiangjiang and Deyang.

The acid rain causes hazards to agriculture, forestry, live farming, fishery, architecture, cultural relics and human health. According to researches on acid precipitation and its effects on ecological environment in China, SO_2 is an important pollutant that causes the agricultural production loss in the 7 provinces of eastern China (Zhejiang, Jiangxi, Hunan, Hubei, Jiangsu, Fujian, Anhui). In these 7 provinces, 19% of the farming lands (10 million hectares) are affected by acid precipitation. The annual production loss is 5.6 million tons, which occupies 4.34% of the total production and values 3.7 billion yuan (in price of 1993). The economic loss of vegetable production is 2.2 billion yuan (60% of total loss). 1.3 million hectares of forest in the 7 eastern provinces are suffered by acid precipitation, accounting for 4.2% of total forest area and 6.5% of timber forestland. The acid rain causes the reduction in timber production of 1 million m^3, of which the economic loss is 0.6 billion yuan and the estimated forest ecological loss is 5.4 billion yuan (see Table 3.9).

Table 3. 9 Economic loss on forest caused by acid precipitation in 7 eastern provinces

(in 10^6 Yuan)

Province	Economic Loss on Timber			Economic Loss on Ecological Benefits		
	Masson Pine	Cedarwood	Average	Masson Pine	Cedarwood	Average
Jiangsu	17	12	29	150	110	260
Zhejiang	150	60	210	1350	540	1890
Anhui	7	2	9	60	200	80
Fujian	15	56	71	140	500	640
Jiangxi	41	93	134	370	840	1210
Hunan	24	56	80	220	500	720
Hubei	30	37	67	270	330	600
Total	284	316	600	256	2840	5400

Source: Research on Acid Precipitation and its Ecological Effects in China, China Research Academy of Environmental Science, 1996

The control of acid precipitation should be intensified considering two trends. First, the biggest source of SO_2 emission will be dominated by coal-burning power plants; secondly, the

percentage of end consumption of coal will be decreased.

3.2.2 Water pollution

In early 1990s, China's main water pollution source is industrial wastewater, especially discharged by state-owned industrial enterprises. With a series of measures including command and control, administrative measures, economic instruments and public participation, the wastewater discharge stopped to increase and turn to decline in the mid of 1990s. However, the water pollution prevention and control is become more complicated and the water quality in many rivers and lakes will be continuously worse.

Wastewater discharge

Although the economy has been developing rapidly since the 1990's, the industrial wastewater discharge basically follows a decreasing trend. The quantity of wastewater that is treated increases in a relatively high speed; at the same time, the rate of treatment and the rate of discharges meeting the State Standards increase year by year. The pressure on water environment is released to certain extent, while water pollution is still in a severe status. The industrial and sanitary wastewater discharge is 4x1010 tons in 1999, including 2 x1010 tons of industrial wastewater and 2x1010 tons of sanitary wastewater. The amount of sanitary wastewater exceeds that of the industrial wastewater for the first time. The total COD discharge is 13.89 million tons. The COD of industrial wastewater and that of sanitary wastewater occupy 49.8% and 50.2% of total COD discharge respectively.

In 2000, the total amount of discharge of municipal and industrial wastewater across China (including sources of pollution from the key town and village enterprises and the enterprises above county level) was 41.5 billion tons, among which the total amount of industrial wastewater was 19.4 billion tons and that of municipal wastewater was 22.1 billion tons. The amount of COD in the discharged wastewater was 14.45 million tons. 7.05 million of COD came from industrial wastewater and 7.4 million tons from municipal wastewater. The rate of industrial wastewater treatment across China was 94.7%. The rate of compliance with the discharging standard for industrial wastewater was 82.0%.

Table 3. 10 Discharges, treatment of wastewater from industrial enterprises above county-level and discharges meeting the state standards

Year	Total Discharges of Industrial Wastewater (billion tons)	Industrial Wastewater Treatment Rate (%)	Percentage of Industrial Wastewater Discharge Meeting the State Standards (%)
1991	23.59	63.5	50.1
1992	23.39	68.6	52.9
1993	21.95	72.0	54.9
1994	21.55	75.0	55.8
1995	22.19	76.8	55.4
1996	20.59	81.6	59.1
1997	18.83	84.7	61.8
1998	17.12	88.2	67.0
1999	16.08	91.1	72.1
2000	15.31	95.0	82.1

Source: China Environment Yearbook 1992-2001

From comparison of wastewater discharge and COD amount in 1995 and 2000 (see Table 3.11), you can find that the discharges of industrial wastewater and COD in it have decreased 31% and 56.6% and the discharge of municipal wastewater and COD in it have increased 65.2% and 21.3%.

Obviously, greater efforts should be made to control the discharge of municipal wastewater, and the control of COD should mainly concentrate on industrial sources. The capacity of municipal wastewater treatment should be improved. It is predicted that this capacity should increase 6-7 times in 20 years with a lot of investment.

Table 3. 11 Comparison of wastewater discharge and COD amount in 1995 and 2000

Item / Year	Discharge of Wastewater (100 million tons)			Discharge of COD (10 thousand tons)		
	Industrial	Municipal	Total	Industrial	Municipal	Total
2000	194.2	220.9	415.1	705	740.5	1445.0
1995	281.6	133.7	415.3	1622.9	610.3	2233.2
Up/down (%)	-31.0	65.2	0.00	-56.6	21.3	-35.3

Source: Report on the State of the Environment in China, 2000, SEPA.

Water pollution in major rivers

According to the water quality data of the 7 main river systems in 1991 and 1998 (see table 3.12), Liao River, Hai River and Huai River are polluted seriously, while Pearl River and Yangtze River are only slightly polluted, and the water quality in these two rivers are basically sound. In

comparison with the state in 1997, the water quality of Yangtze River, Huai River and Pearl River in 1998 had become better, while the water quality of Yellow River, Hai River and Songhua River remained stable and that of Liao River had become worse. Eutrophication occurs in Chao Lake, Dianchi Lake, Tai Lake and some other lakes in urban area. Deterioration of offshore water quality is becoming more and more apparent. The pollution of key estuaries, bays, ports and waters nearby large cities is comparatively severe. Inorganic Nitrogen and inorganic phosphor in most waters and oil in some waters exceed water quality standards. Eutrophication also occurs in offshore waters, Red tide breaks out frequently. Fishery resources in some important waters are destroyed and the number of species is decreasing.

Table 3. 12 Proportions of seven main rivers meeting different water quality standards

Year	1991			1998					
Standards / Water System	I-II (%)	III (%)	IV-V (%)	I (%)	II (%)	III (%)	IV (%)	V (%)	>V (%)
Yangtze River	54	16	30	4	67	4	11	10	4
Yellow River	29	4	67	0	24	5	47	12	12
Pearl River	57	27	16	29	36	7	22	2	4
Huai River	5	30	65	0	11	17	18	6	48
Hai River	9	0	91	5	19	4	10	9	53
Liao River	6	0	94	4.5	2.3	4.5	22.7	4.5	61.4
Songhua River	19	23	58	0	0	4	67	21	8

Source: Report on the State of the Environment in China, 1992,1999, SEPA

In 2000, the organic pollution was universal in the surface water of seven major river basins in China. 57.7% of the sections of mainstreams of various river basins met the water quality standard for Grade III. 21.6% met the standard for Grade IV and 6.9% that for Grade V. And 13.8% has the water quality worse than the standards for Grade V. The eutrophication of major lakes was an outstanding problem.

Marine environment

In 2000, the areas of marine environment with the water quality of Grades II, III and IV and IV above were 102,000 square kilometers, 54000 square kilometers, 21,000 square kilometers and 29,000 square kilometers respectively. The pollution was serious in the offshore and costal areas.

The main pollutants in the marine waters are inorganic nitrogen, phosphate, petroleum, mercury and lead.

Among four major marine areas of Bohai Sea, Yellow Sea, East China Sea and South China Sea, the offshore of Bohai Sea has an obviously abated level of pollution which is still relatively high. The pollution of the offshore of east China Sea is being aggravated and the water quality offshore the Yellow Sea and South China Sea is basically maintained normal. The sequencing of pollution levels of four major marine areas is the East China Sea, Bohai Sea, the South China Sea and the Yellow Sea.

According to an incomplete statistics, about 10 oil spills occurred in the marine areas of China in 2000. Among them, the most serious one happened on November 14 when a foreign oil ship was sunk by another foreign ship near Humen Bridge at the estuary of the Pearl River. The oil ship was seriously damaged and fuel oil of 230 cubic meters it carried was spilled over to the marine areas of Shiziyang and Lingdingyang located at the estuary of the Yellow River. The area contaminated by the oil spills was about 390 square kilometers.

In 1990s, the frequency of recorded red tides suddenly increased. In 2000, China recorded 28 red tides that occurred in the marine areas of China, 13 more than in 1999. The area affected by red tides amounted to more than 10,000 square kilometers. Among all this, 11 red tides happened in the East China Sea, covering an area of over 7,800 square kilometers; 7 in the Bohai Sea, covering an area of 2,000 square kilometers; 4 in the Yellow Sea, covering an area of over 800 square kilometers and 6 in the South China Sea, covering an area of 50 square kilometers.

The marine areas with a high frequency of red tides are the offshore and coastal areas of Zhejiang, Liaoning, Guangdong, Hebei and Fujian and the coastal areas of central Zhejiang, Liaodong Bay, Bohai Bay, Hangzhou Bay, Pearl River Estuary, Xiamen and the northern part of the Yellow River. The organisms causing red tides are mainly plankton.

3.2.3 Solid wastes

The solid wastes affect environmental quality by taking up lands and polluting the air, water and soil pollution. In the 1990's, the quantity of industrial solid waste increased year by year and remained around 6.5 x 10^8 tons (see Table 3.13). In 1998 the total industrial solid waste quantity is 8.0x10^8 tons, including 6.4 x 10^8 tons from industrial enterprises above county level, which accounts for 80% of the total. Industrial solid waste discharge is 70 million tons, including 18 million tons from enterprises above county level and 52 million tons from TVEs (accounting for 74.1% of the total). The reuse and recycle rates of solid waste of TVEs are far less than those of

the enterprises above county level. The amount of solid waste being recycled and reused is increasing. The reuse rate increased from 36.6% in 1991 to 45.6% in 1997. However, the accumulated industrial waste storage increased rapidly from 1993 to 1995. In spite of its decreasing from 1995, the storage is still higher than the level of 1993.

Table 3.13 Industrial solid waste generation, reuse, disposal and discharge

Year	Generation (10^4ton)	Reuse (10^4ton)	Reuse Rate (%)	Storage (10^4ton)	Disposal (10^4ton)	Discharge (10^4ton)	Accumulated Storage (10^4ton)	Storage Area (10^4 m^2)
1991	58759	22284	36.6	27588	11696	3376	596253	50538
1992	61884	25554	39.6	26836	13986	2587	591608	54523
1993	61708	24826	38.7	26665	15720	2152	596576	52052
1994	61704	26693	41.8	24828	17642	1932	646282	55697
1995	64474	28511	42.9	24799	14204	2242	664055	55440
1996	65879	28364	43.0	26364	11491	1690	649286	51680
1997	65749	30009	45.6	27980	10876	1549	647183	50650
1998	63648	33387	48.3	27546	10527	1821	678817	65412

a. County level and above county level industrial enterprises

Source: Report on the State of the Environment in China, 1991-1998, SEPA,

In 2000, the total amount of generation of industrial solid wastes was 820 million tons. 670 million tons came from the industrial enterprises above county levels. 150 million tons came from the township and village enterprises. The total amount of discharging of industrial solid wastes was 31.86 million tons. 21.46 million tons were discharged from the ownership and village enterprises accounting for 67.3%. The amount of generation of hazardous wastes was 8.3 million tons. Among this, 7.96 million tons were generated from the industrial enterprises above county levels, accounting for 95.9% of the total hazardous wastes generated.

In the major big cites of China, municipal solid waste generation is about 1 kg daily per capita, and total amount is increasing at the speed of 6%-7% annually. The innocuous treatment rate is so low that some cities are besieged by garbage. The solid waste pollution problem is now urgent to be solved.

3.3 China's Social Environmental Management System

Social Environmental Management System is the interactions among three actors, the government, the firm and the citizens and the roles played by each actor in addressing environmental problems and improving the environmental situations at both national level and

the local level (see Figure 3.4).

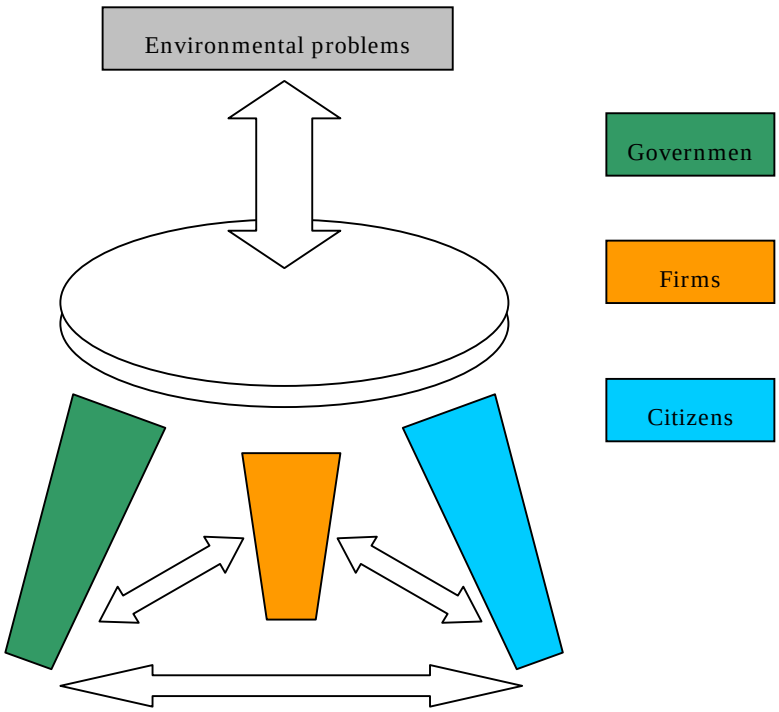


Figure 3. 4 Social Environmental Management System

3.3.1 National government and its role in China's Social Environmental Management System

Similar to other countries, China structures its environmental governance in three organizational systems: legislative bodies, judicial bodies, and administrative bodies (Figure 3.5). Among three systems, environmental legislative bodies and juridical bodies are integral parts of general organizational systems of national legislation and judiciary, respectively, not like environmental administrative bodies which are normally independent organizations under governments.

Environmental legislative bodies

In China, environmental legislation is under authorities of the National People's Congress (NPC) and local people's congresses (LPCs) of provinces and municipalities as well as several special economic districts like Shengzhen. The NPC is the supreme hierarchy of state power responsible for national legislation including environmental contexts, whereas the LPCs have an

authority to stipulate local laws and regulations in their jurisdiction, in according with the national ones related. The Standing Committees act as regular bodies under the NPC and LPCs to deal with general affairs. For environmental purposes, the Standing Committees at all levels install sub-committees of environment and natural resources protection, which have mandates both to make preparations for environmental legislation and to supervise the implementations of environmental laws and regulations by governments. At the national level, normally the State Environmental Protection Administration (SEPA)—an overseeing body for environmental protection—makes a proposal for environmental legislation, and submit to the State Council. The State Council then reviews it and prepares the bill with a consensus among relevant ministries. Next, the NPC starts its work on the bill submitted, with further reviewing, asking for comments from various circles, achieving consensus among relevant interested parts including administrations and civil societies, and removing conflicts and harmonizing contexts between the bill and the existed laws/regulations. Finally, the proposed law/regulation could be stipulated by the NPC. Certainly, the NPC can also make a proposal for legislation. At the local level, a similar process is employed in local environmental legislation. But local process usually takes shorter time because of a smaller jurisdiction and less coordination, compared to the national process.

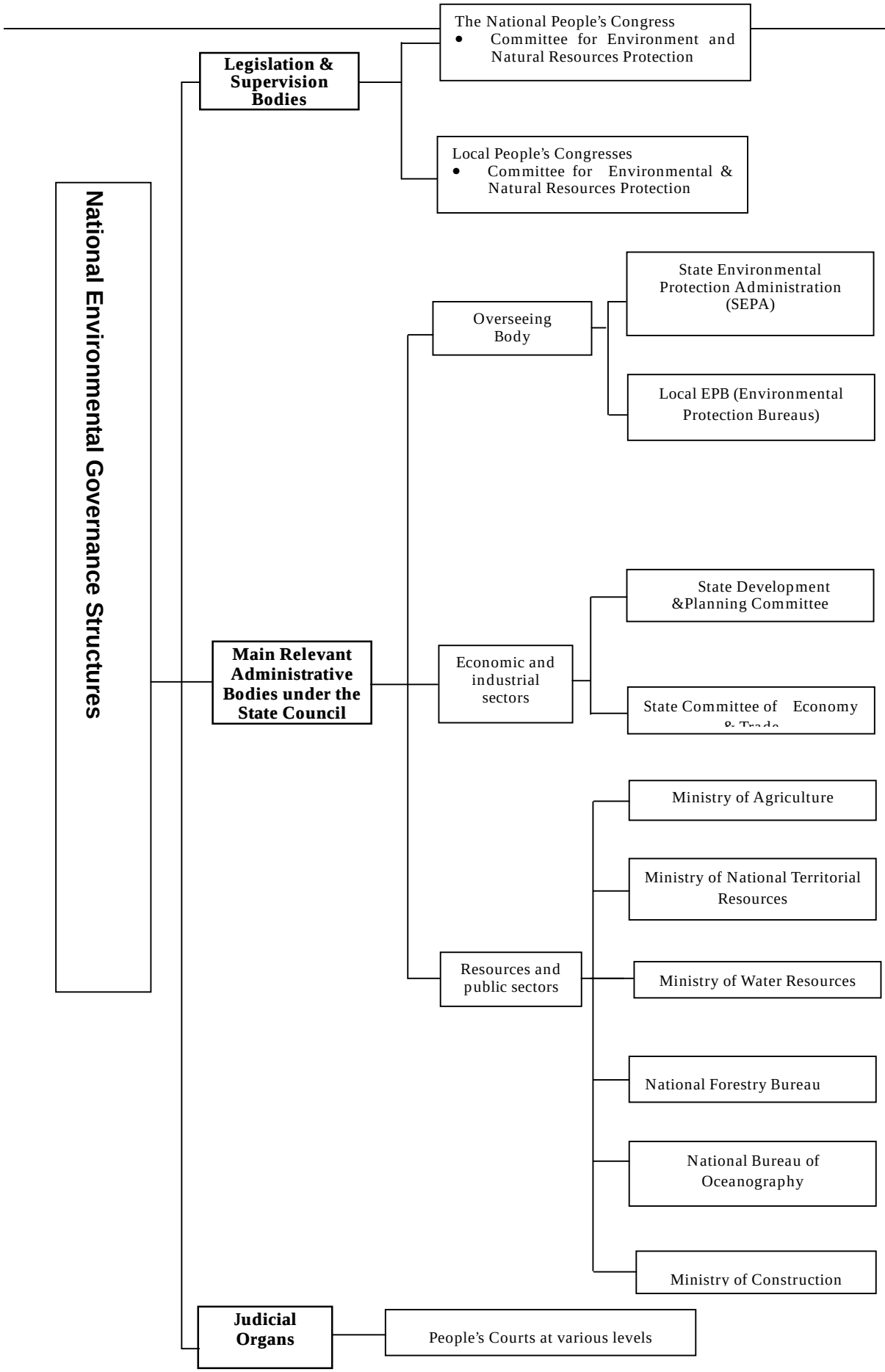


Figure 3. 5 National structures of environmental (and natural resource) governance

Source: The authors

In addition to environmental laws and regulations stipulated by the NPC, the State Council has an authority to issue national ordinances, decisions and rules as necessary, which also have legal basis. Likewise, the SEPA can, independently or jointly with other relevant ministries, issue ministry-level decisions, rules, standards and administrative systems. Provincial and municipal governments have a same authority in their jurisdictions. But the local environmental protection bureaus have rather a mandate to implement environmental policy than to formulate policy, not like the authorities and missions their governments and the SEPA share.

Environmental administrative bodies

The SEPA is mandated as an overseeing body under the State Council, with general missions and responsibilities for formulating environmental policies, plans and standards and supervising implementation of policies nationwide (Box 3.1). However, environmental management involves so many aspects of the socioeconomic system that it is beyond the capacity of one or even a few organizations to address all of them. Therefore, other relevant ministries are necessarily and naturally involved in environmental management. They mainly include economic and industrial sectors and resources and public sectors (Figure 3.5). For example, the State Committee of Development and Planning is responsible for coordination and approval of national environmental plans and regional environmental programs. In many respects the State Committee of Economic and Trade Commission are deeply involved in industrial pollution control, including industrial structures, layout and technology improvement; cleaner production technology; energy conservation; and environmental industry. The Ministry of Construction manages environmental infrastructures including sewage pipe system, sewage treatment, and garbage disposal. Other resources sectors, such as ministries of agriculture, forestry, water resources, national territory and etc., take care environmental protection in their own jurisdictions.

Environmental judicial organs

Environmental judicature is one of important approaches to protecting environmental rights of social members and interested groups. The people's courts at all levels from the national to the local take on this responsibility. They deal with civil, administrative and criminal lawsuits concerning environmental issues and make final adjudication for the cases. In reality, the most of cases of environmental disputes and administrative disputes with regulated parties are resolved

through administrative procedures of mediation, and only a few cases are filed to the courts.

3.3.2 Local structures of environmental administration

The local environmental administration in China is structured in three levels as general administrative hierarchy: provincial/metropolitan/autonomous region, municipal, and district and county. Each local government installs their own environmental protection bureau (EPB), and in many cases, EPBs in districts under municipal jurisdiction are built as branches of municipal EPBs. The structures of local EPBs including their affiliated organizations are, to some extent, similar to the SEPA but simplified in smaller size based on local necessities, and normally the lower, the smaller, from province to county. It is also true, the lower the EPB is from province to county, the more missions and responsibilities for implementation of policies and plans as well as programs the EPB takes on, and the less mandate of policymaking the EPB has.

3.3.3 Implementation mechanism of environmental governance

Chinese environmental governance has being for a long time followed government-driven approach or top-down approach. The government plays a critical role in initiating and conducting environmental activities. Forces or actors outside government including the public, civil societies and environmental NGOs are too week to exert a significant influence on national environmental agenda and to move environmental activities nationwide forward. However, the situation has being changed since the late 1990s particular. The representatives of the NPC and local people's congresses, citizens in big cities, civil societies and environmental NGOs have increased their presence in the ways of both governmental agenda and voluntary activities.

Box 3.1 Structures and Mandates of SEPA

Mandates and missions of SEPA include:

- Drafting national guidelines and policies, formulating administrative regulations on environmental protection; implementing environmental impact assessment for key national economic-technical policies, development plans and economic plans; drafting national environmental protection plans; coordinating the formulation of pollution prevention plans for regions and watershed and supervising their implementation;
- Formulating and implementing regulations on the prevention and control of air pollution, water pollution, soil pollution, noise pollution, solid waste, hazardous waste and automobile pollution; guiding and coordinating the protection of marine environment;

- Supervising activities of environmental-related such as the exploitation and utilization of natural resources which may exert impacts on the ecological environment; the construction of ecological environment and the recovery of ecological degradation; the protections of natural reserves, scenic spots, historic resorts and forest parks; the protections of biodiversity and wild species; desertification conservation and mitigation; and national natural zones;
- Guiding and coordinating local governments and inter-sectors concerned in addressing major cross-regional or cross-watershed environmental issues; investigating and resolving big accidents of pollution and ecological destruction; coordinating cross-provincial environmental disputes and monitoring the implementation of laws and regulations;
- Formulating and issuing national standards including environmental quality and pollution discharge; reviewing municipal master plans in relation with environmental protection; coordinating the compilation of national environmental quality report; issuing national bulletin of environmental state and drafting guidelines for national strategies of sustainable development;
- Formulating and implementing environmental management systems; examining the environmental impact report of developmental projects and providing guidance on the construction of ecological pilot projects and eco-agricultural projects;
- Supervising implementation of eco-labelling system and promoting development of environmental industry;
- Holding the responsibilities for environmental monitoring, statistics and information; and promoting the participation of the public and NGOs;
- Drafting guidelines for global environmental issues; responsible for international environmental cooperation; participating in global environmental activities; supervising and coordinating the performances of international conventions, protocols and agreements in China;
- Holding responsibilities for nuclear safety; and etc.

SEPA installs ten departments in addressing the missions above: general office, dept. of planning and finance; dept. of policy and legislation; dept. of administration and personnel; dept. of science, technology and standard; dept. of pollution control; dept. of natural resource conservation and ecological protection; dept. of nuclear safety and radiation management; dept. of supervision and management, and dept. of international cooperation. There are 200 staff headed by one General Administrator and 4 Deputy Administrators. Under the SEPA, there are also several affiliated organizations which provide technical support services for the SEPA, such as the National Monitoring Station, Chinese Academy of Environmental Science, Policy Research Center for Environment and Economy, the National Environmental Information Center, College of Environmental Official Training and etc.

On the administrative side, environmental management is conducted through cooperation

among bureaucratic hierarchy from national to local (Figure 3.6). Lower governments and EPBs have legal and administrative duties and responsibilities to carry out missions delegated from the upper. In addition, China has introduced two top-down systems to push local governments to play a leading role in environmental management: system of goal-responsibility of local governments for environmental protection, and system of quantitative review of urban environmental performance.

On the other hand, a number of administrative powers and responsibilities as well as a part of tax revenues have devolved upon metropolitan and provincial governments since the carryout of "open and reform" policy in the late 1970s. The local shares in both the total public expenditures and the total tax revenues in China are the highest ones in East Asia. As a result, many local governments, in particular in East developed areas, have good capacities and increasingly initiatives in launching local environmental actions. They inaugurated some campaigns and policy instruments such as voluntarily creation of national model city, total volume control, information disclosure, and public reporting on no-compliance by polluter. In many cases, therefore, Chinese national environmental policies come into birth based on local initiatives and experiences of policy experiments.

3.3.4 Framework and development of Chinese environmental policy

Chinese government set two fundamental national policies: family control and environmental protection. It implicates that environmental management shares high priority on national agendas of social development. Logically, Chinese framework of environmental policy consists of three systems or tiers. The first system/tier includes one basic guideline and three basic policies (Box 3.2), which lay fundamental principles for the formulation of other two system/tiers. The second system/tier is composed of a number of laws and regulations (Table 3.14). The development of environmental laws and regulations from 1979 to 2000 is shown in Figure 3.7. The third one includes a number of policy instruments grouped into command-and-control instruments, economic incentives, voluntary instruments, and public disclosure instruments. Those instruments are formulated in accordance with relevant laws and regulations and play a critical and practical role in actual practice of environmental management of China (Table 3.15 and Table 3.16). The development of environmental policies is shown in Figure 3.8.

Box 3.2 A basic guideline and three basic policies for Chinese environmental protection

- **A basic guideline:** economic construction, urban and rural construction, and environmental construction shall be simultaneously planed, implemented and developed, and economic benefits, social benefits and environmental benefits shall be given the same priorities and achieved at the same time.
- **Three basic policies:** (1) prevention first and combination of prevention and abatement; (2) polluter pay principle and polluter control pollution principle; and (3) enhancement of environmental governance.

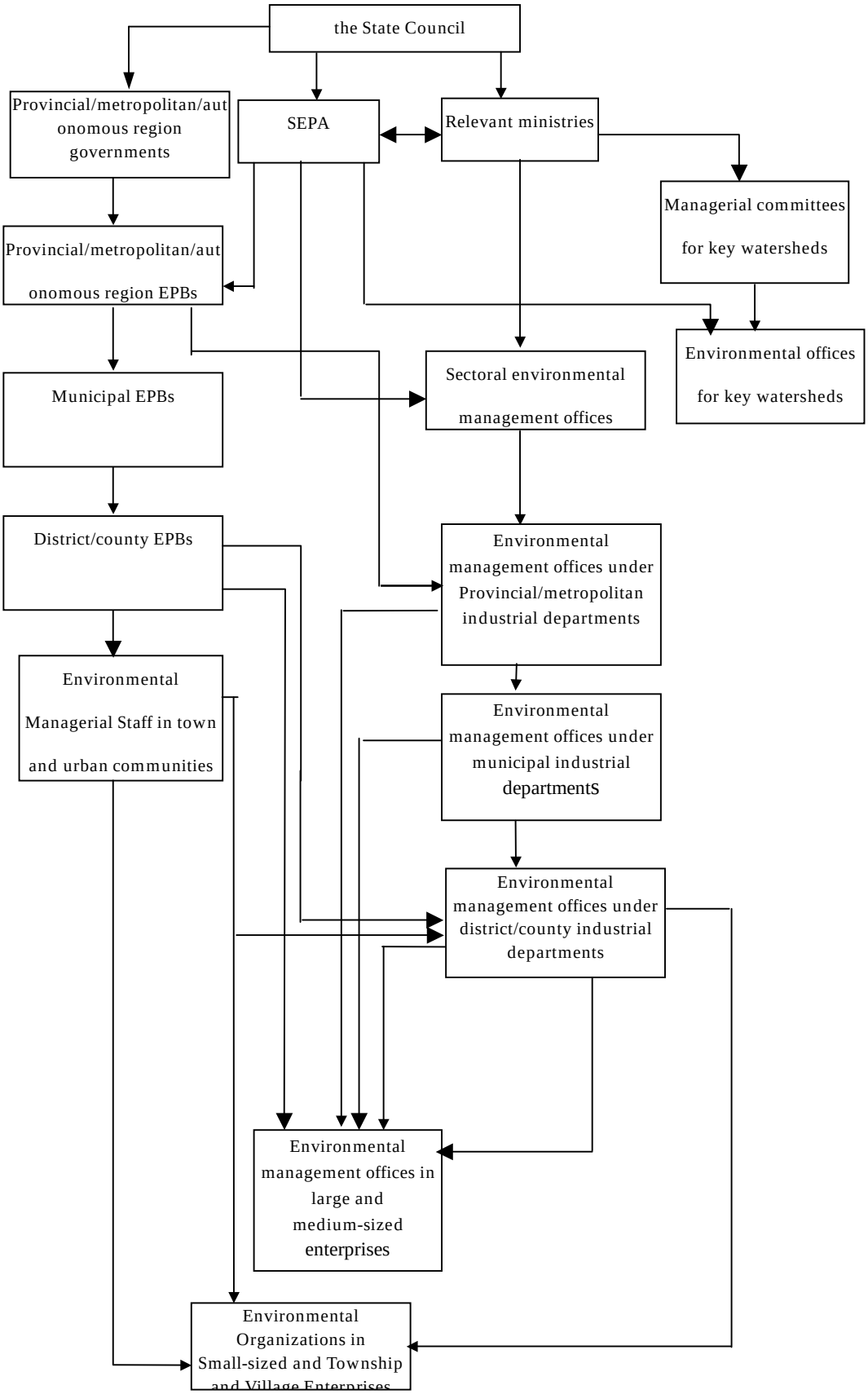


Figure 3.6 Hierarchy of environmental governance in pollution control

Source: the authors

Table 3. 14 Components of the system of Chinese environmental laws and regulations [1]

Components and tiers	Contents/explanations	
Constitution of P.R. China (1982)[2]	Article 26 stipulates that the Sate shall protect and improve living environment and ecological environment and prevent pollution and other public disasters.	
Basic environmental law	Environmental Protection Law (1989)	
Specific laws/regulations	Five laws concerning concrete environmental issues: Marine Environmental Protection Law (1982, 1999), Law of Air Pollution Prevention and Abatement (1987, 1995, 2000), Law of Water Pollution Prevention and Abatement (1984, 1996) Law of Solid Waste Pollution Prevention and Abatement (1995), Law of Noise Pollution Prevention and Abatement (1996).	Ten laws concerning natural resources conservation include: forest, grassland, fishery, mineral resources, land, water resources, wild animals, soil and water conservation, and coal resources.
Administrative ordinances and regulations issued by the State Council	Administrative ordinances and regulations are those issued by the State Council or proposed by ministries but issued in the name of the State Council. They are categorized into two groups. The first group includes detailed rules and regulations in responses to relevant laws, detailed regulation for the implementation of Law of Air Pollution Prevention and Abatement, for example. The second group consists of ordinances and regulations dealing with some important issues that are not touched in the laws issued, Regulation for EIA of Construction Projects, for example. At present, there are 34 pieces of administrative ordinances and regulations for the purposes of environmental protection.	
Sectoral regulations	Sectoral regulations are issued by SEPA or joint with other ministries, in accordance with relevant laws, regulations and administrative ordinances. At present, 90 pieces of sectoral regulations are in place.	
Local laws and regulations and local governmental ordinances and rules	Local people's congresses, including all metropolises, provinces and autonomous regions as well as their capital cities, municipalities directly under the Central Government, and municipalities administrated by both the Central Government and relevant local government, special districts, can issue local laws and regulations and its government can issue governmental ordinances and rules. Up to date, about 1020 pieces of local laws, regulations, ordinances and rules have been in place.	
Environmental standards	At present, 430 sets of environmental standards are available, covering environmental qualities, emission/discharge of pollutants, technical methods, environmental samples, and sectoral standards.	
Laws considering environmental protection	They are mainly in relation with energy conservation, urban planing, flood control, town and village owned industries, heritage conservation, and etc.	
International conventions and protocols	Up to date, China has signed or ratified 30 international environmental conventions and protocols as well as agreements.	

Notes: [1] (summarized in accordance with "Compilation of Chinese Environmental Laws and Regulations", 1982, 1998, 2001)

[2] *the number in the bracket refers to the issued or revised year of the law.*

Source: the authors

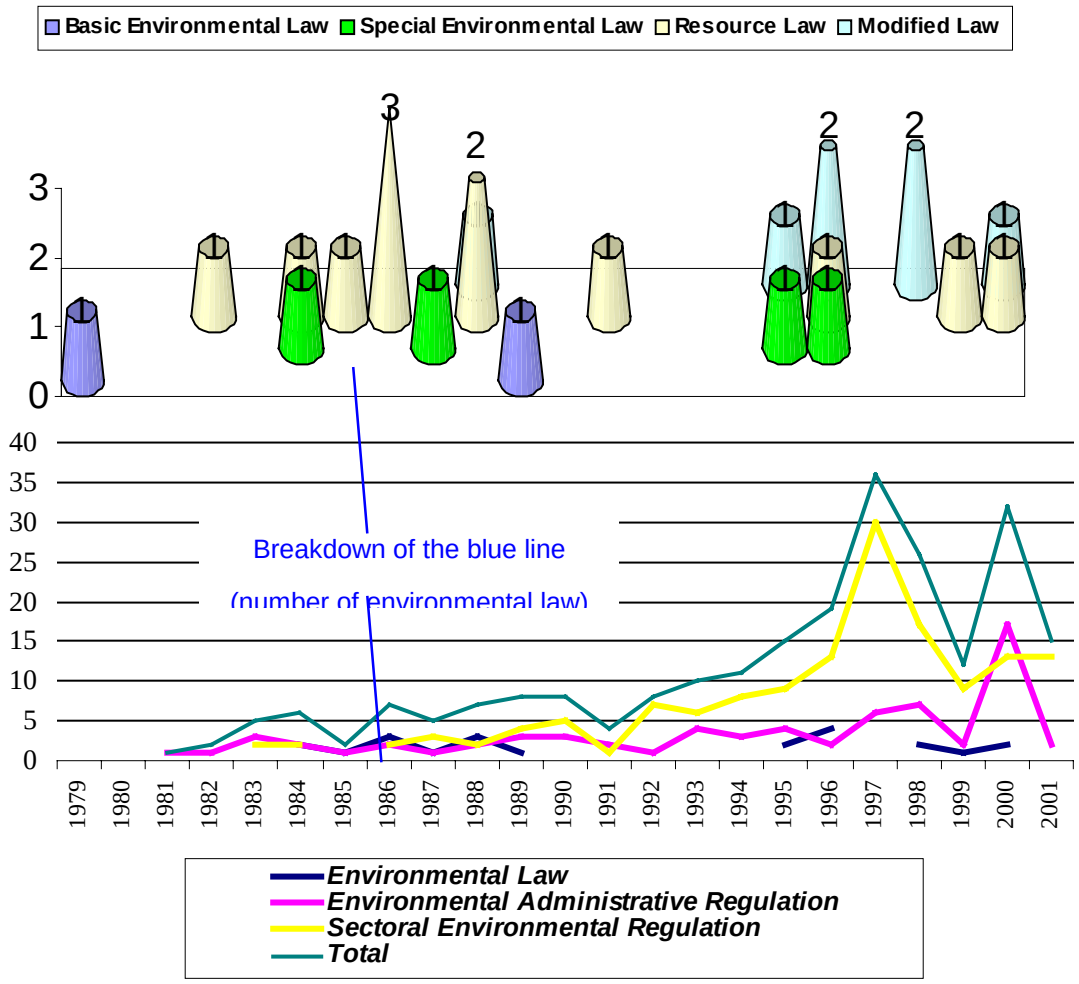


Figure 3. 7 Development in the number of China's environmental laws and regulations

Source: Complete Collection of China's Environmental Laws and Regulations (1982-1997), Complete Collection of China's Environmental Laws and Regulations (1997-1999), Complete Collection of China's Environmental Laws and Regulations (2000-2001)

Note: 1. Environmental laws are those passed by the National People's Congress.

2. Environmental administrative regulations are those issued by the State Council.

3. Sectoral Environmental regulations are those published by governmental ministries.

Figure 3.7 shows that on one hand, there are two peaks in the development of environmental

laws. One is from 1984 to the end of 1980s, when basic environmental law, special environmental laws and resource laws were developed in succession to built up the legal framework for the operation of China's Social Environmental Management System, including stipulations on the liabilities of each actor in the SEMS and instruments for the enforcement. The other peak is from 1995 to 2000, when new laws and modified laws were developed, marking the formation of an improved legal system. On the other hand, started in early 1980s, environmental regulations, including both environmental administrative regulations and sectoral environmental regulations developed rapidly since 1996, indicating strong commitments of the Central Government to national environmental management and the integration of environmental concerns into the agenda of various economic sectors and resource sectors.

Table 3. 15 Current framework for industrial pollution management and control: instruments *(summarized in accordance with relevant sources)*

Command-and-control instruments	**Economic incentives**	**Voluntary instruments**	**Public disclosure instruments**
Concentration-based pollution discharge limits	Pollution levy fee	Environmental labeling system	Information disclosure on managerial performance (experimental)[3]
Volume-based controls on total provincial discharge	Non-compliance fines	Promotion of ISO 14000 system	Environmental awareness campaigns
Environmental impact assessment	Sulfur emission fee	Cleaner production program	
Three synchronous requirement[1]	Emission trading (experimental)		
Setting deadline for enterprises to control pollution	Subsidies for energy-saving products		
Centralized pollution control	Regulation on refuse credit to high-polluted firms		
Two compliance requirement[2]	Tax-breaks for comprehensive utilization of industrial wastes		
Pollution discharge report and permission certification			

Notes: [1] The Three Synchronous requirement is intended to ensure that the planing, design, and construction of pollution control facilities occurs at the time that new enterprises are established and that production does not commence until EPB certification is received.

[2] The Two Compliance Requirement—requires that all polluted enterprises comply with discharge standards and cities comply with environmental quality standards by specific urban areas categorized by their functions in the city.

[3] A few cities such as Zhengjiang in Jiangsu Province publicize managerial performance of enterprises in pollution control after assessment with a set of indicators.

Source: the authors

Table 3. 16 Framework of urban environmental management: instruments and initiatives
(summarized in accordance with relevant sources)

Instruments and initiatives	Contents and explanations
Goal-responsibility system of environmental protection (1994)	Compels provincial governors, city mayors, and county magistrates to sign contracts that specify environmental goals to be attained within their jurisdictions during the contract period. They are designed to ensure that political leaders weigh environmental concerns equally with economic development plans.
Air pollution quality report and forecast (1997, 2000)	46 key cities are obliged to publish and forecast daily air quality indices—indicators of air quality through the national television network.
Annually quantitative review for urban environmental performance (1989)	SEPA conducts an annually quantitative assessment of environmental performance in 46 cities and local governments assess totally 524 cities within their jurisdictions. 24 weighted indices cover four areas: urban environmental quality, pollution control, infrastructure construction of environment related, and environmental governance. The review results are published by environment related media.
Environmental model cities program (1997)	Cities can volunteer to have environmental sustainability of their development programs evaluated by panels of expert organized by SEPA. The evaluation criteria include a range of indices of environmental quality, investment, and management as well as other indicators relating to social and economic conditions and public environmental awareness. Up to date, 24 cities have been nominated as environmental model cities.
Sewage treatment fee and garbage disposal fee (1999)	
Environmental review of regional plans (1998)	SEPA is requested to carry out environmental reviews of regional plans and sectoral economic policies.

Source: the authors

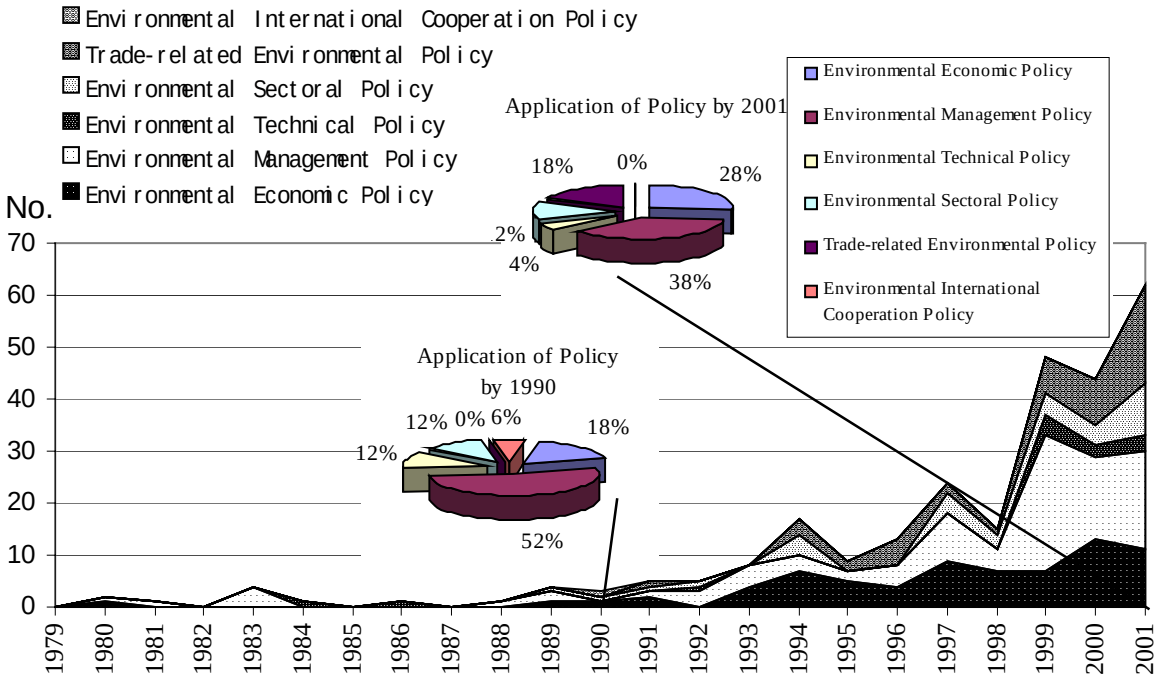


Figure 3. 8 Development of China's environmental policies in numbers

Source: Department of Policy and Regulation of SEPA, Complete Collection of China's Environmental Policy under the Condition of Market Economy (2002)

China's environmental policies are officially divided into six categories, including environmental economic policies, environmental management policies, environmental technical policies, environmental sectoral policies, trade-related environmental policies and environmental international cooperation policies. From Figure 3.8, we can see a smooth growth in environmental policy-making, however, environmental policy-making has increased dramatically since 1993, one year after the Rio World Summit on Environment and Development. From the structural point of view, the adoption of environmental policies by the Government changed with time. Generally, environmental management policies characterized by command and control played dominant role in the policy framework, followed by economic incentives or marked-based instruments. However, on one hand, the share of command and control instruments decreased gradually from 52% in 1990 to 38% in 2000. On the other hand, the share of environmental economic policies increased greatly from 18% in 1990 to 28%. In addition, the overall trend showed the more importance of other environmental policies, especially economic instruments, trade-related environmental policies and sectoral environmental policies and an integrated application of all these instruments.

Usually, environmental policies are designed either for realizing environmental goals (targets) or as operational instruments for the enforcement of environmental laws and regulations. It is consistent to see that during the implementation of the "Ninth Five-year Master Plan on Environmental Protection", environmental policies were developed rapid as a response to realizing the mid-term objectives.

3.3.5 Corporate environmental management in China

In this section, the development of China's industrial sector and its impacts on the environment will be described. The policy responses, including regulatory arrangement, institutional arrangement as well as various instruments applied in the battle of anti-industrial pollution, will then be introduced. In addition, the present situations of corporate environmental management will be analyzed.

Development of China's industrial sector and environmental impacts

China's economy developed rapidly in the past two decades (see Figure 3.9). Industrial sector, an impetus to China's economic growth, contributed to around 46% of GDP (Figure 3.10). The Gross Output Value (GOV) has increased sharply since 1980s, with an annual average growth rate of 9.7% (Figure 3.11).

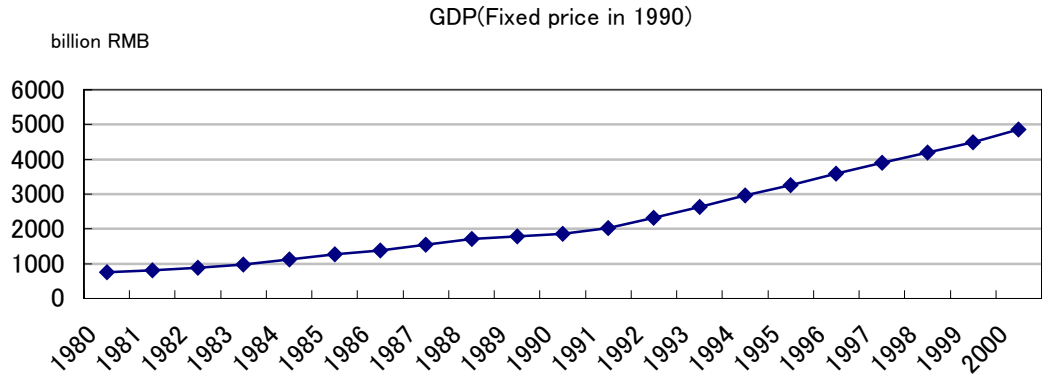


Figure 3. 9 GDP development in China (1980-2000)

Source: China's Statistical Yearbook, 1981-2001

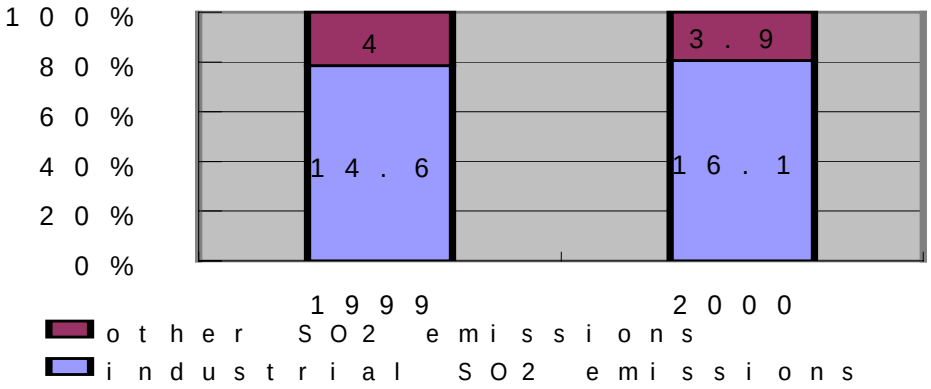


Figure 3. 10 China's economic structure (1980-2000)

Source: China's Statistical Yearbook, 1981-2001

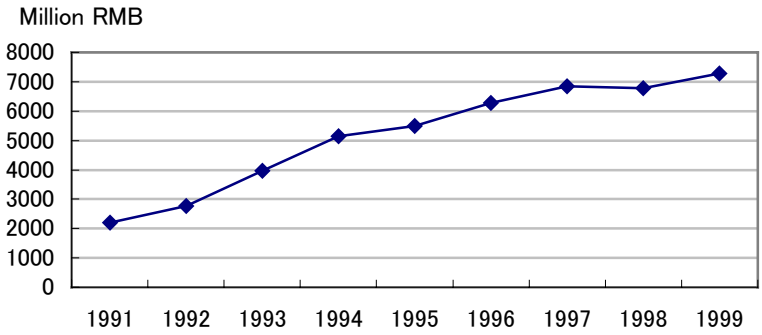


Figure 3. 11 Increase of Gross Output Value (1991-1999)

Source: China's Statistical Yearbook, 1992-2000

Note: The GOV is the price of current year.

Though the ratio of industrial sector is relatively stable in China's economic structure, which changed gradually with the ratios of agricultural sector and service sector, rapid industrialization and the expansion of the scale of industry has caused great pressures on China's environment. The generation of major pollutants from industrial sources, which accounted for a bigger share of total discharges, is shown in Figure 3.12. In addition, the lower productivity in terms of high consumption of materials and energy resources caused environmental deterioration. The level of energy consumption and material consumption is described in Table 3.17.

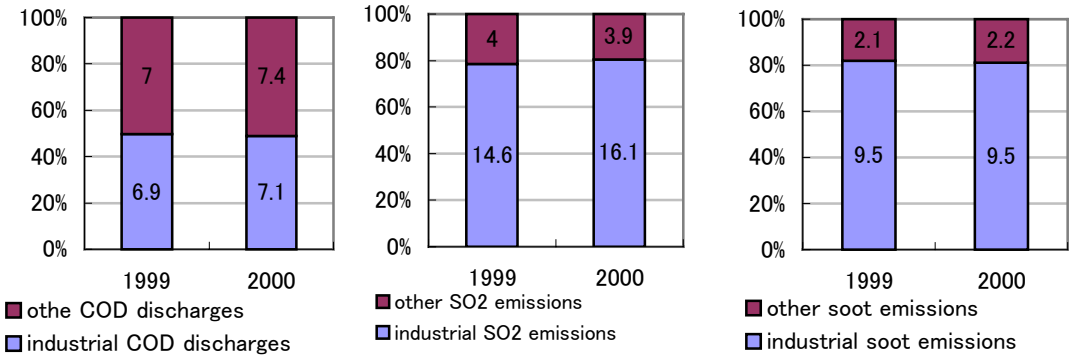


Figure 3. 12 Major pollutant generated from industrial sources (Mt)

Source: China Environmental Yearbook. 2000, 2001

Table 3. 17 The level of energy consumption and material consumption

Item	Unit	Level of China	Level of the World
GDP	kg Oil Equivalent/US$	1.85	0.37
Recycling rate of industrial water consumption	%	50	80
Electricity generation	k Standard Coal/kWh	427	321
Steel production	kg coal/t steal	1640	1000
Steel production	t water /t steal	63	10
Cement manufacture	kg coal/t cement	201.0	113.2
Synthetic Ammonia	t water /t synthetic ammonia	500-1000	12
Paper manufacture	t water /t paper	450	50-200
Oil refinery	t water /t oil	2.4	0.5

Source: Wang Qingyi, Research Report by China's Energy Research Committee

The scale of industries is not only a major parameter influencing corporate profits, but also an important factor related to the intensity of industrial pollution. Usually, the expansion of the scale of industries will greatly contribute to the reduction of emission level. The contribution of large-scale, medium-scale and small-scale enterprise to the total GOV is shown in Figure 3.13. Figure 3.13 shows that the share of large-scale enterprise's GOV increased gradually and the sum of GOV generated by large-scale enterprises and medium-scale enterprises contributed to the majority of total GOV. This trend of structural changes will be conducive to the reduction of industrial pollution.

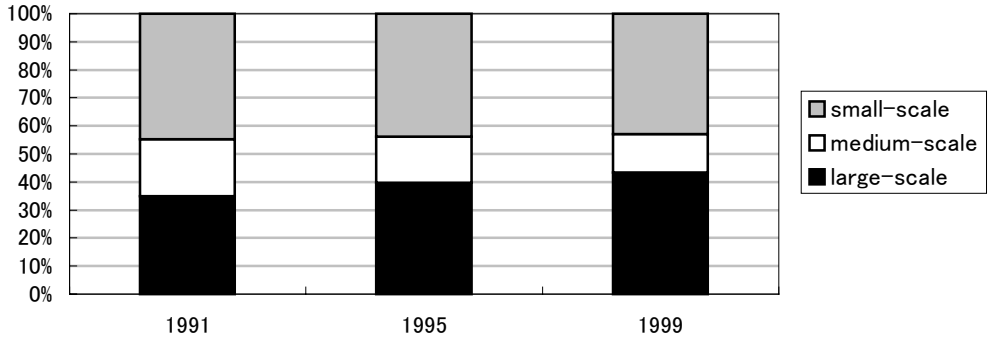


Figure 3. 13 The share of large-scale, medium-scale and small-scale enterprises in the total GOV

Source: China's Statistical Yearbook, 1992, 1996, 2000
Note: The GOV of 1991 and of 1995, respectively is based on the price of 1990, while the GOV of 1999 is on the basis of price of 1999.

From the viewpoint of the ownership of enterprises in Figure 4.6, the share of state-owned enterprises shrank in the industrial sector, while other enterprises and collective enterprises increased greatly. The ownership of enterprises is also related to the emission level. Based on researches conducted by the World Bank, the Chinese Research Academy of Environmental Sciences, and the Policy Research Center for Environment and Economy, respectively, same conclusions were made as follows: the intensity of industrial pollution decreased from collective ownership enterprises, state-owned enterprises down to other enterprises consisting mostly of joint ventures and stock-companies. The impacts of ownership changing in the industrial structure (as shown in Figure 3.14) on the environment is uncertain because though the share of other enterprises (less pollution intensive) increased, the share of collective enterprises (pollution intensive) also increased greatly. The balance is unknown.

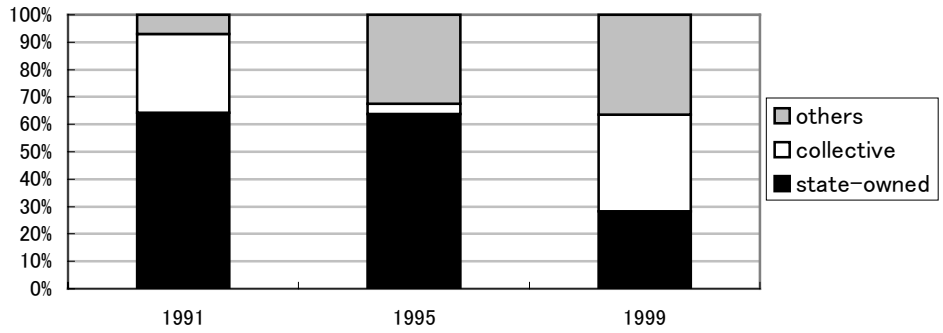


Figure 3. 14 The contribution of enterprises of different ownership to the total GOV

Source: China's Statistical Yearbook, 1992, 1996, 2000

Note: The GOV of 1991 and of 1995, respectively, is based on the price of 1990, while the GOV of 1999 is on the basis of price of 1999.

Another characteristic of China's industrial development is rapid growth of township and village enterprises (TVEs). In 1995, the GOV created by TVEs accounted for 50% of the total GOV, and especially in the coastal areas, the scale of TVEs has greatly exceeded the scale of state-owned enterprises. TVEs at the beginning of their development in 1980s, often small-sized without proper abatement facilities, became major sources of industrial pollution. In 1995, the COD discharges from TVEs accounted for 46.5% of the total industrial discharges and SO_2 emissions from TVEs accounted for 28.2% of the total industrial SO_2 emissions.

Governmental policy response

Generally speaking, China's environmental management in the past 30 years developed with

the emergence of industrial pollution and associated environmental damages. The priority of environmental management, especially in 1970s and 1980s is industrial pollution prevention and control and until 1990s, integrated urban environmental management and ecological protection have been put onto the agenda.

- **Regulatory arrangement**

In response to sever industrial pollution, the development of governmental policies for environmental management of industries experienced two stages. In the beginning stage (1970s to the early 1980s), governmental policies focused on "three wastes" abatement, a typical end-of-pipe strategy. Neither regulatory nor institutional construction started. Corporate liabilities for abatement were not well defined. Since the early 1980s, governmental policies changed fundamentally. Three major environmental policies, i.e. "prevention first and an integration of prevention and abatement", "polluter pay, polluter control" and "enhancement of environmental governance", were proposed. A number of policies for environmental management of industries, including policies on comprehensive utilization of resources, policies on technological innovation, policies on environmental funding and policies on environmental industries were formed in line with these three major policies. A summarization of these policies is listed in Box 3.3.

Box 3.3 Summary of Governmental Policies for Environmental Management of Industry

1. *Interim Procedures on Pollution Levy Collection*, State Council,1982
2. *Several Provisions on Pollution Prevent and Control Integrated with Technological Innovation*, State Council, 1983
3. *Provisions on Strengthening Environmental Management of Township Enterprises*, State Council, 1984
4. *Provisions on Environmental Protection Funding*, the Ministry of Urban Construction and Environmental Protection, 1984
5. *Measures on the Enforcement of the Examination System of Corporate Environmental Management*, the Environmental Protection Committee of the State Council, et al. 1985
6. *Interim Provisions on the Implementation of Comprehensive Utilization*, State Economic Committee, 1985
7. *Regulations on Environmental Management of Construction Projects*, the Environmental Protection Committee of the State Council, et al. 1986
8. *Interim Provision on Environmental Management of Opening-up Economic Regions*, National Environmental Protection Agency, 1986
9. *Provisions on Pollution Prevention and Abatement of Pulp and Paper Sector*, the Environmental Protection Committed of the State Council, et al. 1988
10. *Interim Measures on the Supervision of Water Pollutant Discharge Permit*, National Environmental Protection Agency, 1989
11. *Opinions on the Promotion of Environmental Industry*, the Environmental Protection Committee of the State Council, 1990
12. *Measures on the Supervision of Tail-gas Exhaust from Vehicles*, National Environmental Protection Agency, 1990
13. *Notification on Environmental Management of Foreign Direct Invested Construction Project*, National Environmental Protection Agency, 1992
14. *Measures on the Supervision of Eco-labeling Certification*, National Environmental Protection Agency, 1994
15. *Notification on Strengthening Environmental Management of Catering Service Sector*, National Environmental Protection Agency, 1995
16. *Resolutions on Several Issues Related to Environmental Protection*, State Council, 1996
17. *Provisions on Strengthening Environmental Management of Coal Industry*, Ministry of Coal Industry, 1996
18. *Measures on Environmental Management of Power Industry*, Ministry of Power Industry, 1996
19. Provisions on Strengthening Environmental Protection of Township and Village Enterprises, National

Environmental Protection Agency et al. 1997

20. *Several Opinions on Strengthening Industrial Pollution Prevention and Control During the Ninth Five-year Plan*, National Environmental Protection Agency, 1997

Source: the authors

On the basis of "integration of prevention and abatement" strategy, five legal systems were defined for the enforcement of industrial pollution prevention and abatement. These are the system of Environmental Impact Assessment, the System of "Three-Synchronous Requirement", the Pollution Levy System, the System of Deadline Setting for Pollution Abatement. The systematic scheme of these systems, the pagoda of legal systems, (Zhou, PRCEE) is described in Figure 3.15.

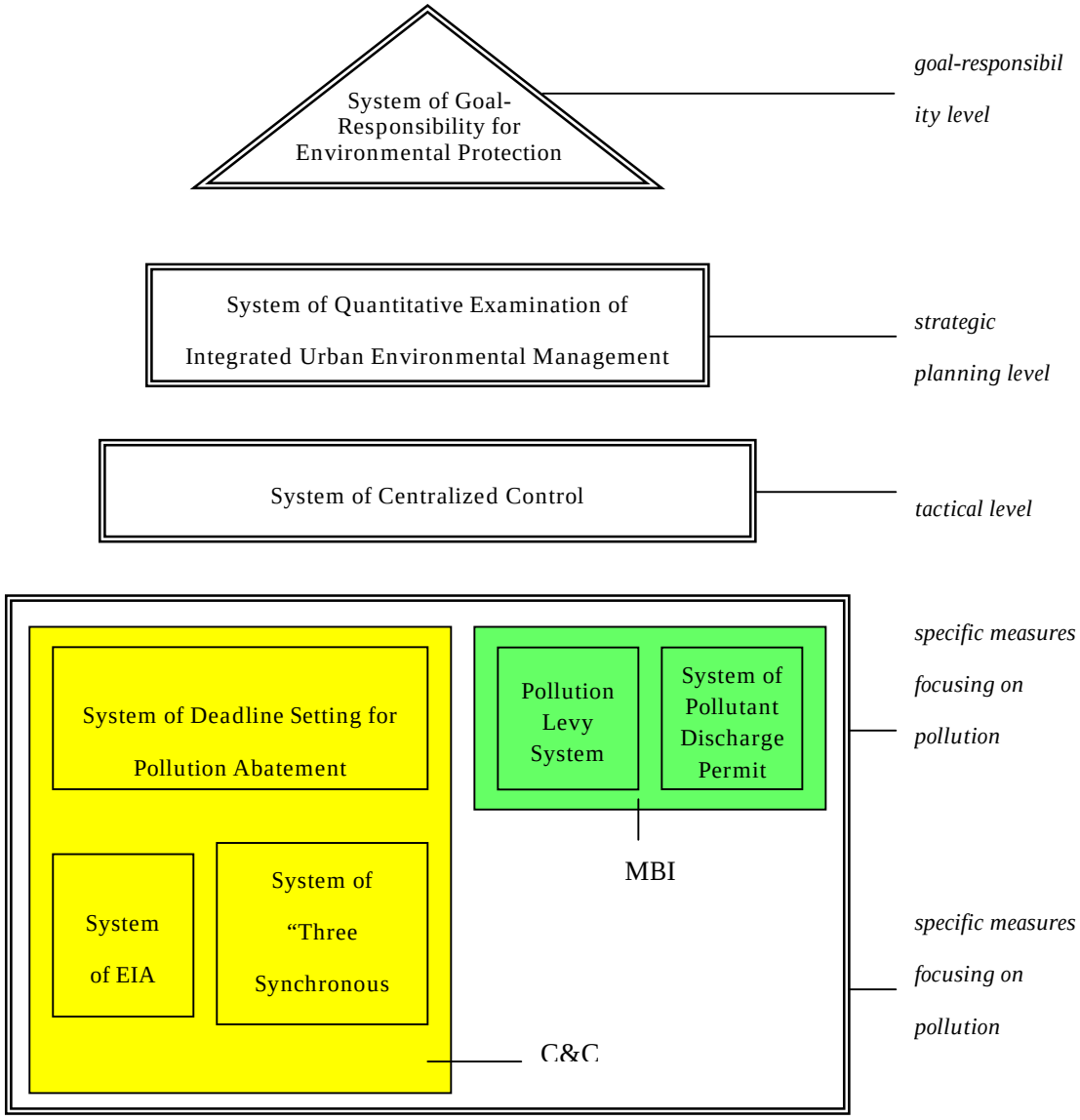


Figure 3. 15 Pagoda of legal system for corporate environmental management

Source: the Author

Note: C&C refers to command and control. MBI refers to market-based instrument.

The upper level of the “Pagoda of Legal System” is the goal-responsibility level, where goals for corporate environmental management and responsibilities and liabilities of government and enterprises are defined. The second level is strategic planning level, where integrated environmental management based on good planning will be performed. In the third level, which is the tactic level, centralized pollution control versus single-source abatement is an optional choice. The base level of the “Pagoda of Legal System” is specific measure for the enforcement of industrial pollution prevention and control. In this level, two sub-layers existed. One is specific measure focusing on pollution abatement or end-of-pipe control, while the other is specific measure focusing on pollution prevention. In addition, the specific measures are categorized into two sets. One is the yellow block, representing command and control measures, while the green block is market based instrument (MBI). The pollution levy system is a MBI, which utilizes markets as incentives. The System of Pollutant Discharge Permit is another MBI, which creates markets by the definition and allocation of property right.

In addition, other direct regulations, such as the shut-down policy to small-scale enterprises in fifteen polluting industrial sectors, structure adjustment of industrial layout and the enforcement of emission standard, etc. also played important role in constraining non-compliance.

In contrast to formal regulations, such informal regulations as public participation, information disclosure system and voluntary approach including eco-labeling, cleaner production and ISO 14000 are implemented as supplements to formal regulations.

- **Institutional arrangement**

The institutional arrangement for environmental management of industries is depicted in Figure 3.16.

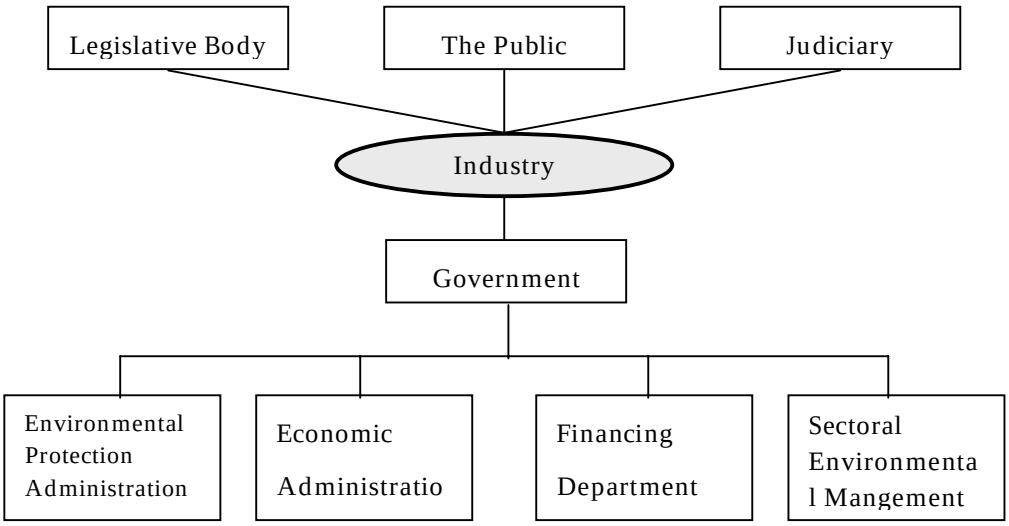


Figure 3. 16 Institutional arrangement for environment management of industries

Source: Cao Dong et al. Economics of China's Industrial Pollution, 1999

The institutional framework consists of five major actors, i.e. the legislative body, the judiciary, the government, the public and the industry. The role played by each of the five elements is discussed as follows. The details have been introduced in Section 3.3.4.

The legislative body is responsible for the construction of legal system for environmental management of industries and conducts supervision over government's enforcement.

The government is responsible for policy making, regulatory construction and the enforcement of laws, regulations and policies.

The judiciary is the Court, which is responsible for the judgement of civil law suits and administrative law suits to guarantee the enforcement of environmental laws and regulations.

The public is the crucial element of social governance. Including the citizens, the community, social organizations and the medium, etc. the public exerted great influences on the government and on industries.

The industry, in the institutional framework for environmental management of industries, is both the object in terms of being a polluter and the subject in sense of self environmental governance.

Responses from enterprises

i) Present Situation of Corporate Environmental Management

Major corporate environmental liabilities prescribed by the Environmental Protection Law are

listed in Box 3.4.

Box 3.4 Corporate Environmental Liabilities

1. Environmental protection work shall be integrated into corporate working plan and corporate environmental protection liability system shall be established (Article 24)
2. Construction project, which may have potential environmental impacts and environmental damage, shall prepare environmental impact assessment report, conduct site-selection and propose pollution abatement measures (Article 13).
3. The System of "Three-synchronous Requirement" shall be implemented strictly by corporate and normal operation of abatement facilities shall be assured (Article 26).
4. Corporate shall report its pollutant discharge according to the *Regulation on the Supervision of Pollutant Discharge Reporting* (Article 27).
5. Corporate shall pay fine for non-compliance as well as pollution levy and is responsible for abatement (Article 28).
6. Corporate shall accept on-site supervision of environmental protection administration and shall report accurately (Article 14).
7. When corporate is set deadline for pollution abatement, it must accept supervision and inspection by environmental protection administration, report progress of abatement and finish abatement by the deadline (Article 29).
8. When pollution accident or potential accident happens, corporate shall adopt mitigation measure, report to relevant institution and citizens, report to environmental protection administration and accept investigation (Article 31).
9. Corporate shall apply equipment and process with high efficiency of resource utilization and low emissions and shall use technologies of waste utilization and abatement of pollution.
10. Corporate shall not import technology or equipment not satisfying China's environmental requirements.
11. Corporate shall not transfer polluting production equipment to those without abatement capabilities.
12. During the production, storage, transport, sale and use of toxic chemicals and goods with radioactive substances, relevant regulations shall be strictly obeyed to avoid environmental pollution.
13. Environmental polluting industrial production facility shall not be constructed in scenic spots, nor in the natural reserves and other protective areas.
14. Ecological environmental protection measures shall be taken during the exploration of natural resources.
15. Administrative penalty on the basis of environmental laws and regulations must be accepted.
16. Corporate who causes environmental damages shall mitigate the damages and compensate to those who suffer from the damages.

Source: the authors

In order to ensure environmental compliance and abide by the liabilities prescribed by the environmental laws and regulations, corporate environmental management has been carried out on both mandatory basis and voluntary basis. A preliminary assessment of the situation of corporate environmental management in China conducted by PRCEE will be provided below.

Five major indicators are selected to described the situation of corporate environmental management, including corporate environmental management organization, the qualification of environmental management personnel, corporate environmental monitoring, installation and operation of abatement facilities, corporate environmental management regulations.

- **Corporate environmental management organization**

The *State Council's Resolution on Environmental Protection* (1984) defined generally that large and medium-scale enterprises should set up corporate environmental protection organization or assigned persons responsible for corporate environmental protection work. In another regulation, which was the *Environmental Regulation on the Designation of Construction Project* (1987), environmental management organization of new construction project or expansion project was required. Sectoral environmental regulations, such as chemical industry, petroleum industry, mechanical industry and light industry, etc. also prescribed general requirements on corporate environmental management organizations.

Since there was not such a law nor a regulation in China, which precisely defined what kind of corporate environmental management organization should be established, such as the size of the organization and the function of the organization, etc., enterprises usually set up organization to perform corporate environmental management according to their own needs. Therefore, corporate environmental management organization varies from one enterprise to another (see Figure 3.17).

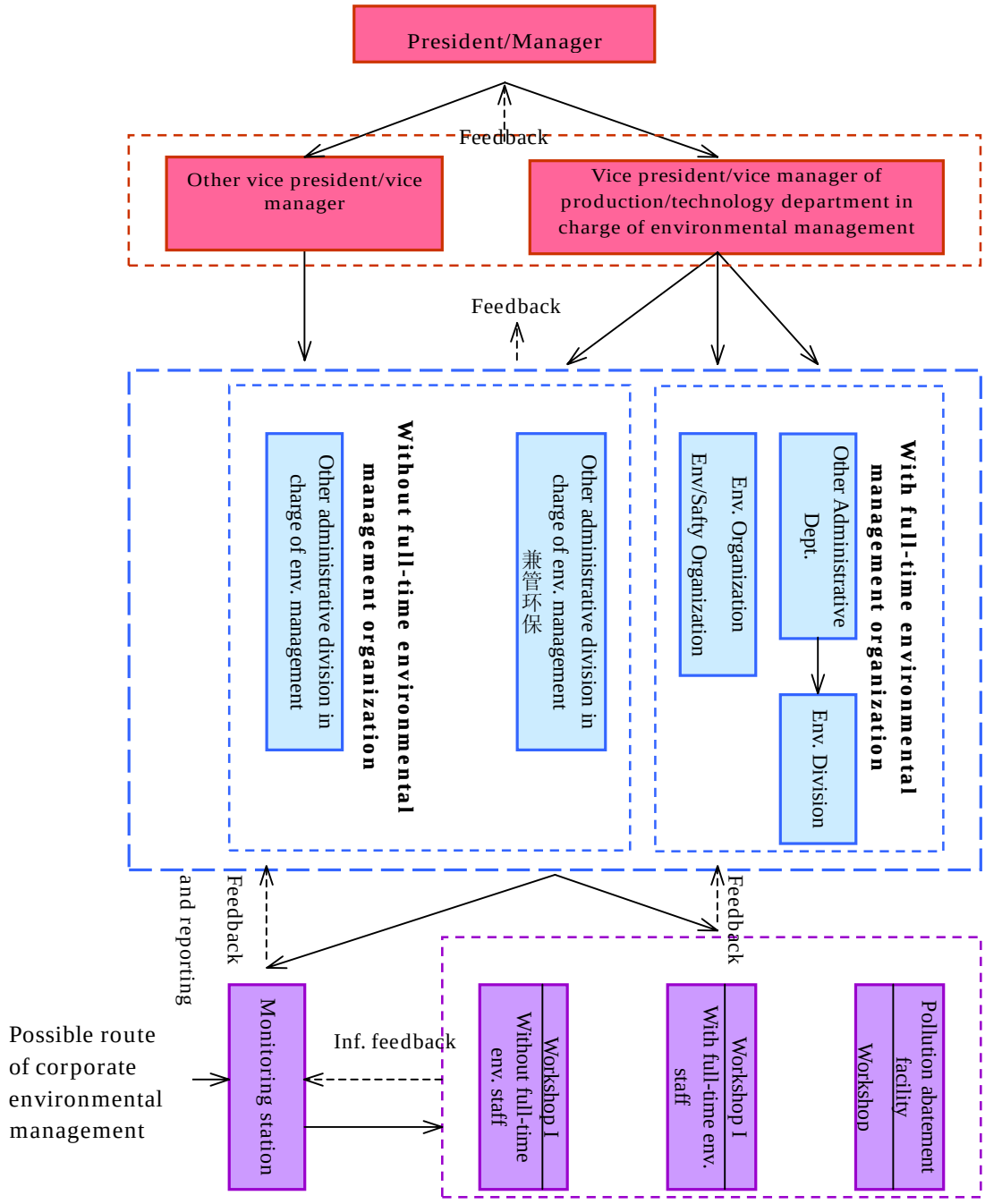


Figure 3. 17 Corporate environmental management organization chart

Source: the Author

Note: This is based on a survey to 70 enterprises representing large, medium and small sized enterprise and different kinds of entities, including state-owned enterprises and none state-owned enterprises. The survey was conducted in five selected provinces/cities, including Chongqing, Dalian City (Liaoning Province), Zhenjiang City (Jiangsu Province), Shenzhen (Guangdong Province), Qinghai Province, and Kunming City (Yunnan Province), representing both developed regions and less developed regions in China.

Generally speaking, on one side, large and medium scale enterprises have special environmental management organization named as environmental protection section (division) or as safety and environmental protection section (division). This kind of organization, usually under the leadership of a vice manager who is in charge of production/technology, or under the leadership of other divisions, such as production and technique division or manufacture division, have full-time staff to help the enterprise achieve environmental compliance. Their responsibilities include formulating corporate environmental management regulations, providing technical support, supervising the enforcement of these regulations, working out corporate environmental plan, conducting corporate environmental monitoring, organizing environmental education for staff and conducting corporate environmental statistical work.

In addition to this special organization, full-time or part-time environmental protection staffs are assigned in workshops, which are pollution sources. In some large-scale enterprises, staffs are necessary for the operation of wastewater treatment plant, dust precipitation facilities and desulphurization facilities. In some large and medium scale enterprises, monitoring stations are established conducting monitoring, sampling and analytical work. In conclusion, environmental management network (system) is established in most large and medium sized enterprises.

On the other side, small enterprises usually do not have special environmental management organizations. The environmental management in these enterprises is often conducted by other section (division), such as production/technology section, equipment section or administrative section, etc. A couple of full-time or part-time staffs take the responsibilities of corporate environmental management.

- **Qualification of corporate environmental management personnel**

The qualification of corporate environmental management personnel also varies greatly. In some enterprises, engineer or senior engineer with three-year or four-year higher education of environmental engineering is employed as corporate environmental management staff. For the operation of abatement facilities, technical workers are required by some enterprises. However, in some other enterprises, corporate environmental management staff, who is not educated in environmental engineering or relevant subjects, may be only high-school graduate or even lower educated. These staffs are not qualified for corporate environmental management. To date, there is no law (regulation) prescribes the requirements for the qualification of corporate environmental management personnel, nor for the qualification of staff who works on abatement facility operation.

- **Corporate environmental monitoring**

Prescribed by relevant environmental regulations, as well as required by local environmental protection bureaus, corporate environmental monitoring is often conducted either by enterprise themselves or entrusted qualified organizations. The frequency of corporate environmental monitoring varies greatly. Some may conduct environmental monitoring once a month, while others may conduct twice a year. Some enterprises even formulate adequate corporate environmental monitoring regulations, defining the responsibilities of monitoring staff, items of monitoring, the frequency and procedure of monitoring, technical specifications and norms, recording, management of documents, and verification of monitoring results, etc.

- **Installation and operation of abatement facilities**

Most of industrial enterprises installed abatement facilities required by the System of "Three-synchronous Requirements" for new and expansion construction projects and the System of Deadline Setting for Pollution Abatement of existing enterprises. Though most of major industrial enterprises achieved environmental compliance in 2000 after the national action plan of environmental compliance of all industrial enterprises was carried out in the period of the Ninth Five-year Plan, the efficiency of abatement varies from one enterprise to another. Some enterprises employ tertiary wastewater treatment and high rate of recycling and realize zero discharge while others simply use sedimentation tank. The abatement facilities in some enterprises are operated normally the year round, but in some other enterprises the abatement facilities may be stopped.

The cost of the operation of abatement facilities is usually affordable by enterprises, however, the investment needed for the installation and construction work, usually not capable of getting financial assistance from commercial banks, is a great challenge to enterprises.

- **Corporate environmental management regulations**

In order to achieve environmental compliance and make regular corporate environmental management possible, enterprises usually formulate various regulations, including goal-responsibility system for environmental protection, post-responsibility system, integration of abatement facility into equipment management, corporate environmental management criteria, maintenance of abatement facility, environmental monitoring, environmental statistics, management of document, and award and punishment, etc. These corporate regulations are

supervised by corporate environmental management staff.

Corporate environmental management: major problems

Though China has established a set of laws, regulations and standards for the enforcement of industrial pollution prevention and control and enterprises also conducted corporate environmental management, industrial pollution still a priority of China's environmental protection work. There are several major problems related to corporate environmental management.

From the regulatory arrangement point of view on one hand, three major problems exist. Firstly, five legal systems for industrial pollution prevention and control, i.e. System of EIA, System of "Three Synchronous Requirements", Pollution Levy System, System of Pollutant Discharge Permit and System of Deadline Setting for Pollution Abatement as illustrated in Figure 3.14, have several flaws.

Both the System of EIA and the System of "Three Synchronous Requirements" are based on the standards of discharge concentration, which influences the effectiveness of the two systems. Since the total volume of pollutant discharges is not controlled, though every new construction project complies with the standards in a specific area, the quality of the environment may get degraded. In addition, both systems focus on end-of-pipe control, which require each construction project must install abatement facility to achieve environmental compliance rather than an optimal strategy for pollution abatement in a region. These regulatory instruments inhibit the application of more flexible market based instruments.

As a major market based instrument for industrial pollution control, the Pollution Levy System has been implemented in China since 1978. However, the system has several defects in its designing. i) The levy rates are far lower than the marginal cost of abatement. At this rate, enterprises would choose pay for their pollution rather than invest in abatement. ii) The levy is based on the single pollutant which exceeds the discharge standards most seriously rather than based on all pollutants that exceed the discharge standards. iii) The levy focuses only on those discharges which exceed the standards and therefore it can not be an incentive for achieving maximum abatement.

Based on the target of pollution control which is not related to the carrying capacity of the environment, the System of Pollutant Discharge Permit has not yet played effective role. The existing capacity of environmental monitoring and ineffective enforcement also constrained its implementation.

Secondly, though China's environmental standards are almost as strict as in other developed

countries, the ineffective enforcement caused by lower capacity of environmental monitoring, the intervention of local government and lack of public participation greatly weaken the effectiveness of environmental laws, regulations and standards.

Thirdly, China's industrial pollution prevention and control still based on regulatory instruments, while other instruments such as market based instruments, public participation, information disclosure and voluntary approaches, such as eco-design, life-cycle analysis, environmental auditing and cleaner production are limited.

From the corporate point of view on the other hand, passive environmental compliance rather than voluntarily corporate environmental management is a major problem. In addition, lack of financing mechanism, efficient technologies and qualified personnel also impeded better corporate environmental management.

Factors influencing corporate environmental management and environmental compliance

According to the researches conducted by the World Band and by the PRCEE, several factors may influence corporate environmental management, including the effectiveness of the enforcement of environmental laws and regulations, public participation, corporate environmental awareness, the scale of corporate and the ownership of corporate.

3.3.6 The roles of citizens, media and NGO's in environmental governance

The public, civil societies, NGOs and representatives of special groups such as the NPC and the National People's Political Consulting Congress (NPPCC) are exerting an increasingly influence on Chinese agenda of environmental governance. Nowadays China sees the roles of the public and civil societies as well as NGOs in environmental governance in several aspects: voluntarily actions to protection of environment, monitoring and publicizing the behaviors polluting and damaging environment, protection of their environmental interests deprived by polluters, participation in policymaking.

The 1996 State Council's Decision on some Issues of Environmental Protection stressed that the public participation mechanism shall be set up, in order to bring the role of the public and social groups into play. And also, the State Council Decision encourages the public participation in environmental protection in the ways such as reporting and exposing various behaviors violated environmental laws and regulations. The Law of Environmental Protection also stipulates that all the organizations and individuals share responsibilities for environmental

protection and have right to report and condemn organizations and individuals who pollute and damage environment. The 2000 revised Law of Water Pollution Prevention and Control added special articles that environmental impact assessment process for a new construction project shall consider comments of local organizations and residents in the location of the project assessed.

For the behaviors polluting or damaging the environment, the social groups and citizens can generally adopt approaches such as negotiation with responsible parties for promptly stopping the behavior, reporting to the mass media for disclosure and to administrative organizations for appliance of regulatory measures or mediation, and even filing lawsuits. Normally, the public prefers to choose administrative approach to voicing through complaint or suggestion letters or directly visits. At present, there are more than a hundred thousand letters and proposals on environmental matters on the desks of environmental administration nationwide each year.

The government encourages the public interests at environmental affairs through various measures. Of particular significance are information disclosure. At present, three kinds of environmental information are accessible to the public: annual environmental status bulletin; annual review of urban environmental performance of 600 cities around; and daily air quality indicators in 46 key cities.

The media is another important actor to monitor environmental performances by industries and governments. The publicizing environmental problems and no-compliance of industries as well as the lack of or inappropriate administration can help attract or push governments and industries to respond the problems. And the same time, the mass media is right venue to educate the public. At present, the environmental protection related reports and news become one of hot topics in Chinese mass media. For example, the Chinese Central TV has developed several popular programs, such as the New Environmental Protection Express, the Nature and Human, and etc. In order to bring the monitoring role by the mass media into a full play and raise the public environmental awareness, SEPA and the Committee of Environment and Natural Resources Protection under the NPC, once jointly launched Tour of Chinese Environmental Protection Century in 1993. More than 750 news agencies from the national and the locals were involved in the Tour. After the 1993's initiatives, the tours on different environmental topics had been sustained for several years. More than 6,000 reporters participated in the tours and over 48,000 reports were publicized on media.

In the recent year, the number of environmental proposals made by representatives of the NPC and NPPCC are getting increase dramatically. In 1993, the relevant proposals were only 35 pieces, and in 1999, this number roaring to 184, more than 6 times increment in 5 years. The proposals covered varied environmental issues from water pollution of river, lake and ocean to

household waste problems, from plastic bag and film pollution to radiation, from wild animal protection to green labeling, etc.

According to a survey jointly conducted by SEPA and the Ministry of Education in 1998 on the public environmental awareness nationwide, 79% of the public surveyed obtain environmental information through the news media such as TV and radio. A nationwide survey of 76 newspapers conducted by the Friend of Nature (NGO) from 1995 to 1997 showed that the environmental awareness and participation interests of the leading news media raised dramatically. In 1995 each newspapers annually reported, on an average, 1358 pieces news and articles in relation with environmental affairs, and in 1996, this number raised to 2508, and 2903 in 1997. Volunteers have also their frequent presence in environmental protection. SEPA and the Ministry of Railway once jointly launched a campaign of clearing the white pollution along the railways, in which over 200,000 youth volunteers were involved and 23 million tons of wastes were cleared. Organized by SEPA and the Chinese Women Federation, a campaign of Woman, Home and Environment called for 1 million women to take part in the environmental protection. Together with the Chinese Society of Science and Technology, SEPA organized 100 Biological Activities for the Chinese Youths, which involved 20 million middle and primary school students to join the environmental observation and other activities.

However, all above illustrate the recent changes in the public environmental awareness and interests at as well as roles in environmental protection in China, and they are not enough to suggest that China has already shared a satisfied all-stakeholders-driven approach to environmental governance. A survey jointly made by SEPA and the Ministry of Education in 2000 may help to appropriately understand the real pictures of the public environmental awareness and their interests at participation in environmental protection. The survey concluded four characteristics in the concerned respects:

i) Totally, the public knowledge about environment and interests at participation into environmental protection are very low. Given 13 questions, the survey asked people to mark 1 point for each if they knew the answers or had the answers. As a result, the average points of the people surveyed accounted for 2.8; and the percentage of people surveyed who actively participated into environmental protection activities was only 8.3%; and the percentage of those who negatively or never participated into environmental protection was 65%.

ii) There is a closely relationship between the education background and environmental awareness: the higher the people share the educated level; the more, the environmental knowledge; and the higher, the environmental awareness. The environmental awareness of citizen in urban area is better than that of in rural area. The environmental awareness of the youth is higher than that of the adults.

iii) The public environmental awareness depends on the environmental governance approach. Governmental-driven approach does not encourage the public initiatives in environmental governance and even provides little chances for the public to know what they should do and they can do for environmental protection.

iv) The most significant factors to raise the public awareness are environmental educating, information disclosure, and the mass media. 79% of the surveyed people obtain the environmental knowledge and information from TV and radio programs.

3.3.7 Intensive environmental actions in the Ninth Five-year Plan (1996-2000)

In the 1990s, three domestic and international changes in political, economic and social context exerted significant influences on the development of environmental protection. First, China moved into the second phase of dramatic growth of economy after the 1980s constituted the first phase. As a result, majority of Chinese population started to enjoy relatively well-off life. It had two implications. Environmental pollution and ecological degradation were further deteriorated, as a result of fast economic growth. And on the other hand, economic growth accumulated an increasingly financial capacity for environmental protection, and also relatively well-off life allowed people to raise their desires for clean environment.

Second, China accelerated its reforms in both economic and political systems. Establishment of market system with Chinese socialism characteristics entered into a critical period, which requires relevant reforms in environmental policies and market-based instruments shall be encouraged.

Third, philosophy of sustainable development has increased its presence in Chinese governmental policies and strategies after the 1992 Earth Summit, with the symbol of issuance of Chinese Agenda 21 in 1994. Of particular significant was the event that China at the first time developed its Ninth Five-year Plan based on sustainable development strategies.

Under the influences of those political and economic moves above and with the relatively full preparations in environmental policy in the 1980s, China launched intensive actions to anti-pollution in the Ninth Five-year Plan, which can be summarized in four aspects.

- Since the 1990s, environmental protection started to have a full presence in Chinese political agenda. The CPC (Communist Party of China) and its government recognize the importance of environmental protection in such a view of that purposes and tasks of environmental protection are to preserve productive forces, to protect essential interests of

people, and to advocate an advance civilization. Hence, the Central Committee of CPC and the State Council hold annual meeting at highest level on review of national performances and determination of important countermeasures in environmental protection and family control from the 1995. Moreover, the Ninth Five-year Plan for National Economy and Social Development (1996-2000) at the first time set quantitative targets for environmental protection. In the governance aspect, NEPA was upgraded to ministerial status and renamed as State Environmental Protection Administration (SEPA). And more lower-level EPBs (Environmental Protection Bureaus at provincial and city governments) were thereby raised to the first-tier status under local governments.

- Based on market mechanism, several policy instruments were innovated for the purposes of providing incentives to polluters to control pollution (reference to table 2.2 and 2.3). In the 1990s, China revised/issued six environmental laws and regulations, and as a consequence, the national system of environmental laws and regulations were well established, compared to Chinese development stage of social and economic (reference to table 2.1). Of particular significance was the 1997 revision of Penal Code of P.R. China, which added new articles on a charge of damage to protection of natural resources and environment and a charge of misconduct in environmental management. It provides judicature for legal authority to coerce violence of environmental laws and regulations and also provides strong implications for normal no-compliance with environmental policies.

- The national government adopted several intensive programs and actions nationwide for anti-pollution. First, the total volume control of 12 pollutants was introduced in 1996, with traditional policy of pollutant concentration control. Moreover, 840,000 small enterprises in 15 industrial categories which are with heavy pollution but economic unreasonable in installation of abatement equipment were shut down from 1996 to 2000 in accordance with relevant ordinance issued by the State Council. Second, China initiated several regional programs for pollution abatement: three rivers (Huai He, Hai He and Liao He) and three lakes (Dian Chi, Tai Hu and Cao Hu)—for water pollution control; two zones (zone of SO_2 control and zone of acid rain control), a sea (Bo Hai marine pollution control); and a city (Beijing air pollution control)—“33211 Programs”. Third, in order to elevate urban environmental management, SEPA launched a voluntary program to build national model city of environmental protection. The city, which reaches to the criteria set in the program, is named a national model city by SEPA. The model city shares good images and reputations in environment, which could facilitate both domestic and foreign investments in the city development. Fourth, the same importance was

attached to ecological conservation as to industrial pollution control. Consequently, the national government issued three important documents: National Plan for Construction of Ecological Environment, Guidelines for Development Planning of Natural Zones, and National Guidelines for Conservation of Ecological Environment.

- As a result, China achieved distinguished successes in anti-pollution in the late half of 1990s. The deteriorating trends of environmental pollution was held back, and environmental quality was significantly improved in a number of cities and regions. Against 1995, the total volume of 12 pollutants, such as SO_2, dust, soot, COD, heavy metal and etc., dropped by 10-15%, while GDP annually grew by 8.3%. 90% of 230,000 enterprises reached to the national standards for pollutant emission/discharge. 25 of 46 cities examined by the national government reached to the national standards of air quality by urban areas classified based on their functions, and 36 cities, the national standards of ground water quality by water areas classified based on their usage. 22 cities won the name of national model of environmental protection.

3.3.8 The Tenth Five-year Plan for Environmental Protection

From 2001, China moved into its Tenth Five-year Plan period (2001-2005). The Sate Council issued a very ambitious Tenth Five-year Plan for Environmental Protection. The Plan includes four parts: strategic orientation and goals, main tasks, measures to ensure the implementation of the Plan; and funds.

Strategic orientations and goals

The Plan establishes two strategic guidelines for environmental protection in next five year:

i) Environmental protection shall service for the main national focus of promotion of sustainable development and attach fundament orientation on improvement of environmental quality and protection of people's health. Concretely, in next five years environmental management shall take the total volume control of pollution discharge as a central consideration of the agenda, and gives priorities to key regional programs such as "three rivers, three lakes, two zones, a sea and a city (33211 Programs)" and to human-caused damages to ecology.

ii) In doing so, several guarantees of measures, policy innovations, and mechanisms are needed. They include enhancement of monitoring and inspecting the enforcement of environmental laws and regulations; raising managerial capacities; integrating the

administrative control with market instruments; innovating administrative system and policy; building a new mechanism of environmental governance with a leading role of government, facilitation by market forces, and public participation.

Based on the strategic orientations above, the Plan sets a very much ambitious goals in general and concrete targets in specific areas. The general goals are 1) to lighten environmental pollution and preliminarily harness deterioration of ecological environment; (2) to improve urban and rural environmental qualities, and in particular environmental quality of mega-and-medium-sized cities and key regions; (3) to perfect environmental laws/regulations, policies and administrative systems, adaptable to market economic system. Under the general goals, the Plan further sets a number of quantitative targets for six areas: the total volume control of discharge of main pollutants; industrial pollution control; urban environmental protection; ecological conservation; rural environmental protection; and key regional programs for environmental pollution control. For the total volume control, for example, by 2005 the discharges of main pollutants such as SO_2, dust (smoke soot and industrial dust), COD, NH_3, and industrial solid wastes, would drop by 10%; and the discharges of SO_2 would decrease by 20% in SO_2 control zone and acid rain control zone, compared to 2000. In industrial pollution control, by 2005 the reuse ratio of industrial water would reach to 60%; and the ratio of comprehensive utilization for industrial solid waste, 50%. In urban environmental protection, by 2005 the percentage of sewage treatment would be up to 45%; the percentage of households with gas-fuel, 92%; the capacity of sanitation disposal for garbage would increase by 150,000 tons a day. For regional pollution control, the national programs add two new areas: Three-gorge area and East Diversion Project area, in addition to "33211 Programs" initiated in the Ninth Five-year Plan. And moreover, the pollution control plans for Yangtse River, Huanghe River, and Song huajiang River would be made and implemented in this five-year plan period.

Main tasks

The Plan specifies clear tasks for each of six areas: industrial pollution control, urban environmental protection, rural environmental protection, marine environmental protection, ecological environment conservation, and nuclear safety and radiation management.

i) Industrial pollution control:

- Strictly control the occurrences of new pollution;
- Solid and improve the outcomes of industrial compliance with pollution discharge standards which were achieved in the last five years;

- Reduce the production capacities of industrial enterprises which are with low quality of products but with heavy pollution.
- Promotion of cleaner production technology;
- Emphasize on pollution control of key industries such as coal industry, power generation, nonferrous metal industry, petrol and chemical industry, and construction materials industry, and light industry.

ii) Urban environmental protection:

- Make sound urban plans and perfect functions of cities;
- Abate sewage pollution;
- Control urban air pollution;
- Abate domestic garbage pollution;
- Control urban noise pollution;
- Emphasize on urban environmental protection of key cities

iii) Rural environmental protection;

- Conserve sources of rural drinking water;
- Prevent the pollution to crops and ensure the safety of agricultural products;
- Control the pollution by aquaculture of livestock and fishery;
- Prohibit burning straws outside, instead of facilitation of comprehensive utilization;
- Protect town environment.

iv) Marine environmental protection:

- Enhance the unified supervision to marine environmental management;
- Control pollutants from the land;
- Implement the Program for Clean Bo Sea;
- Conserve important marine and seashore ecological systems.

v) Ecological environmental protection:

- Adopt urgent measures for protection of crucial ecological systems with special services;
- Adopt coerce measures for protection of natural resource exploration;
- Improve construction quality and management of natural zones and ecological pilot zones;
- Strengthen the protection of biodiversity and the management of biological safety.

vi) Nuclear safety and management of radiation:

- Enhance management for nuclear safety and radiation;
- Prevent and abate electromagnetic radiation.

Measures to ensure the implementation of the Plan

The Plan proposes ten measures to ensure the fulfillment of tasks and targets set in the Plan.

- Build mechanism for integrated decision making to facilitate the harmonious development between economy and environment;
- Perfect environmental laws/regulations system to ensure protecting environment in according with laws/regulations;
- Integrate governmental control approach with market mechanism to raise environmental investment;
- Apply incentive policy instruments to create good atmosphere for all stakeholders involving in environmental protection;
- Strengthen managerial capacity-building to raise the level of environmental management;
- Promote environmental scientific and technological studies to facilitate environmental protection depending on scientific and technological progress;
- Regulate environmental industry market to promote the development of environmental industry;
- Enhance environmental publicizing and education to raise the public environmental awareness;
- Actively participate in global environmental protection and extensively develop international environmental cooperation;
- Carry out goal-responsibility of environmental protection for local governments to ensure the effectiveness of the Plan implementation.

Investment

To achieve the targets and fulfill the tasks set in the Plan, it needs 700 billion Chinese Yuan, accounting for 1.3% of GDP in the same period from 2000 to 2005, and 3.6% of the total social fixed capital investment---1% increased, compared to the Ninth Five-year Plan period. Among this total amount of environmental investment, 270 billion Yuan would be allocated for water pollution abatement; 280 billion Yuan, for air pollution control; 90 billion Yuan, for solid waste disposals; 50 billion Yuan, for ecological conservation; and 10 billion Yuan, for capacity-building including monitoring, surveys, planning, information, education, and scientific studies. For the total costs of 700 billion Yuan for environmental protection in the next five years, governments shall pay 56% of them, and the rest shall be shared by industries based on the "Polluter Pay Principle".

3.3.9 Performance of China's Environmental Management System

In order to analyze the performance of China's Environmental Management System, we selected three indicators, including institutional capacity, efficiency of enforcement and degree of public participation (see Figure 3.18). Each indicator will then be represented by one or several indices according to statistics (see Table 3.18).

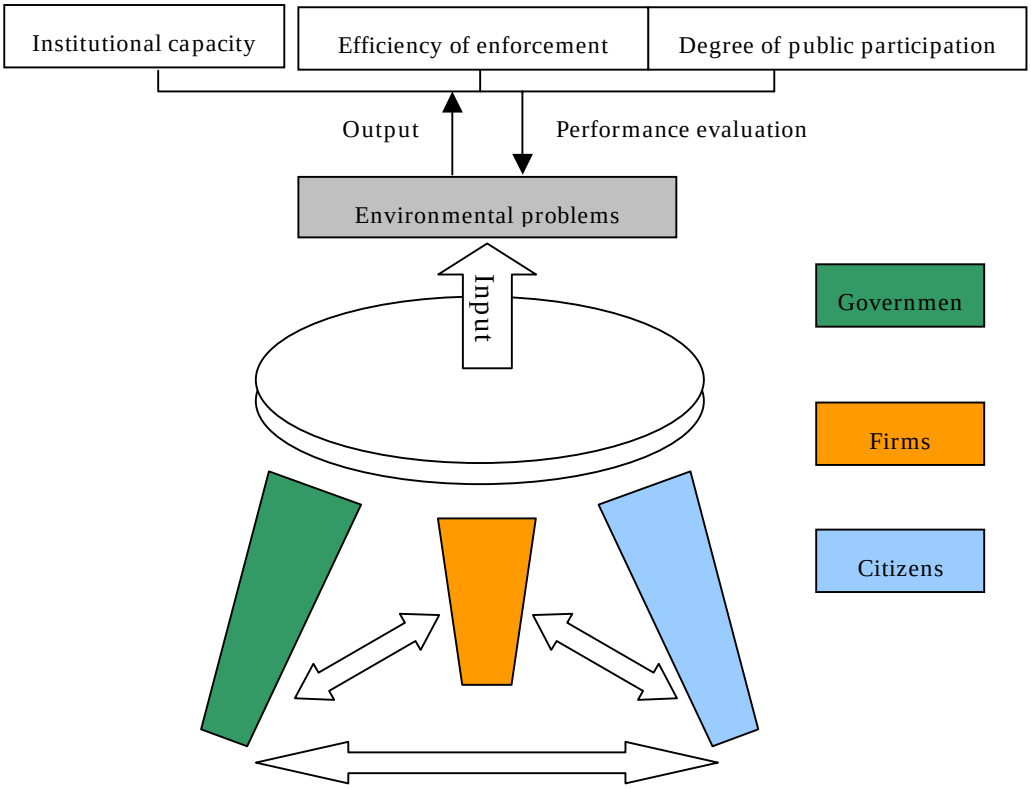


Figure 3. 18 Performance evaluation of China's Social Environmental Management System

Table 3. 18 Indices and Indicators for performance evaluation of China's SEMS

Index	Indicator
Institutional capacity	Number of environmental administrative organization, number of environmental administrative staff
Effectiveness of enforcement	Compliance rate of industrial wastewater discharge, rate of industrial soot removal, rate of industrial process waste gas purification, rate of utilization of industrial solid waste, compliance rate of "the Three Simultaneity System", total revenue from pollution levy, total COD discharge from industrial sources, total SO2 emissions from industrial source, total soot emissions from industrial sources, total dust from industrial source, COD discharges per unit GOV, SO2 emissions per unit GOV, soot emissions per unit GOV, dust emissions per unit GOV, energy consumption per unit GOV
Degree of public participation	Number of letters from citizens, number of visits by citizens

Institutional capacity

The development of institutional capacity in the 1990s is described by two indices, i.e. the number of environmental administrative organization and the number of environmental administrative staff (see Figure 3.19). Both the local environmental administrative organizations and staffs have increased steadily, showing the institutional capacity for governmental environmental management being strengthened.

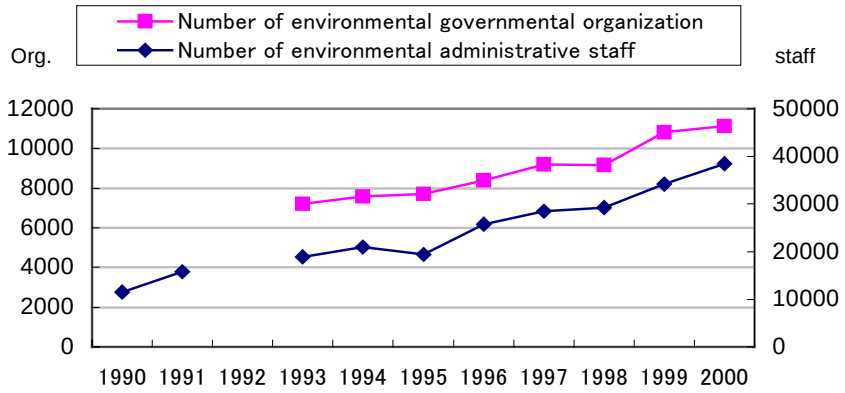


Figure 3. 19 Development of institutional capacity

Source: China Environment Yearbook 1991-2001

Effectiveness of enforcement

The efficiency of enforcement is analyzed by several indices, including the compliance rate of industrial wastewater discharge, the rate of industrial soot removal, the rate of industrial process waste gas purification, the rate of utilization of industrial solid waste, the compliance rate of "the Three Simultaneity System" (see Figure 3.19 and Figure 3.20), total revenue from pollution levy, total COD discharge from industrial sources, total SO2 emissions from industrial source, total soot emissions from industrial sources, total dust from industrial source, COD discharges per unit GOV, SO2 emissions per unit GOV, soot emissions per unit GOV, dust emissions per unit GOV (Figure 3.21), and energy consumption per unit GOV (Figure 3.22).

Figure 3.20 showed an improvement in the performance of corporate compliance and in industrial abatement, especially after 1996, when Chinese Government implemented the "Ninth Five-year Environmental Protection Master Plan" focusing on regional clean-up and compliance enforcement and a great number of policies. The trend in Figure 3.19 shows that the implementation of the "Master Plan" and the policies to achieve the goal was very effective.

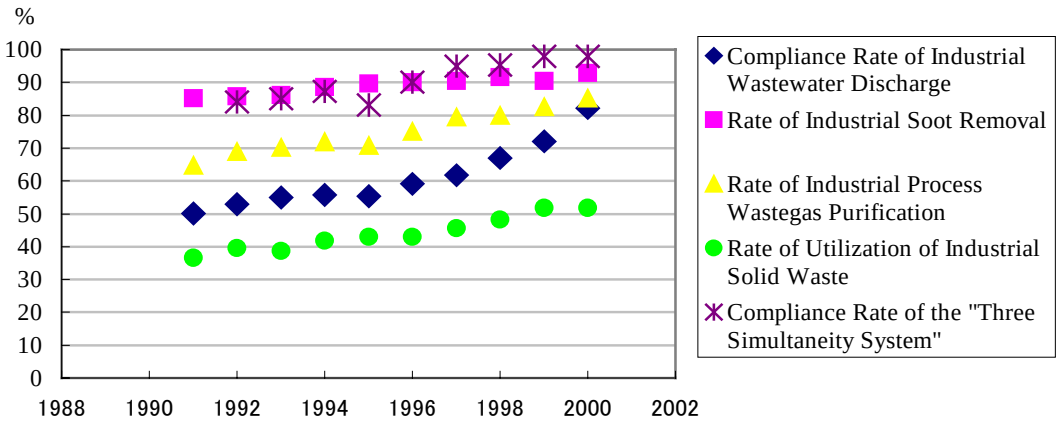


Figure 3. 20 Performance of corporate compliance and industrial abatement

Source: China Environment Yearbook, 1991-2001

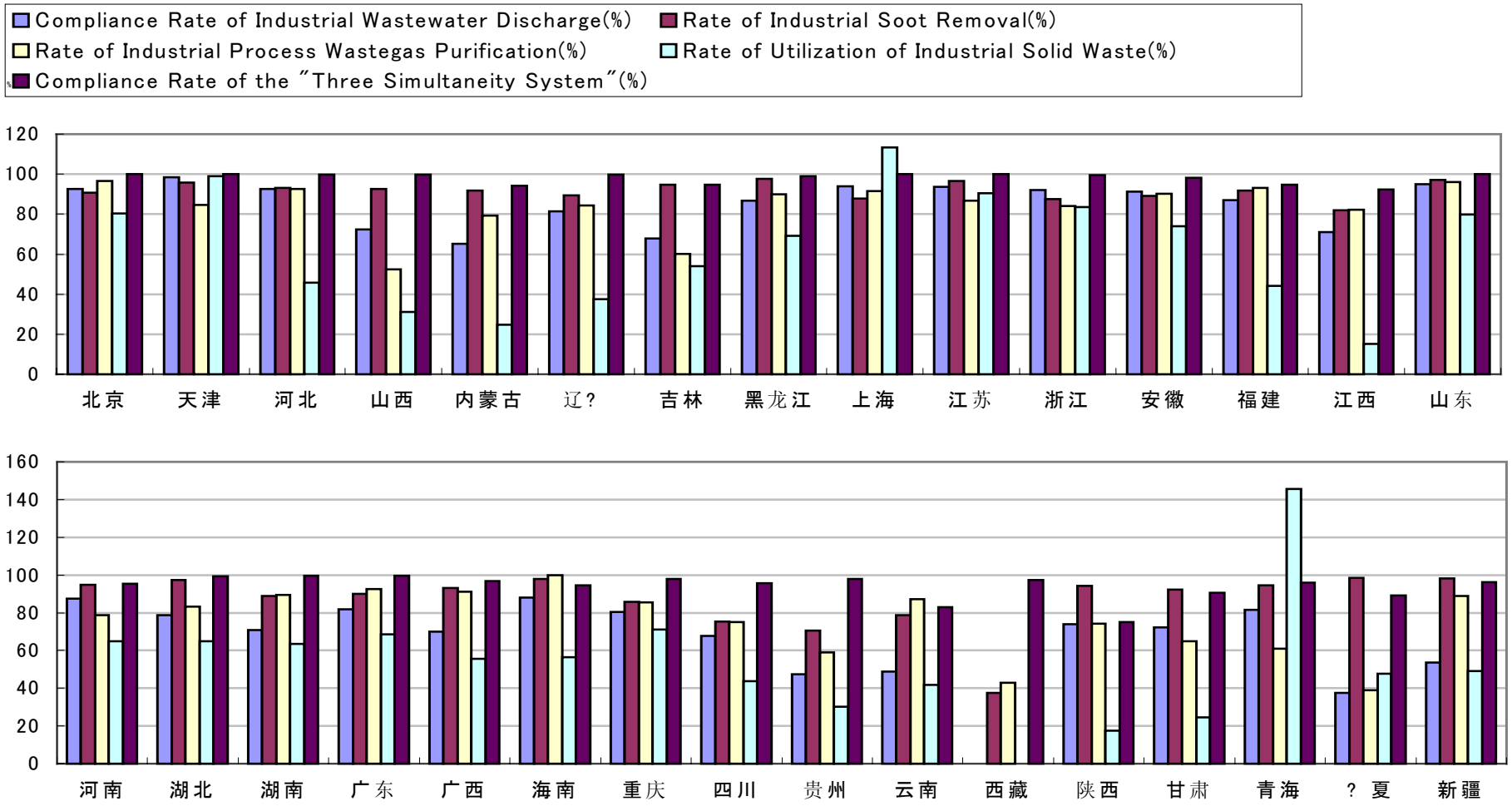


Figure 3. 21 Performance of corporate compliance and industrial abatement across regions

However, the effectiveness of enforcement in different regions in China differs. In Figure 3.21, we can see that the compliance rate of industrial wastewater discharge varies across regions, showing a phenomenon that the compliance rate is higher in the east and coastal regions than in the western regions. The rate of industrial waste gas purification and the rate of utilization of industrial solid wastes also differ across regions. There is no obvious relevance to the development level of different regions. However, the compliance rate of the "Three Simultaneity System" is evenly through the nation, showing a good performance in the enforcement of this system.

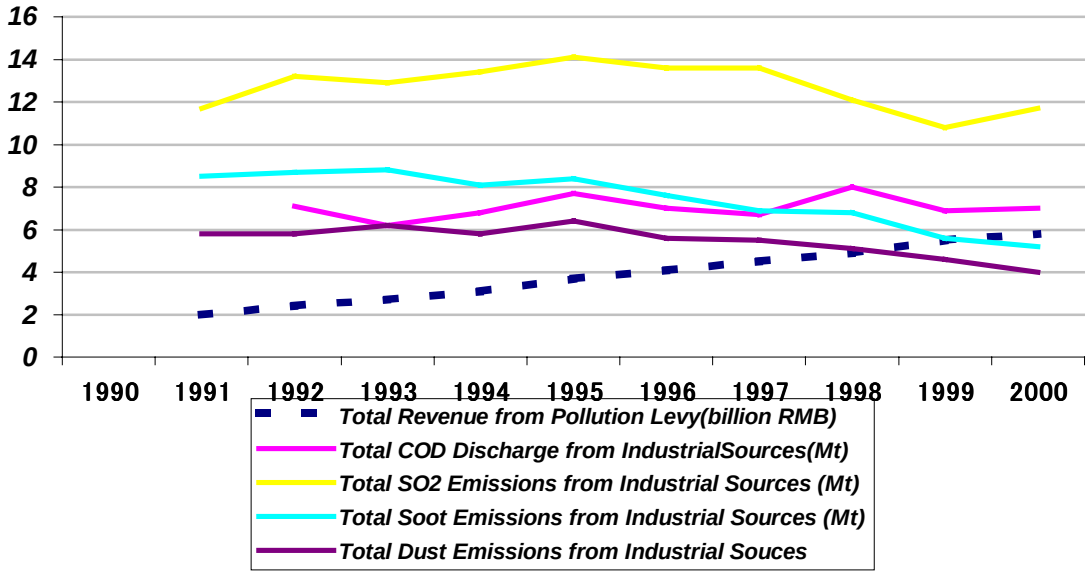


Figure 3. 22 Effectiveness of industrial pollution abatement

Source: China Environment Yearbook, 1991-2001

Figure 3.22 shows a steadily increase in the total revenue of pollution levy, reflecting an improvement in the enforcement of the Pollution Levy System. In addition, the total emissions of major pollutant, including COD, SO_2, soot and dust have kept the level in early 1990s and showed a declining trend. This demonstrates that industrial pollution has been well under control and current policies are effective.

Figure 3.23 shows the development of industrial Gross Output Value (GOV) has a similar trend as emissions per unit GOV. This represents limited improvement in abatement technology. This can also relates to very limited technology based policies are adopted in the SEMS in China (see Figure 3.8).

Degree of public participation

The degree of public participation is described by two indices, i.e. the number of letters from the citizen and the number of visits by the citizens. Both include complaints, suggestions or reflecting the situation to the administrative or legislative organizations. Figure 3.24 shows a stable development in the first half of the 1990s, however, since 1995 both numbers have increased greatly, showing an adverse trend of the performance of corporate compliance (Figure 3.20) and of the effectiveness of industrial pollution abatement (Figure 3.22). One reason can be explained as the public awareness has increased and their requirements on environmental quality also increased. Under the improved policy environment for their participation, their participation in environmental management and surveillance also increased.

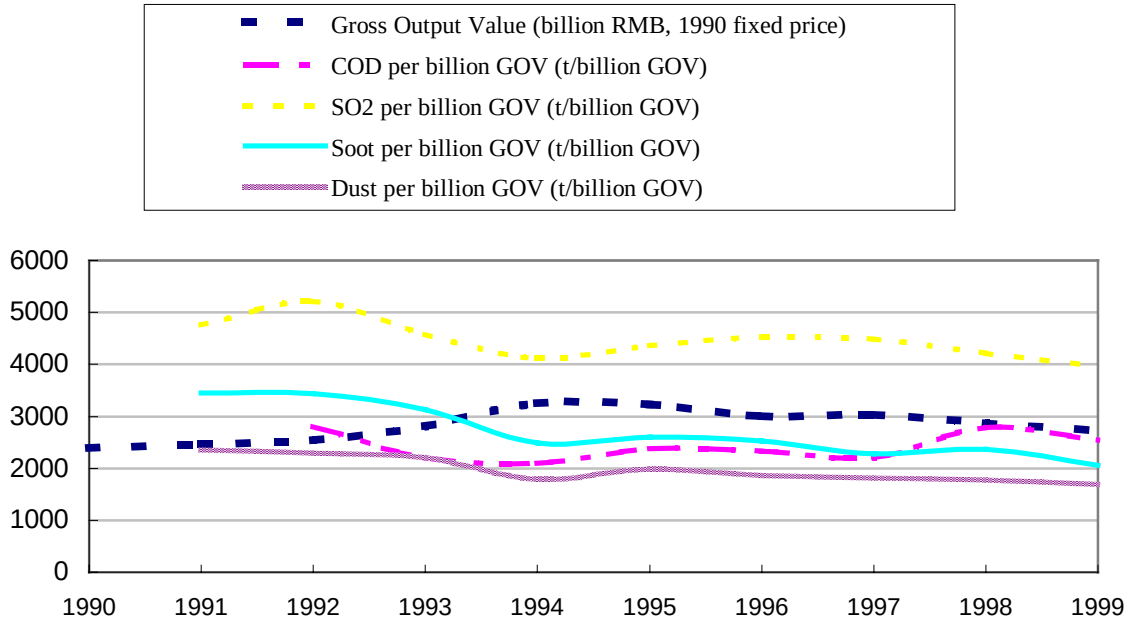


Figure 3. 23 Emissions per unit industrial GOV

Source: China Environment Yearbook, 1991-2001

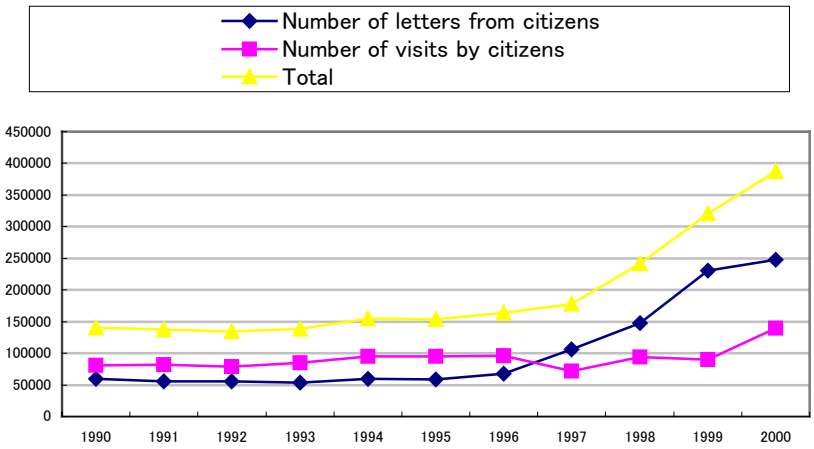


Figure 3. 24 Degree of public participation

Source: China Environment Yearbook 1991-2001

4. Program Evaluation of the Sino-Japan Friendship Center for Environmental Protection

Social environmental management system is an interactive system in which the Government, the public and the enterprises stimulate and affect each other. In general, the Government functions as the dominant figure in environmental management, passes laws and regulations to regulate and guide the environmental protection acts of the enterprises and the society. The enterprises create wealth for social development through organized production, provide infrastructure to solve environmental problems for the human society through technological advances and innovations, and standardize the environmental protection acts of the enterprises themselves through self-adopted environmental management. The public, being the party that suffers from any environmental abuses, functions as the supervisor of the Government and enterprises. On the other hand, problems fed back from the public society and the enterprises in their development process can help and stimulate the Government to pass and complete laws, regulations and policies so as to achieve sustainable development of the whole society.

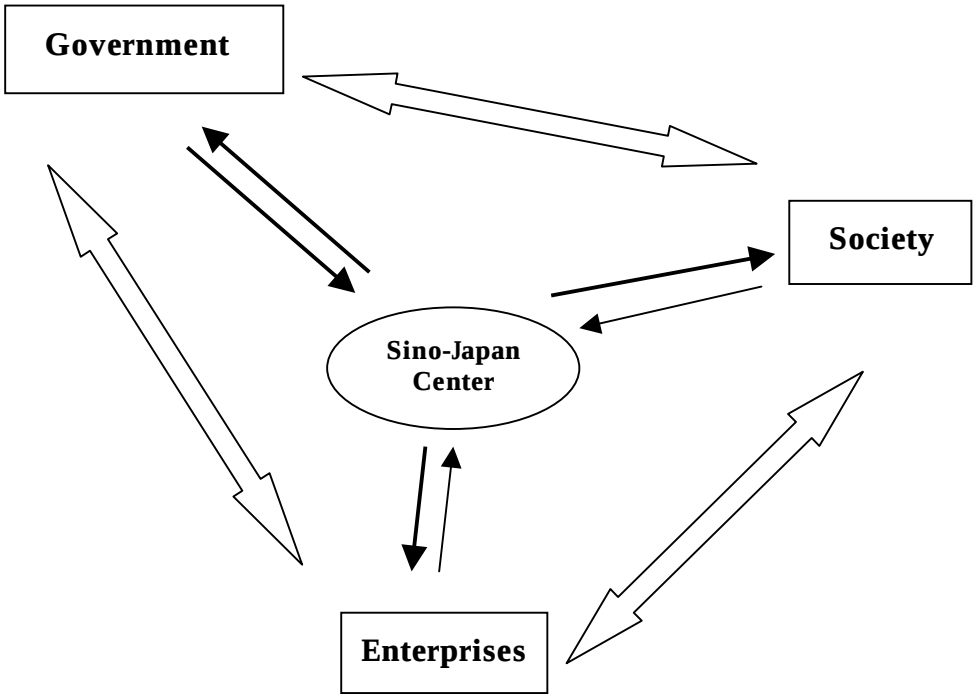


Figure 4. 1 Functions in the Social Environmental Management System played by the Sino-Japan Center

Evaluation of the function in the Social Environmental Management System played by the Sion-Japan Center involves the concrete assessment of the achievements made by the Sino-Japan Center ever from its establishment in promoting the government's efforts on environmental management, the public's environmental awareness and the enterprises' environmental protection level and so on. As a comprehensive scientific research institute directly under the State Environmental Protection Administration, Sion-Japan Center maintains close relations with the functional departments of environmental protection in the government, which, being the demanding party, exist direct impact on the Sino-Japan Center's development. Similarly, the Sion-Japan Center also influences the decision-making, management and public service of the government. Therefore, a relation of mutual impact exists between the government and the Sino-Japan Center. In the meantime, development of the Sino-Japan Center also affects the environmental protection of the society and the enterprises. However, such influences are not equal in both ways: as the output party, the Sino-Japan Center exerts more impact on the society and the enterprises. Work of all the departments of the Sino-Japan Center can directly influence the environmental protection of the whole society and the environmental management of the enterprises. On the other hand, the society and the enterprises only exert relatively weak influence on the Sino-Japan Center because the former's requirements can only be conveyed to the Sino-Japan Center as government's requirements and through the channel of the government departments.

4.1 Role of the Sino-Japan Center in promotion of the work of the government

The governmental departments in charge of environmental management are mainly the State Environmental Protection Administration and the local environmental protection bureaus. The functions the government plays in environmental management largely lies in the following aspects: maintenance of the state's environmental rights, establishment and execution of laws and regulations concerning environmental protection, guidance to the public’s environmental protection acts and public issuance of environmental information. The Sino-Japan Center mainly conducts its functions concerning environmental protection at the following two levels: the state level and the local government level.

4.1.1 Support to the State Environmental Protection Administration

As an institutional unit directly under the State Environmental Protection Administration, the

Sion-Japan Center mainly functions in accordance with the major tasks of the Administration. For the Sino-Japan Center, support to the State Environmental Protection Administration is positioned as one of its basic tasks. With several years of development, the Sino-Japan Center has succeeded in providing support to the State Environmental Protection Administration in the following aspects:

4.1.1.1 Direct participation in the major projects of the Administration

i） Participate in the protection and maintenance of the state's interests in environmental protection

In the negotiation of environmental protection issues, substantial background information and related technical support are needed. During the recent years, the Policy Search Center of the Sion-Japan Center has participated in providing technical support to many negotiations of international environmental agreements. For example, in the negotiation for the establishment of "Convention on Climatic Change Framework ", it not only joined the relevant domestic research work but also directly participated in the negotiation.

Table 4. 1 Participation of the Policy Search Center for Environment and Economy in the research and negotiation of the climatic change convention

	Mission Contents
Research Projects	Research of the Kyoto Conference
	Research of the climatic change and technology transfer mechanism
	Functions of the environmental protection departments in control of greenhouse gas emission
Negotiations	Participation in the COP7 and take charge of relevant negotiations

ii) Participation in the organization and preparation of major conferences and events

The State Environmental Protection Administration has played an active role in the organization and preparation of major conferences and events sponsored by the Administration as shown in the following cases

Participation in the drafting of important documents including speeches and reports to be delivered by the VIPs

As a governmental department in charge of environmental protection, the State Environmental Protection Administration will hold important annual conferences to specify the

policies and work focuses concerning environmental protection and guide the environmental protection work of the country. With the growing influence of China in international affairs concerning environmental protection, over the years some large-scale international environmental conferences have been held in China. The responsibility of organization and preparation of such conferences naturally fall on the State Environmental Protection Administration, which often calls for the support from the institutions under its direct administration during conference and documentation preparation. In fact, this is also one of the important supports rendered to the Administration by the Sion-Japan Center. Besides drafting the speeches for the VIPs, the Policy Search Center also supports the State Environmental Protection Administration by providing the relevant materials, reports or documents. For example, it wrote the speech drafts for the VIPs and the relevant documents at the Ministerial Conference of Asia-Europe Environmental Protection and the GEF Conference.

Participation in major publicity activities

Environmental protection is one of the two fundamental state policies of Chinese Government. However, many people are still unaware of the environmental protection work. Their knowledge of the work of both the State Environmental Protection Administration and the local environmental protection departments is far from adequate. Hence, the departments in charge of environmental protection meet more difficulties in their daily operations. Participating in the state's major events is not only an important task of the Administration but also a great opportunity to showcase the environmental protection achievements and to publicize environmental protection and educate the public and promote the status and influence of the departments in charge of environmental protection. The Sino-Japan Center for Environmental Education and Communications of SEPA of the Sion-Japan Center has successively sponsored and participated in the planning and arrangement of the environmental protection exhibition in the "Glorious Five Years--Achievements in the Construction of Economic and Spiritual Civilization since the 14th Party Congress" and the Series of celebrations for the 50th anniversary of the founding of the People’s Republic of China, as well as the "Yangtze River Origin" --a tree planting event. All these exhibitions and activities have been received warmly and CCTV had a live broadcast of the "Yangtze River Origin" event. Such activities have promoted the awareness and influence of the State Environmental Protection Administration.

4.1.1.2 Promoting and improving state laws and regulations

The laws and regulations about environmental protection include all the laws and policies on environment and natural resources protection, pollution and other public nuisance prevention established and approved by the state and to be compulsorily implemented. China's environmental law system is shown in Figure 4.2.

Box 4.1 Series Celebration Activities on the 50 Anniversary of the founding of the People's Republic of China

1. Participating in celebrations on Tian'AnMen Square on the 50th anniversary of the founding of the People's Republic of China

A float showing environmental protection achievements of China appeared for the first time in the celebration parade, which attracted wide attention of the media at home and abroad. This float demonstrated the rapid development of China's environmental protection especially since China adopted the opening up to the outside world policy. Making of the float was assigned as one of the key projects of the State Environmental Protection Administration for the year 1999. It was built by the Sino-Japan Center for Environmental Education and Communications of SEPA (CEEC) and many leaders of the Administration came to the work site to give instructions and guidance. They were also present at the acceptance examination of the final vehicle.

The environmental protection float reflects the theme of "one globe" for all mankind with every country, every people and every person living on it having the responsibility to protect it. China, with its 1.3 billion population, has made positive contributions to the protection of human being's living environment while maintaining a high-speed economic growth. Five large size green leaves decorated the middle part of the float breaking the stiffness of the square bodywork of the vehicle and highlighting the concept of green environmental protection. In the meantime, the number five coincides with the five decades of the development of People's Republic of China. On the second layer of the float, there were 13 girls in dresses shaped like sunflowers surrounding a globe model. This demonstrated our love and protection of the earth--our motherland. At the front of the float was a 1-diameter insignia surrounded by sunflowers depicting China's environmental protection. On both sides of the bottom layer of the float was a three-sided auto revolving board 10 meters in diameter and 2.5 meters in width highlighting the happy festive atmosphere of the celebration. On these boards painted three theme pictures of modern city, gold wheat field, swans and lakes respectively corresponding to the work of comprehension urban environment regulation, ecological agriculture and biodiversity protection and displaying China's remarkable achievements in environmental protection.

II. Undertaking the environmental protection exhibition "Glorious Progress--Exhibition of Achievements in the 50 Years since the Founding of the People's Republic of China"

This exhibition was sponsored by the State Planning Commission, the Propaganda Department of the CPC Central Committee, the State Economy and Trade Commission, the Ministry of Finance, State Statistics Bureau, the CPC Committee of Beijing, and Beijing Municipality. It was one of the major celebrations for the 50th anniversary of the People's Republic of China. The State Environmental Protection Administration paid high attention to the exhibition and specified it as one of the major tasks in 1999. The task was assigned to CEEC of the Sion-Japan Center. Mr. Wang Yuqing, deputy director of the Administration, presided over two meetings attended by the department leaders to discuss the exhibition outline thus ensuring the authority of the exhibition contents. The exhibition mainly composed of pictures added with videos, touch screens, brochures and other propaganda materials. More than 1.5 million visitors including Premier Zhu Rongji and other state leaders attended the exhibition. The environmental protection achievement exhibition was awarded "the Best Design" and "Excellent Organizer".

The formation process of China's environmental law system has made tremendous progress

since the 1970s marked by the issuance of the environmental protection basic law "Environmental Protection Law (Trial)". At present, a relatively complete system is emerging. In the 1980s, emphasis was laid on lawmaking while in the 1990's work was carried out both in environmental legislation and law implementation. By the end of 2000, altogether 15 laws, 35 administrative regulations, 1000 local regulations and rules on environmental protection and resources conservation had been issued. In China's law system, environmental standards are an important component. Establishment of the environmental standards began in the 1960s. In 1972, the International Organization for Standardization (ISO) started to set up basic standards and method standards in order to unify the nouns, terms, units and sampling and monitoring methods on environmental protection of various countries. By the end of the year 2000, 439 environmental standards had been issued in China (of which 365 are state standards and 74 are standards of the State Environmental Protection Administration). These environmental laws, regulations and standards are inter-related and interdependent exerting supplementary and constraining effects upon one another. In the meantime, China's environmental standards have formed an organic body emerging as an initial environmental standard system of China’s own.

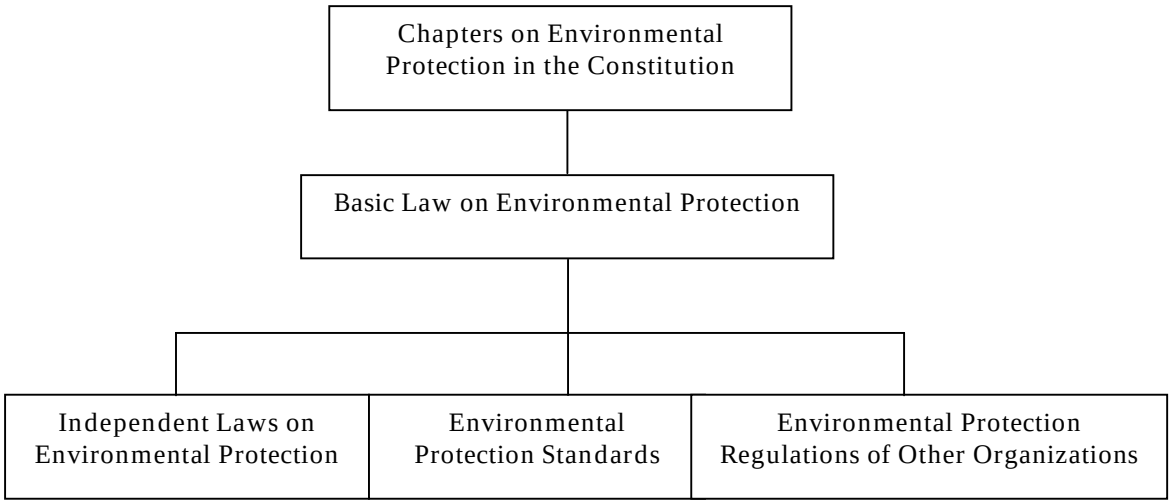


Figure 4. 2 the Environmental law system of China

The state environmental reference materials are an important constituent in environmental standardization. They are mainly created to meet the needs of the environmental language standards as a supplement to the latter. The reference materials and the language standards often serve and supplement each other. These two parts combine to form the main contents of the standardization. In addition, environmental pollution features wide range of natural

environment elements and great varieties of pollutants, complex matrices (media), and diversified pollutant content density. Besides, development of environmental reference materials takes a long period with high technological requirements and heavy costs. Therefore, to be able to get them in a timeliness way during environmental monitoring and research, it is necessary to develop those needed reference materials in advance so as to promote the development of environmental standardization. Ever since the 1970's, work in this field has been growing to meet the demands of environmental standardization and environmental monitoring and management.

Environmental standardization has always remained a major work in the China's environmental protection. Its main purpose is to evaluate the environmental quality and the enterprises' pollution control situation and serves as the criteria for the environmental management and exercise of environmental laws by the environmental protection departments at all levels. Many functions such as environmental planning, environmental management and utilization, environmental assessment, discharge charges, environmental development, daily environmental monitoring and environmental prevention cannot do without the application of environmental standards. Without or with incomplete environmental standards, environment supervision will lack the basic benchmark for evaluation and judgment. Therefore, the State environmental standardization is a baseline throughout environmental management and supervision and all environmental management activities should base upon it. Reference materials, one of the important components in State environmental standardization, define the technical specifications of the environmental standard samples and provide the material standards for environmental management and supervision and law execution regarding environmental quality, discharge and method standards. They are a special fixed-value product, that is, they can produce products and data. In the meantime, they are both scientific in nature and practically productive in terms of environmental protection product production. They function as the benchmark and foundation in concrete environmental standard implementation as well as environmental quality evaluation. In practical application, they can provide scientific and accurate data guaranty for the implementation of environmental standards, environment supervision and environmental quality evaluation. In light with this, the State Environmental Protection Administration promulgated the "Methods for Management of Environmental Standards" on April 1, 1994 in a bid to further strengthen environmental standardization effort. The Methods proclaims that State environmental reference materials should be observed in the following environmental supervisory activities: 1）quality control check of all environmental supervision and analysis labs and analysts; 2）instruments for standard examination and analysis; 3）preparation and production of standard solutions; 4）analytical method verification and other environmental monitoring work.

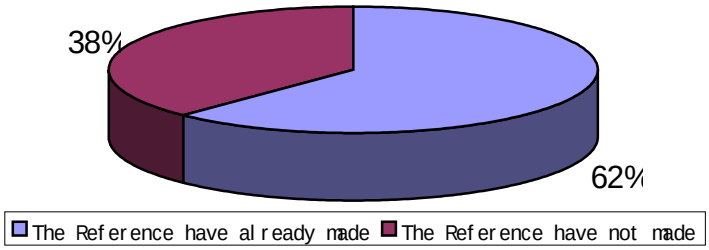


Figure 4. 3 Proportion of the reference materials developed by the Institute of Reference Materials of SEPA in national environmental standards

The Institute of Reference Materials of SEPA of the Sion-Japan Center is the only specialized organization authorized by the State Environmental Protection Administration to develop environmental reference materials. Its main task is to undertake and take charge of the establishment and alteration of the State environmental protection reference materials. The establishment of the State environmental standard reference materials includes processes of research, preparation and production, which involve high technology and constitute part of the environmental science research. At present, the Institute of Reference Materials of SEPA has already produced 227 State environmental standard reference materials, which have filled gaps in the reference material standardization of China's environmental standards and have been specified as State reference materials of the People's Republic of China. The Institute of Reference Materials of SEPA has already become an authorized institution for the development of environmental standard reference materials and contributed greatly to the perfection of the State legal system through its research and development. In the meantime, the state environment reference materials developed by the Institute have already been put into wide application in environmental monitoring of all sectors of the country. They are playing an irreplaceable role in strengthening the enforcement of environmental protection laws and standardized environmental monitoring.

4.1.1.3 Support to national environmental protection decision-making

i）Support through policy research

As China's administrative department in charge of environmental protection, the State Environmental Protection Administration functions as the organization to draw up principles, policies, statutes and administrative rules for environmental protection. Research on policy making is of vital importance as each important decision must undergo thorough investigation and study so as to provide solid theoretical foundation to it before it is put into actual application. As the specialized policy research organization directly under the Administration, the Policy Search Center has played a positive role in providing timely, forward-looking research service to the Administration. In doing so, the Sino-Japan Center has followed the key environmental protection projects of the Administration, utilized its own rich experience accumulated over the years and based on its keen analysis of the development trend of environmental protection.

In actual operation, the Policy Search Center has always kept a close observation of the focus work of the State Environmental Protection Administration and tried hard to provide direct technical support to the decision-making of the Administration on the basis of its research outcome.

Research on China's diplomatic strategy of environmental affairs

In conducting the research on China's diplomatic strategy of environmental affairs, PRCEE made a study of the current diplomatic situations and conflicts concerning environment protection, of the divergence between the developed countries and the developing countries in solving global environmental issues and of the channels to solve the divergence. It has also conducted fundamental research into issues of sovereignty right and development in environmental diplomacy as well as state environmental diplomatic strategies, strategies and countermeasures of international technology cooperation spanning the 20th-21st centuries. In this way, it has provided adequate technical support to the decision-making process of the State Environmental Protection Administration in environmental diplomacy.

Research on the scope, proportion and mechanism of the expenditure on environmental protection financed by the State and local governments

Analysis of investment and performance of environmental protection in foreign countries has been conducted. Researches have also been done of the invested projects of environmental protection financed by the state and the local governments, and of the scope, proportion and mechanism of expenditure financed by the state and local governments on environmental protection as well as its examination standard and methods. Thus, a decision-making basis is

provided for the determination of the proper scope, proportion and mechanism of the expenditure in the state and local budgets on environmental protection and the establishment of examination standards and an effective mechanism.

Research on an indicator system for sustainable development

Study has been made into the theory and the methods of an indicator system for China's sustainable development in order to set up the framework of China's environmental indicator system. This project has made wide case studies in relevant cities and produced an indicator system and an environmental evaluation system handbook for China's sustainable environmental development. In this way, the project has provided the decision-making level with a benchmark for sustainable development and a foundation based on which the environmental protection factor can be included in the national economic accounting system.

Research on the Mechanism for the Coordinated Development of Environment and Economy in the Less Developed Regions of China

This project has probed into the peculiar social and economic conditions of the under-developed areas in Midwest China and the characteristics of the corresponding environmental policies in order to produce feasible strategies towards a harmonious relation between the environment and economic development. The research has provided initial decision-making references for the establishment and innovation of a mechanism of harmonious environmental and economic development, as well as for the management of sustainable regional development. It has also provided the scientific basis for the State Environmental Protection Administration to strengthen environmental protection and for classified guidance to the policy making and environmental management in Midwest China.

Research on foreign trade development and environment strategy

This project belongs to the State key projects during the "Ninth Five-year Plan" period. The Policy Search Center undertakes part of the project. In this project analysis and research have been made into laws and regulations on trade and environment, two major fields, in China. It has made in-depth studies of the provisions and treaties about international trade and environment and of foreign capital attraction. The issues of trade and environmental protection have been analyzed from the perspective of international economy, trade and sustainable development. It

has outlined the basic principles and overall policy framework for coordinating trade and environmental policies. Some proposals and basic ideas concerning decision-making, as well as suggestions about the establishment of sustainable development strategy of foreign trade have been made. The suggestions are highly instructive and practical, some of which have already been adopted by the State Environmental Protection Administration.

Research of the environmental protection countermeasures in China's West exploration project

This project was one of the key projects of the State Environmental Protection Administration in the year 2000, which aims at establishing and implementing proper environmental protection countermeasure schemes suitable for the China's West exploration campaign. It strives to study the environmental protection countermeasures from a nationwide perspective in line with the "Tenth Five-Year Plan" environmental protection program and to bring into full play the functions of the environmental protection departments at all levels while highlighting innovative environmental policies.

All the research projects are conducted in accordance with the work focus in different periods of the State Environmental Protection Administration and the results of the projects have provided significant support to the Administration's decision-making process. In the cases such as "Studies about the raking of long thread mosses (see box 4.2)" and "Investigation and control of damage to the grassland due to chaotic and excessive digging up of the resources of Chinese herbal medicines", the research results have aroused the attention of the State leaders. The State Council has issued relevant policies based on the proposals put forth in the project.

Box 4.2 Investigation into the problem of raking long thread mosses

I. Background of the investigation

Since the early 1980s, large numbers of farmer from Ningxia and Gansu swarm into Inner Mongolia grassland to rake long thread mosses each year, which has resulted in great damage to the grassland. Especially since the 1990s, such a practice has become more and more prevalent and showed no sign of stopping even after the local government issued prohibitory orders. The Inner Mongolia government made many urgent reports to the State Government.

Long thread moss （ nostoc flagelliforme） is a kind of algae which is edible but with little nutritive value. However, just because its Chinese pronunciation coincides with the pronunciation of the Chinese term meaning "making a fortune", to wish for good luck, some people come to like the dishes made from it and thus market demand for it has shot up. To gather it, rakes are used which are about 30-40 cm wide with teeth made of hard steel threads of about 1 mm in diameter. Each tooth is about 1 cm apart from each other. When such a rake is used to gather the long thread moss, grasses that have grown for many years are also pulled up from the root. As a result, the vegetative cover of the field is seriously destroyed.

II. The Investigation

To investigate into the real situation, an investigation team was set up by the State Environmental Protection Administration with members from the Department of Nature of the SEPA and the Policy Search Center and local environmental protection bureaus. From November 1996 to March 1997, the investigation team conducted an on-site investigation in Inner Mongolia and Ningxia. They took photos and made field studies despite the danger of possible attack from those raking the mosses. In the meantime, they also talked with the local farmers and disseminated related policies on environmental protection and grassland protection during home visits.

The investigation showed that raking the mosses had incurred great damage to the grassland causing serious grassland deterioration. Of the grassland on which mosses had been raked, over 80% was damaged with some totally ruined to almost complete desertification. At the same time, it also threatened the precious wild plants because they, including some species under State protection, were also pulled out by the rakes. Raking the mosses also resulted in droughts, semi-droughts, desertification or near desertification and caused more "sand storms" threatening and impacting a larger area.

The economic losses incurred are enormous. After consulting specialists and conducting on-site surveys and experiments, the following conclusion was reached: the raking of 40 - 50 yuan worth of mosses will ruin about 10 mu pastures rendering it profitless for 10 year. Farmers raked the long thread mosses to improve their living conditions, which, however, was only a temporary and ineffective way towards such an end. But the market demand for this "merchandise " was the real underlying force for this large-scale gathering, which was further aggravated by local people's desire to rid themselves out of poverty.

Based on their findings, the investigation team put forth three solutions: stopping the long thread moss trade, artificial planting and restrictive development of long thread moss. At the same time, exhaustive discussions and analyses of the advantages and disadvantages of each solution were conducted in terms of scientific feasibility, economical efficiency and operational possibility. The final conclusion was that the ultimate solution for this problem lied in the first program, that is, to stop the long thread moss trade. To render this conclusion more operational, some practical proposals were offered including law reinforcement measures, a ban on all acquisition, processing and trading markets of long thread mosses, implementation of the leadership responsibility system of the local governments for environmental protection and anti-poverty. More efforts should be made by the government to help the poor areas and to educate and develop replacement of the long thread mosses while implementing relevant policies and supervision mechanisms.

III. Application of investigation results

This investigation work has provided direct technical support to the decision-making process of the government and caused the attention of the leaders of the State Council. In 2000, the State Council issued document No.13 of the year 2000 "Circular on Prohibition of the Raking and Sales of Nostoc Flaglliforme, the Digging of Licorice and Chinese Ephedra". Moreover, joint inspections of long thread moss gathering and trading are carried out annually by the ministries and commissions concerned. At present, long thread moss has been specified as a protected wild plant at the State-level.

This project also created significant social influence and was presented at the international forum "China-Canada Women and Environment" as a keynote speech. Hong Kong's "Changchun Society" came to Beijing on purpose to learn about the achievements of the project and introduced it to other academic societies in Hong Kong.

China's Council on International Cooperation of Environment and Development (hereinafter referred to as CCICED) is a top-level consultative body under the State Council. It has several

workgroups and makes studies of the major issues on China's environment and development. The study results are formulated into policy proposals to be submitted directly to the State Council. The Policy Search Center, as a long-term executive institute for the Secretariat of the Trade and Environment Workgroup of CCICED, conducts series of researches on trade and environmental topics including research on coordination of China's foreign trade and environmental policies; research on the opening-up strategies in the service sector of China's environment protection field, comprehensive evaluation of the trade and environmental policies, and assessment of the trade policy and environmental impacts and so on. The results of these researches have influenced the policy making in the related fields and laid down a solid foundation for China's environmental protection cause in the new situation following China's WTO entry.

ii) Support based on scientific experiments

The formation of policies and regulations of the country not only needs the support of policy research but also of scientific experiments. Only in this way can decision-making be guaranteed to abide by the objective laws and stand up to the test of real situations. In the field of environmental science research, the NRCEAM of the Sion-Japan Center has provided adequate scientific research support to the State Environmental Protection Administration and even to the State. It has conducted a series of major research projects such projects as yellow sand and sandstorm research (see Box 4.3). Such researches have proved to be practical and fruitful and have been put into good application. Some have filled up gaps formerly in existence in the analysis and measurement field of China.

Box4.3 Major projects of the State Environmental Protection Administration-- yellow sand and sandstorm research

I. Background of the project

During recent 20 years, sand storms and yellow sand frequent Northwest China and their frequency of occurrence is on the rise. As a result, the concentration of particulate pollutants in the atmosphere of many big cities are at high level for a long period, seriously hindering the improvement of urban air quality. In recent years, long-haul movement of sandstorms manipulated by the general circulation of atmosphere occurs more often, hitting areas in East China, DPRK, the Republic of Korea and Japan, which are all situated on the leeward side of the East Asia winter wind. Therefore international cooperation of research into the yellow sand and dust storms has very important current significance not only to China but also to Asia and even the northern part of the globe. The Chinese Government has attached high importance to such cooperation. In August 2000, the research group to study the "Impacts of Sand Storms and Yellow Sand on Atmospheric Particulate Pollutants of Beijing" led by Dr. Quan Hao from the Sion-Japan Center was set up under

the instruction of the leaders of the State Environmental Protection Administration and its Department of Science and Technology. The research group also included members from the China Environmental Protection Monitoring Center and the China Research Academy of Environmental Protection. At present, the first stage (from August 2000 to the end of 2001) of the project has already been finished successfully, and the second stage has been going on smoothly since early 2002.

II. Project achievements

Two years of the first-stage research has produced the following results:

1) Two origins of the sand storms have been found: one abroad and another domestic. The origin abroad is in the deserts of Southeast Mongolia and Kazakstan. For the first time, it is discovered that the source zone from Mongolia brings more sand and dust pollutants to China. The domestic source zones mainly include: Sunith basin and Hunsadake desert in Eastern Inner Mongolia; China-Mongolia border region in Alashan League (Badan Jaran dessert); Takelamagan desert in Eastern Xinjiang and Kulbantonggute desert in Northern Sinkiang.
2) Three transmission paths of the sand storms are found and the sand storm in Beijing are classified into four types: upper air transmission mixed with ground fugitive dust; upper air transmission with deposition; ground surface fugitive dust; upper air passage transmission.
3) Analysis has been made of the contribution rate of "exotic dust" of the sandstorm in Beijing by means of element tracking, chemical mass balancing and particle size distribution and so on.

Since early 2002, the second stage has been going on smoothly and emphasizing the following research targets:

a) Classification of the sand dust types influencing Beijing, analysis of the pollution characteristics of different kinds of sand dust weather; application of laser radar to analyze the vertical distribution of the sand dust mass concentration; determination of the horizontal transmission and deposition volume of sand dust in Beijing; exploration of the contribution rate of the sand storm to the atmospheric particulate pollutants in Beijing.

b) Establishing mathematical model for sandstorm process to analyze its original formation and transmission in order to provide technical support to sand storm prevention and control.

III. Application of the research results

On December 20, 2001, the Department of Science and Technology Standards of the State Environmental Protection Administration held the appraising meeting of the project. At the meeting, specialists concluded that the research results were of high value, its technical direction and research method were correct and the final conclusion was sound with adequate data. Besides, based on thorough studies of the major source zones and transmission paths of the sandstorm as well as the ecological environmental status of the ground surface, the project workgroup has put forth some tentative countermeasures for building ecological barriers to reduce the negative impact of the sandstorm. It has also put forth some insightful viewpoints and specific implementation solutions. The above results have been submitted as reports to the State Council, the National People's Congress, CPPCC and other organizations. They have provided the scientific reference basis for sandstorm prevention and control, regional environmental protection cooperation. Part of the results has already been put into application.

The following are some of the major projects:

Key project of the State Environmental Protection Administration: establishment of dioxin analysis lab and dioxin research

The prevention of dioxin pollution is gradually becoming a focus in the environmental protection of China and has been specified as one of the key research fields in the "Tenth Five-Year Plan" period by the State Environmental Protection Administration. Ever since its establishment, the Sion-Japan Center has paid close attention to the dioxin problem in environment. In 1997, the Sino-Japan Center submitted a proposal to conduct dioxin research in China to the National People's Congress's Subcommittee on Environmental Protection and Natural Resources and the State Environmental Protection Agency (predecessor of the present SEPA). The National Research Center for Environmental Analysis and Measurement began to conduct Dioxin Laboratory construction using funds raised by itself and to follow the latest technique of dioxin analysis. In 1998, under the technological structural reorganization programs of the State Environmental Protection Administration, the Center began to put on its agenda of the Dioxin Laboratory as a key project and reported this plan to the Department of Science and Technology Standards of the State Environmental Protection Administration.

In 1999, the Open Laboratory sent researcher to study the latest analytical techniques and the construction of dioxin laboratory in Japan as part of the Sino-Japanese technical cooperation project. Upon returning to China, the researcher and his colleagues set up a dioxins study team. They designed and set up a first-class dioxin analytical lab that adopted the most advanced dioxin analytical procedures. They approached the dioxin research by monitoring dioxins emission from solid waste incinerators and measuring dioxins with high-resolution gas chromatography/high-resolution mass spectroscopy (HRGC/HRMS). In this way, they obtained firsthand information about dioxins emission from refuse incineration while assisting the implementation of the pollutants control standards for solid waste incineration. At present, its analytical technique has past cross-check of inter-labs with other labs around the world and has begun to take up monitoring tasks and research projects.

The Lab has taken several projects such as "Research on the Dioxin Emission and its Control Measures for Municipal Solid Waste Incineration Facilities (1999-- 2001)", a Sino-Japan cooperation project "Research on Dioxin Measurement Method and Dioxin Pollution Status", "Study on Quality Assurance for Dioxins Analytical Lab", "Initial Study on the National Implementation Plan to Reduce and Eliminate POPs", and a project of the Ministry of Civil Administration "Research on Control Technology of Dioxins Pollution from Incinerators". Starting from the year 2001, for two years the Lab conducted projects of investigation on dioxins

emissions from the solid waste incinerators as part of the mission to "survey and monitor the impact of municipal solid waste disposal facilities on the environment ". At present, the Sion-Japan Center has already possessed the basic qualifications for the analysis and monitoring of dioxin and created a network of international exchanges and cooperation.

CAIA （ China Association for Instrumental Analysis) award-winning project-determination of organic carbon and element carbon in atmospheric particulate pollutants

One important constituent of the atmospheric particulate pollutants is carbonous particulate pollutants including organic carbon （OC）, element carbon（EC）and inorganic carbon（IC）. Carbonous particulate pollutants occupy about 40—60% of the total mass in fine particles with a diameter of less than 2.5 micrometers, 25—35% in fine particles with a diameter of less than 10 micrometers and 15-20% of the mass in total suspended particles. If the measurement data lack organic carbon and element carbon, the analytical description of the atmospheric particulate pollutants is incomplete with inadequate source explanation and inefficient technical support to environmental management. Accurate measurement of organic carbon and element carbon in atmospheric particulate pollutants is a hotspot and leading problem in atmospheric environment research, which needs to be solved as soon as possible in order to carry out environmental monitoring and supervisory work. Analytical measurement of the organic carbon and element carbon contents in atmospheric particulate pollutants is seldom conducted at present in China.

Applying commercial CHN analyzer, the National Research Center for Environmental Analysis and Measurement together with Beijing Environmental Protection Monitoring Center has been successful in the analysis and measurement of the three carbonic components (organic carbon, element carbon and carbonate) in the atmospheric particulate pollutants. Then they took advantage of this technique’s ability to provide accurate OC, EC and IC values and developed monitoring models suitable for environmental monitoring. In this way, they have provided adequate technical support to environmental management and scientific research.

Project sponsored by the State Natural Sciences Fund--quantitative measurement and morphological analysis of particulate pollutants from biomass combustion

With atmospheric chemical reaction of the atmospheric particulate pollutants and their impact on global climatologic change as its application purpose, this project used SEM-EDX and EPMA technique to analyze and characterize a large number of single particulates, which are compared

with the lab reference materials. It also combined with the regression analysis and Monte Carlo simulation to successfully carry out quantitative and morphological analysis of the potassium particulate pollutants resulting from combustion of biomass on the micrometer and sub-micron scale. The qualitative and quantitative analyses and morphological analysis of these typical atmospheric particulate pollutants have all been successfully done paving the way for wider quantitative measurement and morphological analysis of more atmospheric particulate pollutants.

It has already been pointed out that potassium is a tracer element resulting from biomass combustion; however its chemical state was less known. This project finds that potassium particulate pollutant is an important type of biomass combustion particle next only to carbonic particles, thus enhancing its understanding from the elemental level to that of a chemical species and form. Besides, dynamic description and comprehension of the atmospheric chemical process of the potassium particulate pollutants have been obtained.

This project has made two innovative scientific discoveries. One is the identification of the chemical state of the potassium particulate pollutants resulting from biomass combustion based on quantitative analysis. The other is the determination of the dynamic process of its atmospheric chemical process. In technical exchange activities, many professionals at home and abroad feel surprised at the element constancy of the biomass combustion particulate and appreciate our in-depth exploration and quantitative analytic table on one or several kinds of particulate pollutants. The dynamic process of the atmospheric chemical transition of the potassium particulate is a complete case from discharge to sediment, which is of important scientific significance and wins high appraisal from the academia. All the reprints of the article formerly published on Atmospheric Chemistry journal were soon ordered by the readers and more copies had to be prepared on demand.

Thanks to the support from the State Natural Science Fund, we have soon succeeded in conducting research work in the field of biomass combustion particulate pollutants. With the technology of carbonic particulate analysis and measurement we are capable of qualitative identification and quantitative analysis for the negative impact on urban air quality of the biomass combustion discharge. On Jun. 19, 2000, the air quality of Beijing dropped sharply, in cooperation with Beijing Environmental Monitoring Center we quickly found out that the reason for this was hay burning in the wheat harvest reason based on the analytical data of organic carbon, element and water-soluble potassium obtained, thus putting our research results into good application.

United Nations University project-- environmental monitoring and analytical techniques

in East Asia area

In January 1996, the Department of Regional Environment of the National Research Center for Environmental Analysis and Measurement participated in the international cooperation project "environmental monitoring and analytical techniques in East Asia area", which was sponsored by the United Nations University in Tokyo, Japan, participated by 7 countries in East Asia. The research covered such areas as measurement technique for residual pesticide in grains and farm soils, measuring methods of residual PCB in typical areas, volatile organic contaminants in drinking water, organotin in seawater and halobios, and volatile organic contaminants in the urban ambient air environment, etc.

The first stage of the project lasted three years (1996--1998) covering measurement technique for residual pesticide in grains and farm soils, measuring methods of residual PCB in typical areas, volatile organic contaminants in drinking water, organotin in seawater and halobios, and volatile organic contaminants in urban ambient air environment. The second stage of the project lasted three years (1999--2001) covering such researches as the pollution survey and analytical methods of organo-chlorine pesticide (including BHC, DDT, DDE, aldrin, and dieldrin), alkyl phenols, chlorinated-phenols, bisphenol-A, phthalates and adipate in surface water and seawater.

Each year, the Sion-Japan Center successfully fulfilled all the assigned research subjects and had the research results published on various academic journals for other professionals to use for reference. The Ministry of Public Security of China adopted our analytical procedure to conduct the pollution survey in the Jiangxi organotin pollution incident in 1999. In addition, our research into the measuring method of the volatile organic contaminants in drinking water has aroused the attention of other domestic professionals who asked for our papers for reference. The Sino-Japan Center was cited for excellent work at the United Nations University Conference in 1998 and 2002. This project has successfully analyzed target pollutants with no standard analytical procedures before or with outdated procedures that cannot meet the present demand. Because of this, our analytical procedures have been incorporated in the fourth edition of "Analytical Procedures for Water and Wastewater Monitoring".

Special projects on new analytical measurement techniques of the Ministry of Science and Technology

Analytical measurement is an important subject covering many sectors of natural science and functions as a guarantee and pre-qualification for scientific research and production. The State-level National Research Center for Analysis and Measurement is the backbone of China's

analytical measurement force in all sectors. It is the most authoritative institute boasting of the most advanced state-level measurement technology. To encourage research into new analytical measurement techniques to fill up China's technology gaps in the related fields, meet the urgent demand of the society, and produce substantial economic and social benefits, the Ministry of Science and Technology has assigned special funds to support all the state -level analysis and measurement centers to conduct such researches since 1998. Each state-level research center for analysis and measurement took about 2 to 3 research projects.

Projects in 1998

Research on the determination of phthalate ester in wastewater by GC

This project is aimed at the establishment of GC analytical procedure of two amphi-plasticizers: terephthalic acid dibutyl ester, dioctyl phthalate in conformity with the "Comprehension Sewage Emission Standards" of China so as to provide technical support to the establishment of relevant domestic standards for analytical procedures.

Separate determination of organic carbon, element carbon and carbonate carbon in atmospheric particulate pollutants

Analytic measurement is conducted of three carbonic components in the atmosphere using commercial CHN analyzer. All the targets listed on the contract paper have been fulfilled indicating the application of commercial CHN analyzer is applicable to the composition measurement of carbonic elements in the atmospheric particulate pollutants and waste auto gas. In this way, technical support to this hotspot issue in atmospheric environment study is provided.

Projects in 1999

Research on determination of phenols –containing in wastewater by GC

To meet the requirements for analysis of phenols as demanded by the "Comprehension Sewage Emission Standards" of China, this project has applied advanced capillary gas chromatography analytical procedure popular around the world and provided technical support to the establishment of relevant domestic standards.

Research of determination of inorganic elements in atomospheric particulate by XRF for pollutant sources identification

This project is mainly aimed at quantitative measurement and analysis of the elementary composition in atmospheric particulate using X fluorescence spectra instrument. It kept a close observation of the universal analytical procedures in the world for elementary composition of the atmospheric particulate pollutants and filled up China's technology gap in this field.

Projects in 2000

Accurate measurement of mixed carbonic particulate pollutants--accurate measurement of element carbon

This project mainly deals with the accurate measurement of element carbon in the atmospheric particulate pollutants. Improvements have been made to the former procedure of using element analysis instrument to measure organic carbon, element carbon and inorganic carbon in the atmospheric particulate pollutants. Instead of indirect differential subtraction method, one-step measurement of element carbon is used now to sufficiently increase the precision for element carbon measurement.

Research of the methods of environmental analysis for impact on water substance and swamps of trifluoroacetic acid--the degradation product of freonre replacement

This project provides the technical support to the analytical procedure for trifluoroacetic acid, the degradation product before the complete freon replacement in China. Measurement of its environmental background value has also been made.

Projects in 2001

Measurement of the polar organic compounds in atmospheric particulate pollutant by GC

In addition, the National Research Center for Environmental Analysis and Measurement has also taken on projects of the Ministry of Science and Technology, such as a special fundamental research on the analytical procedure of persistent organic contaminant, polychlorinated

biphenyls; a project for experimental equipment upgrading--the analytic dat processing systemSEM-EDX; two Sino-Japan cooperation projects--research into the law of occurrence and movement of yellow sand aerocolloid and reference materials of yellow sand; research of the measuring method for dry sedimentation in Northern China. All the above researches have produced good outcome, which has proved to be applicable in real application.

iii) Environmental information support

Decision-making in environmental protection also needs the support of information which can be regarded as having two parts: the transmission of dynamic development of environmental sciences, empirical methods of environmental management and leading issues at home and abroad; The other is the support of information technology to environmental protection decision-making. From both aspects, the State Environmental Protection Administration has benefited form supports of the Sino-Japan Friendship Center.

Support of the dynamic state of environmental sciences at home and abroad to the State Environmental Protection Administration by means of journals, internal reference publications

PRCEE has been supplying valuable reference information to the State Environmental Protection Administration. Besides regular publication of such public journals as "Dynamic Development of Environmental Science", it has edited many other internal reference materials such as "Background Materials for Environmental Decision-Making", "International Environment Reference", "Research and Proposals on Environmental Policies". These references introduce the advanced experience, beneficial viewpoints, focus of attention in the field of environmental protection at home and abroad and provide multi-dimensional reference to environmental protection Decision-making.

"Dynamic Development of Environmental Science" is a comprehensive periodical on environmental protection officially authorized for public circulation by the former State Science and Technology Commission. It covers a wide range of contents including environmental policies at home and abroad, environmental management and new environmental pollution prevention techniques, innovations, new facilities, and treatises and overviews on environmental standards and resources and energy utilization. It also reports dynamic development, information, domestic experience on environmental protection and others. It is an important source of useful information to the State Environmental Protection Administration with a wide domestic reader

base.

"International Environment Reference" and its supplement primarily cover the latest development in foreign environmental management, strategies and programs of environmental protection. It also reports measures taken by foreign countries in environmental protection, news about environment and trade, international contracting, multi-side and bilateral environmental cooperation and so on. It publishes two issues each month with irregular supplement issuance.

"Research and Proposals on Environmental Policies" mainly covers decision-making proposals about domestic environmental protection and development decision-making, environmental economy, technology and management policy proposals, new viewpoints on environmental policy and environmental science and new theories, excerpts of latest research and investigation reports. It is a monthly publication.

Support of information technology to decision-making in environmental protection

In recent 20 years, information technology has made great progresses and been used widely in every sector of the society with convenience and efficiency. As one of the functions of the Environmental Information Centeris to take charge of the collection, treatment, transmission, storage, processing and sharing of information and data for all the environmental protection sectors of China, the Environmental Information Centertakes the responsibility for the establishment and management of the State-level environmental data bases. In addition, it also takes charge of the development, maintenance and implementation of relevant application software in order to provide better information service to the decision-making process of the State Environmental Protection Administration.

Over the past few years, the Environmental Information Centerhas conducted many research projects in this regard, such as "Development of a Multimedia System for Demonstration of the Situation and Countermeasures of China's Ecological Environment", "Survey of the Current Situations of the Ecological Environment in West China". Based on the results of these case studies and through multimedia techniques, the Environmental Information Centerhas provided direct and vivid information service to the State Environmental Protection Administration and other related departments.

Box 4 .4 Introduction to key projects of information technology support

I. Development of a multimedia system for demonstration of the situation and countermeasures of China's ecological environment

In May 1998, to report the present status and countermeasures of China's ecological

environment to the Finance and Economics Leadership Group of the Central Committee of CPC, the State Environmental Protection Administration assigned the project to develop a multimedia demonstration system. The project team employed the results of the case surveys conducted by the former Environmental Protection Bureau in 1997 and resorted to multimedia means to present a visual and direct picture of the situation and countermeasures of China's ecological environment. The team collected the achievements made in the fields of ecological environment protection and construction, analyzed the current situation of ecological damage and put forward suggestions of ecological environment protection. In this way, technical support was provided to the decision-making of the Party and the Central Government from a macroscopic angle. In the meantime, the system was also shown to the public and more people had a better understanding of the current ecological situation in China thus greatly enhancing the environmental protection awareness of the people. In the development of the system, the project team overcame many critical technical obstacles such capture and conversion of video segments, configuration of software and hardware for audio/video play, etc.

The demonstration system vividly showcased the achievements in the field of ecological protection, emphasized the severe status of the current damage to China's ecological environment, and put forward some suggestions and measures for ecological environment protection. After watching the demonstration, the attention of many state leaders and leaders in the environmental protection field was aroused to the issue of natural environmental and ecological environment protection.

II. Survey of the current ecological environment situation in West China by remote sensing

West China, covering an area of 6.6 million sq km, is a relatively economically backward region in China. To boost the economic development of the West region, the Central Committee of the CPC and the State Council launched the grand campaign of "West China Development" at the end of last century. To contribute to the great development of the West region and ensure its sustainable development in society, economy and environment, the project of the survey of West China by remote sensing was launched by the State Environmental Protection Administration. This project aimed at using advanced remote sensing technology to make a comprehensive survey of the current ecological environment situation of the region in order to provide the latest, comprehensive and detailed information for use in the environmental protection of the region. In the meantime, the survey hoped to make further analysis of the current ecological environmental situation and the dynamical development of the West region so as to summarize the relevant features and trends, pinpoint existing problems and find out the causes and put forward countermeasures of these problems. In this way, scientific support could be provided to the decision-making process of ecological environmental protection planning in the great West development campaign. The Environmental Information Center undertook this project.

It made use of the available data, the landscape ecology theory, ecosystem service function theory, sustainable development theory and remote sensing and geographic information system technologies. The project completed the acquisition, geometry precision rectification and image interpretation of American Landsat TM /ETM remote sensing data for over 370 scenes covering 12 provinces (including some autonomous regions and one municipality directly under the Central Government) in West China. Then, based on the operation of multi-temporal, multi-theme, multi-scale and multi-source, systematic analyses of the current ecological environment situation and the dynamic development of desertification, water loss and soil erosion, and comprehensive evaluation of the ecological environment quality were conducted. In addition, eight typical functional regions were selected for in-depth study of their characteristics, patterns and trends of the ecological environmental changes by conducting comprehension contrastive analysis of the American Landsat TM / ETM data in the 1980s, 1990s and the year 2000. Then conclusion was

drawn up of the changes and countermeasures for ecological environment protection. Finally, a comprehensive database of the ecological environment of West China was set up including 1:100,000 land utilization database; 1:100,000 ecological environment background database; 1:100,000 land deterioration database; 1:100,000 environmental assessment database; 1:100,000 typical region database and so on.

The project produced a large number of significant data and information, which provided precious scientific basis for the sustainable application of the resources and environment in the West development campaign. The project won the second class prize of China's National Scientific and Technological Progress Award.

iv) Support to decision-making through international cooperation

As a gateway and platform for international environmental protection cooperation, the Sino-Japan Friendship Center has established good cooperation ties with many countries and international organizations that have helped the Sino-Japan Center with funds, equipment and knowledge. Such cooperation has also benefited the social supervisory work of China. Some international organizations have been concerned about China's environmental policy construction and are willing to assist China's efforts to build up a complete system. It was due to such a reason that the World Bank and PRCEE cooperated in setting up the research project "Renewal of China's Environmental Strategy Reports Made in 1992".

This was an important cooperative project on environmental protection between the World Bank and the State Environmental Protection Administration. Its main purpose was to renew the 1992 China Environmental Strategy Reports made by the World Bank and summarize and evaluate China's environmental situation and related policies since 1990.It hoped to make suggestions to the then on-going drafting of the "Tenth Five-Year Plan" program and provide technical support to strengthen the cooperation ties with the World Bank in the field of environmental protection of China. This project focused on China's environmental protection and ecological protection strategies in the new period, mainly including: strategic researches of water pollution prevention and control, atmospheric pollution prevention and control, and the background of the development and changes of China's environmental protection since the 1990s. The strategic research of ecological protection mainly included: strategic research on biodiversity protection, on prevention and control of land resources degeneration, on forests, on grassland and swamp degradation prevention and control, and on desertification prevention and control and others. The research also involved two major issues that will exert great effect on the environment: China's WTO entry and West China development.

The research aimed at serving two target users both at home and abroad. First of all, it hoped to provide beneficial reference to the "Tenth Five-Year Plan" and other long-term programs of

China's environment and ecological protection. In the meantime, it introduced China's current status and strategies of environment and ecological protection to the outside world in a more systematic way. In addition, the project hoped to produce important technical background information to be used by the World Bank in its interior decision-making concerning environmental protection cooperation and investment in China. Such technical background information can also be used by other countries and international organizations in their cooperation and investment in environmental protection in China.

4.1.1.4 Promotion to China's environmental management capability

Since the 1990s, information technology has developed at a very fast speed and the level of informatization has become an importance indicator for the modernization process and comprehensive national strength of a country. Along with the development of environmental management and environmental decision-making, better and comprehensive environmental information management is now in urgent need. In recent years, the information technology application degree in management of the State Environmental Protection Administration has been increasing gradually. With the deployment of LANs and the development of the E-office system, both the volume and speed of information exchange have risen up. As a result, information accession is easier, which has been beneficial to sound judgment and decision-making and convenient inter-departmental communication. And office efficiency has also been improved obviously.

To provide adequate information support to the efficiency improvement of the environmental management of the State Environmental Protection Administration, the Environmental Information Center has undertaken a series of projects including construction of EIC internal LAN VSAT network for the State Environmental Protection Administration, email system for the national environmental information intranet and the environmental information network of China and so on.

With the advancement in electronics and network technology, network application has enabled the sharing of limited hardware equipment thus saving investment costs. Network application can also enable the staff to share all resources thus bringing convenience to their interaction and communication. And information accession and communication has become more convenient. With the setting up the EIC internal LAN, the Center realizes its own computer networking, data and resources sharing. Through connecting with CHINANET and the satellite ground stations of the China Research Academy of Environmental Protection, interconnection of the LAN to the Internet has been realized, which provides the Environmental Information Center

with such functions as web browsing, email service, and dynamic web information publishing. Internetworking with CHINAPAC has enabled the Environmental Information Center to connect with the LANs of the Environment Information Center in each province.

In order to form a network connecting the State Environmental Protection Administration, the Environmental Information Center, the environmental protection bureaus and their information centers and LANs of the provinces, autonomous regions and the municipalities directly under the central Government, to facilitate the data transmission of the National Environmental Information Center Network and to realize the information-sharing of the statistics and monitoring data of all the environmental protection departments at the state, provincial and municipal levels, the State Environmental Protection Administration began to prepare and construct its private satellite communication network in 1999. Construction of the satellite communication network demonstrates that the State Environmental Protection Administration has acquired the information transmission capability, which will play an irreplaceable role in constructing the Administration's environmental information infrastructure and promoting its work efficiency and decision-making support capability. As a result, the informatization of the environmental protection service and office automation process are boosted generally. What is worth mentioning is that application of the advanced satellite communication has provided a reliable information transfer channel for real-time transmission of water quality and air quality data across the monitoring stations all over the country.

Moreover, now all the in-house staff can use the on-line email system of the environmental Intranet for fast, convenient and secure information exchange and sharing. The Environmental Information Center of the State Environmental Protection Administration, the information centers of each province and institutions directly affiliated to the State Environmental Protection Administration have all built up their own independent sub-domains, DNS servers and email servers which can provide information to each other. What's more, the email systems of each province can be extended to provide service to the municipal and county levels. The establishment of the email system enables the environmental protection administrations at all levels to communicate, access information more easily and efficiently.

4.1.2 Impact on environmental management of local governments

China is a large country with diverse situations in different regions. Due to different economic development level in different regions, staff quality, fund input and management level of the environmental management departments differ greatly. Implementation of the environmental

principles, policies and laws as well as environmental monitoring and environmental information collection are to be conducted by the environmental protection departments at different levels, so the environmental management level and capability of these environmental protection bureaus direct influence the result of the implementation. It is of vital importance to strengthen their capacity building and increase their management level.

As a comprehensive research institute directly under the State Environmental Protection Administration, the Sion-Japan Center shall serve the whole society with its research results, and so shall the following institutions under its administration: the Policy Search Center (PRCEE), National Research Center for Environmental Analysis and Measurement, the Information Center, the Sino-Japan Center for Environmental Education and Communications of SEPA and the Institute of Reference Materials of SEPA. They, too, shall fulfill functions specified to them by the State Environmental Protection Administration and conduct their operations for the benefit of the whole country. Their service is not only rendered to the State Environmental Protection Administration but to the environmental management of the local governments at all levels in China. It is even more so for the two Secretariats for ISO14000 implementation in terms of serving the local governments, the society and the enterprises.

Ever since its establishment, the Sion-Japan Center has contributed positively to the promotion of environmental management of the environmental protection departments at all levels. Some of the cases are as follows:

4.1.2.1 Promoting capacity building of local governments

i) To assistant the local governments promote the basic capacity building.

Much work has been done to promote the basic capacity building of the local governments, primarily the capacity of information technology application. The following are some of the projects conducted by the Environmental Information Center: reconstruction of the environmental information network system at the provincial level, construction of information networks in 100 cities of China (see Box4.5), analysis and design of the B-1 urban environmental information system, construction of the environmental information system at the municipality level and so on.

These projects have first of all strengthened the information system infrastructure construction of the local governments. The Environmental Information Center has offered all kinds of help to local environmental protection bureaus in the project construction, such as timely and scientific

advice to the local departments as to the purchase of needed network equipment, computer system, system software, and basic applications, etc. Comprehensive information network systems with proper configuration, multiple functions and efficient transmission are built. Besides, the Environmental Information Center has also conducted on-site investigation of the local regions to identify their requirements in their information management of the urban environment. Based on the findings, it has developed information management systems that best meet the requirement of different regions. Finally, the staff members of the environmental protection bureaus are trained during the construction of these projects. They have become qualified in environmental information system management and application thus a solid foundation has been laid down for further environmental information system development (to be discussed in the next sector).

Box4.5 Project of the construction of environmental information networks in 100 cities

I. Project background

The project of China's environmental information network construction was part of the "Joint Communique of Environmental Cooperation in the 21st Century between the Chinese Government and Japanese Government" signed on November 26, 1998 and authorized by the heads of Governments of both countries. Both sides agreed that 100 cities in China would be selected to construct environmental information network systems to be funded by the aid given gratis from the Japanese Government. It was agreed upon that the project would be divided into two stages: the first stage would complete the construction of the environmental information LANs of 39 cities; the second stage would learn from the construction experience of the first stage and complete the environmental information LANs of 61 cities and the satellite communication substations of 89 cities.

II. Project implementation

This project lasted 4 years with a total investment of 2.018 billion Japanese yen. The 100 large and medium-sized cities came from 28 provinces, autonomous regions, and municipalities directly under the Central Government. It directly and indirectly benefited 0.16 billion people in China and provided environmental protection bureaus in these 100 cities with advanced equipment such as databank servers, WEB servers, GIS workstations, terminal clients, laptops, printers and so on. It also provided all kinds of system software such as operating system, database, email management, groupware system and geographic information system and so on. Considering the practical application of the environmental management, the project also offered application software that is in need by those environmental protection bureaus, including file management software, environmental management and analysis application software, environmental management GIS application software, environmental information publishing and others. Thus, a comprehensive environmental information network system that could meet the basic environmental management needs of those environmental protection bureaus was built up. This was an all-in-one system boasting of proper architecture and easy information transmission and combining functions of office automation, MIS, GIS, multimedia environmental information application and environmental management decision-making assistance and other.

Besides, to assist the implementation of the project, the "JICA in Country Training on China's

Environmental Information Network System of the Second Country (China) " was also conducted by both sides.

III. Application of project results

Successful construction of the project not only increased the work efficiency and management level of the environmental protection bureaus in those cities but also promoted the operation capacity of the environmental information systems at the city level. This in turn improved the complete environmental information system across China and would surely further deepen the information technology application in environmental protection and provide better technical support and information service to the technical support and decision-making of China.

In the meantime, through the application of advanced information technology such Web service, GIS, multimedia and environmental resources sharing, multi-sided environmental information support and service were provided to the management and decision-making of different environmental protection divisions at all levels. Also, transmission and information sharing were realized among the three levels: state, province and municipality exerting a long lasting effect on the management and decision-making of all the environmental protection organizations and boosting the work capability of China's environmental information system.

ii) Local staff training assistance

Staff quality of the environmental control system is a significant factor determining the quality of environmental protection. Promoting the training of professionals at all levels in the field of environmental protection is an importance measure to build up the management capability of all the environmental protection departments in China. CEEC is responsible for the propaganda and training tasks of the complete environmental protection system in China. They hold all kinds of training courses for the environmental protection system and contribute positively to the capability building of the environmental protection staff. These training courses bear the following characteristics:

4.1.2.1 Enhancing capability building of local government

i) Comprehensive training contents:

To cater to the work focus of China's environmental protection and meet the diverse needs of the local environmental protection departments, CEEC has held training courses on a variety of topics including sustainable development theory, air pollution control, environmental standard,

environmental monitoring technology, environmental education theory, ISO14000 environmental management system and audio-video technology application in environmental protection and so on.

ii）Wide coverage of trainee levels

The training courses held by CEEC suit a wide range of trainees. Some are for the leaders of local environmental protection bureaus like the "On-the-post Training of Heads of Environmental Protection Bureaus at the Provincial, Municipal and City Levels". Some are especially for professionals like "Training Course for Control and Monitoring of the Overall Discharge of Environmental Pollutants in China and Japan", and some are for the administration staff like "Training Course for Popularization of Environmental Management Standards of the ISO14000 series in Sino-Japan Technical Cooperation".

The wide coverage of the types of trainees ensures the diversity of people to be benefited.

iii）Broad coverage of trainees

Almost all the provinces, autonomous regions and municipalities directly under the Central Government as well as many city environmental protection bureaus have participated in the training courses.

CEEC is also responsible for on-the-post training of the heads of the environmental protection bureaus at the provincial, municipal and city levels as designate by the State Environmental Protection Administration. An annual number of 6 to 8 such courses are held with about 300 participants.

Box 4.6 Introduction to Advanced Seminar on Sustainable Development of Environmental Protection for Heads of Provincial Environmental Protection Bureaus

Two Advanced Seminars on the Sustainable Development of Environmental Protection for the Heads of Provincial Environmental Protection Bureaus sponsored by the State Environmental Protection Administration were held on July 31 and August 11, 2000 in Beidaihe and Jiangsu respectively. A total of 33 heads of environmental protection bureaus from 31 provinces and Xinjiang Agricultural Construction Group participated in the Jiangsu seminars. Many leaders delivered speeches at the seminar including Mr.Qu, Chairman of the Committee on Environmental and Natural Resources Protection of the National People's Congress, Xie Zhenhua, Minister of the State Environmental Protection Administration, Qian Xiaoyu, Director of the News Office of the State Council, and Hu Angang (researcher), Director of the Institute for National Conditions Research of the Chinese Academy of Sciences and others. After the Seminar, participants of the seminar went on a fact-finding tour of the enterprises, high and new technology development

areas, industrial parks, Taihu water area and the ecological agriculture area in Nanjing, Zhenjiang, Wuxi, Zhangjiajie, and Suzhou of Jiangsu Province.

Besides training courses held by CEEC, other departments of the Sion-Japan Center such as the PRCEE and the IC also organize relevant train courses. For example, the project of "Sino-German Cooperation on the Capability Building of the State Environmental Protection Administration" and the project of "Research Project of China's Environmental Information Network System of the Second Country (China)(see Box 4.7)".

All the training courses have had positive effect on the improvement of the theoretical level and profession knowledge of the local environmental protection personnel, who had always showed great interests in these courses and were most willing to participate.

Box 4.7 Sino-Japan cooperation project, "JICA in Country Training on China's Environmental Information Network System of the Second Country (China) "

I. Project background

In 1997, the project of constructing China's environmental information network was listed as an important part of the "Agreement on Sino-Japan Cooperation for Environmental Protection toward the 21st Century" signed by Japanese Prime Minister and Chinese Premier. After the signing ceremony, both Governments prepared and started the construction of "China's Environmental Information Network" in an active way. In the meantime, to guarantee the implementation of the aid given gratis of the Japanese Government and the long-term operation of the information centers of urban environment protection in the 100 cities, both sides cooperated to carry out the JICA in country training. The Japanese embassy in China and the JICA China office paid special attention to the operation of the training program. In December 1999, an agreement of a three-year environmental IT training project was signed between JICA and the State Environmental Protection Administration. This so-called second country research project covered systematic and multi-sided contents. For better achievement of the training goals, pre-training surveys were conducted of the basic situations of the participating cities, the technical levels and business fields of the trainees as well as their expectations of the training courses. Based on the survey results, training contents were customized to cater to their special needs.

II. Project implementation

The training project was divided into three years:

The first year period—that is the first year for the implementation of the project. Macroscopic and basic training courses were offered in accordance with the implementation principle. The purpose was to train the trainees formerly with unequal technical and professional background to roughly the same starting level in terms of technical knowledge and expertise regarding information network.

The second year period--Based on the work of the previous year, further training courses were offered in line with the overall training program, and more contents were taught to enable the trainees to handle real situation problems likely to be encountered in operating the software and hardware of the information network system.

The third year period--Focus was laid on both the construction and operation of the system. One

of the training targets was to enable the trainees to master the fundamental technological know-how needed for the proper operation of the system, including courses on network operation and management and application software usage. Besides, overall network operation of the system was emphasized. After this period, the trainees were able to operate the software and hardware systemsin their cities.

III. Effects achieved through the implementation of the training project

Since 1999, many training courses have been carried out on management, development and maintenance to the technical personnel in system operation and network application. About 500 person-times received the training who later played important roles in the construction and operation of the environmental information systems. In particular, in the 100 cities chosen to implement the project, a large number of technicians have mastered the basic skills about system operation and website construction along with other application capability. This has ensured proper network operation. All this indicates that the JICA in country training program has functioned as the "extrinsic factor" to the construction of the environmental information network system and made remarkable contributions to the establishment of the system.

Implementation of this program has greatly improved the overall quality of the local information technology personnel.

4.1.2.2 Technical support to local environmental protection bureaus

i) Information technology support

Information is the foundation of management. Timely and accurate information support is of great importance to scientific policy-making, especially for key national environmental protection projects. To provide adequate information support to river basin environment management and urban environment management, the Environmental Information Center has implemented such projects as "Research and development of GIS system application in key river basins" and "Urban GIS system development". These projects have already achieved good results in the application of many regions.

Development of GIS application system in Huaihe river basin

Severe water pollution in the "three rivers and three lakes", that is, Huaihe river, Haihe river, Liaohe river and Taihu lake, Chaohu lake and Dianchi lake has caused great concern of the Chinese Government. In China's "Ninth Five-Year Plan" and the "Outline of Long-Term Targets toward 2010", prevention and control of water pollution in these river basins has been listed as the key targets for environmental protection in the "Ninth Five-Year Plan" period. To assist the State Environmental Protection Administration in bringing the pollutant discharge of the sources of these river basins under control in conformity with the State standards, the Environmental

Information Center has carried out the research project of "Geographic Information System of Key River Basins" sponsor by the Department of Finance and Planning of the State Environmental Protection Administration. The project is aimed at taking advantage of the geographic information system. Information of the key river basins will be presented vividly by means of graphics and multimedia. Information such as the discharge and control status of the pollution sources of the key river basins will be accessible on the Internet / Intranet. Analysts and managerial staff of the SEPA will be able to query detailed information about the industrial pollution sources in key river basin areas and about the status of the pollution control of these sources to meet the State standards in a timeliness way.

Through 4 years of research, the project has evolved from a stand-alone system to the present network query system. The former system employed the ArcView desktop system while the network system adopted both ArcView and ArcView Internet Map Server systems. To improve system stability, GIS with MapObjects 2.0 and MapObjects Internet Map Server were used to replace the former ArcView system. The initial stand-alone system was presented to the China Environmental and Resources Committee's inspection team during December 12 to December 19, 1997, when the Committee was inspecting whether the pollutant discharge control of the 4 provinces in the Huaihe river basins reached the state standards. The demonstration won high appraisal of Mr. Qu Geping, Director of the Committee. Later, the system was again demonstrated at the national environmental protection work meeting in Shenzhen during December 25-30 of the same year. It was also successful as part of the presentation of the "Zero Action of Pollution Source Discharge in the Huaihe River Basin to Meet the State Standards" made by the State Environmental Protection Administration. After that, cooperating with the environment information centers of Jiangsu, Yunnan and Anhui, the Environmental Information Center of SEPA completed the geographic information system of Taihu Lake, Dianchi Lake, Chaohu Lake, Haihe River and Liaohe River. However, the operation of the stand-alone geographic information system of key river basins also made the Environmental Information Center realizes the limitation of its query function especially its inconvenience to serve the users. Hence, focus was then laid on the development of a network query system. At the time, Web GIS technology was the focus of research in the world but with very few proven systems in existence. The project team decided to carry out an in-depth study of the Web GIS technology while closely following the development trend of the geographic information system. Finally a network query system was developed that was the most advanced product of its kind in China.

ii）Monitoring technology support

The Institute of Reference Materials of SEPA is the only special research organization of Environmental reference materials in the field of environmental protection in China, responsible for the daily technical management and operation of the Subcommittee of Environmental Reference Materials under the National Technical Committee of Reference Materials. It undertakes the task of research, preparation and production of the national environmental reference materials to be used in environmental management and supervision, as well as in environmental monitoring, scientific research, quality evaluation, Lab measurement certification, quality control examination, instrument calibration, method verification, technology evaluation and the authentication of environmental management system and environmental signs and others.

Environmental pollution features wide natural environment elements and great varieties of pollutants, complicated matrices (media), and varied pollution content density. Besides, development of environmental reference materials takes a long period with high technological requirements and heavy costs. Therefore, reproduction of many reference materials is hard for local environmental protection departments. The Institute of Reference Materials of SEPA has actually undertakes the task to provide the environmental protection monitoring departments, factories and mines, and enterprises with the much needed reference materials. At present, the reference materials developed by the Institute of Reference Materials of SEPA are being used in over 20 national environmental monitoring operations (including the quantitative measurement and examination of cities, and the measurement certification for the environmental monitoring stations of the provinces, autonomous regions, cities, prefectures and counties, automatic monitoring system of air and water, lab authentication, indoor air pollution detection and so on). They were also used in key projects during the sixth to ninth "Five-Year Plan" periods. The environmental reference materials are also put into wide use in the fields of instrument, meter, water conservancy, power, metallurgy, agricultural machinery, municipal water supply, academies of high learning, sewage disposal, automobile production, paper manufacture and environmental monitoring and environmental quality assessment and so on. They have provided substantial technical support to environmental monitoring supervision of the enterprises, thus contributing to the capability building of environmental monitoring, promoting the quality of environmental monitoring, testing and analyzing staff, and providing the urgently needed environment reference materials to ensure the quality of environmental monitoring and analysis.

4.1.2.3 Assistance to scientific research of local environmental protection bureaus

In general, as a research institute directly attached to the State Environmental Protection Administration, the research level of the Sion-Japan Center in certain fields is higher than that of local environmental protection departments. In most cases, assistance to the local environmental protection organizations by the Sino-Japan Friendship Center is through the application of its research results instead of actually participating in local research projects. Considering this, actual participation in local research projects to directly serve the local environment supervision should also be regarded as equally important. In recent years, Sino-Japan Friendship Center has begun to take on local research projects, such as the project of "Source identification of the atmospheric particle pollutants in Guangzhou City" taken by the National Research Center for Environmental Analysis and Measurement.

The project, commissioned by Guangzhou EPA, employs the SEM-EDX and EPMA technology to determine and identify the dominant species and sources of atmospheric particulate pollutants. This technology is able to observe the morphology and size of single particle and analyze its chemical composition.

First, PM10 samples were collected from 6 air quality control points and typical emission sources like the cement factory and coal-energized power plant in Guangzhou. After manually analyzing 600 particulate pollutants in our laboratory, six main air particulate pollutants were identified for Guangzhou: soil fugitive dust and carbonic particles each took up 30% of the total pollutants; burnt coal ashes, particles containing calcium each occupy over 10%; sulphur-rich particles and iron-rich particles occupy about 5-10%.

NRAECM also took the opportunity of the China-Belgium cooperation projectto analyze the chemical composition of 8600 particulate pollutants with the automatic SEMs of the Chemical Department of Antwerp University. We also observed the morphology of 5000 particles and their distribution characteristics. The automated analysis results verified the conclusion made by the manual analysis. They also verified the respective characteristics of the 6 State control points in Guangzhou. The automated analysis results found more tiny sulphur-rich particles and biomass particles.

Specialists at the Guangzhou Environmental Monitoring Center stated that utilization of SEM technology to analyze and describe the atmosphere aerosol provided a unique approach to obtain precious and useful information. This method was very effective in source identification of particles in the atmosphere. Some conclusions on the project report have already been accepted and adopted by Guangzhou EPA in taking measures and making policies of environmental management.

4.1.2.4 Assistance to local environmental protection departments to obtain more international cooperation opportunities

As the gateway for international environment cooperation and exchange, in recent years, Sion-Japan Center has established good cooperative relationship with many countries, international organizations and research institutions. Through these exchanges and cooperation, the influence of the Sino-Japan Center is steadily on the enhanced. Based on the established relationship, the Sino-Japan Center has made every effort to create opportunities for local environmental protection bureaus to utilize overseas funds, techniques and advanced management experience by means of cooperation projects, training, overseas survey and so on in order to promote the environmental protection work of all regions.

4.2 The function of impetus to society

Public are the direct undertakers of the change of environmental influence, especially when pollution happens, they are likely to be the weak group who are seriously affected by the change. With the development of economy, public will certainly care more and more about their pursuit to higher qualified life, and environmental rights and interests are an important aspects of it. As to the national environmental protection, environmental consciousness and participation level of the public are influential aspects of it. The participation of public has already been component part of the management of social environment. The participation of public in environmental administration is determined by two basic factors: first, the knowledge level of public, including the cognition of the state's the relevant laws and regulations of environment, especially those laws and regulations which closely concern with their own rights and interests; the cognition level of environmental problem and environmental pollution problems, etc. The gradual heightening of the public cognition level will eventually promote the consciousness of safeguarding rights and interests and the consciousness of participation to further solve the environmental problems. Second, the public's obtainable level of environmental information. If public do not have an unblocked channel on obtaining environmental information, the participation level of public will be directly affected. Therefore, in order to promote the public's participation level and advance the national environmental protection works, the most important thing is to make the environmental education universal and to establish the unblocked channel for spreading environmental information. In this aspect, Sion-Japan Center has done great deal works in recent years, exploited their positive efforts on promoting the consciousness of

environmental protection and advancing environmental protection works and accumulated a wealth of experiences on these aspects.

i) Establishment and maintenance of the environmental websites

Obtaining various information through Internet becomes an important component part of modern social life. Therefore, environmental website is an important channel to spread information to society. “China Environment Protection” is a state level authoritative website on environmental protection, publicized and renewed everyday news, various daily, weekly and monthly of environmental quality, etc in both Chinese and English. The contents include environmental government affaires, environmental communication, environmental quality, pollution prevention and control, natural zoology, environmental protection in regions, science and technological industry, ISO14000, international communication, laws and regulations, environmental knowledge and education, etc. The website also establishes the columns, such as subscription on line, environmental forum and so on to make the on-line visitors’ communication more convenient. Besides that, the “China Environment Protection” has connected to some unit’s networks directly under the environmental system, environmental protection bureau’s websites of all regions, and some international environmental protection websites including the website of Sion-Japan Center, providing more comprehensive, complete, and accurate environmental information for public. The establishing and maintaining work of “China Environment Protection” are undertaken by the Sino-Japan information center, and the Environmental Information Centerhas made a great effort on it. At present, the number of on-line visitor of “China Environment Protection” enlarges continually. Since June 5th, 2000, on-line visitors to “China Environment Protection” have reached 1.45 million person-times, average on over 60 thousand person-times per month, which indicates that “China Environment Protection” is continuing enlarging its influence on the society and gradually promote its function as the channel for obtaining environmental information.

ii) Making full use of modern media, such as broadcast, television and so on to propagate environmental protection

With the progress of the society, people have more and more profusion of means to obtain knowledge. People obtain knowledge mainly through modern media, such as broadcast, television, and so on besides the traditional means, such as books, newspaper and magazines. Therefore, we must make a good use of modern media to carry out environmental

communication and education, disseminating environmental knowledge to all classes of the society and make them understood, publicizing and spreading environmental protection works. This is an important component part to promote the participation of public.

The communication and education center of Sino-Japan Center possess relatively advanced photographing and dark room developing equipment and a complete set of audio and visual producing facilities. So the Sino-Japan Center can photograph environmental film and television textbooks and communication programs, store, search and copy environmental film and television materials. Attaching the advantage of its own, the communication and education center has produced a great deal of environmental protection programs, transmitted by all-level and all-kind television station to propagandize environmental protection, and has received good effects in recent years. The specific works include:

Production of film and television documentaries

☆ In order to make senior leaders deepened their understanding of environmental pollution situation in our county, the Sino-Japan Center produced 2 internal reference environmental documentaries --- “Environmental Protection, an Arduous and Long-Term Task” and “Warnings of Ecological Problems of China”;

☆ To produce a special television documentary of environmental protection ---“Mending the Sky --- Protecting Ozone Layer” and 5 advertisements for public good; in November, 1999, the 11th Meeting of the Parties to the Montreal Protocol was held in Beijing. In coordination with the conference, entrusted by the World Bank, the office of leader team of economic cooperation of the State Environmental Protection Administration, CEEC produced a three-episode television documentary on protecting the ozone layer ---“Mending the Sky”, including two episodes in Chinese: “Mending the Sky --- “Warnings of the Ozone Layer” and “Mending the Sky --- China Is Acting” , one episode in English: “Mending the Sky --- Greeting New Challenges”, and CEEC also produced five advertisements for public good. They are “ the Chapter for Education”, “the Chapter for Injury”, “the Chapter for Danger”, “the Chapter for Production” and “the Chapter for Children”. These projects publicized the necessity of protecting the ozone layer, popularized scientific knowledge, and highlighted the steps and contributions the Chinese government and enterprises are taking to protect the ozone layer. During the conference, the television documentary and advertisements were shown repeatedly at Beijing International Conference Center. Between November 25th, 1999 and February 2000, they were shown on CCTV’s Oriental Horizon Man and Nature, Environmental Express

and China Report, as well as on China Education TV, Beijing TV and relevant programs of some other media in succession, reaching millions of people, evoking wide social repercussions, and achieving a notable social impact. After shown in China, the documentary was sent to the Paris Office of the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Industrial Development Organization (UNIDO), World Bank, the Secretariat of Ozone Layer Convention, the Secretariat of Multilateral Fund and other international organizations and all regional environmental education and communication centers. The documentary is translated into Uygur language, Tibetan language and other languages of national minorities.

☆ The documentary " Waging War against Air Pollution". The documentary was produced by CEEC, entrusted by the Environment and Recourses Protection Commission of National People's Congress. On June 26th, Zou Jiahua, the Vice chairman of the NPC, gave a report named "National Air Pollution Prevention and Control Act" in the 10th conference of Standing Committee of the NPC. The documentary was shown as an appendix of the report to all attendants, and evoked significant repercussion in the hearts of all the attendants. The documentary systematically introduced the present situation, the reasons and countermeasures of our country's air pollution, mainly focused on the characteristics of air pollution in some key city and their successful experiences of control acts, their present environmental conditions, and the undergoing control acts. According to the investigating results of the NPC's law enforcement inspection group on air pollution prevention and control act, the documentary also pointed out suggestions on prevention of air pollution and environmental laws establishment. The documentary won the first prize in the Beijing Ninth Galaxy Awards for Scientific Audio-Visual Works.

☆ The publication of 10 episodes environmental protection documentary. Supported by the Academician Tang Xiaoyan of the Environmental Scientific Center of Peking University, CEEC spent 3 years on producing the 10-episode environmental documentary. After the examination and approval of the specialists consultative committee, the documentary was formally published by the High Education Publishing House in March, 2000. The documentary is mainly targeted on the university students whose major is not concerned with environment and some teachers who educate environmental knowledge in primary and middle school. Each episode is 25 minutes long. They are "What Has Happened in Our Earth", "the Problems of Urban Environment", "Water Pollution and the Control Act", "Protecting the Precious Water Resources", "Protecting Ozone Layer", "the Variety of Organisms", " Acid Rain", " the Desertification of Soil", "Solid Waste" and " Clean

Production".

☆ TV Documentary: " A Happy Trip around a Low Waste City". Produced for UNIDO, the TV documentary makes use of a journalist's experiences to introduce the sorting, landfill, incineration and biochemical processing of waste; publicize and promote waste recycling and harmless processing, nurture a sense of responsibility in people on waste disposal, and encourage them begin to conduct it by themselves.

☆ Producing documentary "Cooperation and Development --- the Choice of New Century" for the Sino- German Environmental Protection Conference. The documentary was shown on the inauguration of the Sino-German Environmental Protection Conference. The documentary introduce the gradual enlargement in the scope of Sino-German technical communication and cooperation; China possess the huge potential and market to make use of Germany advanced technology so that the continual enlargement of Sino-German cooperation and development is the choice of new century.

☆ Producing TV documentary " the Activity Record of the Second Step of Sino-Japan Technological Cooperation". As a conclusion on the second step of Sino-Japan Technological Cooperation for JICA, the documentary introduces the achievements on projects of the Sino-Japan Center, through the recording on the founding, establishing and developing process of the Sino-Japan Center, indicating the concerns with the projects of the center from both Chinese and Japanese government and introducing work which has been done by the specialists, leaders, staff, studying in Japan graduates students of the center.

☆ Translating 10 environmental protection TV documentaries. After 1999, CEEC again translated 10 environmental protection TV documentaries to Uygur language, cooperating with the Environmental Protection Administration of the Xinjiang Uygur Autonomous Region, to make a practical contribution to the environmental protection communication works in the minority nationality regions.

Production of broadcast programs

☆ The broadcast program of "Talking about Environmental Protection on the Joint of Centuries". The program was jointly sponsored by CEEC, Meishou China Group and China National Radio, formally broadcast on March 2nd, 1998.

☆ The broadcast program "The Earth, Our Home". The series programs were jointly sponsored by CEEC and China National Radio, financially supported by China Standard Oil Company, formally broadcast on Jan. 3rd, 1999. The program has the columns, such as

" News Topic(Green Focus, Hot Spots)", "Interviewing Specialists", "the Regional Officers talking about Environmental Protection", " 'Green' Person", "Windows of Environmental Protection Knowledge", "Environmental Protection Development (the Report of the Earth)", "Green Consumption", "Green Education", "Green Travel (Environmental and Ecological Travel)", "Awarded Answering(Environmental Protection Knowledge) and so on. The program has also set "Mail Box of the Audience" for collecting the suggestions feedback information of the audience. The program evoked a significant repercussion among audience and received a great deal of letters from all parts of the country.

Establishing the EETPC

Supported by TVE, CEEC has established the EETPC and the China Environment and Sustainable Development Reference Center (CESDRRC). The two centers open to society free, receiving excellent social benefits. For example, assisted by CEEC, the Environmental Education and Communication Center of Xinjiang Uygur Autonomous Region picked up 8 TV documentaries to translate them to Uygur language and to show on this region.

Box 4.8 EETPC and CESDRRC

1. The China Environment and Sustainable Development Reference Center (CESDRRC)

CESDRRC was sponsored by CEEC and TVE in March, 1998, with the pattern of EETPC. The establishment of center is one of the international environmental protection education and communication projects. The establishment of the center is the fruit of common effort of many special organizations and individuals at both home and broad, for ensuring the China environmental protection and the sustainable development of Chinese economy. With the help of innumerous volunteers and cooperating organizations, the center, the center can provide information to government, non-governmental organizations, and scholars at home and broad, and international accompany organizations. So far, the center has collected 3700 books both in Chinese and foreign languages and 100 kinds of Chinese and English newspapers and magazines. Many other units have cooperated with the center, including Chinese Academy of Sciences (CAS), Chinese Projects Office of International Fund Commission and European Union Europe Commission.

2. Environmental Education Television Project of China

In March, 1997, the CEEC and TVE jointly established the **Environmental Education Television Project of China** (EETPC)**.**

The center opens to government, TV station, environmental protection units, school, social organizations and individuals free. The center possesses over 170 the international communication documentaries on environmental protection, providing for units and individuals who can search and copy these materials. At present, the center is the biggest and the most opened environmental protection material center in China.

Facilitating people of the whole country to use the materials of the center, CEEC has established 16 sub-center of EETPC in Sichuan, Guizhou and other provinces since September, 1998. EETPC trained all the administrators of the sub-centers on the administration of the materials and other aspects to advance the administrative ability and strengthen service consciousness on September 14-16, 1998.

Many other units have cooperated with the center, including China Scientific and Technological Information Center, China Academy of Sciences, Friend of the Nature, Beijing the Earth Environmental Culture Center and Chinese Projects Office of International Fund Commission.

iii) Carrying out environment education activity facing to society vigorously

Since 1990s, environment education has dramatically developed in the whole world. Not only the developed countries emphasize on environment education, but an increasing number of developing countries gradually emphasize on environment education. It is one of the most effective ways to make the environmental knowledge universal on the fundamental education during primary and middle school education, because all kinds of educations started on children, and teenagers are constructors and creators of the future society. Their qualities and environmental consciousness determine in what way they treat the environment. So a sound environment fundamental education will achieve twice the result for half the effort on promoting all people's environmental protection consciousness. Next, through environment education among the primary and middle school students, students, obtaining the environment knowledge, will influence their parents' activities, bringing the effects of "small hands pull the big hands" to make the good habits influenced more people through social relations and promote the initiative of the public participating environmental protection, indirectly to better social environmental activity.

In 1996, former State Environmental Protection Administration, Ministry of Education, China Communist Part Publicity Ministry jointly promulgated "Essentials of National Environmental Education and Communication Activity", and put forward that by the end of 2000, the "Green School" activity would be gradually carried out all over the country. The "Green School" activity advocates that schools carry out environment education and strengthen the cooperation between school and community to promote students' environmental accomplishment. The basic idea of "Green School" is that emphasizing on environmental consciousness and activity should be impenetrate in an overall activity including school's administration, education and teaching process. CEEC actively participated in the establishment of the "Green School". Up to October 2000, there had been over 3000 "Green School" of various levels.

In order to coordinate to the establishment of the "Green School", CEEC also carried out some relevant training activities, such as the training class for headmasters of the national

province-level green school (primary school). Environment quality is one of the basic qualities possessed by people in the 21st century. “Green School” is an important carrier for carrying out environment quality education. The level which the leaders of schools understand the environmental protection and environment education will directly influence teenagers’ environment quality and the environment administrative level of the school. Therefore, based on the understanding of this, in order to renovate the concept of the headmasters’ environment education and the method carrying out environmental education, to make more schools understand the idea of “Green School”, and to promote the “Green School” activity, CEEC conducted the training class for the headmasters of the “Green School” with the help of JICA. During the training, instructors from Beijing Normal University and CEEC introduced the present conditions and problems of environment in China and the whole world, the theories and practices of the “Green School”, main methods of environment education in school and present level of environment education in foreign counties. The representative of “Green School”, the headmaster of Shenzhen Oversee Chinese Primary School, introduced their experience on establishing “Green School”. Many headmasters of the training class reflected that the contents of the training class were well-organized. They also expressed their hope that attending more this kind of training classes and helping them promote to establish “Green School”.

Good textbooks of environment education are necessary to environment education in school. CEEC made great effort to compile environment education textbooks, which are suitable to pupils and middle school students. The domestic experts of environment education and excellence teachers who work at the front line of education organized by CEEC jointly compiled a series of assistant textbooks of environment education for primary school --- “Primary School Environmental Education in the New Century”, published by the Weather Publishing House, imbursed by Ningbo Humao Limited-Liability Company, a famous domestic realias design and production enterprise. The series textbooks are aimed at enlightening students’ environmental consciousness and encouraging students participating environmental protection activities. The series textbooks, based on the age characteristics, psychological characteristics and cognitional characteristics, surmounted the previous textbooks which mainly concern with the introduction of knowledge of environmental science, combine many kinds of teaching methods and teaching forms organically. The series textbook are divided into 6 volumes of students’ book and one volume of teachers’ book.

In order to provide ideas and methods of present environmental education and the blue prints of environmental education activities for environmental educators, teachers in primary and middle schools and other people who hope or are conducting environmental education, CEEC edited the teachers’ guide to environmental education --- “Green Cradle”, published by

Weather Publishing House. The book is divided into three volumes. The first volume introduces the theories and ideas of environmental education and the foundational knowledge of environmental science. The second volume introduces the examples of environmental education in primary school. The third volume introduces the examples of environmental education in middle school. The publishing of "Green Cradle" has greatly pushed forward environmental education in China.

iv) publicizing environmental protection through other activities

Apart from carrying out environmental education systematically, CEEC has also organized contest of environmental protection knowledge, national pupil solicit articles on environmental protection competition and national school students' designing blue print of environmental protection activities competition to popularize environmental knowledge among school students.

In 2000, the CEEC and other organizations cooperated in launching the Competition for Environmental Stars, a creative environmental activity that encouraged various social groups to participate to make the idea of environmental protection deepened in people's mind, started on recycling office paper. All the participating units should conduct environmental communication and education to promote the environmental consciousness of its staff; according to the relevant environmental code of conduct, the units should carry out environmental practice activities; establish the working and living circumstance friendliness to environment. Then the organizers examine and verify these units according to the quantified standards. Those units, which accord with standards, will be awarded the sign of "Environmental Star".

The experimental units which participated the first stage of the "Environmental Star" include: The Environmental Resources Committee of the National People's Congress, SEPA, All-China Federation of Trade Unions, Central Committee of the Communist Youth League and All-China's Women's Federation, General Office of the Beijing Government and so on. The contents are mainly on recycling office paper, including the participating units collected the waste paper of the office and get office paper which is made by recycled paper in return in a certain proportion. The factory providing the recycled paper is charge of transporting both waster paper and the recycled paper so that the transporting links are simplified and the participating units also economize outlay of office paper. The practice and experiment of the first stage of the activity also provided the sound approach to recycling paper in a beneficial circle. Based on the satisfactory results made by the experimental units, the second stage of the Competition for Environmental Stars started on June 5th, 2001 --- the World Environmental Day. The contents are

to create “Green Offices” according to “Green Office Model”. By adopting simple and easy-to-operate measures, the activity aimed to gradually integrate such activities as saving energy resources and water, recycling waste and old material, keeping a beautiful and clean working environment, and reducing noise and air pollution into routine office work. Thirteen organizations, including the State Information Center, China Exxon Corporation, China Epuxon Limited Corporation, the Student Department of Peking University, Changzheng Astronautical Control Project Corporation of the First Academy of Aerospace, took part in the activity.

Conducting all these activities has enlarged the influence the work of environmental protection and linked environment with the daily life of people. The participators understand the advantage of environmental protection in practice, so the activities contribute to deepening the idea of environmental protection in people’s mind.

v) make full use of international wealth to promote the development of environmental education

Although out state increasingly emphasizes on environmental protection, the investment still cannot meet the demand of the environmental protection. It is one of the most effective measures to conquer the problem of insufficiency of investment to carry out international cooperation, using the international wealth to support the domestic environmental protection work. In support of the development of China’s cause of publicity an education concerning environmental protection, Mobil China Corp. donated 10 million RMB to CEEC, and set up Mobil --- China Environmental Education Fund, which is a special item fund. Started from 1998, a series of projects have been carried out in 5 years, which involved various aspects of environmental publicity and education.

Table 4. 2 Some of activities sponsored by Mobil --- China Environmental Education Fund

Name of Projects
Training class for mayors in the “Three Lake” region
June 5th, 1998, the World Environment Day --- Striding to the 21st Century Green Life Activity
“Ramble on Radio --- Talking about Environmental Protection at the Joint of Two Centuries” jointly sponsored with Beijing Broadcasting Station.
“Green Life” series activities --- the Solicit Articles Competition on “ Green Home in My Mind” jointly sponsored by the “Green Home” columns of Hebei TV Station and Hebei Environmental Protection Administration
The Exhibition of “ Value Water Resource” sponsored by Center for Environmental Education and Communication of Jilin Environmental Protection Administration
Loving and Protecting Birds activity --- “ Cuddling Spring to Add New Green for 21st Century” jointly sponsored by Wuhan Environmental Protection Administration and Wuhan Commission of Education
“Recycling Waste and Old Batteries” sponsored by CEEC, Beijing Commission of Education, Beijing Environment and Sanitation Administration, Mobil --- China Environmental Education Fund
Environmental Knowledge Competition “ One Controlling and Two Qualifying” sponsored by Jiangxi Environmental Protection Administration and Jiangxi Commission of Education
“Young Green Angel’s Environmental Traveling On Yangtze River in the New Century” sponsored by Wuhan Environmental Protection Administration, Wuhan Commission of Education and Wuhan Science Association.
Xinjiang Environmental Protection Administration and CEEC jointly organized to translate TV documentaries on environmental protection.
30 episodes series programs of TV, radio and newspaper “ Talking about Environmental Protection on the Aspect of Clothing, Food, Shelter and Transport” sponsored by Hebei Environmental Protection Administration and Hebei TV Station
Guizhou Environmental Protection Administration carried out the environment protection education in ethnic minorities poor region in Karst
Communication and education activity “ hundred schools and thousand dishes” sponsored by Harbin Environmental Protection Administration.
“Top 500 in the World--- Popular Science Education Series Activity in Shapotou, Ningxia” sponsored by Ningxia Environmental Protection Administration and Shapotou Nature Preservation Zone.
TV documentary “ the Homeland” produced by Shandong Environmental Protection Administration and Shandong TV Station
Dubbed documentary in Tibetan language produced by Tibet Environmental Protection Administration
Ecological Protection Publicity in the Source of Honghe in Qinghai, sponsored by Qinghai Environmental Protection Administration, Qinghai Publicity Ministry and Qinghai TV Station
“Friends of Milu” Club, established by CEEC and Beijing Milu Ecological Experiment Center

Box4.9 June 5th, 1998, the World Environmental Day Striding to the 21st Century Green Life Action

In 1998, June 5th, the World Environmental Day --- Striding to the 21st Century Green Life Action, organized and planed by the CEEC of SEPA, sponsored by Mobil- China Environmental Education Fund, started at the same time in Beijing, Shanghai, Guangzhou and Wuhan. To enlarge the scope and influence of the activity, all the four cities respectively hold an opening ceremony in a community where the environmental protection works were rich in distinctive flavor in the city. The chief conference place was located in Hepingjie Community in Beijing, where the Striding to the 21st Century Green Life Action was implementing. Citizens of the community declared a proposal to people all over the country. Wang Xinfang, deputy director of SEPA, attended the opening ceremony, sending cloth bags to purchasers and passing-by people in shopping centers.

After the opening ceremonies, the four cities actively carried out the following-up activities of Striding to

the 21st Century Green Life Action.

- Hepingjie community where the activity were implementing cooperated with CEEC regularly jointly sponsoring the “Investigating the Environmental Consciousness of the Primary and Middle School Students in the Community”, “Visiting the Garbage Buried Place”, “Lecture of Environmental Protection Knowledge” “Green Life --- Exhibition of Paintings and Photography on Environmental Protection” and other publicity and education activities on environmental protection with various forms and varied and colorful contents.
- Guangzhou sponsored “ Environment Publicity and Education Activity of 98 Climbing Baiyun Mountain on Double Ninth Festival”. They also carried out the environmental protection counsel, exhibition of pictures, sending leaflets, publicizing tours and called up public to clean garbage, protect environment, afforest homeland to promote the environmental protection consciousness of public.
- Wuhuan sponsored the “Commemorating the 98 World Protecting Ozone Layer Day Striding to the 21st Century Green Life Action the Detachment of Students”, sending the “ Wuhan Citizens Knowledge of Green Life Card” to citizens.
- Shanghai sponsored the activity of collecting green words, and opening the “Shanghai Environmental Protection Market”.

“Striding to the 21st Century Green Life Action” aimed at carrying through and finalizing “ National Action Essentials of Publicity and Education on Environmental Protection”, and promoting the environmental consciousness of public. The activity promoted the environment publicity and education work on the aspects of popularity, promotion and closing to the life of citizens. The activity also provided a good chance to further conclude and spread the experience on citizens participating environmental protection activities.

After the establishment of Mobil- China Environmental Education Fund, the fund has aided CEEC to carry out many environmental protection activities of various forms and varied contents, in most of provinces, autonomous regions and municipalities directly under the central government in China. Through carrying out these projects, the fund functioned on the following aspects:

- Publicizing the state’s policies of environmental protection
- Promoting the environmental consciousness of the government officials.
- Publicizing the advanced experiences on environmental protection in regions
- Popularizing the environmental protection knowledge in the scope of the whole society.
- Aiding the environmental education in Western China and ethnic minority regions.

4.3 Promotion of the works of corporate environmental management and pollution prevention

Environment management include two levels --- government environmental management and corporate environment management. If we call the government environment management macroscopic management measure, the enterprise environment management is microscopic,

concrete. The administrative level of enterprise environment management directly influences the effectiveness of the macroscopic management. Therefore, the enterprise environment management should be given the enough emphases.

The measures for promoting corporate environmental management include:

Provide information support for the corporate environment management.

Enterprise firstly must know the state's laws and regulation on environment, the relevant environment standards, relevant systems and processes of work and the technologies of preventing pollution to conduct enterprise environment management. Therefore, there must be relatively unblocked channel for enterprises accurately mastering the information on time, which is needed to carry out enterprise environment management.

Provide human resource support for enterprises.

Qualified person is one of the key aspects to conduct environment management, directly conditioning the levels of the enterprise environment management. The measures of advancing the quality of staff include: firstly, recruit high qualified persons; secondly, retrain its staff. As to an enterprise, the second measure is more important and should be considered as a long-term policy. Therefore, government should provide channels for enterprise retraining its staff, helping enterprises to train their human resource.

Provide capital and technology which are needed by the prevention of pollution for enterprises.

Providing capital and technology are the most pragmatic measure to solve the problem of preventing pollution in enterprises. The prevention of pollution in enterprise will be promoted great if providing enough capital and suitable technology of controlling pollution.

Assist enterprise to find out the implementing measures of promoting enterprise's levels of environment management.

At present, the environment management levels of Chinese enterprises have great diversities. Generally speaking, the state-owned large and middle enterprises are superior to the small enterprises. Enterprises will encounter many practical problems during the process of enterprise environment management, such as how to promote the effectiveness and levels of the enterprise environment management, in what way enterprises conduct environment management, what kind of regulations enterprises should follow and what kind of measures enterprises should adopt, so a certain of assistance should be given to promote the enterprise's levels of environment management.

Sion-Japan Center indirectly provide assistance for the enterprise promoting their levels of environment management through establishing website, conducting various environment

training classes, providing environmental products and service and doing scientific researches, while the most effective one is to introduce the ISO14000 Environmental Management System to Chinese enterprises.

At the historical period when our country are actively developing our economy and making great effort to implement the two fundamental transformations, introducing ISO14000 is an important and effective measure for promoting the economic development and harmonizing the relationship to environment and developing economy. The environmental management measures in present China are most implemented compulsorily by laws, regulations and exterior orders of administration, while ISO14000 provide an independent environment management model for enterprises, which can establish environment management system according to their own guidelines of operating and developing on the standard required by ISO14000 system. So enterprises can promote the avail proportion of energy sources, prevent and decrease pollution on the contemporary of developing economy. ISO14000 series standards are a measure for protecting environment effectively on the course of developing economy. The implementation of ISO14000 should become an important environmental protection policy adapting market economy. ISO14000 Environmental Management System is also a kind of complementarity to our country's present measures of environment management.

Since September, 1996, when the International Organization for Standardization (ISO) firstly promulgated the ISO14000 series standards, State Environmental Protection Administration (SEPA) has launched the experiment projects of ISO14000 Environment Management System, ensuring the ISO14000 series environment management standards can implement in China. In order to guarantee the justness and authority of the ISO14000 Environment Management System, government established state certification system which is a standardized and scientific Chinese environment management system on the contemporary of launching the experiment projects. In August, 1997, the State Department granted the establishment of China Accreditation Committee for Environmental Management System Certification Bodies and China Registration Committee for Environmental Auditors, respectively taking the charge of certification management of the bodies which conduct the environmental management system certification and the state qualified registration authority bodies for auditors who conduct the environmental management system certification and all the training classes. Both secretariats of the committees are set in Sion-Japan Center, taking charge of daily works.

These years, the China Registration Committee for Environmental Auditors (CRCE) and China Accreditation Committee for Environmental Management system Certification Bodies (CACE) mainly carried out the following tasks:

Establishment of regulations

Since their foundation, the China Registration Committee for Environmental Auditors and China Accreditation Committee for Environmental Management system Certification Bodies have been devoting to the establishment of the state confirmation regulation on China's environmental management system certification. Through the continuous efforts and tremendous works, based on studying the international regulations of certification and confirmation, the CRCE and the CACE formulated and issued a serial standardized documents; in accordance with these documents they also comprehensively carried out the works on the conformation of the state environmental management system certification bodies, on registration of the auditors, and on the conformation of training courses. Thereby the state certification and confirmation regulation on China's environmental management system was effectively established and gain the healthy development.

Firstly, the CRCE and the CACE issued the symbol for the conformation or registration of the state and established the authority of the state conformation regulation. In 1997, the Secretariat of CACE and CRCE organized and designed the symbol of the state confirmation on the environmental management system certification bodies and environment and the symbol of the state registration on environmental management auditor, and they also issued *the measures of usage and management for the state conformation symbol on China environmental management system certification bodies* and *the measures of usage and management for the state registration symbol on China environmental management system auditor.*

Secondly, the CRCE and the CACE established the confirmation standard of environmental management certification bodies and management regulation of environmental management auditors' registration and training.

- To standardize the registration work of environmental management system the Secretariat of CRCE formulated *the registration standard for environmental management system auditors* in accordance with the international standard and married with China's practical condition and comprehensively carried out the registration work of environmental management system auditor's state qualification.

- To standardize the training work of environmental management system auditor and ensure the authority and seriousness of state registration system, the Secretariat of CRCE formulated *the registration standard for environmental management system auditor's training course* and meanwhile *the registration measures for environmental management system auditor's teacher,* and they also carried out the training of the teachers, thereby ensure the qualification of the environmental management system auditors' training program.

- To standardize the certification work of environmental management system and enforce the confirmation management to the environmental management system certification bodies, the Secretariat of CACE formulated *the basic confirmation requirement for environmental management system certificate* and *the confirmation procedure for environmental management system certification bodies* based on the studying of foreign counterparts' experiences and the marriage of our country's practical situation.

Thirdly, the CACE and the CRCE established the standard charging system of certificate, confirmation and registration. To enhance the effective management to the environmental management system certification work and standardize the charging system of environmental management system certificate, the Secretariat of CACE and CRCE formulated the charging standard for China environmental management system certificate, confirmation, auditor's training and registration which had submitted to the national planning committee to examine and approve. Currently, the charging standard for confirmation, auditors' training and registration have been approved by the national planning committee. The Secretariat of CACE and CRCE will strictly implement the charging standard in their daily work and will strictly standardize and manage the whole country's charging work of environmental management system certificate.

Table 4. 3 Situation of the Secretariats of the two committees' establishments of regulations

Names of regulations	Issued time
The measures of the usage and the management for state confirmation symbol of China environmental management system certification bodies	Year 1997
The measures of the usage and the management for state registration symbol and registration certificate of China environmental management system auditors	Year 1997
The committee's regulations for China's certification personal majored in environmental management of state registration committee	Year 1997
The registration standard for environmental management system auditors (first edition)	Year 1997
The basic confirmation requirements for environmental management system certification bodies	Year 1998
The confirmation procedure for environmental management system bodies	Year 1998
The business scope, procedures and conditions of confirmation for environmental management system bodies	Year 1998
The regulation for state confirmation symbol and confirmation certificate of China environmental management system bodies	Year 1998
The management regulation for the certification credentials and certification symbol of China environmental management system bodies	Year 1998
The registration measures for the environmental management system auditors' major	Year 1999
The registration regulation for the environmental management system auditors' training courses	Year 1999

The registration procedure of the environmental management system auditors' training courses	Year 1999
The registration and management measures for teachers' training course of the environmental management system auditors	Year 2000
The management procedure for the qualification examination of the auditors' teachers	Year 2000
The punishment regulations for the environmental management system certification bodies	Year 2000
The registration regulation for the environmental management system auditor (second edition)	Year 2001
The management measures for the environmental management system to test and verify auditors	Year 2001
The registration and management regulation for the teachers of internal auditors' training	Year 2002

Textbook compiling and the training course holding

To standardize the training work of the environmental management system auditors and ensure the authority and seriousness of state registration regulation, the Secretariat of CRCE formulated the registration standard for the environmental management system auditors' training courses and compiled *China environmental management system registered auditors' state training course (fundamental knowledge section), China environmental management system registered auditors' state training course (audit knowledge section)* and *China environmental management system internal auditors' training course*; meanwhile they formulated *the registration measures for the teachers of the environmental management system auditors*, and carried out the training for teachers, and ensured the training quality of the environmental management system auditors.

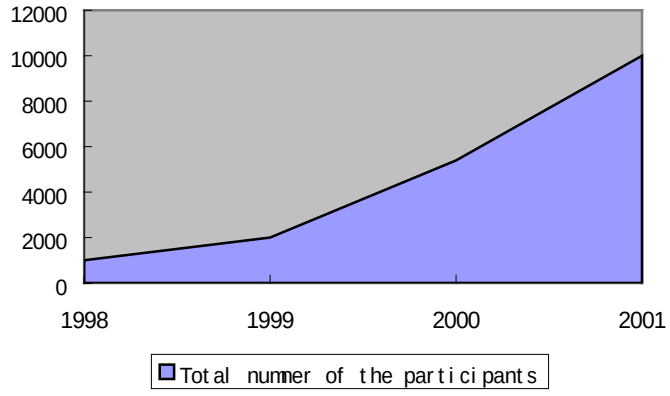


Figure 4. 4 1998-2001 the condition for participants of the environmental management auditors' training

These years, the Secretariat of the CRCE organized and approved some 360 terms of training course (including the fundamental knowledge training course and the audit knowledge training

course), and training about 10,000 person-time.

The work of registration on the environmental management system auditor and the registration and management work on the training courses

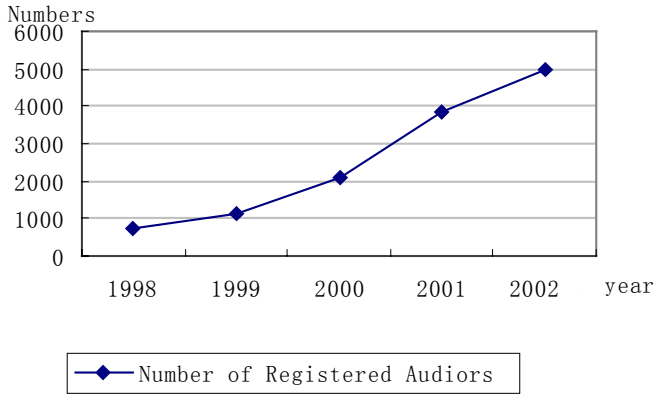


Figure 4. 5 1998-2002 the increasing condition for the number of registered auditors

To standardize the registration work on the environmental management system auditors, the Secretariat of the CRCE formulated *the registration standard for the environmental management system auditors* in accordance with the international standards and married with China's practical condition, and comprehensively carried out the state qualification registration work on the environmental management system auditors. Up to now, 5,004 persons in total became the environmental management system auditors with the state registered qualification in the whole country.

Confirmation work on the environmental management system certification bodies

To standardize the confirmation work on the environmental management system certificate and enforce the management for the environmental management system certification bodies' confirmation, based on studying of the foreign counterparts' experiences and married with our country's practical condition, the Secretariat of CRCE formulated *the basic confirmation requirements for the environmental management system certification bodies* and *the confirmation procedure for the environmental management system certification bodies*. According to those, the Secretariat of CACE carried out the confirmation work on the environmental management system certification bodies. Currently, 46 certification bodies has already obtained the confirmation qualification of the CACE. In the course of implementing the confirmation, examination and evaluation, the auditor strictly guaranteed the quality in accordance with "the

basic confirmation requirement" and "confirmation procedure", practically realized the "authority and justification" and render the confirmation work with a effective and ordered operation. Though the confirmation to the certification bodies, the certification market was effectively standardized and unified; the criteria and authoritativeness of certification were as well enhanced.

Efforts made in the communication work for the implementation of ISO14000 and the state confirmation regulation

In order to make extensively known the meaning of implementing the ISO 14000 to the whole society and in order to make known the relevant general and specific policies and some relevant regulations, the Secretariat of the two committees in succession held various communication activities, published many communication articles on *people's daily*, *China daily* and *China environmental press*, initiated the magazine *China ISO14000 certification*, and set up the communication website. All of those aroused the universally attention from various circles and obtained the positive effect.

International exchange

To draw on the foreign counterparts' advanced experiences and ensure basic coherency between the international conventions and our certification and confirmation regulation of China environmental management system, the Secretariat of CACE and CRCE, since their foundation, have been attaching attention to keep the connect with the internationally related organizations, and actively carrying out the exchange activities. The Secretariat of CECA and CRCA respectively became the official member of the two most influential international organizations for mutual reorganization at present, the IATCA (international association for training and registering auditors) and the IAF (international acceptance forum), actively participated the various activities of international organizations, and effect some importance in these international organizations. Meanwhile the Secretariat of the two committees also established bilateral and multilateral relationship with many confirmation organizations of many countries.

At the same time they established and ran the state confirmation regulations, the CACE and the CRCE gradually constructed a set of feasible measures, which married confirmation management of ISO14000 with China's environmental management regulations, and thereby effectively standardized environmental management certification works. Through the standard

operation and the strict management, China's ISO14000 certification work developed vigorously. Up to the end of year 2001, more than 1000 enterprises succeeded in passing the ISO 14001 certification, which also exploited the active effects to facilitate the work on our country's enterprises' environmental management.

4.4 External Evaluation of the work of the Sino-Japan Friendship Center for Environmental Protection

4.4.1 Evaluation of questionnaire on the training course for directors of local EPBs

4.4.1.1 Project overview

To improve the overall quality of the staff members in the field of environmental protection throughout the country, the State Environmental Protection Administration has established the Program of Education and Training of Cadres in the field of environmental protection of China in 2001- 2005. The program requires that training programs or implementation plans be made for the on-the-post training of environmental protection cadres in different parts of the country by combining the local situations. The on-site training program covers three targets respectively for leaders of environmental protection bureaus at the provincial, prefecture and municipal levels and for staff members at the county level. Of the three, training courses held for the leaders of environmental protection bureaus at the provincial level are conducted by the Department of Human Affairs of the State Environmental Protection Administration assisted by the Center for Environmental Education and Communications of SEPA (CEEC). Training courses for leaders at the prefecture and municipal levels are undertaken by the Center for Environmental Education and Communications of SEPA (CEEC). And the courses for the county heads are conducted by the respective provinces, autonomous regions and municipalities directly under the Central Authority under the instruction of the Department of Human Resources of SEPA and the Center for Environmental Education and Communications of SEPA (CEEC). Hence, it can well be said that the Center for Environmental Education and Communications of SEPA has participated in the implementation of all the training programs. In the past two years, two senior seminars have been conducted for the heads of the provincial environmental protection bureaus with 75 participants from 31 provinces and autonomous regions as well as municipalities directly under the Central Authority. Ten on-the-post-training courses have been held for leaders of local environmental protection bureaus at the prefecture and municipality levels with 434 participants. And 45 courses have been held for leaders at the county level with 2165 trainees.

4.4.1.2 On-site training for director of local EPBs at the prefecture and municipality levels

The on-site training for the director of local EPBs at the prefecture and municipality levels are mainly conducted by the Center for Environmental Education and Communications of SEPA targeting at trainees who are the leaders of environmental protection bureaus at the prefecture and municipality levels. Such on-site training courses have received high attention from the leaders of the State Environmental Protection Administration. Minister Xie Zhenhua of SEPA, Vice Minister Wang Yuqing of SEPA and other leaders have delivered special lectures at the training courses. This demonstrates that the leaders of SEPA attach high importance to the training courses and are greatly concerned with the development and capability building of these local leaders who in turn are stimulated to work still harder.

The curricula of on-site training include two parts: fundamental course and seminars. The former includes theories on environmental protection and sustainable development, environmental law and environmental management. The lectures are arranged in a systematic way and are mainly delivered by specialists, scholars both at home and abroad. The latter are mainly given by leaders of the Operation Division of SEPA covering such practical and operable contents as are instructive to real on-site implementation. Besides, all kinds of discussions and field studies have been carried out.

Almost all the trainees think highly of such training, which have serviced as eye-openers and helped laying down a solid theoretical foundation for their work. They say such training have provided systematic and latest theoretical knowledge to them regarding environmental protection. The training have presented a better landscape of China's environmental protection, clarified their responsibilities and proved practical in their every day work. In the meantime, the courses have provided trainee-to- trainee and trainee-to- teacher exchanges and opened up new horizons for them and are mutually beneficial to them all.

To get the trainees' opinions on the course contents, mode of teaching and results of learning, the Center for Environmental Education and Communications of SEPA has designed a questionnaire (see Appendix 1) for the trainees to fill up in order to discover problems and make improvements.

4.4.1.3 Analysis of the questionnaires

Basic situation of the sample questionnaires

To obtain the opinions on the on-the-post training for heads of environmental protection bureaus at the prefecture and municipality levels, an analysis has been conducted on some selected prefectures of the first and second on-the-post-training courses in 2002.

The fundamental situations are as the follows (Table 4.4):

Table 4. 4 General situations of the first two on-the-post training courses for directors of local EPBs

First Course: 33 trainees	Second Course: 30 trainees
Environmental protection ABC	History and development of China's environmental organizations
Introduction to environmental laws	China's environment development construction
Implementation and development of ISO14000	US environmental legislation and enforcement system
Environmental management of construction projects	Publicity of environmental information and environmental administration
Development of China's environmental management and policies	Hong Kong's environmental law and administration
Foundation and channels for public participation in environmental protection	Law administration in urban environmental management
China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	Introduction to the work experience in environmental law administration at the prefecture and municipal levels
Construction of China's environmental law system and WTO regulations	Introduction to Lanzhou's work experience in environmental management
Japan's environmental policies and evolution	Enterprises, environment and law

As seen from the curriculum of the first two training courses, the curriculum of the first training was comparatively comprehensive covering the ABC of environmental protection, environmental management, national key environmental protection projects and foreign experience of environmental management and so on. The second training course gave more emphasis to the environmental law, especially the administration of environmental law.

General situation of the questionnaire

For the first two training courses, altogether 18 subjects were offered to 63 trainees. Altogether 567 scheduled times were issued with 488 returned accounting to an average return rate of 86% with respectively 90% and 82% for the first and second training courses.

Table 4. 5 Return of the questionnaires

Item	Subject	Questionnaire returned	Return rate
Training course one	Environmental protection knowledge	31	94%
	Introduction to environmental laws	33	100%
	Implementation and development of ISO14000	28	85%
	Environmental management of construction projects	29	88%
	Development of China's environmental management and policies	27	82%
	Foundation and channels for public participation in environmental protection	22	67%
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30	91%
	Construction of China's environmental law system and WTO regulations	33	100%
	Japan's environmental policies and evolution	33	100%
Training course two	History and development of China's environmental organizations	19	63%
	China's environment development construction	18	60%
	US environmental legislation and enforcement system	22	73%
	Publicity of environmental information and environmental administration	26	87%
	Hong Kong's environmental law and administration	26	87%
	Law administration in urban environmental management	26	87%
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28	93%
	Introduction to Lanzhou's work experience in environmental management	30	100%
	Enterprises, environment and law	27	90%
Total	**567 questionnaires**	**488**	**86%**

Answers of the questionnaire

The questionnaire is composed of two parts: the first part is compulsory questions designed to learn the training effects. The questions include the following: the degree of correlation between your present job and the training subjects? Whether the subjects are new to you? Whether you have obtained any useful information from the course? Whether the training has been pertinent to your needs and up to your expectancy of the training? What is your opinion of the overall utility of the whole curriculum?

The second part of the questionnaire is for voluntary answers mainly targeting contents concerning the training patterns including the degree up to your expectancy of the subjects offered, the overall teaching quality, the mode, quality, effect of the lecture delivery and any concrete proposals toward the training.

In accordance with the requirements of this study, the first part of the questionnaire is chosen to be the subject for analysis. And the following conclusion is concluded:

Question 1. Degree of correlation between your present work and the training subjects

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		1	6	14	8	
	Introduction to environmental laws	33				7	26	
	Implementation and development of ISO14000	28		1	5	10	12	
	Environmental management of construction projects	29			3	5	21	
	Development of China's environmental management and policies	27		1	4	8	14	
	Foundation and channels for public participation in environmental protection	22			2	4	16	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			4	9	17	
	Construction of China's environmental law system and WTO regulations	33			1	1	31	
	Japan's environmental policies and evolution	33		1	4	12	15	
Training course two	History and development of China's environmental organizations	19			4	7	8	
	China's environment development construction	18				4	14	
	US environmental legislation and enforcement system	22	1	3	5	7	6	
	Publicity of environmental information and environmental administration	26	1	1	4	6	13	
	Hong Kong's environmental law and administration	26		1	10	7	7	1
	Law administration in urban environmental management	26	1	1	5	10	9	
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28			3	10	13	
	Introduction to Lanzhou's work experience in environmental management	30	1		3	8	18	
	Enterprises, environment and law	27	1		1	8	15	
Total		488	1%	2%	13 %	28 %	54 %	

Note: 1 represents extremely unsatisfactory or very unsatisfactory; 2 represents unsatisfactory or not so satisfactory; 3 represents ordinary, 4 represents good or fairly good; 5 represents very good or very satisfactory; and X represents indifferent

Question 2. Whether the subjects offered are new to you

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		3	15	7	4	
	Introduction to environmental laws	33			3	12	18	
	Implementation and development of ISO14000	28		1	4	9	14	
	Environmental management of construction projects	29			5	7	17	
	Development of China's environmental management and policies	27		1	7	9	10	
	Foundation and channels for public participation in environmental protection	22			1	7	14	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			1	9	20	
	Construction of China's environmental law system and WTO regulations	33			1	6	26	
	Japan's environmental policies and evolution	33			4	7	19	
Training course two	History and development of China's environmental organizations	19	2	2	5	4	7	
	China's environment development construction	18			2	7	9	
	US environmental legislation and enforcement system	22		1	1	4	16	
	Publicity of environmental information and environmental administration	26	1		1	13	8	
	Hong Kong's environmental law and administration	26			4	7	15	
	Law administration in urban environmental management	26		3	3	2	18	
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28		1	11	10	4	
	Introduction to Lanzhou's work experience in environmental management	30	1	2	10	10	7	
	Enterprises, environment and law	27	1		3	4	18	
Total		488	1 %	3 %	17 %	27 %	50 %	

Question 3. Usefulness of the knowledge learned from the course

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		6	9	9	6	1
	Introduction to environmental laws	33				11	22	
	Implementation and development of ISO14000	28		1	6	12	9	
	Environmental management of construction projects	29			5	7	17	
	Development of China's environmental management and policies	27		1	9	8	7	
	Foundation and channels for public participation in environmental protection	22				8	14	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			1	9	20	
	Construction of China's environmental law system and WTO regulations	33			1	5	27	
	Japan's environmental policies and evolution	33			6	10	16	
Training course two	History and development of China's environmental organizations	19		1	8	7	3	
	China's environment development construction	18			3	1	14	
	US environmental legislation and enforcement system	22	1	1	3	10	7	
	Publicity of environmental information and environmental administration	26	1	1	3	7	12	
	Hong Kong's environmental law and administration	26		3	12	7	4	
	Law administration in urban environmental management	26	1	2	5	8	10	
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28			7	12	7	
	Introduction to Lanzhou's work experience in environmental management	30	2	1	7	11	9	
	Enterprises, environment and law	27	1		1	5	18	
Total		488	1%	3%	18 %	30 %	45 %	

Question 4. Whether the training has been pertinent to your needs

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		8	7	9	5	
	Introduction to environmental laws	33			1	9	23	
	Implementation and development of ISO14000	28		2	12	8	5	
	Environmental management of construction projects	29			4	7	18	
	Development of China's environmental management and policies	27		2	8	8	6	
	Foundation and channels for public participation in environmental protection	22				10	12	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			1	11	18	
	Construction of China's environmental law system and WTO regulations	33			1	2	30	
	Japan's environmental policies and evolution	33		1	12	5	13	
Training course two	History and development of China's environmental organizations	19	1	3	5	7	3	
	China's environment development construction	18			1	5	12	
	US environmental legislation and enforcement system	22	1	2	6	7	6	
	Publicity of environmental information and environmental administration	26	1	1	5	8	9	
	Hong Kong's environmental law and administration	26	2	1	6	9	8	
	Law administration in urban environmental management	26		1	11	10	3	
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28		1	9	10	6	
	Introduction to Lanzhou's work experience in environmental management	30	2	2	6	11	8	
	Enterprises, environment and law	27	1		1	5	18	
Total		488	2%	5%	20 %	29 %	42 %	

Question 5. Whether the training has been up to your expectancy of the training?

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		5	11	13	1	
	Introduction to environmental laws	33		1		13	19	
	Implementation and development of ISO14000	28		2	11	11	4	
	Environmental management of construction projects	29			4	9	16	
	Development of China's environmental management and policies	27			8	12	6	
	Foundation and channels for public participation in environmental protection	22				9	13	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			1	14	14	
	Construction of China's environmental law system and WTO regulations	33			1	5	27	
	Japan's environmental policies and evolution	33		1	6	11	13	
Training course two	History and development of China's environmental organizations	19	1	2	3	6	6	
	China's environment development construction	18			2	3	13	
	US environmental legislation and enforcement system	22	1	1	5	10	5	
	Publicity of environmental information and environmental administration	26	1	2	1	14	6	
	Hong Kong's environmental law and administration	26		3	9	7	6	
	Law administration in urban environmental management	26	1		7	9	8	1
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28		1	5	14	6	
	Introduction to Lanzhou's work experience in environmental management	30	2	1	8	14	5	
	Enterprises, environment and law	27	1			6	18	
Total		488	1%	4%	17 %	37 %	38 %	

Question 6. What is your opinion of the overall utility of the whole curriculum?

Item	Subject	Questionnaire returned	1	2	3	4	5	X
Training course one	Environmental protection knowledge	31		4	8	13	2	
	Introduction to environmental laws	33				8	25	
	Implementation and development of ISO14000	28		2	11	7	7	
	Environmental management of construction projects	29		1	3	9	16	
	Development of China's environmental management and policies	27			10	8	8	
	Foundation and channels for public participation in environmental protection	22				8	14	
	China's ecological environmental protection outlines and analysis of the current ecological environment situation in West China	30			1	14	15	
	Construction of China's environmental law system and WTO regulations	33			1	3	29	
	Japan's environmental policies and evolution	33	1	2	7	11	11	
Training course two	History and development of China's environmental organizations	19		2	3	7	7	
	China's environment development construction	18			1	4	13	
	US environmental legislation and enforcement system	22	1	2	9	6	4	
	Publicity of environmental information and environmental administration	26	1	1	4	10	8	
	Hong Kong's environmental law and administration	26		3	10	8	4	
	Law administration in urban environmental management	26		1	9	8	7	1
	Introduction to the work experience in environmental law administration at the prefecture and municipality levels	28		1	6	10	9	
	Introduction to Lanzhou's work experience in environmental management	30	2		6	11	11	
	Enterprises, environment and law	27	1		1	5	18	
Total		488	1 %	4 %	18 %	31 %	43 %	

Evaluation and conclusion of the questionnaires

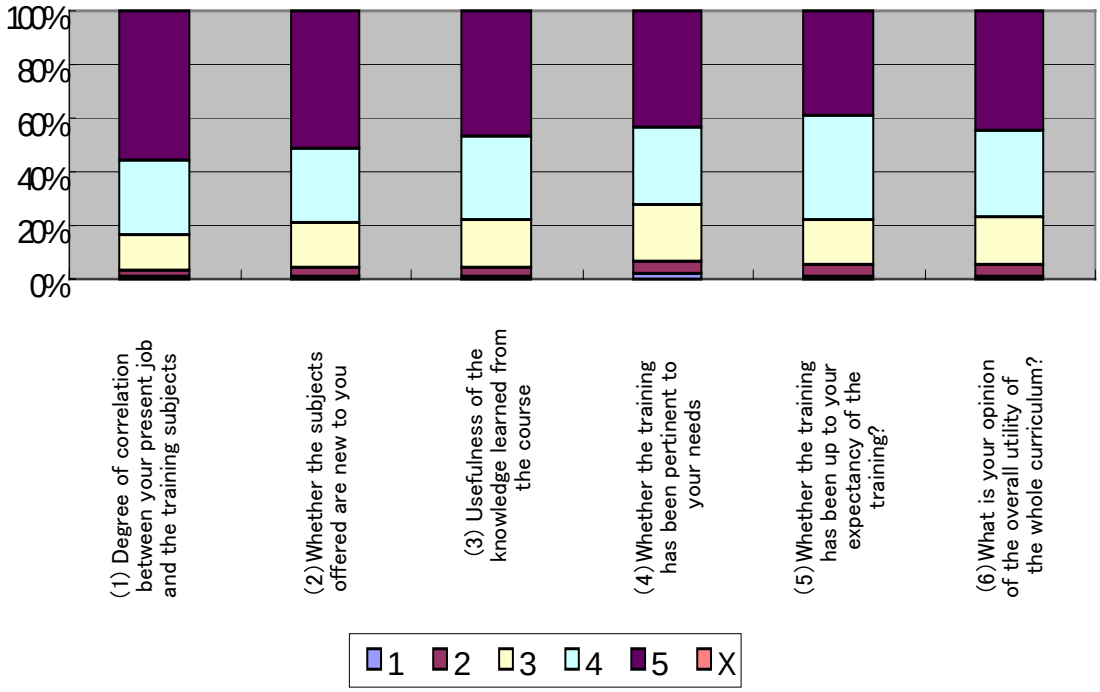


Figure 4. 6 General situation of the questionnaire

As seen from the general answers, the majority of the trainees think the training subjects are closely related to their jobs, 54% think they are very closely related, 28% think comparatively closed, and only 3% think they are not related at all or very little. This shows that during the implementation of the training items, the Center for Environmental Education and Communications of SEPA has made its best to meet the real needs of the trainees. Because of this, approximately 74% of the trainee's thinks the overall utility of the curriculum is up to their expectancy and hence is satisfactory, 43% think the utility level of the overall curriculum is very high, and only 1% think the training contents are not practical.

In terms of the subject contents, 50% of the trainees think the contents are new to them, 27% think they are comparatively new and only a few trainees, accounting to about 4% of the total trainees think the curricular contents are out-of-date are rather old. In regard to the feedback about the usefulness of the knowledge learned through the training, 18% of the trainees think it is ordinary, 75% think quite useful of which 45% think it very useful.

For the pertinence of the training subjects, most of the trainees think the curriculum is highly pertinent or comparatively pertinent. However the number of trainees discontented with the pertinence of the curriculum is evidently higher compared with the other items in that 7% of the

trainees think it unsatisfactory and comparatively unsatisfactory.

To the degree of their expectancy to the training effect, the majority of the trainees think the training results are satisfactory or very satisfactory accounting to 75%. However, a few trainees think the training has failed to live up to their expectancy.

In general, the above feedback shows that except for question item （1）, the proportion of the different reactions remain almost the same to all the other questions . The high degree of satisfaction to item （1） demonstrates that the training has been very necessary and timely in improving the environmental protection cadres' personal quality. Furthermore, the majority of the participants say that the subjects offered are new, pertinent, practical and useful to their work. But regarding the degree of the training to meet their expectancies, the proportion of the different answers is not the same as with the other questions. The trainees select 4 and 5 to show their satisfaction with 75% choose satisfactory for all the questions. However, in the choice for question (5), a higher proportion of trainees choose comparatively satisfactory, that is, more trainee (37%) choose item 4. This means that although the training has met the demand to improve the quality of the environmental protection cadres, much still needs to be done for improvement and better achievement. After the analysis, the following conclusions are made:

- On-site training for the heads of environmental protection bureaus at the prefecture and municipality levels by the Center for Environmental Education and Communications of SEPA is highly timely and necessary.
- The curriculum has well combined with the real practice of the trainees hence is highly practical.
- The training has resulted in the upgrading of the trainees' knowledge structure and the improvement of the trainees.
- Improvement of the cadres' quality has in turn promoted the local environmental management level.

4.4.2 Construction Project of the Environmental Information Network Systems in 100 Cities of China

4.4.2.1 Project overview

On November 26, 1998, the Joint Communiqué on Environmental Cooperation toward the 21st Century between the Japanese Government and the People's Republic of China was signed.

In the Communiqué, both sides agreed that 100 cities would be chosen in China to construct China's environmental information network system funded by aid given gratis provided by the Japanese Government. On the basis of this agreement, meetings were held to discuss the practical operations of setting up the systems in these 100 cities. Through the joint efforts on both sides, a consensus was reached as to the basic contents of the project. 100 target cities to receive the assistance were chosen with the agreement of both sides. It was decided that the project would be divided into two stages: the first stage would complete the construction of the environmental information LANs of 39 cities; the second stage would learn from the construction experience of the first stage and complete the environmental information LANs the remaining 61 cities and the satellite communication substation WANs of 89 cities.

The year 2000 was the first stage of the project implementation. In this year, the urban environmental information LANs of 39 cities were built. In January 2000, after on-site survey and joint discussions conducted in advance, the outline of the basic project design was completed. It specified the concrete contents of the project implementation. On March 29, the ceremony for the exchange of notes was held in Beijing by both governments. On July 13, the project went for public international competitive bidding in Japan. In August, evaluation of bid was carried out in Japan and Japan's ITOCHU CORP won a bid to become the contractor in this stage. Through the joint efforts on both sides, now this stage went on smoothly with the processes of project purchasing, transport, installation and adjustment. Now the project has already been completed fulfilling every target as designed. On January 18, 2001, all the parties concerned officially signed the documents announcing the successful completion of the stage in Beijing.

The year 2001 was the second stage of the project implementation. In this year, 61 urban environmental Information LANs and 89 urban satellite communication substation WANs would be constructed. At the beginning of 2001, the Japanese side finished the pre-project survey. In April, the outline of the basic design of the second stage of the project was completed. On June 15, both governments officially exchanged notes. On the basis of the exchange of notes, both sides conducted detailed project design and drew up the invitation to bid of the project. On October 19, 2001, after the evaluation of bid, Japan's ITOCHU CORP won the bid as the contractor for the stage. With active cooperation from all sides concerned, the project was implemented in a smooth way. On April 18, 2002, the installation, adjustment and inspection of the urban LANs and WANs were all completed. And on April 24, documents testifying the successful completion of the second stage project were signed. Up to then, all the construction tasks of the project had been completed successfully achieving every design objective as expected.

After the completion of the project, the Environmental Information Center conducted a follow-up investigation of project implementation and network operation through

questionnaires (see appendix 2) and field studies.

4.4.2.2. Analysis of the questionnaires

- Target of the questionnaires: 100 cities that received the project
- The questionnaire covered three aspects: institution building, system operation and system performance and proposals. The first aspect, that is, institution building, covers nature of the institutions, number of personnel and so on. For the investigation of operation performance, it includes the operation expenditure, operation evaluation of the software and hardware, and technical support and so on.
- General status of questionnaire feedback: all the questionnaires issued were filled up and returned.

4.4.2.3. Analysis of the answers

i) Distribution of cities participating in the project

This project lasted 4 years with a total investment of 2.018 billion Japanese yen with the cities coming from 28 provinces, autonomous regions and municipalities directly under the Central Government directly and indirectly benefiting 0.16 billion people in China.

It can be seen from table 1 that of the 100 cities, one is a municipality directly under the Central Authority. There are also 18 provincial capital cities of which 10 are from West China (including Chongqing) occupying 92% of such cities (provincial capitals and the municipality under the administration of the Central Government). The rest of the provincial capitals are mostly from the midland of China while provincial capitals in East China are not included. This reflects the diversified development status in economy and science and technology of China with that of the East evidently stronger than that of the Midwest areas. Therefore the construction project of environmental information system networks in 100 cities took a different approach to provide support to different areas in China. In the East, the project mainly covers some medium-sized cities while in the Midwest areas its targets are oriented toward the provincial capitals and large cities.

Table 4. 6 Distribution of the 100 Cities

Province (autonomous regions and municipalities directly under the Central Government)	Capital of Province (autonomous region)	City
Beijing		
Shanghai		
Tianjin		
Chongqing	Chongqing	
Heilongjiang	Harbin	Jiamusi,Yichun,Daqing,Hegang,Qiqihar
Jilin	Changchun	Tonghua,Siping,Yanji
Liaoning	Shenyang	Dalian,Anshan,Yingkou,Benxi,Jinzhou,Dandon
Shandong		Zibo,Qingdao,Zaozhuang,Jining,Yantai
Shanxi	Taiyuan	Datong,Linfen,Yuncheng
Neimenggu	Huhehaote	Baotou
Hebei	Shijiazhuang	Tangshan,Chengde,Baoding,Zhangjiakou,Qinhuangdao
Henan		Jiaozuo, Anyang, Kaifeng, Pingdingshan
Hubei		Jingsha,Huangshi,Xiangfan,Yichang
Hunan	Changsha	Hengyang,Yueyang,Zhuzhou
Jiangsu		Yangzhou, Zhenjiang, Wuxi, Xuzhou Changzhou, Suzhou, Huaiyin
Zhejiang	Hangzhou	Ningbo, Wenzhou, Zhoushan
Anhui	Hefei	Anqing, Wuhu, Huainan, Bengbu
Jiangxi		Pingxiang, Jiujiang, Ganzhou, Jingdezhen
Fujian		Quanzhou, Sanming
Guangdong		Zhaoqing, Shenzhen, Shantou, Shaoguan, Zhuhai
Gangxi	Nanning	Wuzhou, Liuzhou
Hainan		Sanya
Guizhou	Guiyang	Zunyi
Yunnan	Kunming	Gejiu, Dali
Sichuan	Chengdu	Zigong, Neijiang
Shanxi	Xi'an	Baoji, Yanan, Hanzhong
Chinghai	Xining	Germu
Gansu	Lanzhou	Tianshui, Jiayuguan
Ningxia	Yinchuan	Shizuishan
Xinjiang		Yining, Shihezi
Tibet	Lasa	

ii) Analysis of project implementation performance

In regard to institutional building, the majority of the environmental protection bureaus have their information centers which are independent institutions with an establishment of 5 or over 5 persons. In reality, the number of staff working in these institutions differs from the established number. A few information centers are an in-house institutions or information management offices taking charge of environmental information management for the environmental protection bureaus. Implementation of the project has promoted the operation of these administrative organizations of environmental information under the city environmental protection bureaus. Such promotion is shown in the following two aspects: On the one hand, for

those large cities already with a solid environmental management informatization foundation such as well-established information centers, implementation of the project has further highlighted the work of these centers, promoted support for them from all sides and created better environment for their further development. For example, to provide assistance to the project implementation, Qingdao, Shandong Province has strengthened its support to the information center. It ha not only expanded the office space of the Environmental Information Centerbut also carried out innovation and upgrading of the machinery room in order to meet the requirements of the project. On the other hand, for those small cities with poor environmental information management foundation, the implementation of the project has directly resulted in the construction and establishment of the information centers. For instance, to satisfy the implementation requirements, environmental protection bureaus of Zaozhuang, Shandong Province, and Anqing, Anhui Province have both applied and been authorized to build up their information centers which is very significant to the environmental management of the cities.

In regard to operation finance, it varies greatly with different economic capabilities and status of equipment from tens of thousands to hundreds of thousands annually.

In the aspect of software and hardware operation, most cities have reported stabile and normal operation but owing to limited technology capabilities, many functions remain to be developed and perfected.

As for after-sales technical support, nearly all the cities have expressed their satisfaction over the after-sales technical support following the implementation of the project.

In terms of the function and application of the project, most cities have already been able to utilize the project facilities such software and hardware equipment in applications of website development, office automation, pollution source management as well as division of urban function areas and so on. All beneficiary cities of the project think implement of the project has improved the administrative level and efficiency of urban environment. For instance, Anqing, Anhui Province has made initial application of the applied geography information system in the pollution source management and water function area division. Zibo, Shandong Province has used the installed software and hardware facilities in the applications of website construction, multimedia video production, geographic information system and so on, thus improving its management information application efficiency.

Regarding problems and suggestions, a view shared by nearly all the beneficiary cities of the project is that more efforts should be made on training as much work still remains to be done on improving the abilities of the local technicians so as to bring into better play of the information network system. Some cities have suggested that better exchange and communication should be maintained among the departments of environmental information

institutions at all levels.

4.4.2.4 Conclusions

The questionnaire conducted shows that a high degree of satisfaction exists among the beneficiary cities as to the project implementation. All the cities have expressed positive affirmation and evaluation to the organization, management and implementation of the project. Good effects of the project have already begun to appear such as:

i) Better technical support and service of environmental information is obtained to the environmental management and decision-making of the city environmental protection bureaus as a result of improved capabilities of the environmental information network systems. The project has provided advanced computers and network communications equipment which are capable of storing, analyzing, processing and issuing all kinds of environmental data and information such as environmental monitoring data, environmental statistical data and pollution source data and so on. As a result, effective data management is achieved. The exploration and application of environmental information resources has been raised, which can provide better support and service to the environmental management and decision-making of the cities.

ii) Environmental management and decision-making levels of the cities are promoted with improved informatization and networking of the environmental management of the environmental protection bureaus in these cities.

iii) Technology capability of the environmental information network systems at the municipality level are strengthened which has resulted in better fundamental support to the provincial and State-level network systems of environmental information.

iv) Important roles are played by the municipality-level environmental information network systems in the national environmental information network systems, as a result the overall technology capability of the national environmental information network systems are strengthened.

v) China's informatization of environmental information has been boosted which has provided a solid foundation for the further development of China’s environmental protection cause.

To conclude, the successful implementation of China's environmental information network project has not only increased the work efficiency and management level of the environmental protection bureaus in those cities but also promoted the operation capability of the environmental information systems at the municipality level which has in turn improved the operation of China's environmental information system as a whole. It will surely further deepen the information technology application in environmental protection and provide better technical support and information service to the technical support and decision-making of China.

4.5 Analysis of functions of Sino-Japan Friendship Center for Environmental Protection in Social Environmental Management System

As shown in the above analysis, in the framework of the entire social management system, Sino-Japan Friendship Center has exerted important impact on the capability building of the government's environmental management, the promotion of the public's environment participation level and the prevention and control of pollution of the enterprises. It can be concluded that Sino-Japan Friendship Center has contributed its part of the efforts in promoting the environmental protection of China. Compared with other environmental protection organizations also directly under the State Environmental Protection Administration, such as China Environmental Sciences Academy, China Environmental Protection Monitoring Center, China Environmental News Agency, Sino-Japan Friendship Center's role in the social environmental management system has some unique characteristics.

4.5.1 Characteristics of functionality of Sino-Japan Center in the social environment management system

i) Comprehensive and all-sided function

The institutional composition of the Sino-Japan Friendship Center indicates that its function is not positioned to just one aspect of environmental protection but to comprehensive functions including scientific research, publicity and education, information network, supervisory service, international exchange and so on. If the China Environmental Protection Monitoring Center and the China Environmental News Agency are like "vocational colleges", the Sino-Japan Friendship Center can be regarded as a "comprehensive university". It is precisely because of the

comprehensiveness of the Sino-Japan Friendship Center, its functions in the social environmental management system are also comprehensive and so is its influence, which extends to the government, enterprises and the public.

Such comprehensiveness and all-sidedness are manifested not only by its effective support to the decision-making, technical and information service, and capability building of the State Environmental Protection Administration but also by its promotion to the work of the local environmental protection bureaus, its positive influence on the awareness of the public and the enterprises for environmental protection. All this has laid down a solid foundation for the implementation of the environmental protection policies and programs. After all, the ultimate implementation of the environmental policies and programs call for the promotion efforts from the environmental protection departments across the country. The environmental objectives are to be achieved through the joint efforts of both the public and the enterprises.

ii) Different levels of functions played by the Sino-Japan Friendship Center in the social environmental management system

The functions played by the Sino-Japan Center in the social environmental management system are not made at the same but various levels in accordance with the work responsibilities of each department of the Center.

State-level authority

The Institute of Reference Materials of SEPA and the two ISO14000 Secretariats, although much different in their respective businesses, are both the authoritative institutions in their respective field; therefore, their functions are highly authoritative.

As an important constituent in the environmental law system, environmental standards exert a vital function in the entire environmental protection work. Many functions such as environmental planning, environmental management and utilization, environmental assessment, pollution charges, environmental development, daily environmental monitoring, environmental prevention cannot do without the application of environmental standards. Reference materials, one of the important components in the state environmental standardization, define the technical specifications of the environmental standard samples such as the environmental quality, discharge method standards. They provide the material standards for environmental management and supervision and law execution. The Institute of Reference Materials of SEPA is the only specialized research organization of environmental reference materials in the field of

environmental protection of China, responsible for the daily technical management and operation of the Subcommittee of Environmental Reference Materials under the National Technical Committee of Reference Materials. Its function in the research, development, reproduction of standard environmental reference materials are irreplaceable.

The Secretariat of China Accreditation Committee for Environmental Management System certification Bodies and the Secretariat of China Registration Committee for Environmental Auditors are authorized to set up by the State Council. They are responsible for the accreditation management of the certification bodies of environmental management system and for the State-level qualification registration of auditors and training courses for environmental management system. The two secretariats are based at the Sino-Japan Center. They are the State-level authorities in the regulation building of the accreditation system, auditors training registration and accreditation of the certification bodies of the environmental management system.

Dominant figure in relevant fields

Operation of the Sino-Japan Center relies on the application of various infrastructure systems where the development and application level of the Center may not be most advanced or in a leading position.

However, so long as the environmental field is concerned, the work of the Center obviously assumes the leading role, such as in the case of the Environmental Information Center and CEEC.

The former functions as the national environmental information network center, data communication center, information exchange center and technical service center and provides information technology and service support to the management work of the State Environmental Protection Administration. It also participates in the planning and establishment of the development programs of national environmental information, organize the drafting of environmental information standards and technical specifications. Cooperating with the State Environmental Protection Administration, it organizes the construction of the national environmental information network and computer application system and assumes the responsibility for the management and maintenance of the national environmental information network system, the satellite communication system and the web-site. It is also responsible for the collection, processing, transmission, storage and sharing of the environmental protection system information and data as well as for the establishment and management of the State-level environmental databases. In addition, it also takes charge of the development, maintenance and implementation of relevant application software. It takes charge of China's environmental

information personnel training and technical exchange. Thus the dominant role of the Environmental Information Center in the construction and development of the national environmental information is obvious.

Exercising on the functional status assigned by the State Environmental Protection Administration and utilizing its own advanced technological facilities, the Center for Environmental Education and Communications of SEPA has grown into a strong major force. It is now exerting its leading influence as the national network center, the base for audio-video production and training, and China's gateway for international cooperation in environmental publicity and education.

An importance constituent in promotion of social environmental management system

Through years of unremitting efforts of the Policy Search Center and the National Research Center for Environmental Analysis and Measurement, the support provided by the Sino-Japan Friendship Center in the fields of environmental policy research and environmental science research to the State Environmental Protection Administration is more and more obvious. However, as environmental protection is a multi-disciplinary and interdisciplinary science with its own uniqueness and complexity, great social forces are involved in environmental science and policy studies. They also contribute enormously to the promotion of China's environmental protection work. Therefore, the function played by the Sino-Japan Friendship Center in the field of research is only an important constituent among such social forces.

iii) Unbalanced functions in the social environmental management system

As an institute directly under the State Environmental Protection Administration, the focus and emphasis of the Sino-Japan Friendship Center's work is basically the same as or follows that of the State Environmental Protection Administration. This means that the Center surely inputs plenty of time, manpower and physical resources into the support and promotion of the government's work.

This in turn will result in the imbalance of its function on the three constituents of the social environmental management system, that is, the government, the public and the enterprises. Although there is no definite and operable quota system to carry out a quantitative comparison of the functions on the three parts, a rough estimation can be concluded by reviewing the development of the Center over the last few years: in the entire social environment management system, the Sino-Japan Center has done more in supporting and promoting the government's work than on that of the society and the enterprises. This is determined by the nature of the

Center. It is forecasted that such an imbalance will continue to exist in the future development of the Center. Of course, the support and promotion to the government's work can also indirectly influence the society and the enterprises, which will in turn promote the overall progress of the social environment management system.

4.5.2 Analysis of reasons leading to achievements in functionality of Sino-Japan Center

In a short period of five-six years after its establishment, the Sino-Japan Center has not only survived against the backdrop of market economy, but also maintained a healthy development making progress in every respect and contributing substantially to the development of the social environment management system. This is quite an achievement. The reasons behind this can be contributed to the following aspects:

i) A good basis

In terms of hardware, the Sino-Japan Center not only has utilized the 10 billion Japanese yen of aid given gratis from the Japanese Government and 66.3 million yuan in Chinese Government fund to construct comprehensive facilities including an all-function scientific research laboratory building, an international conference hall, a specialist hostel, dormitories, restaurants and a power supply building, but also used self-raised funds and international environment technical cooperation opportunities especially Sino-Japan cooperation to purchase a lot of top instruments, such as vapor phase chromatography/ mass spectra liquid instruments, vapor phase chromatography / fourier infrared liquid chromatograph-mass spectrometer-instrument, inductively coupled plasma atomic emission spectroscopy instrument and so on.

In regard to the software foundation, the Center did not start from nothing to attract qualified professionals. Instead, it grew out of the scientific research and institutional organizations formerly under the State Environmental Protection Administration while implementing unified management by setting up some functional departments. As these organizations already went through several even a dozen or more years of development and possessed considerable foundation and capabilities. This is very important for the Sino-Japan Center to survive and rapidly develop inside the system of the State Environmental Protection Administration and in the background of the competitive market economy.

ii) Adoption of a proper operation mechanism

The establishment of the Sino-Japan Center coincided with the start of the structural reorganization of science and technology institutions and faced the approaching reform of state-funded institutional units.

Despite its favorable software and hardware foundations, such fundamental reform did pose serious challenges to the newly established Sino-Japan Friendship Center. Under these circumstances, the Center adopted the internal incentive mechanism by implementing the target responsibility system. It distributed the annual development targets to each unit which was tested for its performance in accordance with the fulfillment of these targets at the end of the year, thus greatly stimulating the enthusiasm of each unit. Later, the Center has gradually increased the financial quota of each unit in the responsibility system while reduced the proportion of wages and subsidies funded by the Center to the business departments until at last they were entirely provided by the departments themselves. Such practices include the four departments, one research institute and two secretariats under the Center. In this way, on the one hand, the resolution and enthusiasm of the business segments were brought into full play, which relieved the finance burden off the Center. On the other hand, sufficient space and freedom are provided to these business segments in terms of development policy, which has contributed to their rapid development. Facts have proved that these measures are of high vitality, which has led to the survival and remarkable progress of the Sino-Japan Center and ensured its proper function in the social environmental management system.

iii) Progress promoted by supports from home and abroad

One important reason contributing to the progress of the Sino-Japan Center is the facts that all the departments of the Sino-Japan Center take on some importance functions assigned by the State Environmental Protection Administration.

These departments are not only the Open Laboratory, Dept. of Environment Information, Dept. of Environment Technology Exchange and Public Education, Dept. of Environmental Strategy and Policy Research. What's more important, at the same time they are also the National Research Center for Environmental Analysis and Measurement, Environmental Information Centerof SEPA, Center for Environmental Education and Communications of SEPA (CEEC), and the Institute of Reference Materials of SEPA. The assignment of these functions has secured wide support from the SEPA, the society and the enterprises to the Sino-Japan Center whose progress in turn has promoted the environmental management level of the former three. The majority of

the research projects, publicity and training programs and management service function the Sino-Japan Center takes on come from the domestic, which constitutes the driving power for the development of the Center.

Along with the continuous deepening of opening-up, good cooperative relationship has been established between the Sino-Japan Center and many countries, international organizations and overseas research institutions. It should be pointed out that international environmental cooperation and exchanges including Sino-Japan cooperation indeed have contributed to the progress of the Center in that they have not only supported its construction and growth but also expanded its international influence. However, international exchanges and cooperation are only the catalyzer to the development of the Sino-Japan Center whose major driving force lies in its functionality as an institute directly under the State Environmental Protection Administration.

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Annex 1. The questionnaire of Project of Training Course of the Directors of Local EPBs

The Training Course of the Directors of Local EPBs

The questionnaire to the trainees

To promote the teaching quality of the training course, please write the assessing chart. Thank you very much. And you needn't sign your name.

Note: each question has the scores 1 to 5. 1 is the lowest (express as the worst or the most dissatisfactory), 5 is the highest (express as very well or most satisfactory), 3 is in the middle and X express as no related. Please write "✓" on the score that you chose.

The question you must answer.

1. Degree of correlation between your present job and the training subjects.	1	2	3	4	5	X
2. Whether the subjects offered are new to you?	1	2	3	4	5	X
3. Usefulness of the knowledge learned from the course.	1	2	3	4	5	X
4. Whether the training has been pertinent to your needs?	1	2	3	4	5	X
5. Whether the training has been up to your expectancy of the training?	1	2	3	4	5	X
6. What is your opinion of the overall utility of the whole curriculum?	1	2	3	4	5	X

Other question.

7. Does the course anatomose the knowledge you want to study?	1	2	3	4	5	X
8. How is the teaching quality of the course in general?	1	2	3	4	5	X
9. How are the teaching forms about?	1	2	3	4	5	X
10. How is the teachers' level about?	1	2	3	4	5	X
11. How is the effect of the teaching about?	1	2	3	4	5	X

12. Please write your suggestion to the training course:

_____

_____

_____

_____

Thank you for the cooperation.

Annex 2. The questionnaire of the Project of the construction of Environmental Information Network System in 100 Cities of China

The Project of Building the Environmental Information System in 100 Cities of China

The questionnaire to cities

The name of Organization	
The character of the organization	independent cling to local EPBs not setting up
Responsible person	Name: _____ telephone No.: _____ Fax No.:_____ Email address:_____
The cost of operation	
Assessment on the operation of the hardware and software	
The situation of technical service	
The application and effect of the environmental information system	
Questions and suggestions	

Research Paper No.2 [China: 2]

Social Environmental Management System in China

January 27, 2003

Jinnan WANG & Chazhong GE

Chinese Research Academy of Environmental Sciences

Executive Summary

Over the last three decades, PRC has made significant progress in establishing a comprehensive public institutional framework for environmental management. Under this framework, environmental management responsibilities are shared by a wide array of government institutions at the national, provincial, and local levels levels of government.

Coordination is crucial for a successful public environmental management in which so many stakeholders are involved. Between SEPA and other departments exists horizontal coordination in which a designated or higher level authority serves as a coordinator and vertical coodination facilitates the implementation of national laws, regulations and policies at regional and local levels.

Driving forces promoting environmental management in PRC are both domestic and international. Domestically, political commitment, especially top official at various level, economic development and environmental protection as new growth pole of the economy, the improvement of people's livelihood and demand for better environment, the public awareness raising, and environmental pollution are key factors driving for more stringent environmental management. International drivers are the need for recognition at the early stage by international community after it was apartheid for more than one decade because of domestic turmoil, obtaining international assistance and maintaining good image of open and green, and the commitiment to its matching rights and responsibilities stated in many international agreements, conventions and treaties PRC has signed.

The public involvement in law and policy formulation has been increased as more ways for such involvement have been provided and people are getting more and more aware of good enviroment. Important conferences are used to forums to formulate national environmental policieses and campangn for their implementation.

A wide range of policy instruments have been tried out in enviornmental management in PRC though their effectiveness and efficiency vary. It is time to do more comprehensive review of these instruments and sort out a clear, simple, efficient and effectivepolicy framework for environmental management. Command and control instruments are fundalmental but some of them are ad hoc. Economic instruments are getting more attention for environmental protection while increasing trend of using voulentary approaches and information tools is witnessed in PRC.

The increase of investment for environmental protection has been seen in PRC, especially during the 9th five year period. Though Polluter Pay Principle has been advocated in PRC, public

funding is still a large share for environmental protection, especially for comprehensive pollution control and public environmental infrastrure. Public funding can be either general budget, emark fund from pollution levy and user charges such wastewater treatment fee, national bond and governmental loans from commercial banks and international financial institutions. The financing channels for pollution control of enterprises are their own profit, commercial bank loan and other financial institutions, grant or soft loan from pollution levy based fund, share market and enterprise bond market. International assistance has a role to play in capacity building, the implementatation of international conventions and treaties and public environmental infrastructure development.

1. INTRODUCTION

This paper is prepared at the request from Dr. Shunji MATSUOKA, Graduate School for International Development and Cooperation, Hiroshima University. It is aimed to analyze social environmental management system (SEMS) in PRC with focus on the roles of different actors such as government, enterprises, citizens, and international institutions; and review and evaluate the development of environmental policy/management in PRC and driving force for environmental policy/management in the future.

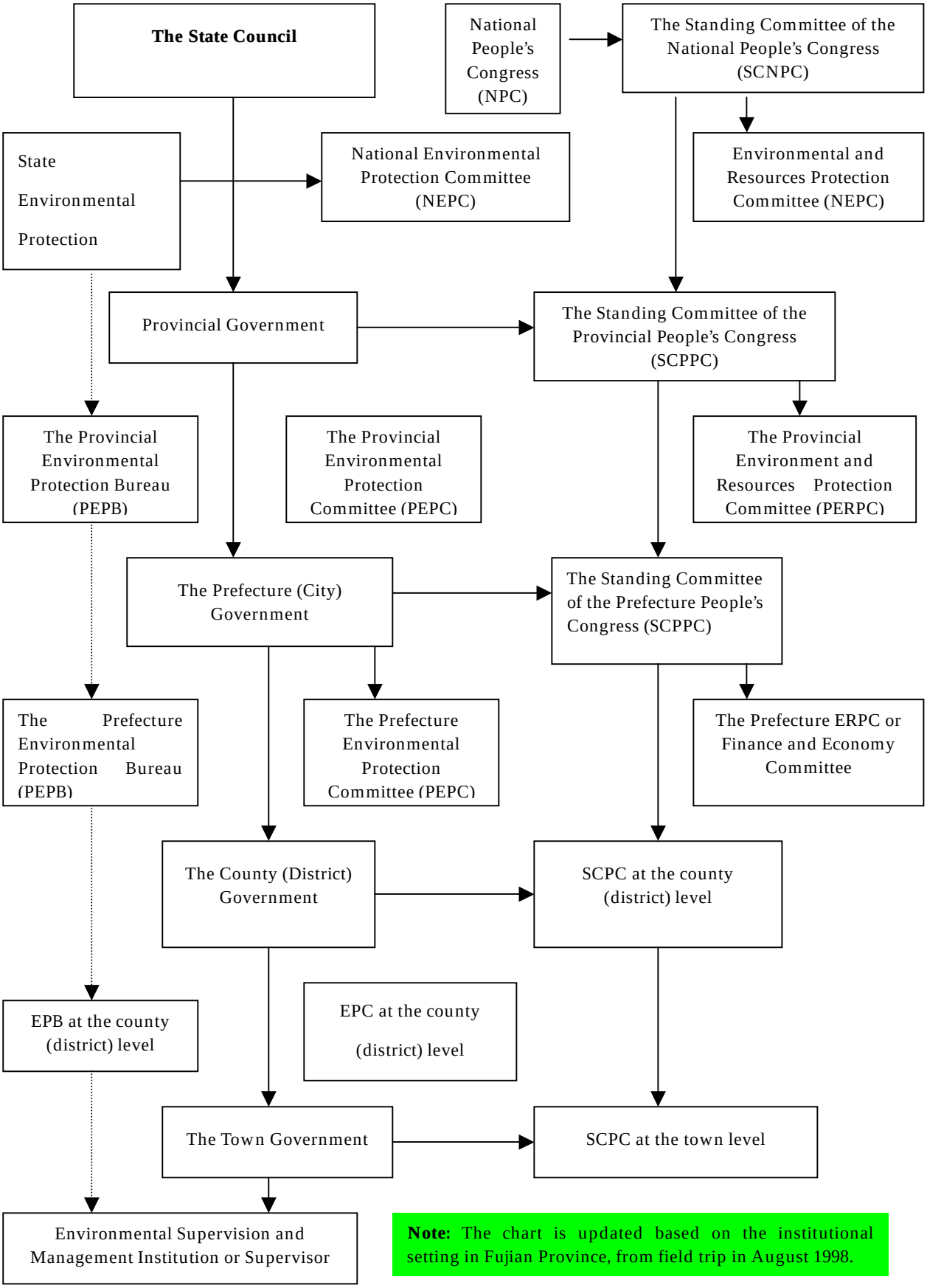
The paper follows the framework developed by Dr. Matsuoka for the project. In order to facilitate the introduction, the paper is divided into three aspects, namely, institutional setting for environmental protection, instruments used for environmental management and investment acquired for environmental management.

The paper consists of five sections. In addition to this introduction section, Section 2 analyzes the institutional setting in PRC, Section 3 reviews the instruments applied to PRC, Section 4 describes the environmental investment and Section 5 summarizes the discussion in the previous sections.

2. ENVIRONMENTAL GOVERNANCE: HOW ENVIRONMENTAL INSTITUTIONS FUNCTION?

Over the last three decades, PRC has made significant progress in establishing a comprehensive public institutional framework for environmental management. Under this framework, environmental management responsibilities are shared by a wide array of government institutions at the national (i.e., the State Council, the State Environmental Protection Administration (SEPA) and a number of sector ministries, agencies, and special organizations), provincial (i.e., Environmental Protection Bureaus (EPBs) in each of the provinces), and local levels (i.e., Environmental Protection Bureaus in the cities and other special organizations in the counties and towns) levels of government. Figure 1 contains a schematic representation of these institutional arrangements for environmental management(HIID, 1999). In addition, a number of supporting institutions, such as scientific institutes, universities, and non-governmental organizations (NGOs), play a role in environmental management. A brief description of these institutions and their roles in environmental management follows.

Figure 1 Institutional Framework for Environmental Management in PRC



2.1 Governmental Administration

PRC environmental management has generally four levels: national, provincial, prefecture/city, county. There are a few provinces (such as Jiansu province) that have town level governmental environmental management entities. Each level consists of legislative body and administrative entity, that is, people's congress for legislation and environmental protection institutions and relevant governmental agencies for environmental administration. The SEPA is the State Council's department responsible for national-level environmental management. Environmental protection bureaus (EPBs) are responsible for environmental management at the local level.

At the end of 2000, there were 132,739 people working in 11,139 public environmental institutions nationwide(Table 1a and 1b). There were 3051 environmental administration institutions with staff of 38,7000.

Table 1a Number of Public Environmental Institutions in 2000

Type of Institutions	*Sub total*	*National level*	*Provincial level*	*Prefecture level*	*County level*	*Town level*
Total	11139	24	318	1719	7195	1883
Environmental Protection Administration	3051	1	33	384	2633	
Supervision Institution	2251	1	41	363	1846	
Monitoring Station	2552		31	353	2168	
Sciences and Technologies Research Institution	244	4	33	207		
Propaganda and Education Center	98	1	30	67		
Information Center	94	1	24	69		
Others	966	16	126	276	548	

Source: China Environmental Book 2001

Table 1b Staff Working in Public Environmental Institutions in 2000

Type of Institutions	*Sub total*	*National level*	*Provincial level*	*Prefecture level*	*County level*	*Town level*
Total	132739	1647	10876	35521	81574	3121
Environmental Protection Administration	38700	215	1851	8039	28595	
Supervision Institution	40771	97	2881	13980	23813	
Monitoring Station	31228		487	5972	24769	

Sciences and Technologies Research Institution	7177	783	3142	3252		
Propaganda and Education Center	901	19	393	489		
Information Center	496	18	177	301		
Others	10345	515	1945	3488	4397	

Source: China Environmental Book 2001

2.1.1 National Governmental Administration

The constitution identifies the principal organizations responsible for enacting laws and making policy. The National People's Congress (NPC) is the highest-level law-making institution in the PRC. The NPC is entitled to enact and amend "fundamental" national statutes. The NPC's Standing Committee may enact and amend all laws with the exception of "fundamental laws" reserved for the NPC itself. Because the PRC is so large and legislation would cover so many different circumstances, the NPC writes laws as guidance and general principles. Detailed provisions come from the State Council as regulations.

To improve the efficiency with which laws are drafted and amended, the NPC created several special committees in 1993 with responsibility for specific sectors of law. The Environmental Protection and Natural Resources Conservation (EPNRC) Committee has played an important role in drafting or amending several environmental statutes.

The 9th National People's Politic Consultative Congress (NPPCC) also has Committee of Population, Resources and Environment. NPPCC is the organization for partriotism and unity of all Chinese and serves as a venue for multi-party cooperation and politic consultation with the Chinese Communist Party. NPPCC focuses on suggestions on main policies and supervising the enforcement of national laws and regulations. The committee of Population, Resources and Environment discusses main issues and provides proposals related to population, resources and environment and supervises the implementation of laws and regulations related to population, resources and environment.

At the national level, the highest policy-making authority rests with the State Council, which brings together representatives of the central government's 29 ministries and commissions that exercise macro control over PRC's economic sectors, social programs and political and administrative affairs according to 1998 central governmental reform plan. The State Council also has 15 affiliating agencies, one of which is the State Environmental Protection Administration, and six administrative institutions that assist it in execution of state policies. As PRC's highest executive policy-making authority, the State Council implements and enforces

the laws and policies passed by PRC's highest legislative body, the National People's Congress. To this end, the State Council sets overall national policy, approves regulations, decrees, and policies implementing national laws, and oversees the execution of these laws by state, provincial, and local administrations.

SEPA is the executive arm responsible for supervising and managing environmental protection. It has the responsibility for setting national policy on environment, implementing the policies and regulations approved by the State Council, and supervising and coordinating all environmental management activities within the government. The SEPA's functions, established by the Law on Environmental Protection, include preparing policies, legislation, and regulations on environmental protection; organizing implementation of environmental laws and regulations; monitoring effects on the ecological environment; addressing trans-boundary environmental problems; formulating environmental quality criteria and pollutant discharge standards; organizing scientific research and development; conducting environmental monitoring; etc. As noted above, the recent institutional reforms elevated the SEPA to ministerial status and conferred on it additional environmental management responsibilities. SEPA's organization and staffing reflect these responsibilities.

To carry out its responsibilities under the various Laws on Environmental Protection, the SEPA has organized into ten functional departments designated in the 1998 central government institutional reform in which SEPA became a ministeral level administration (See Table 2).

Table 2 Organization of the State Environmental Protection Administration (SEPA)

Administrative Department	● Office of Administrator ● Secretariat ● Comprehensive Division ● Secretary and Archive Division ● Public Appealing Office ● Propaganda and Education Office ● Accounting Division ● Information and Technology Office
Department of Planning and Finance	● Comprehensive Division ● Planning and Statistics Division ● Investment and Accounting Division
Department of Policy, Law and Regulation	● Policy Research Division ● Law and Regulation Division ● Administrative Fine and Reconsidering Division
Department of Institutions and Personnel	● Institutional Reform Division ● Cadre Management Division ● Human Resources Division ● Retired Cadre Management Division

Department of Pollution Control	● Comprehensive Division ● Water pollution Control Division ● Air and Noise Pollution Control Division ● Solid Waste and Hazardous Chemicals Management Division
Department of Science, Technology and Standards	● Technological Conditions and Key Task Division ● Standards Division ● Technological Policy and Industrial Guidance Division
Department of Natural Protection	● Natural Environmental Management Division ● Natural Reserve and Species Management Division ● Marine Environmental Management
Department of Nuclear Security and Radioactive Environmental Management	● Comprehensive Division ● Nuclear Power Division ● Nuclear Reactor Division ● Nuclear Material Division ● Radioactive Environment Management Division ● Radioactive Waste Management and Risk Management Division
Department of Supervision and Management	● Development Construction Management and Supervision Division ● Environmental Impact Review Division ● Environmental Supervision Division
Department of International Cooperation	● Comprehensive Division ● International Organization Division ● Bilateral Cooperation Division

The bulk of SEPA's responsibilities are implemented by the Department of Pollution Control, which monitors and controls municipal and industrial pollution, the Department of Natural Protection, which manages biodiversity conservation and state natural conservation areas, and the Department of Supervision and Management, which oversees implementation and enforcement of environmental requirements, including EIA requirements, the pollution levy system, as well as other policies, laws and regulations.

The 1998 central government's institutional reform had further consolidated SEPA as a regulator to enforce environmental laws and decoupled and delegated some of its management responsibilities that it used to have to its affiliations. After the 1998 reform, SEPA has a staff of approximately 200, most of whom are trained environmental specialists. They are managed by an administrator, who has four deputy administrators and 31 directors-general managing the various departments, divisions, and units of SEPA.

Though work efficiency has been raised after the 1998 reform, over-load of its staff is of normal in the administration because of the cut-off of its staff and expansion of its responsibilities. The capacity needs to be improved in order to accommodate its strengthening responsibilities and improve its governance performance.

2.1.2 Local Administration

Local Environmental Protection Bureaus (EPB) are generally responsible for day to day implementation of regulations, including permitting, monitoring, enforcement and collection of the pollution levy. NGOs also play an active and expanding role.

Pursuant to Article 16 of the Law on Environmental Protection ("The local people's governments at all levels shall be responsible for the environmental quality of areas under their jurisdiction and take measures to improve the environmental quality."), PRC has created an extensive network of environmental institutions at the provincial, municipal, county, and town levels. In what may be the largest institutional framework for environmental management on earth, PRC has literally thousands of local organizations and tens of thousands of personnel carrying out environmental protection functions. These organizations function administratively under the various provincial, municipal, county, and town governments, receive their budgets and staffs from these local government authorities, and exercise their environmental management authority within these various jurisdictions. They operate technically, however, under the leadership and supervision of SEPA, whose policies and regulations they are charged with implementing and enforcing.

At the provincial level, each provincial government has established an Environmental Protection Bureau (EPB) to assume the responsibilities for environmental management within the province. Organized along the lines of SEPA, each EPB is the primary executing arm of SEPA and as such has responsibility for implementation and enforcement of national policies and regulations, as well as those adopted by the provincial government itself. As might be expected in a country as large and diverse as PRC, each EPB varies in size, institutional capacity, and effectiveness (See Box 1). The same devolution of authority generally follows down to the municipal, county, and town levels of government, with each having authority to execute environmental policies and programs (including, for example, the pollution levy system) within its jurisdiction.

Box 1 Environmental Protection Bureaus in Fujian and Shaanxi

Although Environmental Protection Bureaus (EPBs) vary in size and capacity across PRC's provinces and cities, they share the same basic organization and functions, mirroring that of the SEPA. The EPBs of Fujian and Shaanxi Provinces and Beijing Municipality are illustrative.

The Fujian EPB is organized into a number of technical departments and affiliated institutions. The technical departments include: the Comprehensive Department,

responsible for planning, economy and trade, and finance; the Industrial Department, responsible for local petroleum, textile, paper, electricity, coal, and construction material industries; the Resources Department, responsible for agriculture, forestry, mineral resources, water conservancy, and water and soil conservation; the Construction Department, responsible for urban construction, transportation, environmental health; etc. Among the affiliated institutions are the Propaganda and Education Center, the Environmental Information Center, the Supervision Institute for Pollution Levy, the Environmental Monitoring Central Station, etc. The Provincial EPB oversees 9 prefecture level EPBs, 83 County level EPBs and a number of Town Environmental Supervision Institutes. At the end of 2000, the provincial EPB had a total staff of 47, but the total number of persons engaging in environment-related work in the province was 3,089, including 760 working in prefecture- and county-level EPBs.

The EPBs in Shaanxi Province and Beijing Municipality have similar institutional settings. The EPB oversaw 10 prefecture/city EPBs and 105county EPBs. In the case of Shaanxi Province, there were 55 staff in the EPB and a total of 4154 staff working on environment-related work, including 159 working in prefecture-level EPBs and 1075 working in county level EPBs.

Source: based on the authors' trip to these province (city) in 1998 and data in *China Environmental Yearbook 2001*:587-93.

2.2 Supporting Institutions

2.2.1Academic, research and other governmental institutions

A number of scientific institutes, universities, and other supporting institutions play a role in environmental management in PRC. These institutes can be classified into three catergories: those affiliated to SEPA and its local EPBs, those in universities and those under research academies.

According to the Table 1a, there are 2552 monitoring stations, 244 science and technology research institions, 98 propagada and ecducation centers and 94 information centers nationwide. At the national level, SEPA has several affiliations to meet varous needs. These incluse the Chinese Research Academy of Environmental Sciences (CRAES), the Chinese Academy for Environmental Planning (CAEP), the Sino-Japanese Environmental Center, the Policy Research Center on Environment and Economy (PRCEE) of SEPA, China Environmental Monitoring General Station, China Environmental Information Center, China Environmental Propagada and Education Center, China Environmental News, China Environmental Sciences Press and so on. These institutes are set up to meet varous responsiblilities desigated by SEPA.

Established in 1979, CRAES is a multi-disciplinary national institution doing wide-ranging research in environmental sciences and technologies, environmental economics, policies, planning, and design, environmental labeling, and environmental impact assessment (EIA). CRAES serves as a think-tank for the SEPA and has eleven research institutes and centers. In addition, CRAES is entrusted by SEPA with some regulatory functions, such as EIA review and hazardous chemical registration.

The Academy for Environmental Planning of SEPA, founded in 2002 with the staff from CRAES, is to enhance environmental planning in China. It is responsible for drafting national five-year environmental planning, assess regional and local environmental plans and other related tasks.

The Policy Research Center on Environment and Economy(PRCEE) of the SEPA is another institution that provides polilcy suggestions to the SEPA. It is also responsible for drafting national policies for the SEPA and for applied economic and policy studies.

China Environmental Monitoring General Station is responbile for nationwide environmental monitoring through its network and disclosure environmental quality data to public. China Environmental Propagada and Education Center is responsible for environmental propagada and education.

A number of universities have departments of environment-related studies, including the Department of Environmental Engineering of Tsinghua University and Environment School of Peking University. Apart from carrying out their educational duties, these universities also conduct significant research on environmental issues and contribute to the development of PRC.

Chinese Academy of Sciences and Chinese Acdemy of Social Sciences have institutes related to environmental and sustainable studies. Academies under the supervision of other governmental departments also have environmental related institutes. They are responsible for environmental studies related to their sectors.

2.2.2 Non-governmental Organizations (NGOs)

There are a growing number of non-governmental and community organizations that have a role in environmental management in PRC. According to incomplete information, there are quite a few NGOs in PRC active on environmental issues, including Friends of Nature, Earth Village, Beijing Environmental Development Institute, China Association of Human Ecology, and Volunteers for Greening Home Gardens. These NGOs work on a wide range of environmental issues, from nature conservation to pollution control and environmental protection. There are

reports that the Administrator of the SEPA favors using environmental NGOs as a mechanism to control environmental pollution and ecological degradation. Without a tradition of environmental activism in PRC, these nascent environmental NGOs face a number of opportunities as well as constraints in pursuing their role in environmental management in PRC.

The political culture in China has made the Government Organized Non-Governmental Organization (GONGO) a unique force in the environmental protection in China. Chinese Society for Environmental Science, Chinese Environmental Protection Fundation and Chinese Society for Sustainable Development are some of environmental GONGOs. Taking the advantage of its affiliation with governmental department and flexible connection with international organizations, GONGOs are playing an increasing role in influencing national environmental policy formulation and facilitating the dialogue between the Chinesee government and internaitonal NGOs. Though GONGOs are the creations of the state, these environmental GONGOs are pursuing organizational goals beyond the state's original expectation because of the growing self-capcity and support from the outside (Wu 2002).

With the economic development, increase of people's livelihood and empowerment of citizens, communities and public involvement have been increasing in environmental management. Communities and the public are concerning more than ever about their living environment and acting as a third party to supervise the compliance of polluters and the enforcement of laws, regulations and policies.

2.2.3 Other Actors

Polluting Enterprises

Polluting enterprises, or polluters, are the targets for regulating by environmental laws, regulations and policies because their activities bring about negative externalities while pursuing their economic profits. Polluting enterprises are reqiured to comply with environmental laws, regulations and standards as *Polluter Pay Principle* is a core bone for environmental protection.

In order to cope with environmental requirement, generally an office or staffs responsible for environmental matters are designated in a medium or large enterprise in China. They are responsible for pollution control of the enterprise. However, in the past polluting enterprises did not pay enough attention ot the compliance of environmental laws, regulation and standards due to the government's non-stringent enforcement supervision. This brought to discharge or emission with concentration over national standard and total mass discharge or emission higher

than the required amount breakdown under national total local control policy in the 9th five year plan.

The increasingly more stringent implementation of environmental laws in recent years, typically simboled by deadline of compliance of discharge or emission standards and the closue of polluting small enterpises in a due time schedule, has brought to polluters to take more proactive attitude toward environmental protection by pursuing greening development to realize *win-win* strategy. Cleaner production and ISO14000 are some of approaches they have adopted or will adopt.

Environmental Services

Environmental services, known as environmental industry, are those pursuing to obtain profit through control pollution. Therefore, its development represents, in one hand, the contribution to the betterment of environment, and, on other hand, more opportunities because of increasing environmental pressure.

Though environmental industry in PRC started from the late 1970's and has a history of 20 years up to now, its development of environmental industry has been growing slowly due to restraint arising from the planned economy. In the initial period, the environmental industry lacked policy guidance and support since the government did not plan its development. Consequently, most of the enterprises could not see the potential of development. Instead some township enterprises saw the market demands and took the initiative to develop the environmental industry, so they became pioneers of PRC's environmental industry. At the end of the 1980's, as the environmental legal system improved and the law enforcement intensified, the market demands for environmental products increased substantially and the environmental industry grew rapidly.

According to a statistics made by SEPA, by the end of 1997, there were 9090 institutions and enterprises engaged in environmental protection for different functions. The number of employees working in this sector amounted to 1.699 million. The total amount of fixed assets was 72.01 billion yuan, with 52.17 billion yuan generated yearly and the profit of 581 million yuan created annually. Among them, there are 7617 enterprises, accounting for 83.8% of the total and their fixed assets amounted to 62.09 billion yuan, accounting for 86.2% of the total. So the environmental industry has become a sector with a considerable scale.

International organizations and donors

Since the reform and open-up policy was adopted in the late 70s, PRC has been actively involved in international arena. Environment is one of the areas that PRC is actively involved. The PRC has been active in participating in the drafting, negotiation, ratification and implementation of international environmental agreements. By the end of 2001, the PRC had signed 50 international environmental agreements and another 25 bilateral agreements with other nations (http://www.zhb.gov.cn/index3.htm). China is active in regional environmental issues through regional framework such as Asian and Pacific Economic Cooperation and The Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region. Furthermore, PRC is a developing country, international aid is needed for its economic development and environmental protection. Therefore, international organizations and donors have role to play in influencing policy direction.

2.3 Environmental Decision Making

2.3.1 Driving Forces

Driving forces promoting environmental management in PRC are both domestic and international. Domestically, political commitment, especially top official at various level, economic development and environmental protection as new growth pole of the economy, the improvement of people's livelihood and demand for better environment, the public awareness raising, and environmental pollution are key factors driving for more stringent environmental management. Recent years have seen rapid economic growth because of reform and open-up policy, leading the improvement of people's living standard and mounting pressure on environment.

Economic growth have improved its ability to control environmental pollution while the improvement of people's living standard has increased the demand for better environment and raised the environmental awareness of citizens. The growth has also brought negative impacts to environment. Environmental pollution and ecological degradation are the bad consequences of economic development which should be addressed appropriately in order to sustain economic development.

Internationally, PRC is eager to get recognized by international community after it was apartheid for more than one decade because of domestic turmoil and would like to hold its matching rights and responsibilities. PRC has joined in many international organizations, treaties and agreement concerning the protection of environment. PRC is one of the countries that enjoys technical assistance for enhancing environment its environmental management from international donors. PRC was also among nations that signed the Rio Convention at the first stage. The commitment to its responsibilities to those international organizations, treaties and agreements and maintenance of good image for political, social and business reasons internationally have been international impetus to PRC's environmental management.

2.3.2 Process

Law

At the national level, draft legislation is proposed by relevant government department, for example, SEPA in case of the recently passed Environmental Impact Assessment Law(EIAL). The draft will then be sent to Legislation Bureau of the State Council and delivered to other relevant departments for review by the Bureau. The Bureau then sends back the feedback to the drafting department, SEPA in case of Environmental Impact Assessment Law. After revising, the revised draft will then send to the Bureau again for review and approval. These processes happen several times depending the consensus reached among departments concerned. Once the revised draft is approved by the Bureau in the name of the State Council, it is sent to relevant committee of National People's Congress for review, Natural Resources and Environment Committee in case of EIAL. It is then sent to the session of the Standing Committee of NPC for first reading. There is hardly occasion that the first reading of a draft law is passed, indicating that the draft law will be sent back to the Bureau and then to the proposing department for revising. The revised draft law will be brought to the session again for approval. Normally, law proposal will be read two to three times before it is passed.

Provincial or municipal legislation normally follows the similar procedure as PRC is centralized country. The difference is that local legislative bodies only pass regulations, rules and measures while central legislative body, NPC, passes laws.

Policy

There are different classifications of policies. At the national level, the highest one is national policies and strategies issued by the State Council, the second is those issued by different governmental departments and third is those inter-department ones. Similar to the national setting, policies in provinces or municipalities follow the same styles.

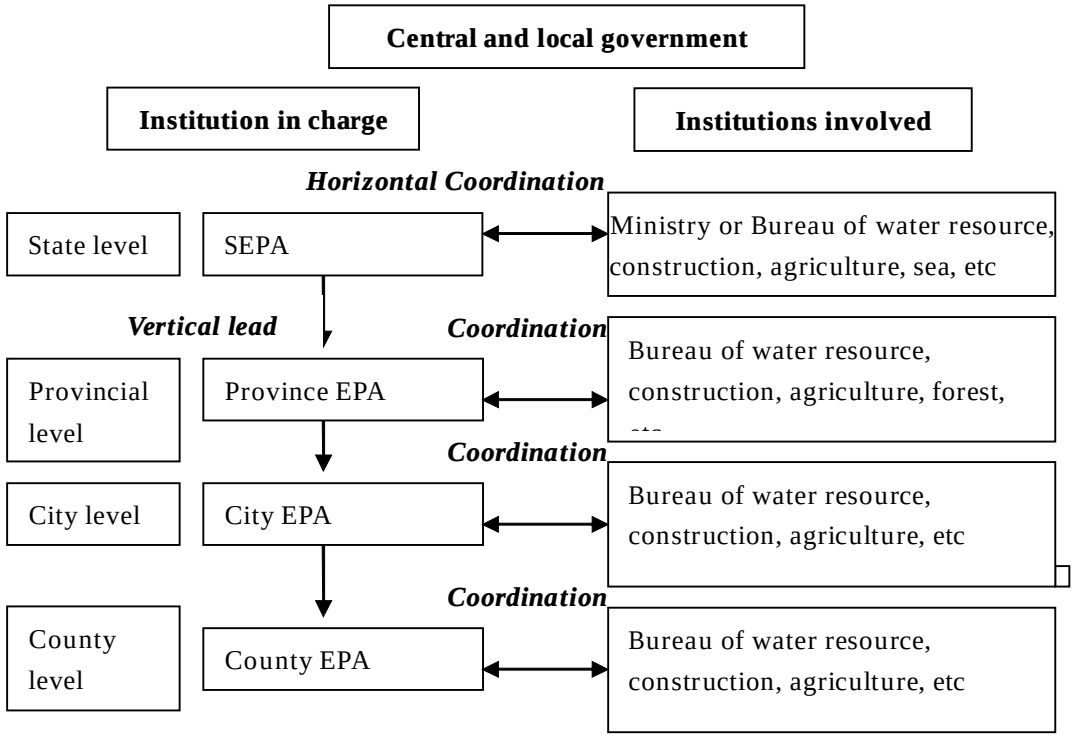
The importance of a policy depends on the level of authority by which the policy is issued. If it is issued by the State Council, it is thought to be the highest level one and normally applied to nationwide.

Environmental policy and strategy in PRC is of a higher order than environmental plans; normally takes the form of 'guiding principles'; is meant to provide overall direction, establish relative importance and achieve coordination; is issued by the State Council or the Central Committee of the CCP and involves a large number of government agencies. Long-term and annual environmental protection plans are meant to set objectives and specify measures to achieve them; are developed at the four levels of environmental administration under the supervision of the State Development and Planning Commission (SDPC). The current environmental monitoring and reporting system is designed for the dual purpose of monitoring on a continuous basis all factors affecting the environment including the discharges of pollutants by various units and the preparation of prescribed environmental reports. Within the framework of the Environmental Protection Law and of the 'three simultaneity' principle environmental impact assessments are required for construction projects.

2.4 Coordination

The coordination for environmental management can be in two categories: horizontal and vertical just as show in Figure 2.

Figure 2 Horizontal and vertical coordination in case of water pollution control



2.4.1 Horizontal and Vertical Coordination

Horizontal coordination means the coordination between environmental agencies and other governmental departments at the same level. In that case, SEPA, powerful commissions such as State Development Planning Commission or the State Council will sever as mediators at the national level. SEPA and provincial governments will serve as mediators between provinces. Similar analogy applies to cities and counties. Because of political system setup and no clarification of rights and responsibilities assigned by constitution, laws and special administrative regulation, there are cases that different departments that share similar rights and responsibilities for which coordination is needed. For example, there are some similar responsibilities for SEPA and Ministry of Water Resources(MWR) designated by relevant laws, namely, Water Pollution Prevention and Control Law and Water Law respectively and some conflicts in operation have been broken(Box 2).

Box 2 Overlapping of basic functions for SEPA and MWR in case of water pollution control

The experiences in water pollution control (WPC) in PRC has called for an integrated approach toward pollution control, under which the key institutions responsible for both functions

participate effectively and jointly in the major activities in order to achieve this objective. Such an approach, however, is challenging as basic water administrative functions are separated between different agencies.

On one hand, article 12 of the Water Law[1]outlines that the department of water administration under the State Council (i.e. the Ministry of Water Resources (MWR) and its Water Resource Bureaus (WRB) at provincial level and below) *is in charge of the unified administration and supervision of water resources throughout China.* On the other hand, article 4 of the Water Pollution Prevention and Control (WPPC) Law[2], stipulates that the environmental protection departments of the People's governments at various levels (i.e. the State Environmental Protection Administration (SEPA) and Environmental Protection Bureaus (EPBs) at province level and below) *shall be the organs exercising unified supervision and management of the prevention and control of water pollution*. This legal framework implies that MWR and its WRBs are in charge of overall WRM while SEPA and EPBs under the leadership of local governments are in charge of WPC.

This distinction reflected in the two laws have largely established a practice of limited cooperation (and in many cases, none) between the two agencies and in some cases extensive duplication such as in water quality monitoring, which is largely counterproductive, especially in view of the challenges PRC is facing with regard to overall water shortage and sever water quality deterioration. The lack of effective cooperation between the two agencies in both planning, implementation and control is widely regarded as one of the most important barriers to establishing and implementing integrated water environment management (IWEM) in PRC.

Vertical coordination means the coordination taking place within the hierarchy of environmental protection agencies. In that case, upper level EPBs always assume leadership role in terms of technical matters. The fact that local EPBs are an integral part of local governments at the corresponding levels hinders the stringent enforcement of the policy directives and program from upper level EPBs by local EPBs, especially when such policies and program somewhat confront with local economic development. In such case, environment is always the second. This

[1] Water Law of the People's Republic of China, Adopted at the 29th Session of the Standing Committee of the Ninth National People's Congress on August 29, 2002.

[2] Law of the People's Republic of China on Prevention and Control of Water Pollution, adopted at the Fifth Meeting of the Standing committee of the Sixth National People's Congress on May 11, 1984, and revised in accordance with the Decision of the Standing Committee of the Eight National People's Congress and adopted at its 19th Meeting on May 15, 1996.

is why there are calls from environmental professionals to decouple local EPBs from local governments and make them more independent. Nevertheless, the independent EPB setting does not seemly work well with the environmental protection law which delegates the responsibilities to local governments. So the trend is to have SEPA more say when provincial governments appoint their heads of EPBs or provincial EPBs more say when prefecture governments appoints their heads of EPB.

2.4.2 Internal Decision Making Mechanism within Environmental Administration

While decision-making in the PRC involves various agencies at different levels it basically follows a similar pattern based on the 'leadership' system determining the key actors, processes and procedures. Annual work plans, different from environmental protection plans, are developed by SEPA and EPBs and, in the case of SEPA, are subjected to an approval by a National Conference. Performance monitoring and evaluations for SEPA, EPBs and all environmental protection related agencies are done in conformity with the 'administrator responsibility system'. The General office is currently tasked with corporate coordinating functions, administrative functions and program functions.

According to a ADB TA study, named the Environmental Capacity Building for State Environmental Protection Administration, the following observations and conclusions can been drawn:

- Decision-making within SEPA is based on the 'administrator responsibility' system and modalities are specified in the *Working Rules in SEPA* issued in 1995.
- Within SEPA, collective decision-making is effected through specific 'meetings' including *Leading Party Group* meetings (organizational and personnel matters), *Administrative* meetings (policy and legal instruments, work planning and coordination) *Work* meetings (operational aspects) and *Brief* meetings (information exchange and urgent matters)
- Decision-making outside SEPA is governed by the fact that in PRC Party Committees and governments at various levels play a leadership role, people's congresses of all levels exercise supervision, government agencies take individual responsibility and SEPA and EPBs exercise unified supervision and management
- As a rule a policy proposed by a ministry is issued by the State Council and because external coordination is necessary to make the policy binding on other government

agencies it is normally achieved through a 'coordination from above' process involving such mechanisms as *National Conferences*, the *State Councilor* and work meetings of the *State Council*

- As a result of the 'coordination from above' approach used in decision-making, horizontal coordination and communication is not well established in the bureaucracy
- Contrary to environmental protection plans, there is no regulation or written instructions governing the preparation of annual work plans
- SEPA work plans are essentially developed through a 'bottom-up' aggregation process, are primarily outward oriented, lack the assignment of responsibilities and definition of tasks and are not complemented by the identification of performance indicators to monitor results
- Mechanisms for performance monitoring and evaluation include: multi tiered *performance contracts* and *quantitative evaluations* for qualification, recognition and performance appraisal purposes but in practice, performance appraisal varies greatly form region to region and between functional areas
- Five of the six responsibilities assigned to the General Office are clearly focused and have distinct divisions tasked for their implementation; the Ministerial support and 'corporate coordinating' role is the most crucial function from a Minister's perspective and to a large extent determines the overall operational performance of the ministry
- In its support to the Minister, the General Office is expected to provide strategic guidance while at the same time respond to a myriad of duties and urgent tasks—a next to impossible task
- The absence of a policy and strategy development coordination function within SEPA imposes further demands and pressures on the General Office(ESSA, 2001)

3. ENVIRONMENTAL INSTRUMENTS: HOW DO THEY WORK?

3.1 Command and Control

3.1.1 Laws, Regulations, Standards and Policies

PRC's legal framework for environmental management includes six laws on environmental protection, ten laws on natural resources management, 34 administrative rules and regulations, and some 427 standards for environmental protection(China Environmental Yearbook 2001:141).

Environmental Laws

In 1979, the Standing Committee of the NPC enacted the PRC's first major environmental statute, the Environmental Protection Law (EPL). Since 1979, at least 21 laws dealing with pollution control and natural resource conservation (including energy resources) have been enacted by the NPC.

- The Law on Environmental Protection (1979), amended 1989 and 2001;
- The Law of Marine Environmental Protection (1982);
- The Law of Forests (1984), amended 1998;
- The Law of Water Pollution Prevention and Control (1984), amended 1996;
- The Law of Grasslands (1985);
- The Law of Fisheries (1986);
- The Law of Mineral Resources (1986), amended 1996 and 1999;
- The Law of Land Resources (1986);
- The Law of Air Pollution Prevention and Control (1987), amended 1995 and 2000;
- The Law of Water (1988), amended in 1996 and 2002;
- The Law of Wildlife Protection (1988);
- The Law of Water and Soil Conservation (1991);
- The Law of Solid Waste Pollution Prevention and Control (1995);
- The Environmental Noise Pollution Prevention Law (1996);
- The Law on Coal (1996);
- The Law on Conservation of Energy Resources (1997);
- The Flood Prevention Law (1997);
- The Land Administration Law (1998);
- The Energy Saving Law (1998);
- The Law on Prevention and Control of Sandifaction (2001);
- The Law of Cleaner Production Promotion (2002);
- The Law of Environmental Impact Assessment (2002).

Environmental legislation has been developed very fast. The year 2002 has seen great progress for environmental legislation. *The Law of Environmental Impact Assessment* and *The Law of Cleaner Production Promotion* had been passed by the NPC, putting PRC in leading place in the world. Nevertheless, the enforcement of such laws is a very challenging task facing by the Chinese government. *Agricultural Law* and *Pastural Law* were issued in January 2003.

Environmental Regulations

At the next level of authority below the statutes are regulations issued by the State Council, which are generally more technical and specific. These regulations implement the legislation by setting forth legally binding requirements at a greater level of detail than is provided in the statutes themselves.

Since 1979, the State Council has issued more than 34 regulations specifically addressing environmental protection and natural resource conservation. Regulations provide details regarding the compliance measures expected of different sources and the means for assessing compliance. At the local level, the people's congresses of the provinces formulate local environmental protection regulations. The local regulations represent the integration of state and local factors. While local standards must be based on national environmental statutes, they must also address the special social and economic conditions of each locality.

Environmental Rules, Methods, and Standards

In addition to the system of regulations, at still a lower level of authority, are the rules, methods, and standards documents formulated by SEPA, other ministries and agencies under the State Council. Broadly speaking, rules are more administrative, whereas methods are more technical in nature. Standards documents generally provide numerical bases for compliance that must be used in reference to regulations, rules, and methods. Without accompanying legislation, standards documents do not have any independent legal meaning. Rules and methods, however, prescribe conduct for the regulated community and have independent legal relevance. To date, over 100 environmental rules and methods and 427 standards have been issued.

Local environmental protection bureaus and other sector bureaus are delegated the principal authority to enact rules, methods and standards. National standards serve as guides to local environmental protection administrations. Local governments may also establish laws, regulations, or standards for pollutants that are not covered by national laws as well as set more

stringent standards for those pollutants that are already covered. While such provisions may be more stringent than that already established by the central government, they can never be less stringent, and this kind of standard must be forwarded to SEPA for review and published in a national register.

By the end of 2000, the PRC had promulgated 427 national and industrial environmental standards, many of which were drawn in accordance with those of the International Standards Organization (ISO). In adapting PRC national standards to the particular conditions of the PRC, many of the standards have proven more lenient than ISO standards. The principal method for achieving compliance with standards is the pollution levy system, which imposes fees for violating emissions standards. Unfortunately, the fees often are well below the marginal cost of meeting the effluent standard. Consequently firms may decide to pay the fee rather than invest in pollution control.

3.1.2 Environmental Management Systems and their Enforcement

Along with the three policies, PRC adopted eight management approaches to improving environmental protection that remain the backbone of PRC's environmental program today:

- the environmental impact assessment system;
- the "three simultaneousness" system (design, build, put into operation environmental protection facilities at the same time with the development of a project);
- the pollution levy system (consisting of charges for environmental pollution);
- the management responsibility system for environmental protection targets;
- the quantitative examination system for urban environmental control and improvement;
- the pollution discharge permit system;
- the centralized pollution control system; and
- the compliance deadline system.

3.1.2.1. Environmental Impact Assessment

Stipulation of laws and regulations

The system of environmental impact assessment (EIA) is a basic principle orienting at pollution prevention. It is also an important legal system for preventing new pollution and protecting ecological environment. The effective environmental management system has played important roles in PRC's environmental pollution control since its promulgation in 1980s. As stipulated in Provision 13 of the Law of Environmental Protection, "the environmental impact assessment (EIA) should evaluate the pollution and environmental impacts for construction projects, stipulate the prevention measures, and be preliminarily approved by responsible agencies and, according to related procedures, be reported to environmental protection departments for final approval." After 1990s, the SEPA strengthened the environmental management of development zones, and required to do regional EIAs for the development zones. In order to guide the environmental management in the development zones, the SEPA formulated the Management Measures for Regional Environmental Impact Assessment in the Development Zones and the Guideline for Regional Environmental Impact Assessment in the Development Zones.

In 1998, the State Council issued a comprehensive regulation on EIA in the amended Management Measures for Environmental Protection of Construction Projects. The People's Congress also plans to formulate and promulgate the Law of Environmental Impact Assessment, in which environmental impact assessment for some national and regional important social and economic policies will be carried out. In 2002, the Law of Environmental Impact Assessment was passed by NPC. Strategic environmental impact assessment is included in the law.

Enforcement situations

At present, 690 institutions have obtained environmental impact assessment certificates, including 240 Class A certificates and 450 Class B certificates. Almost all the large and medium projects with potential environmental impacts have implemented the system of EIA. According to statistics, the implementing rate of EIA of construction projects was 83% in 1995, of which 5% had compiled EISs, 78% had filled out environmental impact tables and 18% were registered for file (China Environment Yearbook, 1996). Since 1990s, in the coastal areas and highly developed inner land areas, the regional EIA was successively conducted for demonstration. In 1996, 130 regional EIAs for development zones were conducted in Zhejiang and Fujian provinces, with the implementing rates of 76.8% and 84.5% respectively (China Environment Yearbook 1997). In

1995, in order to adapt to the total quantity control, the SEPA started to set up basic principles for implementing total quantity control in the approval of environmental impact statements/tables of construction projects. In 1996, the SEPA required that all the EIAs of construction projects, with 12 state-controlled pollutants that are supposed to be approved by the SEPA, should be finally examined by the Administration Meetings of SEPA.

3.1.2.2.“Three Simultaneousness”System

Stipulation of laws and regulations

“Three simultaneousness” system for construction projects is an important one to strengthen environmental supervision and management during the whole process of the project construction. The system has explicitly and legally determined in both the Law of Environmental Protection (1979) and its amendment (1989). According to Provision 26 of the law, the “three simultaneousness” system implies that: “Facilities for preventing and controlling environmental pollution and destruction shall be planned, constructed and put into use at the same time as the main production projects. The pollution prevention-and-control facilities should be examined and approved by environmental protection agencies that have been responsible for the approval of environmental impact assessment before they are put into use. The prevention-and-control facilities should not be demolished or set aside without authorization. If there are exact necessities for demolishing or setting aside the facilities, it should be approved by the responsible environmental agencies.” Obviously, the so called simultaneousness in the system refer to the simultaneousness between pollution prevention and control facilities and the main-body construction in three steps of design, construction, and approval upon completion. The system mainly aims at preventing newly-built, rebuilt and expanded projects from becoming new pollution sources.

Enforcement situations

“The simultaneousness” system is one of the “three old” environmental management systems in PRC, having played important roles in environmental protection and pollution control in PRC. In the Eighth Five-Year Plan Period (1991~ 1995), more than 85% projects have implemented the “three simultaneousness” while 70.4% of the implementation rate was found in the Seventh

Five-Year Plan Period (1986~1990). Table 3 shows the implementation status of "three simultaneousness" in 1995 and 2000. Overall, the compliance rate is well high.

The State requires that the environmental investment in new projects should not be less than 7% of the total investment. However, in the Seventh, Eighth and Ninth Five-Year Plan Periods, the stipulated requirement was not met, the national average rate was less than 4.5%. The investment for three simultaneousness in 2000 was 5.9% of the total investment(China Environmental Yearbook 2001).

Table 3 Implementation Status of "Three Simultaneousness" System in PRC

Indicator	*1995*				*2000*
	Provincial level	*City level*	*County level*	*Total*	*National Total*
No. projects expected for "three simultaneousness"	1,106	3,750	16,767	21,623	29,321
No. projects actually implemented "three simultaneousness"	1,053	3,392	14,090	18,535	28,709
Implementation rate (%)	95.2	90.4	84	85.7	97.9
No. Of projects complying with "three simultaneousness"	996	2,848	11,575	15,419	27,831
Compliance rate(%)	94.58	83.96	82	83.18	94.0

Source: China Environment Yearbook 1996; 2001.

With the establishment of market economy, the "three simultaneousness" system can not meet the present requirements and should be reformed. Currently, the main problems in the implementation of this system are:

- Due to administrative interventions in the approval procedures of "three simultaneousness" and less concerns on environmental protection by some officials, the "three simultaneousness" has become "three steps" or "one synchrony" which prohibit environmental protection agencies from strict enforcement.
- To overcome the implementation difficulty of "three simultaneousness", in some areas, a deposit fund system for "three simultaneousness" of construction projects has been initiated. In this system, a deposit fund is charged based on the project's total investment upon the approval of the project for implementing "three simultaneousness". However, this has less legal foundations and not so reasonable criteria for the charge.
- The legal system and procedural norms of "three simultaneousness" are not as

strict as those of environmental impact assessment (EIA) system. The supervision of three phases is only carried at the final examination and approval phase (this is called “one synchrony”). Therefore the supervision and management of “three simultaneousness” should be enforced in the design and construction phases, especially the design phase.

3.1.2.3. Pollution Permit System

Stipulation of laws and regulations

At present in PRC, pollution permits are stipulated mainly in the Regulation on Waste Discharge in the Ocean, the Law of Solid Waste Pollution Prevention and Treatment, the Law of Water Pollution Prevention and Treatment. These include permit for waste discharge into the ocean, permit for collection, storage and disposal of hazardous waste, and permit for water pollution discharge. On July 12, 1989, the State Council approved Detailed Regulation for the Implementation of the Law of Water Pollution Prevention and Treatment, in which it is clearly stipulated that the discharge permit certificate is a management measure for polluation reporting and registration. Since then, the trial implementation has been started for water discharge and air emission. In 1993, the SEPA issued the Tentative Methods for Management of Water Pollution Permits. The water pollution permit system involves pollutants discharge reporting and registration, allocation of pollution amount, issuance of permits, and supervision and management afterwards, etc. In March 1994, at the Evaluation Meeting of Discharge Permit System in Shanxi and Jiangsu Provinces, SEPA (now SEPA) announced the end of the trial implementation of wastewater discharge permit system and the beginning of the extension in PRC.

In the beginning of 1997, SEPA issued the Notification of Overall Implementation of Reporting of Pollutant Discharge which requires that all reporting work should be finished within the next two years. In PRC, the pollution discharge reporting and registration system is generally implemented by each polluting unit. But the pollution permit system is only implemented for the quantitative management of main pollutants in key regions and key polluting sources.

Enforcement situations

The pollution permit system in PRC is under the demonstration and promotion phases, with the main pollution media of water, gas and solid waste. By 1995, the issuance of water pollution permit has been carried out all over PRC. For the air pollution permit, the SEPA has selected 16 cities for demonstration and the first batch of cities passed the approval in 1993. At the end of 2000, 504 cities had implemented water discharge permit system with 80,899 permits being issued to 71,027 enterprises and 427 cities had implemented air emission permit system with 50,467 permits being issued to 46,613 enterprises(China Environmental Yearbook 2001:575).

Through the demonstration and promotion of countrywide pollution discharge reporting and registration and pollution permit systems, the following five effects have been made: (1) having strengthened the idea of total amount control of environmental protection agencies; (2) having promoted the “three simultaneousness” and made the environmental management to be on the track of total quantity control; (3) having promoted the renovation of old pollution sources and realized in the reduction of pollution loads; (4) having promoted the improvement of performance of environmental management agencies; (5) having deepened the environmental management. Currently, SEPA is planning to extend discharge permit system to serve as a basis for enforcement supervision and performance assessment.

However, as the pollution discharge reporting and registration and pollution permit systems were initiated rather late without mature experience, some problems also occurred:

- legal problem. The establishment of legal status of pollution permit is the key point for the smooth promotion of this system.
- supervision and management problem. The supervision and examination of the implementation status of the allowable amounts approved by the pollution permits is key to whether the pollution permit can have legal, economic and regulatory effects.
- the problem of coordination between the permit system and other management systems especially the pollutant charge system.

3.1.2.4.System of Compliance Deadline

Stipulation of laws and regulations

The legal system of deadline for compliance has a comparatively complete legal system base. Provision 29 and 39 of the Law of Environmental Protection explicitly stipulate that “the deadline for compliance is required for seriously polluting enterprises. The governments of provinces/autonomous region/municipalities directly under the central government can determine the deadlines for compliance for enterprises and polluters owned by them. The city/county governments can determine the deadline for compliance for enterprises owned by them or government below county level. At present, there are more than 50 regulations on deadline for compliance at different levels and by different departments.

Enforcement situations

From 1978 to 1995, two batches of state-level projects (227 and 140 projects respectively) of deadlines for compliance were implemented. Including the local ones, the total number of projects of deadline for compliance was more than 43000. These projects have strongly promoted the realization of pollution control targets. In 1996, Chinese Government approved the third batch of 121 projects, with a total investment of 9 billion yuan. Figure 3 gives the actual number of projects and their investment status in deadline for compliance from 1992 to 2000. In recent years, various levels of governments have enriched the contents of the system by incorporating technological renovation, phase-out of backward technologies and products, whole process control, and promotion of cleaner production, etc. The system targets have expanded from point sources to river basins, regions and sectors. From the figure, it is seen that the number of enterprises and investment for deadline compliance have substantively increased during 9th five year plan period from 1996 to 2000.

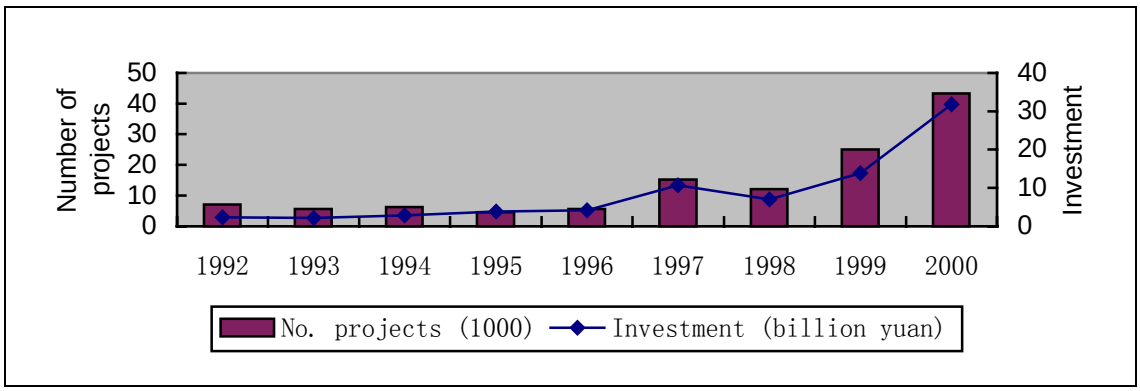


Figure 3 Implementation of Projects of Treating within A Prescribed Time in PRC

Source: data from China Environmental Yearbook 1993;…;2001.

3.1.2.5. SSMC System

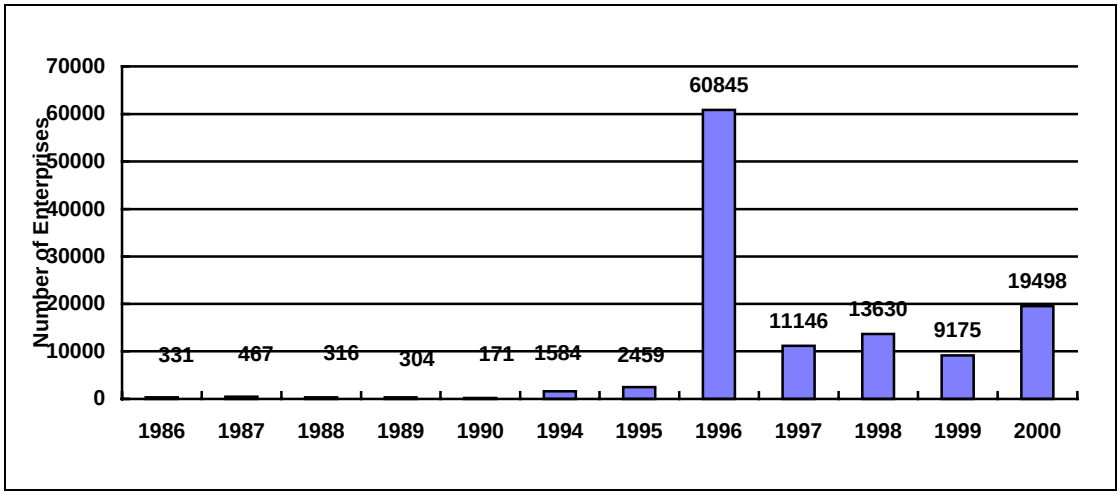
Stipulation of laws and regulations

The system of shutting down, stopping, merging and converting polluting enterprises (SSMS System) is last measure to be taken for those that can not meet the standards after treatment within a prescribed time or that are seriously polluted but difficult to be treated. As stipulated in Provision 39 of the Law of Environmental Protection, "for the enterprises that have not completed the treatment tasks after the prescribed time, penalty or shutting down, stopping, merging and converting orders can be exerted based on the harzardous degree of the polluting sources in addition to levying over-standard pollutant charge according to the government stipulation. The decision on shutting down, stopping, merging and converting order should be made by the governments at corresponding levels. The decision on the shutting down, stopping, merging and converting enterprises directed by central governments should be approved by the State Council." The shutting down, stopping, merging and converting system is a typical government intervention behavior, having strong administrative intervention color, and may be the strictest system for industrial pollution control in PRC currently.

Enforcement situations

Figure 4 illustrates the shutting down, stopping, merging and converting status of polluting enterprises in PRC in recent 15 years. According to the figure, the enforcement of the system had been intensified from 1996 to 2000, especially in 1996 when major pollution control projects were started afterward. At present, no comprehensive evaluation on environmental and economic effectiveness has been conducted for the policy of shutting down, stopping, merging and converting. However according to normal experiences, most of enterprises subject to shutting down, stopping, merging and converting have great environmental liability. Normally, shutting down, stopping, merging and converting these enterprises is a comparatively effective instrument for solving the problem of being harmful to local human health.

Figure 4 Shutting Down, Stopping, Merging and Converting of Polluting Enterprises in PRC in Recent 15 Years



Note: The data from 1986 to 1990 were based on those of 57 key environmental protection cities, and the data of from 1994 to 2000 were based on those of the whole country.
Source: Data from China Environmental Yearbook 1987;…;2001.

1996 saw massive increase in the number of enterprises under SSMC as in that year PRC initiated a world famous pollution treatment program. According to the State Council's Decision on Several Issues on the Environmental Protection in August 3 of the year, the local governments at all levels should outlaw and shut down fifteen kinds of seriously-polluting enterprises, e.g. small paper-making and backward indigenous coking, etc.. This is called the policy of outlawing and shutting down of "fifteen small"enterprises. The policy is the Government's environmental regulatory action which has biggest international influence in 1996. According to the policy plan, a total of 70247 seriously-polluting enterprises should be outlawed and shut down in the whole country, of which 51786 should be outlawed, 19664 shut down and 2718 stopped their production. The sectoral distribution of these enterprises is shown in Table 4.

Table 4 Sectoral Distribution of "Fifteen Small" Enterprises

Industry	*No. enterprises that should be banned by shut down*	*Percent in total No. of that should be banned by shut down (%)*
Plants with paper output of less than 500t	6362	8.57
Factories with dye output of less than 500t	493	0.66
Small tannery	8288	11.17
Plants with backward indigenous coking	16737	22.57
Plants with backward indigenous sulfur making	1835	2.47

Plants with backward indigenous arsenic making	54	0.07
Plants with backward indigenous mercury making	160	0.22
Plants with backward indigenous lead making	7032	9.48
Plants with backward indigenous oil refining	4341	5.85
Plants with backward indigenous gold concentration	23072	31.11
Plants with backward indigenous pesticide	106	0.14
Plants with backward indigenous bleaching and dying	1026	1.38
Plants with backward indigenous electric plating	4082	5.50
Plants with backward indigenous asbestos products	405	0.55
Plants with backward indigenous radioactive product	21	0.02
Other	214	0.29
Total	74168	100

Source: SEPA, 1997.

By May 31, 1997, 64,083 “fifteen small” enterprises have been banned by shut down, with the rate of 86.4%. Those that have not been banned by shut down are in the regions with backward economy. For examples, the rates of banning via shutting down in Guizhou, Gansu and Xinjiang are low, especially for backward indigenous coking and backward indigenous lead and zinc making, with rates of baning via shutting down of only 62.0% and 62.5% respectively (SEPA, 1997). The outlawing and shutting down status of “fifteen small” enterprises is shown in Table 5.

Table 5 The Outlawing and Shutting Down Status of “Fifteen Small” Enterprises in PRC (As of May 31, 1997)

Province	*No. to be outlawed*	*No. to be shut down*	*No. to shop production*	*No. having been outlawed*	*No. having been shut down*	*No. having stopped production*	*Rate of outlawing and shutting down(%)*
Beijing	8	17	11	13	23	0	100.0
Tianjin	37	52	0	37	0	52	100.0
Hebei	7,419	2,994	0	5,523	2,460	2,430	100.0
Shanxi	5,932	3,066	0	5,869	3,066	0	99.3
Inner	3,052	600	0	3,028	600	0	99.3

Mongolia							
Liaoning	134	0	576	134	0	576	100.0
Jilin	59	118	36	59	118	36	100.0
Heilongliang	724	84	98	724	84	98	100.0
Jiangsu	276	365	229	276	365	229	100.0
Zhejiang	0	1620	0	0	1,620	0	100.0
Anhui	413	344	0	290	362	105	100.0
Fujian	209	233	90	209	233	90	100.0
Jiangxi	230	0	0	230	0	0	100.0
Shandong	648	1342	0	648	1,342	0	100.0
Henan	16,677	552	0	16,677	522	0	100.0
Hubei	2,648	190	1	2,455	169	1	92.5
Hunan	755	634	0	737	621	0	97.8
Guangdong	95	382	262	95	382	262	100.0
Guangxi	212	206	166	212	166	212	100.0
Hainan	17	43	15	17	43	15	100.0
Sichuan	1,622	0	0	800	200	432	88.3
Guizhou	8,277	4,306	533	1415	290	2,600	32.8
Yunnan	792	554	605	90	175	500	80.7
Shannxi	743	623	0	741	619	0	99.6
Gansu	181	449	0	81	421	0	79.7
Qinghai	8	11	26	8	11	26	100.0
Ningxia	62	636	10	0	4	656	93.2
Xinjiang	102	200	60	102	110	5	59.8
Shanghai	0	73	0	0	73	0	100.0
Chongqing	459	0	0	405	0	0	88.2
Total	51,786	19,664	2,718	41,685	14,119	8,279	86.4

Source: SEPA, 1997.

According to statistics and survey in 10 provinces by the SEPA, 43653 “fifteen small” enterprises should be outlawed and shut down in the 10 provinces, only accounting for 0.57% of the township and village enterprise (TVEs) in the areas. Their employee, output value and profit and tax respectively account for 0.9%, 0.89% and 1.06% of the those by whole TVEs. The outlawing and shutting down of enterprises in the 10 provinces will reduce industrial wastewater, industrial waste gas and solid waste by 1.004 billion t, 291 thousand billion m3, and 17.99 million t respectively. Taking the nation as the whole, the industrial wastewater, industrial waste gas and solid waste will be reduced respectively by 5%, 0.3% and 2.9% (SEPA, 1997).

3.1.2.6.Quantitative Examination on Integrated Control of Urban Environment

Stipulation of laws and regulations

In September 1988, the State Council Environmental Protection Commission issued the Decision on Quantitative Examination on Integrated Control of Urban Environment and the Implementation Methods for Quantitative Examination on Integrated Control of Urban Environment, giving detailed stipulations on the systems of quantitative examination on integrated control of urban environment. The former mainly stipulates the examination significance, governmental tasks, major responsibility system, tasks of environmental protection departments, etc., while the later mainly stipulates the cities and the indicators that are examined directly by the State. In the Eighth Five-Year Plan Period, there are 21 indicators in 3 classifications, including 6 environmental quality indicators, 10 pollution control indicators, and 5 environmental construction indicators (4 for non-heating cities). In the Ninth Five-Year Plan Period, there are 26 indicators in 4 classifications, including 7 environmental quality indicators, 6 environmental construction indicators, 8 pollution control indicators, and 5 environmental management indicators. The detailed indicators are shown in Table 6.

Table 6 Quantitative Examination Indicators for Integrated Control of Urban Environment in the Ninth Five-year Plan Period

Classification	Indicator	Unit
Environmental quality	Daily average of air TSP	Mg/ m^3
	Annual daily average of SO_2	Mg/ m^3
	Annual daily average of NO_x	Mg/ m^3
	Water quality compliance rate of drink water source	%
	Water quality compliance rate of urban surface water	%
	Average regional environmental noise	dB(A)
	Average traffic main line noise	dB(A)
Pollution control	Total amount reduction rate of water pollutant discharge	%
	Total amount reduction rate of air pollutant discharge	%
	Coverage rate of smoke dust control area	%
	Discharge compliance rate of Industrial waste water	%
	Compliance rate of automobile exhaust gas	%
	Comprehensive utilization rate of Industrial solid waste	%
	Hazardous waste disposal rate	%
	Treatment rate of urban sewage	%
	Urban central heating rate	%

Environmental construction	Urban gasification rate	%
	Residential garbage treatment rate	%
	Greening coverage rate in constructed areas	%
	Natural reserve coverage rate	%
Environmental management	Environmental protection institution building	%
	Urban environmental protection Investment index	%
	Qualification rate "three simultaneousness" implementation	%
	Levying coverage of pollutant charge	%
	Operation rate of pollution control facilities	%

Enforcement situations

Since 1996, the cities subject to be examined by the state and the cities directly under the jurisdiction of provinces started to implement the quantitative examination for integrated control of urban environment for the Ninth Five-Year Plan Period. The number of state examined cities directly under SEPA evaluation expands from 37 in the Eighth Five-Year Plan Period to 46. Cities evaluated by provincial EPBs, city EPBs and County EPBs reached to 605 in 1999. At the same time, on the base of the quantitative examination for integrated control of urban environment, the SEPA have also formulated the indicator system and the implementing measures for environmental protection model cities, and has widely conducted the actions for promoting environmental protection model cities. Table 7 shows the scores and their ranking of 42 cities in the quantitative examination for integrated control of urban environment in 1997.

Table 7 Results of Quantitative Examination for Integrated Control of Urban Environment (1997)

City	Comprehensive Examination		Environmental quality		Pollution control		Environmental construction		Environmental management	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Guilin	83.62	1	26.39	5	20.82	14	18.37	1	15.27	6
Shantou	81.60	2	26.7	1	22.55	3	13.85	30	16.00	1
Haokou	81.13	3	23.53	13	22.54	4	16.76	7	16.00	1
Chengdu	79.25	4	26.63	2	20.83	13	16.33	8	13.74	22
Ningbo	78.09	5	26.19	8	20.62	17	14.09	25	15.19	7
Tianjin	77.94	6	21.11	21	22.37	6	17.25	3	14.41	13
Shijiazhuang	77.76	7	23.31	14	20.98	12	16.33	8	14.84	12
Suzhou	77.53	8	21.30	20	22.46	5	15.68	12	15.29	5
Yantai	76.71	9	26.26	7	19.46	22	14.55	19	15.41	8
Beijing	75.11	10	18.94	27	21.49	10	16.21	9	15.47	4

Hanzhou	74.38	11	19.38	25	21.68	9	16.88	5	13.94	20
Beihai	73.91	12	25.79	9	19.41	23	15.40	14	11.31	37
Nanning	73.61	13	22.19	18	20.35	18	16.09	10	12.78	32
Nanjing	73.45	14	18.16	31	21.82	8	17.77	2	13.40	26
Changchun	73.02	15	24.06	12	19.39	24	13.39	31	14.39	14
Fuzhou	72.64	16	22.53	16	19.38	25	14.35	23	15.08	9
Changsha	72.51	17	21.32	19	22.66	1	14.32	24	12.71	33
Zhengzhou	72.02	18	24.4	11	18.65	30	14.51	20	12.46	36
Shanghai	71.88	19	15.05	38	22.63	2	15.44	13	15.76	3
Qingdao	71.54	20	17.33	35	21.05	11	16.84	6	14.32	16
Wenzhou	71.32	21	26.40	4	16.79	34	11.92	40	13.91	21
Nancang	70.99	22	25.78	10	19.35	26	14.81	17	9.55	40
Lianyungang	70.29	23	26.27	6	14.80	37	13.23	33	13.99	18
Shenyang	69.31	24	22.32	17	15.31	35	14.99	15	13.99	18
Guangzhou	69.03	25	18.12	32	20.65	16	14.41	21	14.35	15
Wuhan	67.99	26	19.97	23	21.90	7	12.85	34	12.47	34
Yinchuan	67.82	27	18.19	30	19.92	20	12.57	36	14.94	10
Haerbin	67.54	28	17.90	33	19.63	21	14.40	22	13.62	24
Hefei	67.45	29	23.11	15	15.02	36	12.09	38	14.93	11
Xi'an	66.90	30	20.05	22	19.15	28	14.84	16	10.66	39
Xining	65.58	31	18.26	29	20.82	14	12.03	39	12.47	34
Jinan	65.22	32	14.52	39	20.09	19	14.07	26	13.74	22
Guiyang	63.74	33	16.48	36	18.64	31	13.39	31	13.23	29
Nantong	63.10	34	19.35	26	18.73	29	11.65	41	11.07	38
Taiyuan	62.92	35	15.59	37	16.89	33	14.60	18	13.24	28
Chongqing	61.61	36	19.88	24	17.20	32	13.86	29	8.67	41
Zhanjiang	58.89	37	26.40	4	6.63	42	12.10	37	13.55	25
Urumqi	57.28	38	9.73	42	19.25	27	14.00	28	12.80	31
Lanzhou	56.43	39	13.62	41	12.77	39	14.06	27	14.27	17
Huhhot	56.07	40	14.25	40	14.61	38	12.63	35	12.88	30
Qinghuangdao	54.08	41	18.71	28	10.71	40	11.34	42	13.32	27
Kunming	53.33	42	17.64	34	10.59	41	17.02	4	8.08	42

In the tenth five year plan, the indicators and management mechanism for quantitative environmental examination have been perfected, making it more influential in urban environmental management. The number of key cities for environmental protection have been increased to 113.

3.2 Economic Instruments

3.2.1 A general review of Economic Instruments

The use of economic instruments for environmental protection is a growing trend as PRC is transacting into a market economy. The economic instruments used in PRC's environmental

management can be classified into pollution levies, use fees, resources taxes and fees, excises, tradable permits, deposit-refund and etc(Table 8).

Pollution levy is an important economic instrument in PRC which will be discussed later. In addition to pollution levy, wastewater treatment charge and urban solid waste charge have been progressively introduced as urban wastewater pollution and solid wastes problems have gradually caught the attention after the milestone of industrial pollution control.

Table 8 Economic instruments applied in PRC's environmental management

Instrument	Targeted pollutants and pollution media	Year introduced	Target of policy	Implementation coverage
1. Pollution levies				
1.1 Excess pollution charge	18 pollutants specified by national discharge standards	1982 -	Firms	Country-wide
1.2 Volume-based effluent charge	Wastewater	1991-	Firms	Country-wide
1.3. TAC-based charge	18 pollutants specified by national discharge standards	June 1998	Firms	Cities of Hangzhou, Zhenzhou and Jilin, and Jiangsu province
1.4 SO_2 charge	SO_2 emissions or SO_2 content of burned coal	1992-1998 1998-	Coal-burning industrial facilities	Nine cities (e.g Chongqing, Guilin, etc.) and Guandong and Guizhou provinces Acid-rain-control and SO_2-control areas
2. User fees				
2.1 Sewage network fee	Wastewater volume	1993-	Firms	Country-wide
2.2 Municipal wastewater charge	Wastewater volume	1991-	Households	Selected cities (incl. Beijing) and Huaihe basin
3. Resource taxes and fees				
3.1 Extraction tax	Crude oil, coal	1986	Exploiting Firms	Country-wide
3.2 Ecological damage tax	Water, soil, air	1989-1997; now discont'd	Resource developer	Seven provinces

3.3 Mineral resource tax	Ores, gravel	1986-	Mineral developer	Country-wide
4. Excises				
4.1 Gasoline and diesel		1993	Consumers	Country-wide
4.2 Vehicle use	Vehicle tonnage	1986	Vehicle users	Country-wide
5. Other taxes				
5.1 Land use tax (cultivated land or urban)		1987/88	Firms	Country-wide
6. Tradable permits				
6.1 Wastewater discharge tradable permit	COD	1985- (in a very restricted way)	Firms	Shenyang, Shanghai
SO_2 and TSP tradable permits	SO_2 and TSP		Firms	Nine cities
ODS tradable permit	CFC and ODS	1998	Firms	
Tradable development rights			Firms	Beijing, Province of Inner Mongolia
7. Deposit-refund				
7.1 Deposit for "3S"		1989-1997 Now discont'd	Newly built facilities	Fushun Jiangsu, and other cities
7.2 Pollution abatement deposit		1995-1997 Now discont'd	Firms with pollution control facilities	Changshu City
7.3 Solid waste disposal deposit	Selected products		Consumers and producers	Country-wide
8. Other instruments				
8.1 Waste material trading	Recyclable materials	1989-	Interested firms	Shanghai, Shenyang
9. Tax treatment and credit				
9.1 Earmarking of urban maintenance &construction tax		1985	Firms	Country-wide
9.2 Fixed asset investment adjustment tax	Potential heavy polluters	1991	Firms	Country-wide

as a planning tool				
9.3 Tax rebate on operations using recycled materials	VAT	1984	Firms particip'ng	Country-wide
9.4 Budget subsidies for env investments		1982	Firms req'd to reduce pollution	Country-wide
9.5 Budget allocations for envirn. investments		1984	Firms req'd to reduce pollution	Country-wide
10. Resource pricing reform				
10.1 Reform of water pricing		1998	All water users	Country-wide

Note: 3S =Three simultaneousness; EPB = Environmental Protection Bureau; UCB=Urban Construction Bureau; CFC = chlorofluorocarbons; TAC=Total amount control ; ODS=Ozone-depleting substances;
Source: adapted from Wang (1998)

3.2.2 Pollution Levy System

Stipulation of laws and regulations

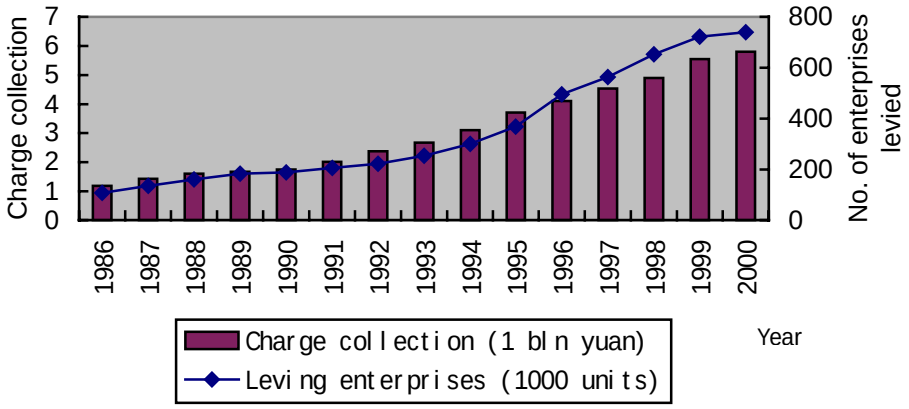
PRC put forward the pollution levy system in 1978, based on the "polluters pay principle". The system was formally stipulated in the Environmental Protection Law of the People's Republic of China (tentative) in 1979. Later on, the system was also stipulated in others laws, e.g. the Law of Air Pollution Prevention and Treatment, the Law of Water Pollution Prevention and Treatment, the Law of Solid Waste Pollution Prevention and Treatment, the Law of Noise Pollution Prevention and Treatment. So far, a comparatively complete legal system has been established for this system. In the Tentative Regulation on Levying Discharge Fee (1982) and the Tentative Regulation on the Repayable Usage of Specific Fund for Pollution Sources Control (1988), the State Council has detailed stipulations on the levying targets, levying scope, levying standards, fee calculation methods, levying procedure, and fee management and usage, etc. Currently, this system has been implemented in all the provinces, cities, and counties in PRC. It

is proven that the current pollution charge system in general is a comparatively mature and effective environmental management system, despite some problems to be reformed urgently.

Enforcement situations

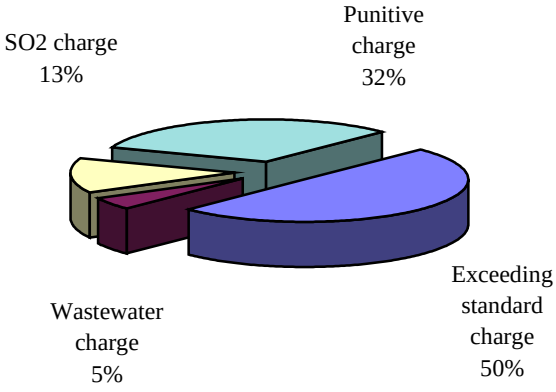
Since pollution levy was introduced in PRC, the revenue collected from pollution levy has been increasing (Figure 5). In 2000, the total revenue collected was 5.80 billion yuan, collecting from 739,193 enterprises.

Figure 5 Change of the revenue collected under pollution levy system



Of the total revenue collected in 2000, 2.90 billion was collected in the name of exceeding standard charge levied on enterprises against the concentration standards, 2.7 billion was collected against the volume of wastewater discharge and the rest were SO2 charge and four punitive charges(Figure 6).

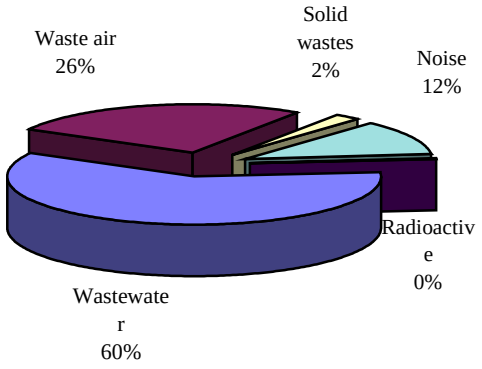
Figure 6 Revenue collected under pollution levy system in 2000



Source: China Environmental Yearbook 2001

For exceeding standard charge, wastewater ranked first in contribution to the charge proceeds, waste air, solid waste, noise and radioactive come next in order(Figure 7).

Figure 7 Structure of the revenue from exceeding standard charge by media in 2000



According to PRC's policies for the use of charge revenue, 80% the revenue of exceeding standard charge is used for the pollution treatment of enterprises. The left 20% and the part of "Four-Small-Items" are used by the environmental protection departments, mainly for the cost of implementation of levying and the self capacity building of environmental protection departments. Some provinces and municipalities also have adjustment of above distribution proportion. This will be discussed in section 4.2.1.

Since 1990s, reform of pollution charge system has been conducted. This mainly includes: (1) the reform of repayment use of pollution charge since 1988; (2) the adjustment of charge rate for wastewater and the unification of noise charge standards in 1991; (3) pilot implementation of SO2 pollution charge for industrial coal-burning in 1992, and extending SO2 pollution charge in the "Two-Control-Zones" (i.e. SO2 Pollution Control Zones and Acid Rain Control Zones) in 1996; (4) demonstration implementation of total-amount charge system in Hangzhou, Zhenzhou and Jilin cities in 1998; (5) initiation of urban sewage treatment fee in 1998; (6) amendment of the Tentative Regulation on Levying Discharge Fee and the Tentative Regulation on the Repayable Usage of Specific Fund for Pollution Sources Control, and Tentative Regulations on Levying Pollution Charge in 1999; and (7) levying of total-amount pollution charge in the State's key polluting areas or in the whole country by 2000.

While pollution levy system was practiced largely as usual in the most part of PRC, a pilot implementation of the reformed pollution levy system was carried out in Hangzhou City of Zhejiang Province, Jilin City of Jilin Province and Zhengzhou City of Henan Province in July 1,

1998 for a peiod of one year. The reformed pollution levy system was based on the Study on Desing and Implementation of Pollution Levy System in PRC done by the Chinese Research Academy of Environmental Sciences and funded with the loan from the World Bank. In the reformed system, total amount pollution levy was adopted, that is, a levy was charged to a polluter based on any pollutant emission instead of the amount exceeding the related emission standard. Charge schedule was unified in the reformed system with the adoption of a concept of pollution equivelent with which a total of PE can be deprived by asigning pollution equivelent value to each pollutants in emission. A charge rate was aslo increased in the reformed system with 0.4-0.7 yuan/PE for water pollutants and 0.3-0.6yuan/PE for air pollutants. According to preliminary review meeting held at the end of April, the reform has forced enterprises to control their pollution while generating additional revenue.

The State Council has approved the new regulation on pollution levy in 2002 and new pollution levy policy will be implemented in July 2003. Right now, SEPA, SDPC, and MOF are working on drafting new management rule on collection pollution levy.

3.3 Voluntary Approaches

3.3.1 ISO14000

Stipulation of laws and regulations

Since the late 1990s, PRC started environmental management system (EMS) auditing and ISO14000. In several years, the SEPA successively issued related management documents and established a set of effective management measures. These include: (1) Tentative Regulations on Certificate Issuing and its Use for Environmental Management System Auditing (Pilot); (2) Tentative Regulations on China's Certification of Environmental Management System; (3) Basic Requirements for Accreditation of Environmental Management System Certification Institutions; (4) Accreditation Procedure of Environmental Management System Certification Institutions; (5) Tentative Regulations on Filing China's Environmental Management System Consultation Institutions, etc.

Enforcement situations

In 1995, China Technical Committee for Environmental Management Standardization was established to be in charge of liaison with ISO/TC207 and tracking and studying ISO14000 series. In 1996, the Environmental Management System Auditing Center of SEPA was founded to carry out EMS auditing. Authorized by the State Council, China Steering Committee for Environmental Management System Certification was set up on May 27, 1997. The Office of Steering Committee (SC), under SEPA's Department of Science and Technology and Standards, is the stationary agency of SC, being in charge of the routine work of SC. Under the SC, there are two subordinate bodies, i.e. China Accreditation Council for Environmental Management System Certification Institutions and China Registration Council for Environmental Management System Auditor. In the end of 1999, there were 1133 registered auditors working in 15 environmental management ceterification institutions sanctioned by SEPA's Environmental Management System Auditing Center .

The SEPA initiated pilot certification of EMS in 1996 and identified 55 pilot enterprises for the certification of ISO14001. In 1997, SEPA approved 13 pilot cities (areas) for implementing ISO14000 series. By the end of 1999, 263 enterprises had obtained ISO14001certificates Electronic industry and commnincation industry had more share in EMS certification and so is economically developed region. As seen from the demonstration in PRC, large-scale export-oriented enterprises and foreign investment enterprises, especially world-famous international enterprises, are more positive in EMS audit and certification. These enterprises generally have either obtained environmental labeling, or carried out cleaner production, or obtained certificate for ISO9000.

From the demonstration experience, there are three main barriers or problems for implementing ISO14000 in PRC. (1) The enterprise management level is low and environmental management awareness is poor. It is difficult for the enterprises that do not even care about the product quality management could pay attention to EMS auditing. (2) The enterprises technological level is low and production manner is backward. Most enterprises are oriented at domestic market and have no conscience to develop international markets. They can hardly meet with the requirements of ISO14000 recently. (3) Some current environmental management policies and regulations have big gaps with the whole process management. Many environmental regulations and standards do not totally comply with ISO14000 series and international conventions, thus should be adjusted accordingly.

3.3.2 Environmental Labeling

Stipulation of laws and regulations

PRC has conducted its environmental labeling works in accordance with Managerial Regulation of Product Quality Certification of the People's Republic of China and Managerial Method of Product Quality Certification Committee issued by the State Bureau for Technology Supervision and referring to the experience of other countries. In order to better conduct the environmental labeling system, Regulation of China Certification Council for Environmental Labeling Product as well as Managerial Method of Environmental Labeling Product Certification has been formulated to normalize and guide the labeling. The Managerial Method of Environmental Labeling Product Certification mainly includes general rules, products classification for environmental labeling, conditions of applying for certification, certification procedure, certifying, and supervision and appeal after the use of environmental labels, etc.

The main strategies for enforcing environmental labeling in PRC are: (1) extending implementation scope of labeling products step by step; (2) the certification laying the foundations for enterprises' voluntary application; (3) keeping the labeled products at a limit proportion to play the role of guidance; (4) conducting environmental labeling among export products, which is an important orientation of labeling; (5) keeping the kinds of labeling products identical to the foreign ones.

Enforcement situations

PRC's environmental labeling started in March 1993. In May 1994, China Environmental Labeling Product Certification Commission was formally established, with China Environmental Labeling Product Certification Commission Secretariat as the standing office. In March 1996, the Office of Environmental Labeling Management was set up within the National Environmental Protection Agency (NEPA, old name of SEPA). By December 1998, the State Environmental Protection Administration (SEPA) has promulgated technical requirements for 31 kinds of products. Until 2002, the environmental labelling certificates had been conducted for1000 product models in 46 catergories from some 300 companies ranging from low-fluorine household refrigerator, fluorine-free aerosol product, lead-free vehicle gasoline, water paint,

toilet paper, real silk, and mercury-free, cadmium-free and lead-free rechargeable batteries, etc.. have obtained environmental labeling certification[3].

3.3.1Cleaner Production

General Status

Cleaner production (CP) was initiated in PRC in 1980's with the aim of enhancing environmental management. PRC's CP practice so far has achieved a reduction in emissions for 20% via various measures to enhance environmental management such as minimizing loss of materials and pollution generation depending on the enhancement of environmental management, and finalizing the total load control of pollution through mass balance. In the meantime, some environmental management regulations, for example, environmental impact assessment and "Three Simultaneousness" system, also reflect the CP concept to different extent, which plays a significant role in pollution prevention of PRC.

The main work related to CP in PRC can be classified into in-plant demonstration, training, institutional building and policy advice. Since 1993 there have been 24 provinces, autonomous regions and cities directly under the State Council conducted or initiated CP demonstration project, promoted by the environmental protection agencies, economic comprehensive departments and sectoral administrations. The demonstration mainly covers more than 10 industrial sectors including chemical, light industry, building materials, metallurgy, petrochemical, power generation, aircraft manufacturing, pharmacy, mining, electronics, tobacco, machinery, textile, printing and dyeing of silks and transportation, etc. After the CP options generated from the CP audits being implemented, an overall economic returns for 500 million yuan has been achieved annually. And from these implemented options, sound environmental benefits have also obtained: COD was reduced by 78,000 t/a, wastewater by 12.6 million t/a and gas emission by 800 million standard m3 per year.

By the end of 2001, PRC has organized some 150 training workshops on CP and the number of trainees reached 11,000. After being fostered in these training, a large number of managerial staffs at various levels have got understanding on CP, and the CP professionals have been trained in specialized CP knowledge and skills. Among these workshops 11 Fundamental

[3] From a remark given by SEPA official at the 8th anniversary of environmental labeling in PRC.

Courses for Cleaner Production Auditors were held and 240 external cleaner production auditors have been fostered. About 50 lectures on basic knowledge of CP were organized with 3000 trainees and some 400 on-the-job training workshops on CP in enterprises were held with 8000 participants.

Since the end of 1994, 16 sectoral or local CP centers have been established in PRC, including 1 national CP center, 4 sectoral CP centers (covering petro-chemical industry, chemical industry, metallurgy and aircraft manufacturing sector), and 11 local CP centers (involving Beijing, Shanghai, Tianjin, Huhehot, Shaanxi, Heilongjiang, Shandong, Jiangxi, Liaoning, Inner Mongolia and Sinkiang Autonomous Region).

Policy advice for decision making on CP had been proposed from some international cooperation projects. For instance, one of the most important contents of the World Bank funded project B-4 Subproject is to conduct research on CP policy advice. In April 1997, SEPA prepared and issued "Recommendation on Promoting CP in PRC", in which it is required that the local environmental protection agencies have to integrate CP into the existing environmental management policies so as to further CP in depth. The document also brings forward requirements on CP awareness, training and dissemination, working focus and international cooperation, etc.. In May 1999, the State Economic and Trade Commission of PRC selected 10 cities like Beijing and Shanghai and 5 sectors like petro-chemical and metallurgy as pilot city/sector for carrying out CP demonstration. Shaanxi Province has formulated economic incentive policies for CP audit. Part of pollution levy fee has been returned to the payers to make them conduct CP audit, depending on which a large number of enterprises have been promoted to take part in CP activities. This local policy has been in use for years. Since 1995, CP has been written into some national environmental protection laws and regulations, such as "Solid Wastes Pollution Prevention and Control Law", "Air Pollution Prevention and Control Law" and "Water Pollution Prevention and Control Law". The Cleaner Production Promotion Law of the People's Republic of China was issued in the end of June 2002, and to be put into effect from January 1, 2003.

Issues

Less enthusiasm of PRC's enterprises in CP audit. Based on the achievements from CP audits in PRC's enterprises, each enterprise obtained obvious environmental and economic benefits through CP audit in general. According to a statistics on CP audits in more than 100 enterprises,

on average each enterprise can reduce the major pollutants by over 20% and achieve more than 1 million yuan per year. However there is no market driven mechanism in PRC yet, CP has not been linked with the market sales of enterprises, and the economic returns gained from the reduction in both pollution generated and use of raw materials and energy have brought less effect to the enterprises who has conducted CP audit, so the enterprises generally lack enthusiasm to participate in CP activities.

Low sustainability of results from CP audit. The achievements gained from CP audits mainly depended on implementing non/low cost options in enterprises. However after the audit finished, most enterprises went back to the previous management rules and operational level. According to the results from a review on CP audits in 27 pulp and paper mills located in Huai River Basin, a large majority of mills returns to previous loose management status half or one year later than the completion of the audits.

3.4 Public Participation

3.4.1 Information Disclosure

Public disclosure of firms' environmental performance has been characterized as the "third wave" of environmental regulation, after command-and-control and market-based approaches (Tietenberg, 1998). PRC's State Environmental Protection Agency (SEPA) has become interested in public disclosure because PRC's pollution problem remains severe, despite long-standing attempts to control it with traditional regulatory instruments. Since late 1998, supported by the World Bank's InfoDev Program, the authors have been working with China's State Environmental Protection Administration (SEPA) to establish GreenWatch, a public disclosure program for polluters in which the environmental performance of firms is rated and reported to the public. Firms are rated from best to worst using five colors -- green, blue, yellow, red and black -- and the ratings are disseminated to the public through the media.

The experience of the first two disclosure programs, in Zhenjiang, Jiangsu Province and Hohhot, Inner Mongolia has shown the impact has been substantial, suggesting that public disclosure provides a significant incentive for firms to improve their environmental performance. The Zhenjiang and Hohhot experiences have also shown that performance disclosure can significantly reduce pollution, even in settings where environmental NGO's play little role and there is no formal channel for public participation in environmental regulation.

Right now, Jiangsu Province is extending environmental information disclosure practice in 13 cities within the province.

Because of the success in the pilot program, SEPA is now promoting to extend the disclosure program to major cities for environmental protection. Some provinces and cities such as Jiangsu Province have already started to implement the system.

3.4.2 Eco- and Environmental Campaigns

Eco- and environmental campaigns are promoted by the Chinese government to raise environmental profile and integrate environment into social and economic development. The campaigns have not only raised the awareness of the general public and officials in other department, but also served as opportunities to increase environmental profile, integrate environment consideration into macro economic and sectoral policies at various levels. Some program led by SEPA, some provincial governments and city governments have contributed to eco- and environmental campaigns. For example, program of environmental model city recognition and the program of recognition of environment benign towns led by SEPA have attracted many cities and towns to participate. Local governments of cities and towns, not only their environmental divisions, coordinate their efforts to get such recognition. In this way, environmental problems are easier to be solved with the commitment of local governments.

At the national level, SEPA is promoting such campaigns by organizing recogonition of national environmental model city (NEMC) and ecological model district (EMD). Right now there are 32 cities being granted as National Environmental Model City by SEPA. Over 300 districts have been selected as Model Eco-district by SEPA.

Eco-orientation has been new development trend for provinces, cities and industrial parks these days. Therefore, there are eco-province development planning, eco-city development planning, eco-industrial park development planning in provinces, cities and parks. These planning are always taken charge by governments at corresponding levels, not their environmental departments and involved by many relevant departments. Therefore, environmental profile has been raised and environmental consideration has been integrated into macro economic and sectoral policies and plans.

3.5 Overall Evaluation

Cao Dong and Wang Jinnan (1999) had done expert suvery on the evaluation of 18 instruments applied for industrial pollution control in PRC. The criteria used for such evaluation are environmental effectiveness, economic effectiveness, fairness, administrative cost and acceptance. The evaluation results are shown in the following table. From the table, pollution levy system, environmental impact system and SSMC for pollution control ranked the top three in order (Table 9). The assessment is confirmed by local environmental professionals when discussing it in some field missions by authors.

Table 9 Evaluation Results of Main Instruments Applied to Control Industrial Pollution in PRC

No.	Instruments	Environmental Effectiveness	Economic Effectiveness	Fairness	Administrative cost	Acceptance	Overall performance
1	Environmental Impact Assessment	8.17	8.05	7.17	7.43	8.33	39.2
2	Three simultaneousness system	8.17	7.17	6.27	7.85	7.00	36.5
3	Pollutant Discharge permit system	7.93	6.85	7.5	6.77	7.42	36.5
4	Deadline for pollution control	8.00	6.75	6.75	7.18	6.08	34.8
5	SSMC for serious pollution enterprises	9.43	7.67	6.97	7.93	6.83	38.9
6	Pollution discharge reporting and permit system	7.33	7.25	7.94	6.58	6.58	35.7
7	Centralized pollution control	7.75	8.25	6.75	5.63	5.00	33.4
8	Target responsibilities system for enterprises	4.75	5.10	4.17	4.85	4.97	23.8
9	Total load control system	8.42	7.25	7.83	7.00	7.25	37.8
10	ISO14000 auditing	5.58	5.6	4.00	4.00	3.42	22.6
11	Cleaner production auditing	7.83	8.00	7.00	6.83	6.43	36.1
12	Public and media supervision	5.33	6.5	5.83	7.02	5.53	30.2
13	Pollution levy system	8.12	8.35	8.00	7.28	8.17	39.9
14	Fund for Three simultaneousness	4.83	3.85	3.83	5.08	2.75	20.3
15	Subsidy for pollution reduction	5.17	4.68	3.91	4.25	4.75	22.8
16	Emission trading	6.25	6.67	6.5	5.92	4.92	30.3

Note: scores assigned to each criterion are as following: poor (1-5.0), general (5.1-7.0), good (7.1-8.5), better (8.6-10). The full score for each criterion is 10 and the total score is 50.

4. ENVIRONMENTAL FINANCING: WHO PAYS FOR ENVIRONMENTAL PROTECTION?

4.1Current Status of Environmental Investment

With the further reform of the economic system and the investment and financing system, the mechanism for environmental investment and financing is experiencing great change, which is characterized by the multi-channels of investment.

4.1.1 Total Investment

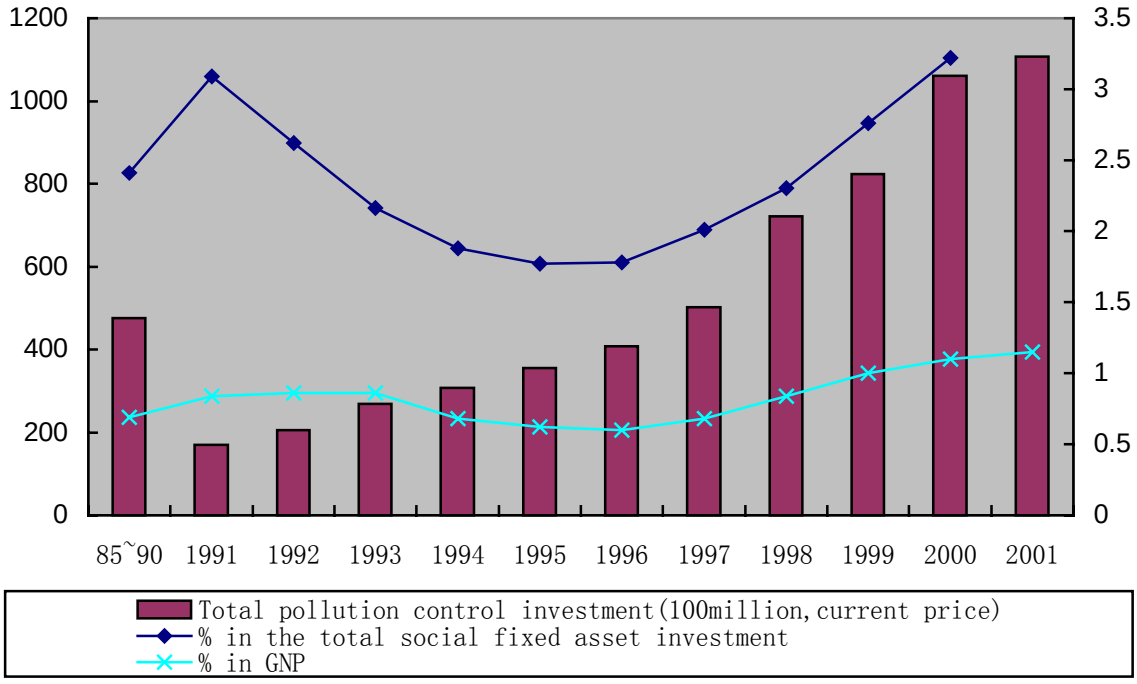
Environmental pollution in PRC is becoming more and more concerned by the government and the whole society. The total investment in treating environmental pollution was increased gradually from 1986 to 2000, with the total investment during the Eighth Five-year Plan period being 2.7 fold of that during the Seventh Five-year Plan and the investment during Ninth Five-year Plan period reaching 344.75 billion RMB and being 1.6 fold greater than that during the Eighth Five-year Plan period (Figure 8).

The total investment in environmental pollution control accounted for a small portion of the GNP of the same period with a 0.7% or so during the seventh five-year plan. And this proportion during the eighth five-year plan was 0.73% which is somewhat higher than that during the seventh five-year plan. While for the first 2 years during the ninth five-plan, this proportion has been decreased a little. Till 1998, the investment proportion has been increased and in 1999, the proportion reached 1% for the first time with an amount of 106.07 billion RMB. During the ninth five-year plan, the environmental investment is 360 billion RMB, accounting for 0.93% of the GNP of the same period.

Besides, the proportion of the environmental investment to the total investment for the fixed properties of the whole society showed the similar fluctuation with a higher proportion during the late period of the seventh five-year and the early period of the eighth five-year. While the proportion fell a little in the late period of the eighth five-year and kept increasing during the first 4 years of the ninth five-year period. All of this demonstrated that the investment in environmental protection is closely related with the economic development of the State and on

the other hand environmental investment has been increased with the enforcement of the environmental policies and the law.

Figure 8 Total environmental investment and its proportions in GNP and the societal fixed properties.



Source： China Environmental Yearbook, 1996;…;2001.

Comparing with the OECD countries, the environmental expenditure in PRC was not that low and in the averaged level in 2000 (table 10). While what makes PRC different from OECD countries is that they are facing the different stages from pollution control. PRC is in its beginning stage for pollution control and facing severe pollution problems and has to solve lots of new and bequeathed. While the pollution control in OECD countries has been in advanced stage where pollution control is under control. Therefore, more environmental investment is needed in PRC.

Table 10 International comparison on environmental investment

Country	Expenditures on pollution prevention to GDP	The proportion of investment in pollution control to the government investment
PRC	1.15（in 2001）	3.2(in 2000)
Switzerland	2.1	3.1
Netherland	1.9	3.1

s		
Austria	1.7	3.7
Japan	1.6	3.0
USA	1.6	3.4
Germany	1.5	3.2
France	1.2	1.8
Sweden	1.2	1.8
Canada	0.9	1.7
Italy	0.9	2.2
Australia	0.7	1.9
Portugal	0.7	1.6

Source: The data for PRC is the 2000 data selected from China Environmental Yearbook2001 and China Statistics Yearbook 2001. The data for other countries are the 90s data obtained from OECD Statistic Data 1996

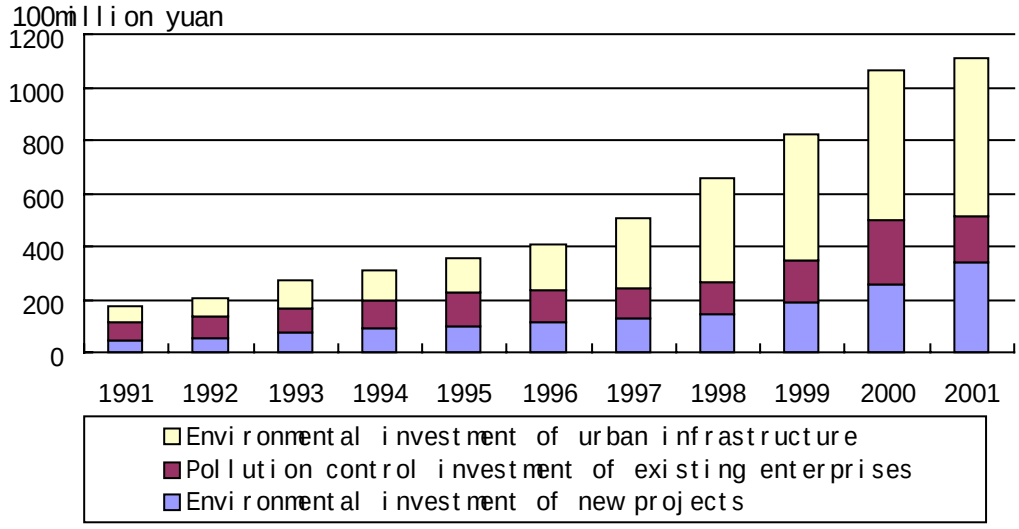
4.1.2 The Distribution and Sub-fields of the Investment

During the recent 10 years, the structure of the investment in environmental protection has changed as shown in Figure 8. The Figure shows that the investment in building the infrastructural facilities for environmental protection has been increasing. Till 2000, the investment in building municipal infrastructural facilities for environmental protection exceeded that used to control environmental pollution. Among all the projects for treating industrial pollution, the projects for wastewater treatment and air pollution control were the two major subfield for investment.

The distribution of environmental investment shows that though the total investment has been increased in all the sub-fields, their proportions are greatly changed. The environmental investment in old enterprises hasn't shown significant changes, but its proportion in the total environmental investment has decreased greatly with a 41.18% during the Seventh Five-year Plan period, a 35.54% during the Eighth Five-year Plan period and a 16% in 2001. The environmental investment in newly-built enterprises has been increased annually, with its proportion in the total investment fluctuating from the 26.57% during the Seventh Five-year Plan period, the 27.91% ring the Eighth Five-year Plan period to the 30% in 2001. The amount and proportion of environmental investment in municipal infrastructural facilities has been greatly increased with an investment of 15.364 billion RMB during the Seventh Five-year Plan period, 47.75 billion RMB during the Eighth Five-year Plan period to the 185.714 billion RMB during the Ninth Five-year Plan period and with its proportion being increased from the 32.25% during the Seventh Five-year Plan period to the 54% during the Ninth Five-year Plan period which

surpassed half of the total investment. The trends of environmental investment distribution are shown as figure 9.

Figure 9 Trends of environmental investment distribution



As for the projects for controlling industrial pollution, the two major investment sub-fields are wastewater treatment and air pollution control. In 1996, there were 2647 projects for wastewater treatment with a total investment of 4.74 billion RMB and an averaged investment of 1.79 million RMB. In 2000, there were 8759 projects for wastewater treatment with a total investment of 10.96 billion RMB and an averaged investment of 1.24 million RMB (See table 11).

Table 11 Projects for industrial pollution control and the status of investment

Year	Wastewater treatment		Exhaust gases control		Solid waste disposal		Yawp Prevention		Others	
	Projects	Amount (Million RMB)	Projects	Amount (Million RMB)	Projects	Amount (Million RMB)	Projects	Amount (Million RMB)	Projects	Amount (Million RMB)
1996	2649	4741.0	3012	2808.0	450	909.8	504	95.9	375	1007.9
1997	4243	7279.1	3431	2872.3	425	630.9	493	82.8	393	778.8
1998	7376	7167.9	5153	3238.1	628	872.4	551	76.6	666	849.5
1999	n.a.	6880	n.a.	5100	n.a.	830	n.a.	90	n.a.	2370
2000	8759	10959	10552	9092.4	622	1146.7	454	601.9	683	2143.9

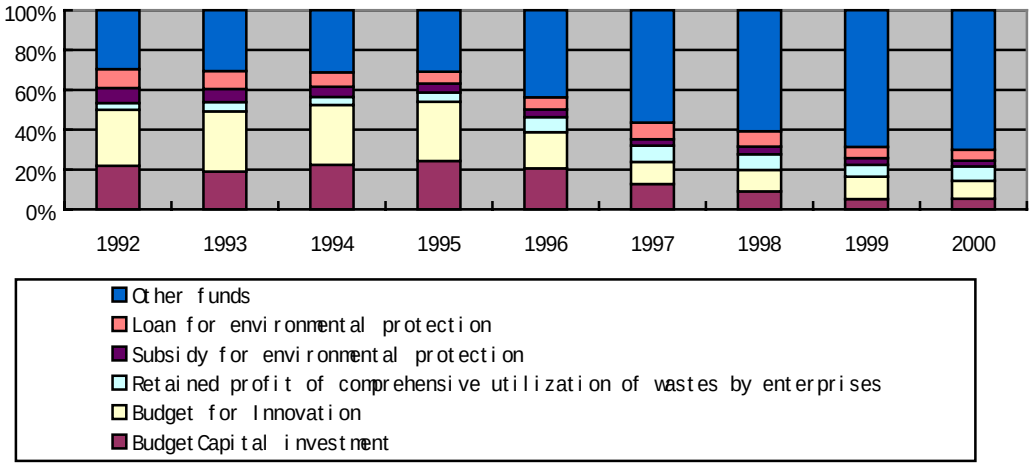
Source: China Environment Yearbook 1997：496-7, 1998：607-8, 1999：534-5

4.1.3 Investment Sources

Investment sources for old enterprises to control pollution

The pollution control in old enterprises is very important in environmental protection in PRC. In 1984, among the 8 financing channels prescribed by the State Council, 6 were related with the pollution control in old enterprises, as infrastructure construction funds, renovation and reconstruction funds, and subsidy for environmental protection, special funds for pollution control and loan from banks. During the Eighth Five-year Plan Period, the major environmental investment sources were budgeted infrastructure construction funds and budgeted renovation and reconstruction funds which accounted for more than 50% of the total funds. The funds sources were greatly changed during the Ninth Five-year Plan Period and the original funds sources deceased and other sources as self-raised funds by enterprises have been increased with a proportion greater than 60%. Meanwhile, foreign investment also shows an increasing trend(figure 10).

Figure 10 Funds sources for industrial pollution control



Source： China Environmental Yearbook，1993;…;2001.

Environmental investment in new projects

Four ministries including the State Planning Commission jointly issued Management on Environmental Protection in Construction Projects, which prescribed that the facilities for

preventing pollution and other pollutions of social effects must be design, constructed and operated simultaneously(known as three simultaneity in Chinese) along with the major part of project and after the facilities being operated, their emission must not exceed the emission standards of the province or municipality directly under the Central Government and the autonomous regions. Environmental investment in new projects, namely the three simultaneity environmental funds is an important part of the environmental funds for pollution control since a long period. Table 12 shows that the three simultaneity environmental funds is a stable source for environmental investment in PRC and shows a continuously increasing trends in the 90s with its increasing pace speeded in the recent two years. The three simultaneity environmental funds in projects keeps accounting for 4% or so of the expected total three simultaneity environmental funds, which indicates that part for environmental investment has become a stable component of the project investment and played an important role in controlling new emission sources.

It should be stated that the three simultaneity environmental funds is closely related to the scale of the governmental investment in infrastructure construction and changes with the governmental investment in infrastructure construction. The increase of the three simultaneity environmental funds is the result of the increase of the investment in infrastructural construction and the high proportion of environmental investment in the project investment.

Table 12 Three simultaneity environmental funds in the expected total three simultaneity environmental funds in recent years

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Three simultaneity environmental investment (Billion RMB)	4.449	5.551	7.491	8.852	10.123	11.083	12.88	14.20	19.16	26
The proportion of environmental investment in the total project investment (%)	4.18	3.99	3.51	3.74	3.93	3.69	5.31	4.07	4.47	5.94

Source： China Environmental Yearbook1996;…; 2001. China Statistics Yearbook 1992;…;2001.

Environmental investment sources for building environmental infrastructure

In PRC, the increase of the capacity for treating sewage has always been less than the increase of the generation of sewage, from 1991 till 1996, municipal water supplying capability increased

by 10 million ton/day and from 1990 to 1998, the increase of the municipal sewage treatment capacity was 1.10million ton or so per day. Statistically, in 1999 there were 283 municipal sewage treatment plants nationwide, with a daily treatment capacity of 11.91 million ton. In PRC, the concentrated treatment rate of municipal sewage is only 31.7% and many municipal sewage treatment plants haven't been built with corresponding drainage. In this way, the role of municipal sewage treatment plants can't be brought full play and large amount of wastewater is being discharged into rivers and lakes. In America, in 1999, the treated rate of wastewater meeting Grade 2 or above of discharge standard reached 84% and in the 13 countries in Europe the coverage of drainage area reached 84% in 1983, 52~61% of the population was served by sewage treatment plants, and averagely every 10 thousand people owned one sewage treatment plant. In 1988, there were 476 sewage treatment plants in operation in Thames region with a treatment of 4.705 million m3 per day and each sewage treatment plant serving 33475 people. Comparatively, in PRC among the population of cities and towns, averagely every 1.5 million people owned one sewage treatment plant. Nine of the planned municipal sewage treatment plants had been fulfilled in Haihe region and five in Liaohe region had been finished. (Wang Yuqing, Lu Xinyuan, *et al*, 2001).

The investment in building municipal infrastructural facilities for environmental protection mainly come from the tax for urban construction and maintenance and the local financial appropriation with this investment showing an increasing trend in the recent years. Sharp increase in the investment was found during the ninth five-year plan period, indicating that the local governments put great emphasis on building infrastructural facilities for environmental protection and give more input in it in the recent years (Table 13).

In foreign countries the operation and investment in sewage treatment plants and waste disposal plants is mainly from the user charge from the consumers. While in PRC, the government manages and operates municipal sewage treatment plants and fiscal allocation becomes the major financial source to build and maintain sewage treatment plants, which leads to the singleness of investment channels, the severe shortage of funds, and the inseparateness of the government and the enterprises in management, the insapidness of enterprises and low profits. This frame severely hinders the growing of the wastewater treatment market, constricts the formation of a benign operating mechanism for waste water treatment. In recent years, the way of enterprisization or corporatization is being explored.

Table 13 Municipal environmental investment in infrastructure facilities during 1991-2000

(unit, billion RMB)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000

Total investment	5.58	7.15	10.63	11.31	13.08	17.08	25.73	38.89	41.19	51.53
The proportion of municipal environmental investment in infrastructural facilities to the total investment (%)	32.64	25.25	20.37	16.99	16.20	18.01	25.51	26.32	25.89	27.27

Source：China Environmental Yearbook, 1996-2001 and SEPA.

4.1.4 Contribution of Environmental Investment to Macro Economy

In general, people think that investment in pollution control is for bettering environment and has adverse effect on economy. In other words, investment in pollution control generates only social benefit and no economic benefit. The concerning studies show that pollution control enlarged domestic demands, built pollution controlling facilities, enhanced the capacity for pollution control, provided conditions for bettering environmental quality and met the demands on environmental quality. Meanwhile, investment in pollution control contributed to the national GDP, provided new job opportunities and drove the development of economy. In 2000, the investment in pollution control which accounted for 1.19% of GDP and the GDP generated accounted for 1.70% of the GDP(Table 14) (Xiaomin Guo2001).

Table 14 The comprehensive effect of investment and operation of pollution controlling facilities on economic development

Year	Investment in pollution control	Cost for operation environmental facilities	Net-added GDP	Net-added GDP/GDP	Net-added benefit	Net-added benefit /total benefit	Net-added Employees
	Million RMB	Million RMB	Million RMB	%	Million RMB	%	Thousand People
1991	17012	3442	17302	0.7940	5708	1.0434	4244
1992	20556	4532	18474	0.6887	5691	0.7895	3585.
1993	26883	6784	23491	0.6737	6698	0.6391	3876.4
1994	30720	9763	25839	0.5496	5481	0.3849	3696.8
1995	35486	11431	30155	0.5131	5957	0.3680	3095.3
199	37826	13968	38446	0.5632	6529	0.3666	3781.5

6							
1997	50240	16809	64276	0.8558	17398	0.8106	5525.9
1998	72580	17547	98048	1.2360	33170	1.4417	7718.8
1999	83220	18613	118731	1.4263	40238	1.7763	8684.3
2000	106200	24227	143846	1.5672	49441	1.8998	9610.3

Source：Guo Xiaomin，2001.

4.2 Environmental Financing in PRC

Presently, the environmental financing channels have formed a market-oriented system with multi-investors, based on the original eight channels. Nowadays, the planned financing channels dominate, complemented by private investment and other financing channels. With the further reform of the investment and financing system, the planned financing or the government controlled financing will be decreased gradually and statistics shows that financing from other channels depict an increasing trends.

4.2.1 Governmental Financing for Environmental Protection

The funds from the government are the principal sources of environmental investment, which refer to the funds within the budget and/or beyond the budget, and mainly include the budget for construction, the budget for renovation and reconstruction, municipal maintenance fee and emission charge etc..

Budgetary payment

Fiscal payout is the principal way to invest in environmental protection for the government, which is mainly spent in building municipal infrastructural facilities and carrying out regional key environmental projects. The major sources for fiscal income are revenue from taxes, regulatory and administrative charges and special funds. In the recent years, the part of the fiscal payout for environmental protection has been increased. For instances, the fiscal payout for environmental protection in 1997 and in 1998 in Beijing were 2.84 billion RMB and 4.53 billion

RMB, which account for 12% and 16% of the total fiscal payout of the same year respectively. Table 15 shows the details for the annual fiscal payout.

Table 15 Budget for environmental protection in Beijing

Projects	1992	1993	1994	1995	1996	1997	1998
Fiscal payout	7280.25	8280.71	9853.02	15440.28	18744.72	23639.40	28068.27
Environmental Investment						2840.60	4530.71
Of which:							
1. Urban environmental clean and maintenance (Landfill, disposal plants, waste gas control)	189.50	250.70	531.24	426.42	639.48	831.45	1914.32
2. Afforestation	24.17	27.93	37.94	36.24	40.84	41.82	35.48
3. Greening and gardening	23.68	37.50	57.42	80.69	88.51	95.04	107.26
4. Water and soil conservation	8.50	8.90	9.00	9.50	11.35	11.39	11.44
5. Watercourse treatment	9.00	9.60	9.70	11.10	9.20	8.90	7.60
6. Greening and cleanness of city rivers							11.00

Note: Funds are excluded in fiscal payout
Sources: Beijing Municipal Finance Bureau and Beijing Environmental Protection Agency

Issuing national bond

The continuously stable increase of the economy in PRC renders investor have confidence in national bond and offers great opportunity for PRC to issue national bond to raise funds for infrastructural facilities construction as well as offers a new channel of environmental financing. During the period of 1998~2000, the central government issued 360 billion RMB long-term national bond, among which 46 billions were used for ecology-restoration and environmental protection as started up the projects of regional ecology restoration, natural forests protection, natural pasture protection and the transformation of farming to forestry in the central and west part of PRC, supported the project for pollution control in Beijing areas, developed the project for controlling the advancement of desert in Beijing-Tianjin region, built 44 projects for water pollution control in the three rivers and the three lakes region. Issuing national bond drives the local government, enterprises and banks to invest in environmental protection, which offers

great financial support for the better environment quality and solving the severe pollution problems.

Environmental Protection Funds

Various kinds of environmental protection funds have been set up in PRC, which includes Governmental Funds, Investment Funds, Special Funds for Pollution Sources Control and Environmental Protection Funds etc. by their nature. The sources and financing ways and running mechanisms are different for these funds. Environmental Protection Funds plays the roles of an investor and the carrier of financing and bringing full play the role that Environmental Protection Funds is the key means to perfect the investment and financing system.

Presently, in some places, funds for controlling emission sources and environmental investment companies are built by using pollution charges. The efficiency of the free utilization of pollution charge was very low and the government was engaged in reforming allocation system, thus on 28th, July, 1988, the State Council issued Draft management on the payable utilization of pollution charge (the State Council No.10 order), in which part of the pollution charge would be used to set up special funds for pollution sources control, thus to provide loan for enterprises to control emission. Specifically, environmental protection agency open a special account for environmental protection funds in its appointed bank and the financial department transfers the planned funds into the Funds account. Then EPA will be in charge of selecting projects, and financial department check these projects followed by the loan to the selected enterprises.

Local environmental protection agencies are governmental organizations, which haven't qualified with the experience of how to manage funds effectively. In order to improve the utilization efficiency of funds and maintain its sustainability, in 1988 the State Environmental Protection Agency ratified the set-up of Shenyang Environmental Protection Investment Company. In June, 1993, on the basis of the piloted environmental investment company in Shenyang, the SEPA extended the pilot into 21 province, municipality directly under the Central Government and the autonomous regions as Hunan, Shanxi and Liaoning etc.. Besides, special funds for pollution control were set up in Tianjin, Zhejiang province, Liaoning province, Changzhou and Jinsha etc, by utilizing the funds from the World Bank and the pollution charge. Actually, these companies are affiliated to local EPBs and EABs are in charge of managing the

funds. The appointment and removal of personnel is decided by EPB. So they are not completely independently run environmental funds

These funds are mainly from the pollution charge as well as some local financial input. Since 1994, PRC has begun to prepare for setting up National Environmental Protection Funds, but till now, the National Environmental Protection Funds hasn't been set up.

Pollution charge

The pollution charge system in PRC was set up in 1979. After experiencing the more than 20 years development, the pollution charge system has built a comparatively complete laws and regulations system, which include the state laws, administrative regulations and departmental and local regulations etc.. More than 100 items of pollution charge standards of the following five categories have been made, i.e. wastewater, waste gases, solid wastes, noise and radioactive materials. According to the provisions, 80% of the pollution charge from the enterprises should be used as the supplementary funds for the enterprises or the administrative bodies to control the pollution sources, aiming to solve the problems of funds shortage for the existing enterprises. As a stable source for environmental funds, pollution charge plays an active role in abating and controlling the emission of pollutants. During the recent years, some 5 billion RMB had been used to prevent pollution annually. Table 16 shows the status of pollution charge and its use since 1991.

Table 16 The pollution charge and its use during 1991-2000

Year	Total revenue spent (Million RMB)		Used for			
			Subsidy for pollution control by enterprises		Subsidy for capacity building for environmental protection	
	Expense	%	Expense	%	Expense	%
1991	1760	87.6	1200	68.2	560	31.8
1992	2140	89.9	1400	65.4	740	34.6
1993	2450	91.4	1510	61.6	940	38.4
1994	2670	86.1	1620	60.7	1050	39.3
1995	3190	86.0	1770	55.5	1420	44.5
1996	3960	96.6	2320	58.6	1640	41.4
1997	4580	100.9	2660	58.1	1920	41.9
1998	4967	101.1	2730	54.9	2240	45.1
1999	5460	98.4	2780	50.9	2690	49.1
2000	6278	108.32	3712	59.13	2566	40.87
Total	37458	98.90	21702	57.94	15756	42.06

Source： China Environmental Yearbook，1992－2001， The over use of the emission charge in 1997 and 2000 is from the surplus of their very previous year respectively

Users charges

Wastewater treatment fee. Based on the users pay principle, in November, 1999, the State Development and Planning Commission, the Construction Ministry, jointly with the State Environmental Protection Agency issued the document for the enforcement of levying wastewater treatment fee, to advance the concentrated treatment of wastewater , thus to better control the discharge of municipal wastewater. As a matter of fact, some of the provinces and cities have begun to charge municipal wastewater treatment fee before the central government issued the paper. While the levied funds couldn't afford to maintain the normal running of wastewater treatment plants due to the low charge rate. Nevertheless, there is no uniform charge rate nation-widely due to the discrepancy of regional economic development, and the affordability of the local residents and the grade of the water being polluted. Local governments make their own charge rates with a range of 0.2~1.0 RMB per ton of water consumed and the charge revenue was used to help run wastewater treatment plants. Presently, it's found that in some cities water consumers have been charged be wastewater treatment fee before the wastewater treatment plants being set up. Even those consumers who haven't connected the drainage network have been charged, since the wastewater treatment fee is levied according to the amount of water consumption. In this way, the funds for building wastewater treatment plants could be raised. But whether it's rational deserves discussing, since consumers should be charged only after they were serviced according to the users pay principle.

Solid waste disposal charge. At present, solid waste charge system has been set up in such cities as Beijing, Nanjing, Zhuhai, Shanghai, Qiangdao and Shenyang etc., with the domestic waste being charged according to the amount on a month per family or a month per capita basis. In some cities the solid waste disposal fee was collected with water bills while in some other cities, the concerning persons in charge of collecting the bills. The solid waste disposal fee collected will be deposited to the special account only for solid waste disposal purpose as maintenance of community sanitation, removal of the daily waste, the construction of facilities for environmental protection and the salaries of concerning workers. See Table 17.

Table 17 Solid waste disposal charge practiced in some cities

City	Charged Objectives	Charging Standard	By

Beijing	Permanent resident	3RMB/month/capita	Street Office
	Non-permanent residents	2RMB/ month/capita	
Nanjing	Unit	4RMB/ month/capita	Trusting Banks
	Resident	5RMB/month/Household	Toll collector
	Guest houses and Hotels	4RMB/Bed/capita	Trusting Banks
	Building sites	5RMB/ton	Managerial Office of Municipal waste solid
Zhuhai	Households in cities and towns No married	8RMB/month/Household 3RMB/ month/capita	Real Estate Co. Village or community servicing office
	Village household and fishing household with cities and towns No married	5RMB/month/Household 2RMB/ month/capita	Village servicing office
Hohehot	Resident Non-permanent and tourist population	2RMB/ month/capita 3 RMB/ month/capita	Real Estate Co. or Environmental maintenance department
Beihai	Resident	1.5RMB/month/capita	

The transfer of ownership

The transfer of ownership for environmental infrastructural facilities includes the enterprisizing or renting of the facilities and adopting BOT mode. Traditionally, environmental infrastructural facilities are public belongings, which demand the State's investment to built and operate. To gain investment via transferring the operating rights is a popular financing way internationally, which can attract private investment from in and abroad. In recent years, there are some cases in treating municipal sewage and disposing waste by adopting BOT or BROT way in PRC, which become an important channel in environmental financing for infrastructural facilities. For instance, Beijing Jinyuan Environmental Protection Company and Beijing Sound Environmental Protection Company have built sewage treatment plants in Beijing and Hubei in succession. (For details, see special column 2). How to deal with the charge rate rationally for sewage treatment plants is the key factor affecting BOT financing approach in sewage treatment. The present running cost for sewage treatment is about 0.5RMB/ ton, the investment in sewage treatment plant is 2100 RMB/ton/day. Therefore, to build a sewage treatment plant with a daily treatment capacity of 100,000 ton and an expected operation period of 20 years, the sewage treatment charge rate of 1.05 RMB or so/ m3 should be levied to collect investment and maintain

its operation, but it's difficult to adjust the sewage treatment charge to the amount of this level. Besides, as the same with the other BOT projects, they are facing the risk of governmental credit, and the problems concerning the sources for the project funding and the building of charging system for environmental services etc..

4.2.2 Financing in Enterprises Producing Environmentally Sound Products

Financing in Stock Market

In 1996, Shenyang Special Environmental Protection Facilities Manufacturing Co. Ltd became the first environmental protection enterprises to raise funds from the public. Till 1999, there are already 30 enterprises concerning environmental protection being listed on the stock market, which form the environmental board in the securities market. The environmental board in both Shanghai Stock Market and Shenzhen Stock Market shows an outstanding achievement of the listed enterprises, which boost up the confidence of investors in environmental enterprises. Being listed in the stock market, the financial channel has been enhanced for the environmental industry and pollution controlling industry, which shake off the shortcoming of the ordered and guiding sources as the major part and make environmental financing market-oriented. The part of the funds via financing in Stock Market in environmental prevention is limited and still need regulating.

Enterprises bond

As the same with the stock shares, bond has strong function in raising funds. But due to reasons of management system, bond financing accounts for only a minute part of the total securities market. In 1993, Regulations on Management of Enterprises Bond was issued in traffic construction, communication construction, municipal construction, irrigation works and high-tech projects. Statistics shows that up to now, the accumulatively more than 200 billion RMB bond has been issued and mainly by the state-owned large enterprises and large projects. In recent years, the issued bond by enterprises only has 30 billion or so and in 2000, the bond was even less with an amount of a little bit more than 10 billion RMB. While at the same period, financing by stock shares amounted to more than 140 billion RMB. Compared with stock shares, the cost for issuing enterprise bond is lower and the management structure and bonus are free of

impact. Furthermore, the bonus of shareholders can be increased via financial approaches, viz., to utilize outside investment to enlarge the scale of the enterprises. There are some enterprises attempting environmental financing by issuing bond, but there are no environmental enterprises set foot in it.

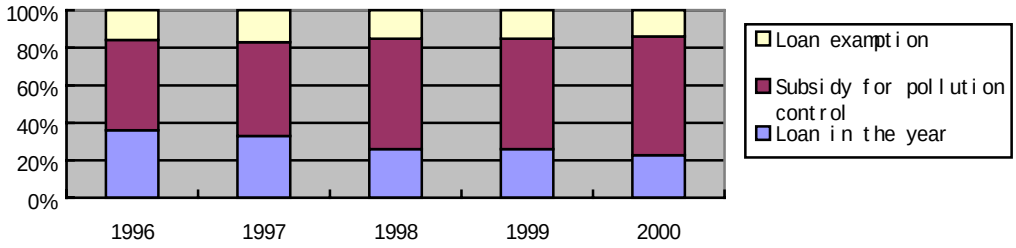
Loan from banks

Loan from banks is the major leasehold form. In 1995, China People's Bank prescribed in the Notice of China People's Bank on Implementing Credit loan policies and Strengthening Work Concerning Environmental Protection ({1995} No. 24 issued by China People's Bank) that for those projects and enterprises engaged in environmental protection and pollution treatment, the financial departments of different levels should give preference according to their economic profits and reimbursing capability. For those state key environmental projects with good environmental benefit, low economic profit but being able to reimburse, the banks such as China Development Bank should provide necessary support in loan after ascertaining their reimbursement. As it is always the case that those enterprises causing pollution severely are those badly-operated. And these enterprises with low economic profit are always facing tough task in controlling pollution. Therefore, these enterprise are lacking funds in controlling pollution, and can't get loan due to their economic conditions.

Subsidy for controlling emission sources

Subsidy for controlling emission sources refers to the funds used to assist the enterprises to control emissions, which is allocated as subsidies or loaned from the emission charge. Early before 1998, enterprises were allowed to use pollution charge freely. After 1988, free use of emission charge was gradually changed to loan. While during the Ninth Five-year Plan period, the proportion of loan has been decreased and the fund used to exempt the previous loans has been increased accordingly(See Figure 11).

Figure 11 Subsidy used for enterprises to control their emission sources



4.2.3 The Role of Banks in Environmental Financing

With the reform of the financial system, mainly the banks system, banks are playing an important role in environmental protection: one is to implement the concerning policies of the State to provide loan on a favorable interest to environmental protection and technical renovation projects, the other is to provide loan to those enterprises producing environmental protection products with good economic benefit according to pursue their economic benefits.

With the consummation of the investment and financing system, banks will play a more important role in environmental financing. On one hand, most of the environmental financing counts on banks, and banks should offer good business services, on the other hand, banks have the functions of investment and financing. Thus, bringing full play the role of banks should be emphasized.

On the operational basis, banks can be divided into banks subjected to concerning policies and commercial banks and the role of the two categories of banks is somewhat different in environmental investment and financing. Banks subjected to concerning policies focus on carrying out the governmental environmental policies, granting some loans on a favorable interest in compliance with the policies. While commercial banks mainly invest in some profitable environmental projects. Presently, in PRC, banks subjected to concerning policies play a more important role in environmental financing.

4.2.4 Donor Supported Environment Activities

Overall

There has been increasing collaboration between the PRC government and multilateral, bilateral and non-government organizations (NGOs) in the area of environment. This increase coincides with the PRC White Paper on Agenda 21's call for increased technology transfer and development funds in 1993. The United Nations Development Program (UNDP) prepared a comprehensive review of donor related environmental activities in PRC between 1993 and 1996. UNDP's review is the primary source of the following documentation. The review includes 405 projects totaling $3,192 million in expenditures. Of the 405, 15 projects account for 68 percent of total expenditures. UNDP reports that environmental investments from donors constitute 20% of total environmental spending in the PRC. Donor activities are clearly an important aspect of the PRC environmental agenda.

Of the 405 projects reviewed, 217 are from bilateral donors, 164 are from multilateral donors and 24 are from NGOs. By volume, multilateral donors account for $2,431.4 million; bilateral donors $756.5 million; and NGOs $3.2 million. It should be noted however, that due to difficulties in obtaining data on NGO activities, actual activities are likely to be larger than documented. Of the bilateral assistance, Germany contributed $297 million or 39 percent. Next come Japan at 13.5 percent; Australia at 12.9 percent; and Sweden at 9.1 percent. Of the multilateral assistance, 60 percent ($1,906.4 million) comes from the World Bank, while ADB contributed 15 percent ($359.8 million) in the period 1993-1996.

Seventy-eight projects, constituting 56 percent of commitments between 1993 and 1996 were classified as capital assistance. Loans with a technical assistance component accounted for 25.7 percent, while purely technical cooperation projects (including pre-investment activities) constituted 11 percent of investments. Investment-related technical cooperation and food aid accounted for the rest of commitments.

Japan's Environmental Work in PRC

According to China Environmental Series, Issue 5(2002), there are 30 projects with the funding over 200 billion yuan from Japanese government. These sino-Japanese projects included into the suvery were those initiated between 1996 and 2001[4]. Of which, 11 are funded through Japan International Cooperation Agency (JICA) and 20 are funded through Japanese Bank of

[4] There are 13 Sino-Germany environmental cooperation projects included in the survey, imitated between 1994 to 2001, with a total funding of 231 million Euro (approximately1.8 billion yuans)

International Cooperation (JBIC). The scope of JICA projects focus on capacity building for national environmental management, biodiversity management and training in air quality management, conservation and biodiversity while most of JBIC projects focus on water management. Less focus is given to policy studies.

5. CONCLUSION

After more than of 2 decades of work, PRC's social environmental management system has been progressively established and perfected. For governmental administration, a hierarchy of environmental institution has been established with SEPA as the highest environmental administration. As there involve several governmental agencies at various levels, coordination is needed and inevitable. Public participation and media supervision have been increased in environmental protection. The increasing practice of eco-planning at various levels is seen as new form of integrating environment into macro economic and sectoral policies and plans.

Many instruments have been tried out in environmental protection in PRC. Laws, regulations, standards and rules for environmental protection have been gradually perfected. Recent development in environmental legislation has put PRC in lead position. Environmental systems are under going changes. The use of economic instruments and voluntary instruments have been increasing as PRC enters socialist market economy and more stringent enforcement of environmental laws and regulations. It is time to sort out and establish a clear and efficient management framework in which all instruments can play their roles.

Environmental investment and financing has made great progresses, but there are still limitations existing as the narrow investment channel and the simple financing approach, especially in building the infrastructural facilities for municipal sewage treatment and solid waste disposal. Environmental investment from the government is limited, and the societal capitals, private investment, enterprises investment, and foreign investment are needed to broaden the investment channels. It's imperative to strengthen the environmental awareness of the enterprises and the government, to properly manage the finance, the funds of the enterprises ownership, credit funds, societal capital and foreign capital, and to build a environmental investment and financing mechanism with multi-investors.

Increasing collaboration between PRC and multilateral, bilateral and non-government organizations in environment has helped PRC in obtaining international funding and know-how needed for improving environment and pollution control.

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Research Paper No.3 [China: 3]

Evaluation on the JICA's Cooperation of Sino-Japan Friendship Center for Environmental Protection

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Executive summary

This report includes six parts as follows:

The first introduces the background and the objectives of thisresearch, the employed methods and the framework of the report.

The second is the overview of Japan-China environmental cooperation, consisting of brief historic review, profile of programs, projects and activities, relevant bilateral agreements and accords as legal basis, institutional framework for implementation of Japan-China environmental cooperation, a brief introduction of Sino-Japan Friendship Center for Environmental Protection.

In the third part, the overview of domestic background in China is presented, including national goals of socioeconomic development and microeconomic performance, national environmental goals, national environmental programs and plan and performance, recent development in environmental legislation, environmental regulatory framework and description of the roles of different stakeholders in environmental regulatory framework.

The fourth and the fifth introduce the case study on the role of Sino-Japan Friendship Center for Environmental Protection. In the two parts, the number of programs, projects and activities implemented by the Center in the latest five years is listed, followed by the analysis of environmental and socioeconomic impacts of the Center's projects and activities within the context of Sino-Japan cooperation.. The Center promotes the improvement of the environmental management system in China from many aspects, such as supporting technical support and information support for decision-making process; enhancing analytical capacity, building measurement and monitoring capacity and improving public environmental awareness. The Center has made great achievements in enhancing institutional capacity of Chinese national and local governments, improving researching capacity of Chinese environmental protection researchers, promoting technology transfer to China, and appealing broader stakeholders to participate in the environmental protection activities.

The sixth part draws several conclusions and makes some recommendations. Sino-Japan Friendship Center for Environmental Protection is expected to play more important roles in environmental protection in China through improvement of the facilities as well as through the energetic activities of experts and staff members, covering wide-ranging areas from R&D to the

collection and analysis of information, development of strategies and policies, human resources development and education on environmental protection. The Center should emphasis their work on providing high-quality support to the decision-making and enhancing the environmental management; making greater endeavor to promote wider participation of different stakeholders including individual citizen, NGOs, private sectors, academia, media, and others; extending their cooperation with other government departments; considering combining poverty alleviation with environmental protection, and making efforts to deal with complex global environmental problems.

At the end of this report, the annex lists the important programs, projects and activities implemented by the Sino-Japan Center for Environmental Protection in the past five years as well as references.

1.0 Introduction

1.1 The background and the objective of the research

As the world moves from the 20th century into the 21st century, the focus of global economic development is projected to increasingly shift to the Asia-Pacific region. However, the problem of environmental degradation is an issue which must be dealt with. China, as a country with the world's largest population and currently charting dramatic economic growth, also faces the serious environmental problems. Chinese environmental protection needs international cooperation, especially needs the close cooperation with her neighbor country— Japan. In the past twenty years, Japan-China environmental cooperation has gotten rapid development and achieved a great deal of achievement.

In order to improve the effectiveness of Japan-China environmental cooperation further, it is needed to assess the role and impacts of the Japan-China environmental cooperation programs, projects and activities. The primary objective of the research is to take the Sino-Japan Friendship Center for Environmental protection as a case to examine the role of the Center in the social environmental management system in China from the local expert's view..

1.2 The methods employed in this research

The methods employed in the research are as follows:

Literature research is conducted throughout the research. By internet, relevant books and research reports, related material was collected, especially for overview of Japan-China environmental cooperation, overview of domestic background in China.
Expert interview was also implemented in this research. The introduction of Sino-Japan Center and information of detailed projects implemented by the Center was given by interviewing experts from the Center and SEPA.

Case study was conducted in the whole research. As mentioned above, the research takes the Sino-Japan Friendship Center for Environmental Protection as a case and intends to assess the impacts of Japan-China environmental cooperation programs based on a case study.

1.3 The framework of the report

The report includes six parts.

The first part is introduction, including the background and the objective of the research, the methods used in the research and the framework of the report.

The second part is the overview of Japan-China environmental cooperation, consisting of brief historic review, profile of programs, projects and activities, relevant bilateral agreements and accords as legal basis, institutional framework for implementation of Japan-China environmental cooperation, a brief introduction of Sino-Japan Friendship Center for Environmental Protection.
In the third part, the overview of domestic background in China is presented, including national goals of socioeconomic development and microeconomic performance, national environmental goals, national environmental programs and plan and performance, recent development in environmental legislation, environmental regulatory framework and description of the roles of different stakeholders in environmental regulatory framework.

The fourth part and the fifth part introduce the case study on the role of China – Japan Friendship Center for Environmental Protection. In the two parts, the number of programs, projects and activities implemented by the Center in the recent five years is listed firstly, and the environmental and socioeconomic impacts of the Center are analyzed. The Center promotes the improvement of the environmental management system in China from many sides, such as supporting technical support and information support for decision-making process; promoting the enhancement of analysis, measurement and monitoring capacity and environmental awareness of the public. The Center has made great achievements in enhancing institutional capacity of Chinese national and local governments, improving researching capacity of Chinese environmental protection researchers, promoting technology transfer to China, and appealing more broader stakeholders to participate the environmental protection activities.

The sixth part gives some conclusions and recommendations. Sino-Japan Friendship Center for Environmental Protection is expected to further through improvement of the facilities as well as through the energetic activities of experts and staff members to act as the base for environmental protection activities in China, covering wide-ranging areas from R&D to the gathering and analysis of information, formulation of strategies and policies, human resources development and education on environmental protection. The Center should emphasis their works on providing high-quality support to the decision-making and enhancing the environmental

management, making greater endeavor to broadening participation of different stakeholders: individual citizen, NGOs, private sectors, academia, media, and others, extending their cooperation with other government departments, considering combining poverty alleviation with environmental protection, and making efforts to deal with complex global environmental problems.

2.0 Overview of Japan-China environmental cooperation

2.1 Brief historic review

Along with the economic development, environment pollution and ecological degradation have been serious. Environment problem has been a phenomenon coming to exert a grave impact on the planet as a whole and also has been a prior problem some areas concern about. Since entering into the eighties, with the continuously rapid economic development of China, Environment problem has been a problem standing out. Chinese government has done much to protect environment but has also been confronted with many difficulties and serious tasks. Japan, a country next to China, and which has succeeded in surmounting environmental challenges in the past, has paid attention to environment problem in China and regarded environmental cooperation as one of the important bilateral cooperation. Japan has gradually built up personnel intercourse and technology cooperation, established official mechanism and increased free assistance in the environmental field. (Zhijia Wang, 1999)

Japan-China environmental cooperation can trace back to the seventies. In 1977, Japanese environmental delegacy visited China for the first time. After this, two countries' environmental intercommunion has been frequent via all kinds of channels. Graduate schools, universities and other folk organizations between Japan and China have arranged a great number of activities such as exchange visits, training, seeing about, workshops and some technology cooperation programs.

Chinese government has attached importance to Japan-China environmental cooperation all along. On May 28th, 1994, two countries' governments signed 'China-Japan environment protect cooperation agreement'. In December of the same year, both sides held the first meeting of Japan-China environmental cooperation committee and approved a group of programs. In December 1996, 40 environmental technology cooperation programs were ratified in the third meeting. Among these 20 formal programs and 20 optional programs.

At the same time, Japan-China folk environmental cooperation has been developed abroad relying on Sino-Japan Friendship Center for Environmental Protection, such as personnel training, environment scientific research, environmental education. Cooperation has been more and more flourishing by the local channel.

In a word, Japan and China have made much progress in the environmental intercourse and cooperation. The characters are: cooperation fields are wide, the content is abundant, the levels are diverse and personnel intercommunication is frequent.

2.2 Profile of programs, projects and activities within the Japan – China cooperation framework

There are different levels of programs or projects within the Japan-China environmental cooperation framework, including government level, municipalities level and corporate level.

Firstly, we can see many programs, projects and activities in the government level.

In 1988,when the Japanese Prime Ministry Takeshita Noboru visited China, he put forward that Japanese government provide 10 billion yen of grand aid to build Sino-Japan Friendship Center for Environmental Protection, which got Chinese government's active response. The project was approved and began to build on July 7th, 1991 and built up in May, 1996. In order to guarantee the favoring running of the Center, special technology cooperation plan was implemented from the year of 1992. The plan was signed by SEPA and JICA, carried out by JICA. The first period of the plan was from September of 1992 to August of 1995, and the second from February of 1996 to January of 2001. The comprehensive technical cooperation included JICA sending experts to China, accepting research staff for the study in Japan, providing instruments, etc.

In 1996 'Japan-China environmental cooperation forum' was established in order to strengthen the intercourses and dialogues between two countries in the environmental field. The first forum was came off in 1996 in China, and the second in 1997 in Japan. In the first meeting, both sides were convinced of that in after years environmental issues would be prominent in China, a country charting dramatic economic growth, so the international including Japanese assistance and cooperation should be very necessary to China to protect environment and achieve sustainable development.

In September of 1997, in the period of the former Prime Minister of Japan Hashimoto Ryutaro

visiting China he brought forward to establishing ‘Japan-China environmental cooperation plan facing the 21st century ’, mostly including providing 20 million dollars of grand aid to help 100 cities in China to build environmental information system, developing 2-3 Japan-China environmental cooperation model cities, reducing the credit rate of the environmental projects to China and actively promoting establishing the East Asia Arid Rain Monitoring Network.

Also in September of 1997, seminar on environmental and economic policies towards sustainable cities in APEC, held in China, received active support form Japanese government. Japan sent many experts and provide fund assistance, helping the seminar held successfully.

Recently, as one of the four basic principle of its ‘ODA outline’, the Japanese government has defined ‘compatibility between the environment and development’ as one of the goal, with China also positioned as a key sector of cooperation in the environmental field. Under the fourth series of yen credits to China, environment-linked projects represent a major share 15 of the 40 projects in the first half (three years) of the program. In terms of value, this works out to 88 billion yen, or approximately 15 percent of the total of 580 billion yen.

The Ministry of International Trade and Industry (MITI) is currently advancing the ‘Green Aid Plan’, a program which seeks to put to work Japan’s experience and technology in formulating pollution countermeasures to contribute to improving the problems of pollution in developing countries. The Environment Agency, meanwhile, is working to form an East Asia acid rain monitoring network, and promoting other efforts in a concerted push to systemize acid rain measurements.

Secondly, positive approaches have been advance by individual municipalities in both nations. The leading examples are Kita-Kyushu City in Japan and Dalian City in China, and Hiroshima City in Japan and Chongqing City in China. Besides these, about 30 other municipalities are promoting programs based on ‘friendship city’ relationships.

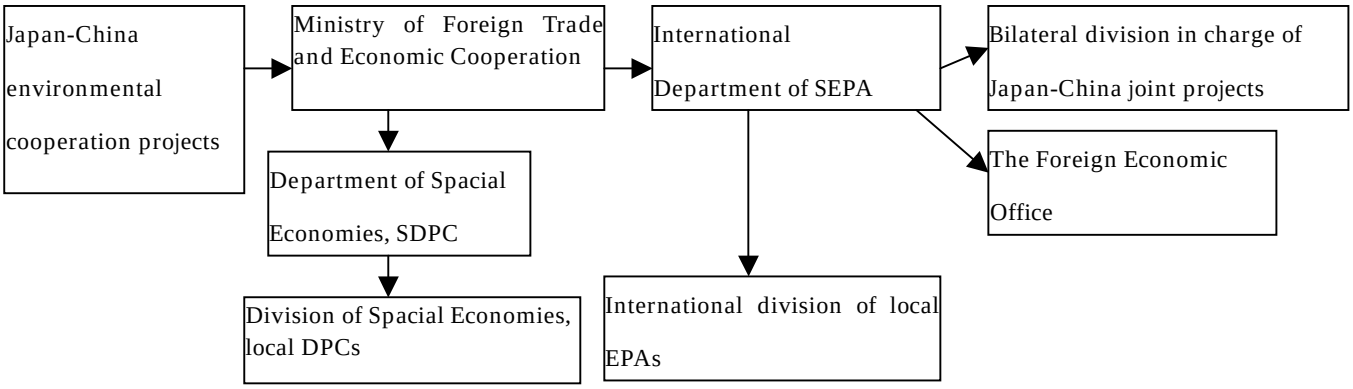
Lastly, at the private sector level, trainees were hosted in Japan and engineers were sent abroad through JICA, regular exchanges and seminars were sponsored by industry groups, and various other approaches were adopted over a broad sphere ranging from technical guidance to the establishment of independent corporate foundations.

2.3 Legal basis: relevant bilateral agreements and accords

'Sino-Japan environment protect cooperation agreement', signed by two nations' governments on May 28th, 1994, is the basic legal basis for carrying on corporate environment protect cooperation programs and projects.

2.4 Institutional framework for implementation of Japan-China environmental cooperation

Chart 1: institutional framework for implementing cooperation projects



As is shown in the above chart, firstly, the Foreign Economic and trade Ministry receives Japan-China environmental cooperation projects and sends these projects through two channels, sending to the International Department of State Environment Protection Administration (SEPA) or sending to the Area Department of State Development Plan Committee (SDPC). In the former channel, the International Department of SEPA delivers cooperation projects to bilateral division or the Foreign Economic Office or the International Department of local EPA in the SEPA system. In the latter channel, these projects are implemented by the Area Department of SPDC or the Area Department of local PDC in the Area Department of PDC systems.

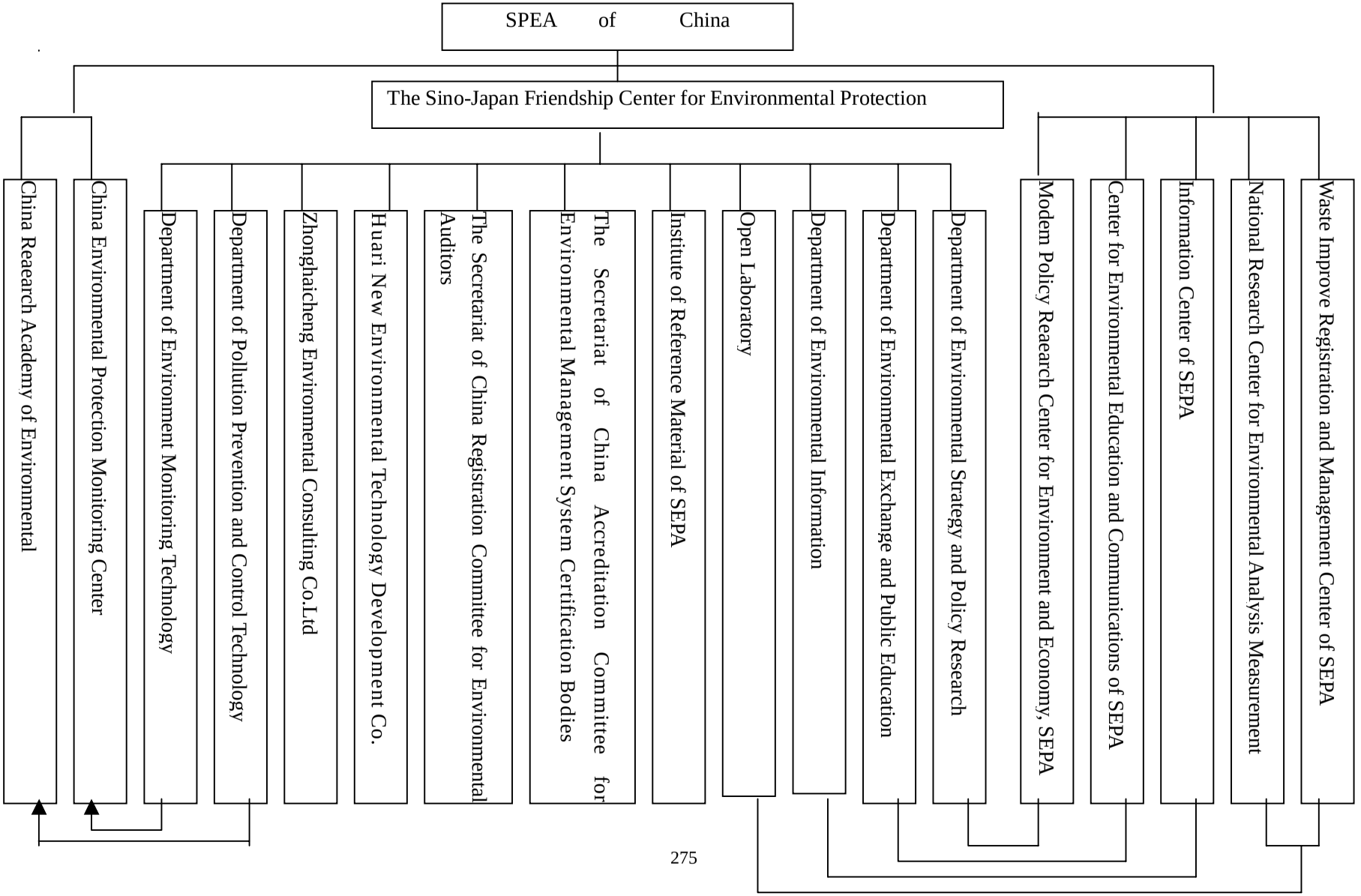
2.5 Sino-Japan Friendship Center for Environmental Protection: a brief introduction

The Sino-Japan Friendship Center for Environmental Protection is a key national environmental protection project established with the grant aid of 10.5 billion yen by the Japanese government and a funding of 66.3 million yuan raised by the Chinese government. Opening on May 5,1996,the Sino-Japan Center occupies a total land area of 2.9 hect., 1.9km east of Anhui Flyover on the North Fourth Ring Road, and 23 km. to the Beijing International Airport. The Center consists of a research la building, an international conference hall, a residential building for experts, accommodations with a dining hall for trainees, and a power and energy building, with a total floor space of 31,000sq.meters. The Department of Pollution Prevention and Control Technology of the Center is located in the Chinese Research Academy of Environmental Sciences, with an area of 1.4 hect.. This department has a simulation lab building and a precision instrument building occupying a floor space of 3,000 sq, meters. The Center is equipped with a variety of over 3,000 research and experiment facilities including first-rate environment

monitoring and analysis equipments, a computer system for collecting and processing environment information data, simulation experiments instruments for the prevention and control of air, water and waste pollution, and facilities for audio-video producing and public education. The Center organization chart is as follows:

The Sino-Japan Friendship Center, directly affiliated to the State Environmental Protection Administration of China (SEPA), is an institution combining research, management and implementation. It serves as an excellent link for international environmental cooperation and exchange. The second phase of special projects on China-Japan technical cooperation has been carried out since 1996. The Center conducts environmental cooperation in various fields by means of the following mechanisms. The Japanese party sending long-term and short-term experts to work for the Center, the Center sending trainees for advanced studies in Japan, and the Japanese party providing aids in form of equipment and spare parts. While continually strengthening the cooperation with Japan, the Center sets up extensive relationship with other countries, regions and international organizations, and conducts exchange and cooperation of various kinds a an important part of China APEC Environmental Protection Center.

Chart 2: Organization Chart for the Sino-Japan Friendship Center for Environmental Protection



3.0 Overview of domestic background in China

3.1 National goals of socioeconomic development and microeconomic performance

Beginning from 2001, China has implemented the first five-year plan for the new century. The Proposal of the CPC Central Committee for the Formulation of the 10th Five-Year Plan for national Economic and Social Development was adopted at the Fifth Plenary Session of the 15th CPC Central Committee.

The proposal defined objectives, guiding principles and major tasks for China's economic and social development during the next five years. In the spirit of the proposal and on the basis of opinions solicited from all sectors of society, the State Council drew up the Outline of the 10th Five-Year Plan for National Economic and Social Development.

In the Report on the Outline of the 10th Five-Year Plan for National Economic and Social Development delivered at the Fourth Session of the Ninth NPC, Premier Zhu Rongji said, looking ahead at the situation at home and abroad at the beginning of the new century, the next five to 10 years will be an extremely important period for China's economic and social development.

The worldwide new technology revolution is progressing rapidly with great momentum. The economic globalization trend is gaining strength. Many countries are actively restructuring their industries and the neighboring countries are accelerating their development. All this constitutes a severe challenge and provides a historic opportunity for China to strive to catch up and achieve development by leaps and bounds.

Domestically, China is at a crucial juncture in economic restructuring, and reform is in a vital period. China's entry into the World Trade Organization will bring the country a number of new problems.

China is facing many arduous tasks and many deep-seated problems need to be solved. All this requires China to seize the opportunity and accelerate development. At the same time, there are many favorable conditions for China's national economy to achieve rather rapid development over a fairly long period.

In light of the situation and tasks facing China during the 10th Five-Year Plan period, the outline sets forth the main targets for economic and social development in the next five years as follows:

- To maintain a fairly rapid growth rate in the national economy, achieve noticeable success in the strategic restructuring of the economy;
- To make marked improvement in the quality and benefits of economic growth to lay a solid foundation for doubling the 2000 GDP by 2010;
- To make significant progress in establishing a modern corporate structure in State-owned enterprises;
- To increase the soundness of the social security system, improve the socialist market economy and open wider to the outside world and strengthen cooperation with other countries;
- To expand avenues of employment, increase the income of urban and rural residents steadily, improve people's material and cultural standards of living,
- To improve ecological conservation and environmental protection;
- To accelerate the development of science, technology and education, further improve the quality of the Chinese people, and achieve marked progress in improving culture and ethics, democracy and the legal system.

The Outline of the 10th Five-Year Plan embodies the following major guiding principles: Making development the central theme. Stress will be placed on a balance between a high growth rate and good economic returns, striving for fairly rapid growth on the basis of improved economic returns. Sound economic growth must be based on strong market demand and good economic returns. This is a fundamental principle.

Based on an overall analysis of conditions in all sectors of the economy, China has set the target for the average annual economic growth rate in the 10th Five-Year Plan period at around 7 percent. Though slightly lower than the actual growth rate in the Ninth Five-Year Plan period, it is still fairly high.

Arduous efforts have to be made to attain this target through better economic performance. However, as some uncertainties exist both at home and abroad, China has to leave some leeway when defining its target. This will help various sectors focus on restructuring and improving economic returns, and also help prevent overheating of the economy and poor quality or

redundant development.

Concentrating on economic restructuring. The Chinese economy has reached a point where further development cannot be achieved without structural adjustments. Should the old structure and rude manner of growth remain unchanged in economic development, products will find no market, and also, it will be impossible to sustain resources and preserve the environment. It is imperative for China to adjust the economic structure in developing the economy and maintain a relatively rapid growth in structural adjustment.

In the next five years, efforts should be intensified to adjust the patterns of economic development between different industries, between different regions, and between urban and rural areas, with emphasis on the industrial structure.

Measures should be taken to stabilize and strengthen agriculture as the foundation of the economy, accelerate industrial reform, reorganization, upgrading and optimization, vigorously develop the service industry, promote IT for national economic and social development, and continue to reinforce the infrastructure.

Making reform and opening up and technological progress the driving force. The success of both economic development and structural adjustment depends on institutional, scientific and technological innovation.
In the next five years, efforts must be made to unswervingly pursue reform, open China wider to the outside world, and break down the institutional obstacles to the development of productive forces. This will provide a strong impetus for economic and social development. In addition, priority will be given to the development of science, technology and education. Efforts will be made to further implement the strategy of developing China through science and education, invigorate science and technology, train more skilled personnel, and better integrate science, technology and education with the economy

Making improvement of the people's living standards the basic starting point. Raising the people's living standards in both urban and rural areas is the basic goal of the economic development and a crucial factor for expanding domestic demand and stimulating sustained economic growth. Priority will be given to raising the people's living standards. For this purpose, measures must be taken to create more jobs, increase the income of residents, distribute income more equitably, improve the social security system, and ensure a more comfortable life for the

people.

Coordinating economic development with social development. China will make great efforts to improve socialist culture and ethics, democracy and the legal system, balance reform, development and stability, accelerate development of various social undertakings, and ensure social stability. Efforts should also be made to pay close attention to and solve issues in relation to population, resources and the ecological environment, take further steps to implement the strategy of sustainable development, and stimulate coordinated economic and social development.

The Outline of the 10th Five-Year Plan highlights its strategic vision, broad perspectives and policy principles. It contains fewer specific targets and sets more tentative ones adjustable to structural changes.

The outline focuses on key development areas and the settlement of major problems, orients efforts, and presents corresponding policies and measures. It stresses that the role of market mechanisms should be given full play in the implementation of the plan and economic levers, economic policy and legislation be further employed in the Government's macro-control. In the process of formulating the plan, more participation by all elements of society should be encouraged, thus making it a process of giving full scope to democracy, absorbing all useful ideas, and reaching agreement among all sides.

3.2 National environmental goals

According to “The National Ninth Five-Year Plan for Environmental Protection and the Long-Term Targets for the Year 2010”, By 2010, China shall have implemented the strategy of sustainable development fairly well, further improved the environmental management and legal systems, changed the state of environmental pollution and ecological deterioration on the whole, improved the environmental quality noticeably and built an umber of cities and regions with rapid economic development, clean and beautiful environment and benign ecological circle.

The State Council of China approved the National Tenth Five-Year Plan for Environmental Protection on 26 December 2001, requesting the local governments and the various departments to strengthen environmental protection in close relation with the economic restructuring; raise funds for environmental protection through multi-channel in connection with the expansion of

the domestic demands, and establish the mechanism of environmental protection with the government playing the dominant role, the market promotion and the public participation.

The State Council emphasizes that the local governments should undertake the major responsibilities of environmental protection. The people's governments at various levels should integrate the tasks of the Plan into the target responsibility system for provincial governors, mayors and county heads; periodic examination should be carried out on the targets of total pollutant discharge control and environmental quality. The implementation of the Plan should be inspected and summarized every year.

The State Council requests that the relevant departments should strengthen the guidance and support to the implementation of the Plan according to the respective responsibilities. The State Environmental Protection Administration should conduct coordinated supervision and management and enhance supervision and inspection on the implementation of the Plan.

I. Environmental Situation

With unremitting efforts for many years, the environment in the entire country is transiting from the overall deterioration of the environment, and improvement in certain areas towards the situation with preliminary control of the deterioration of the pollution and certain improvement in some cities and areas. However, the environmental pollution remains rather serious, with large amount of pollutant discharge in the entire country, serious the pollution and deteriorating environmental quality. The ecological deterioration is not under effective control and the ecological damages in some areas are being aggravated. The environmental pollution and the ecological damages in some areas have become a key element with harms on the public health and restrictions on the economic development and social stabilization.

II. Guiding Principles and Targets

China is at the preliminary stage of socialism, with weak comprehensive national strength. In face of the severe environmental situation, China should stick to the basic state policy of environmental protection, focus on economic development, and implement the principles of emphasizing both pollution prevention and ecological conservation in accordance with the strategic economic restructuring. China should conduct comprehensive planning, suit measuring to the local conditions, focus on key issues, identify prevention as the major measures, devote

priority efforts to the prevention, and formulate practical targets for various stages so as to improve the ecology, treat the pollution and realize sustainable development.

1. Guiding Principle

China will regard the important thoughts of the Three-Representations of President Jiang Zemin as the guiding principle of the Plan, the sustainable development as the theme, the control of the total pollutant discharge as the main stream, the prevention of the pollution in the key regions of Three Rivers, Three Lakes, Two Zones, One City and One Sea and the containment of the artificial ecological damages as the key work, the enhancement of the enforcement supervision and the improvement of the environmental management ability as the guarantee, the improvement of the environmental quality and the protection of the public health as the fundamental work. The governmental regulating and the market mechanism should be consolidated. By the means of institutional and policy innovation, China will establish a new mechanism of environmental protection, with governmental domination, the market promotion and public participation.

2. Overall Objectives

By 2005, the environmental pollution will be reduced; the eco--environmental deterioration will be contained preliminarily; the urban and rural environmental quality, especially the environmental quality in large and medium cities and the key areas will be improved; and the environmental laws, policies and management systems suited to the socialist market economic system will be further improved.

3. Main Indices of the Plan

A. Indices of Total Discharge Control of the Key Pollutants

Planned Indices for Five-Year Plan Period

(Unit: 10 thousand tons)

Indicators	2000	2005	Comparison of 2000 (+-%)
Amount of SO_2 emission	1995.00	1796.00	-10.0

Industry:	1612.50	1450.00	-10.1
Domestic:	382.50	346.00	-9.5
Two-Controlling Zone	1316.40	1053.20	-20.0
Amount of soot emission	1165.00	1060.30	-9.0
Industry:	953.30	850.00	-10.8
Domestic:	211.70	210.30	-0.7
Amount of Industrial Dust emission	1092.00	898.71	-17.7
Amount of COD discharge	1445.00	1300.00	-10.0
Industry:	704.54	646.78	-8.2
Domestic:	740.46	653.22	-11.8
Amount of ammonia nitrogen	183.50	165.00	-10.1
Industry:	77.84	70.89	-8.9
Domestic:	105.66	94.11	-10.9
Amount of industrial solid wastes	3186.09	2860.00	-10.2

B. Indices of Urban Environmental Protection

- The air quality in over 50% of the cities above prefecture level will attain the Second Grade of the national standards;
- The surface water quality in over 60% of the cities above prefecture level will attain the standards based on the functioning zones;
- The ambient noises of road traffic in over 50% of the cities above prefecture leve1and regions will attain the national standards;
- The centralized treatment rate of the urban domestic sewage will reach 45%;
- The rate of gas use in urban households shall reach 92%;
- The incremental capacity of the sanitary treatment of urban garbage will reach150000 tons/day;
- The green established urban areas will reach 35%.

C. Indices of Eco-Environmental Conservation

- The nature reserves will account for over13% of the land territory areas, and the marine nature reserves will hit 40000 km2;
- The natural, mature and over-mature forests will remain stable and the quality will remain stable with certain improvement;
- The growth of the new soil-erosion area, Three-Trends grassland areas and the desertification 1and areas will decrease by 60% compared with that in 2000;
- The ecological rehabilitation of the mining areas will be over 25%.

D. Indices of Rural Environmental Protection

- The water qua1ity in the centralized drinking water sources will basically attain the environmental quality standards;
- The rate of limiting the stalk burning in the stalk burning forbidding zones will reach 95% and the comprehensive utilization rate of the stalk in the entire country will reach 80%;
- The attainment rate of the sewage discharge of the large-scaled animal-poultry farms will reach 60%, with 70% of the feces turned into resources;
- The agriculture irrigation water will basically attain the standards for agriculture irrigation water quality standards and the quality and safety of the agriculture products will be improved on full scale.

4.Indices of Environmental Protection in Key Areas

The pollution prevention of the Three Rivers (Huai River, Hai River and Liao River), Three Lakes (Tai Lake, Chao Lake and Dian Lake), Two-Zones (acid rain control zone and S02 control zone), One City (Beijing) and One Sea (Bo Sea) will be further promoted. Efforts will be devoted to the water pollution treatment in Three-Gorges Reservoir zone and along the Water Diversion Engineering route. The comprehensive water pollution treatment at the upper reaches of the Yangtze River, the middle reaches of the Yellow River and the Songhua River Basin will be kicked off.

Indices of Environmental Protection in Key Areas for Tenth Five-Year Plan

(Unit: 10 thousand tons)

River Basins	COD		Total Phosphorus		Ammonia Nitrogen	
	2000	2005	2000	2005	2000	2005
Huai River	105.9	64.3			15.1	11.3
Hai River	158.4	106.5			26.2	20.5
Liao River	58.33	32.58			7.43	5.21
Tai Lake	49.15	37.81	1.44	1.24	13	9.91
Chao Lake	6.38	5.91	0.15	0.11	1.23(Total Nitrogen)	1.14(Total Nitrogen)
Dian Lake	4.39	3.52	0.13	0.11	1.09(Total Nitrogen)	0.88(Total Nitrogen)
Water Diversion (Eastern Route)	97.2	54.7			13.9	7
Three-Gorges Reservoir Area and Upper Reaches	135.55	102.8			11.36	8.3
Bo Sea	114	102.6	1.3	1.0	16.5	13.2
Beijing	18.60	13.00			3.80	3.10
Two-controlling Zones	SO_2					
	2000		2005			
	1316		1053			

3.3 National environmental programs and plan and performance

Ⅰ. Demand of Investment of Environmental Protection Distribution of Environmental Protection Investment in Tenth Five-Year Plan Period

During the Tenth Five-Year Plan period, the total demand of the investment of environmental

protection in the entire country will hit 700 billion Yuan, accounting for about 1.3% of the GDP at the same period and about 3.6% of the total fixed investment of the entire society.

Distribution of Environmental Protection Investment in Tenth Five-Year Plan Period

Projects	Investment (hundred million yuan)	Percentage (%)
Air Pollution Prevention	2800	40
Water Pollution Prevention	2700	38.5
Solid Waste Treatment	900	12.9
Ecological Conservation	500	7.2
Capacity Building of Environmental Protection	100	1.4
Total	7000	100

II. China Trans-Century Green Project Plan

China Trans-Century Green Project Plan is an important component part of The National Ninth Five-Year Plan for Environmental Protection and the Long-Term Targets for the Year 2010. It is a concrete plan with specific projects and key areas, designed to organize the relevant departments, localities and enterprises and pool financial and material resources in carrying out a series of project measures with regard to some key areas, major basins and vital environmental problems and in conformity with the implementation of international conventions, wage several great campaigns, promote the work as a whole and declare war on environmental pollution and ecological destruction so as to bring the worsening trend of environmental pollution and ecological destruction undercontrol by and large and improve the environmental quality of some cities and regions at the end of this century and gradually attain the general objectives of environmental protection in China in 2010.

The Green Project Plan covers 15 years, divided into three stages. The first stage synchronizes with the Ninth Five-Year Plan period from 1996 to 2000; the second and third stages shall cover the ensuing years. The project shall be implemented by stages and in a rolling way.

The Principles on Working Out the Green Project Plan:

- Laying stress on key environmental problems;
- Ensuring technological and economic feasibility;
- Bringing about the harmony of environmental benefits, social effects and economic returns;
- "The polluter pays" and the input of funds shall come mainly from enterprises and localities;

The implementation of the specific projects shall be managed within the framework of the present system of investment management.

Remarkable results have been achieved since “China's Cross-century Green Project Plan" was implemented six years ago. By 2000, 836 projects have been completed and 409 projects are ongoing, accounting for 85.7% of the total projects. A total of 110.7 billion yuan RMB have been invested in these projects, accounting for 73.8% of the total investment in the projects. The rate of project construction and completion in 29 provinces, autonomous regions and municipalities has exceeded 80%, 13 more in the number of provinces. Some provinces like Liaoning, Fujian, Hainan, Xizang, Qinghai, Ningxia, Xinjiang and some cities like Dalian, Ningbo and Xiamen has started or completed all of their projects.

There are 1137 projects in the National Tenth Five-Year Program of the Key Engineering Project of Environmental Protection (China Trans-Century Green Project Plan - The second stage) and the investment demand is about 262 billion Yuan.

Projects of China Trans-Century Green Project Plan (The second stage)

Type of Projects	Number of Projects	Expected Investment (10 thousand Yuan)
Water Pollution Treatment in Huai River Basin	88	926650
Water Pollution Treatment in Hai River Basin	119	1696872
Water Pollution Treatment in Liao River Basin	16	388772
Water Pollution Treatment in Tai Lake Basin	18	520796
Water Pollution Treatment in Dian Lake Basin	2	347300
Water Pollution Treatment in Chao Lake Basin	9	90768

Water Pollution Treatment in Three0Gorges Reservoir and Upper Reaches	98	1459894
Environmental Treatment in Beijing (2002 2007)	75	5359720
Comprehensive Treatment in Bo Sea	11	161333
Water Pollution Treatment at Middle and Lower Reaches of the Yangtze River	70	2836371
Water Pollution Treatment at Middle and Upper Reaches of the Yellow River	37	679379
Water Pollution Treatment in Songhua River Basin	19	523517
Pearl River	27	912575
Water Pollution Treatment in other River Basins	17	412666
SO_2 Treatment in Two-Controlling Zones	130	4227157
Air Pollution Treatment in Non-Two-Controlling Zones	27	746193
Safe Disposal of Hazardous Wastes	28	652458
Treatment of Urban Domestic Garbage	126	1776811
Ecological Conservation	220	2496144
Total	1137	26200870

3.4 Environmental regulatory framework

China pays great attention to environmental legislative work and has now established an environmental statutory framework that takes the Constitution of the People's Republic of China as the foundation and the Environmental Protection Law of the People's Republic of China as the main body.

The Constitution of the People's Republic of China stipulates, “the state protects and improves the living environment and the ecological environment, and prevents and remedies pollution and other public hazards,” and “The state ensures the rational use of natural resources and

protects rare animals and plants. The appropriation or damage of natural resources by any organization or individual by whatever means is prohibited."

The Environmental Protection Law of the People's Republic of China is the cardinal law for environmental protection in China. The law has established the basic principle for coordinated development between economic construction, social progress and environmental protection, and defined the rights and duties of governments at all levels, all units and individuals as regards environmental protection.

China has enacted and promulgated many special laws on environmental protection as well as laws on natural resources related to environmental protection. They include the Law on the Prevention and Control of Water Pollution, Law on the Prevention and Control of Air Pollution, Law on the Prevention and Control of Environmental Pollution by Solid Wastes, Marine Environment Protection Law, Forestry Law, Grassland Law, Fisheries Law, Mineral Resources Law, Land Administration Law, Water Resources Law, Law on the Protection of Wild Animals, Law on Water and Soil Conservation, and Agriculture Law.

The Chinese government has also enacted more than 30 administrative decrees regarding environmental protection, including the Regulations for the Prevention and Control of Noise Pollution, Regulations on Nature Reserves, Regulations on the Prevention of and Protection Against Radiation from Radio Isotopes and Radioactive Device, Regulations on the Safe Administration of Chemicals and Other Dangerous Materials, Provisional Regulations on the Prevention and Control of Water Pollution in the Huaihe River Drainage Area, Regulations Governing Environmental Protection Administration in Offshore Oil Exploration and Development, Regulations on the Control of Marine Wastes Dumping, Regulations for the Implementation of the Protection of Terrestrial Wildlife, Provisional Regulations on the Administration of National Parks, Regulations on the Protection of Basic Farmland, and Regulations on Urban Afforestation. In addition, departments concerned have also issued a number of administrative rules and decrees on environmental protection.

To implement the state's environmental protection laws and regulations, people's congresses and people's governments at local levels, proceeding from specific conditions in their own areas, have enacted and promulgated more than 600 local laws on environmental protection.

Environmental standards are an important component of China's environmental statutory

framework. They include environmental quality standards, pollutant discharge or emission standards, basic environmental criteria, criteria for samples, and criteria for methodology. The environmental quality standards and pollutant discharge or emission standards are divided into state standards and local standards. By the end of 1995, China had promulgated state environmental standards on 364 items. As stipulated in Chinese law, the environmental quality standards and pollutant discharge standards are compulsory standards, and those who violate these compulsory environmental standards must bear the corresponding legal responsibility.

International environmental treaties are also an important component of China's environmental law framework. By now, in order to protect global environment, China has signed over 30 international environmental treaties, such as, the UN Framework Convention on Climate Change and Its Kyoto Protocol, the Montreal Protocol on substances that Deplete the Ozone Layer, the Basel Convention on the control of the Transboundary Movement of Dangerous Wastes and Their Disposal, the Convention on the Prevention of the Dumping of Wastes and Other Pollutants into the Seas and Oceans and Its 1996 Protocol, the Legally-Binding International Instrument on International Actions on Certain Persistent Organic Pollutants(POPs),the Rotterdam Convention on the Adoption of the Prior Informed Consent Procedure in International Trade in Certain Dangerous Chemicals and Agriculture Chemicals, the Convention on International Trade in the Endangered Species of Wild Fauna and Flora, the Cartagena Protocol on Bio-Safety, etc.

3.5 Recent development in environmental legislation

In recent years, China has made great efforts to enhance EP laws. Especially the Criminal Law amended in 1997 for the first time added fourteen criminal charges to the section on the crime of jeopardizing environmental resources so the environmental law system improved in the new period.

In 2001, the local legislation institutions formulated over 20 local environmental protection rules and regulations and over 50 local governmental chapters on environmental protection. The Standing Committee of the National People's Congress has promulgated the Law of Sandification Prevention. The State Council has promulgated the Management Rules of the Agriculture GMO Safety, Management rules of Discarded Vehicle Recycling, Management rules of Hazardous Chemicals' Safety. With the ratification of the State Council, State Environmental Protection Administration has issued the Ratification Measures of the Local Standards of the

Vehicle Pollutant Discharge. State Environmental Protection Administration has issued the Management Measures of Organic Food Certification, Management Rules of Poultry and Animal Aqua-Culture Pollution Prevention, the Trial Management Measures of the Permits of the Key Water Pollutant Discharge in Huai River and Tai Lake Water Systems, and the Management Measures of Inspection and Acceptance of the Environmental Protection of the Construction Projects.

To meet the needs of China's entry into the WTO, in June 2002 the national legislature again adopted the Law of the PRC on the Promotion of Clean Production. Drawing on the legislation experience at home and abroad in preventing pollution, in comprehensively utilizing resources, in recovering and using wastes and in economic cycling, the Law has made stipulations on practical issues to promote domestic clean production. It has particularly defined government responsibilities in promoting clean production, and made it compulsory for enterprises to carry out clean production. Meanwhile enterprises doing so are given support and encouragement. This law shall come into effect as of January 1, 2003.

The Law of People's Republic of China on Environmental Impact Assessment was approved by the top legislature, the Standing Committee of Ninth National People's Congress (NPC), at its 30th Meeting on October 28, 2002. This new law will take effect on September 1, 2003. According to the Law, relevant departments of the State Council and the people's governments at city or above levels should conduct environmental impact assessment (EIA) on planning of land use and regional development. EIA should also be conducted on the specialized development planning for industry, agriculture, forestry, energy, water works, transport, urban construction, tourism and natural resources. The implementation of EIA in China started in 1980s. In the past two decades, the practice focused mainly on construction projects. Relative provisions for EIA requirements can be found in the Law on Environmental Protection in general and some specialized laws on water and air pollution prevention and control. Regulation on Management of EIA on Construction Projects has been used for this purpose. The adoption of EIA Law is a great move. It is also remarkable in that the Law expands the scope to cover the planning activities.

After exertions for two decades or more China's environmental legislation has initially formed a framework of the environmental law system that suits the socialist market economy. By now China have promulgated seven EP laws, 10 laws of resource protection, over 30 EP administrative regulations, over 90 regulations by EP governmental departments and over 1020

local EP regulations and government rules, concluded or acceded to over 30 international environmental pacts and formulated over 400 environmental standards. Under such a law system the Chinese Government has effectively prevented and controlled the impact of economic development on the environment and avoided serious impact and damages on environmental quality as a result of sustained rapid economic development.

3.6 Description of the roles of different stakeholders in environmental regulatory framework

China attaches equal importance to the establishment of an environmental administrative system. It has established a system in which the National People's Congress enacts the laws, governments at different levels take responsibility for their enforcement, the administrative departments in charge of environmental protection exercise overall supervision and administration and the various departments concerned exercise supervision and administration according to the stipulations of the law.

The National People's Congress has established an Environment and Resources Protection Committee, whose work it is to organize the formulation and examination of drafted laws related to environmental and resources protection and prepare the necessary reports, exercise supervision over the enforcement of laws governing environmental and resources protection, put forward motions related to the issue of environmental and resources protection, and conduct exchanges with parliaments in other countries in the field of environmental and resources protection. The people's congresses of some provinces and cities have also established corresponding environmental and resources protection organizations.

The Environmental Protection Committee under the State Council is made up of leaders of various related ministries under the State Council. It is the State Council's consultancy and coordination agency for environmental protection work. Its major tasks are studying and examining the principles, policies and measures relating to coordinative development of the country's economy and environmental protection, giving guidance to and coordinating efforts in tackling major environmental problems, exercising supervision over and conducting checks on the implementation of the environmental protection laws and regulations by various localities and departments, and promoting the development of environmental protection undertakings throughout the country. The people's governments at the provincial, city and county levels have also established corresponding environmental protection committees.

The National Environmental Protection Agency is the competent environmental protection administration agency under the State Council, whose task it is to exercise overall supervision and administration over the country's environmental protection work. The people's governments at the provincial, city and county levels have also successively established environmental protection administration departments to carry out overall supervision and administration of the environmental protection work in their localities. At present, there are nationwide more than 2,500 environmental protection administration departments above the county level with a total staff of 88,000 engaged in environmental administration, monitoring, inspection and control, statistics collection, scientific research, publicity and education.

Environmental protection organizations have also been established in comprehensive administration departments, resources administration departments and industrial departments under governments at various levels to take charge of related environmental and resources protection work. Most of China's large and medium-sized enterprises have also set up environmental protection organizations responsible for their own anti-pollution work and the promotion of cleaner production.

China pays great attention to supervision exercised by the people、media and environmental NGO over law-breaking activities regarding the environment—it has opened channels for the masses of people to report on environmental problems and adopted measures for the media to expose environmental law-breaking activities.

Chinese judges have provided strong judicial guarantee for national EP. China’s EP judicial activities are carried out in ordinary courts. Judges engaging in EP case trials try the cases in the criminal, civil or administrative court according to the case category. They have received systematic training on EP criminal, civil and administrative laws and regulations and are well trained professionally. EP departments of governments at all levels are special organs for monitoring and administering EP implementation. It is one of the important functions and responsibilities of the Chinese courts and judges to supervise and support EP departments in administering according to law. Through trying EP administrative cases according to law, the Chinese judges support the state EP administrative organs in administering according to law.

4.0 Assessment of environmental impacts of Japan-China environmental cooperative programs and projects: a case study on the role of Sino-Japan

Friendship Center for Environmental Protection

In order to assess the environmental impacts of Japan-China environmental cooperative programs and projects, we can take the Sino-Japan Friendship Center for Environmental Protection as a case. From the case study on the role of the Center we can thereby get a glimpse of the environmental impacts of the whole cooperation activities from a point.

The number of programs, projects and activities implemented by the Sino-Japan Center in the recent five years is listed in the below table. And concrete description on important activities can be seen in the annex.

Table 1: number of programs, projects and activities implemented by the Center in the recent five years

	1997	1998	1999	2000	2001
1.scientific research	54	53	36	34	32
Water	14	15	7	4	5
Air	12	10	8	6	2
Solid wastes	8	6	3	4	1
Ecological systems	4	2	1		
Global environmental issues					
Others (analyzing, monitoring, standard samples, policies research, etc.)	16	20	17	20	24
2.Management service	25	30	28	31	31
3.publization and training	5	13	12	33	8
4.academic activities (workshop, etc)	11	8	8	7	6
5.International communion	29	31	19	25	38

From the annex of the report, it is clear to see that programs, projects and activities implemented by the Center in the recent five years includes much study on the waste water treatment technology or other pollution prevention and control technology, analyzing, monitoring and measurement technology, and all kinds of standard samples. They also include many

environmental management and information diffusion capacity building projects. The Center has also carried out some projects to train the governmental offices, enterpriser and students to enhance the environmental awareness of the public. It has also organized many academic activities such as workshops and seminars on environmental policies, monitoring technology and pollution control technology, etc. At the same time, the Center has arranged a great number of international intercommunion projects and activities.

The role of the Center can be assessed mostly from the projects and activities and their effects. Its role in the Chinese environmental management system may be expounded as following:

Above all, the research on policies of environment and economy and international issues carried by the Center gives support for the macro-decisions making on environmental protection and may in a way promote the scientific level of environmental policies decision-making in China. In addition, the Center offers technical support for environmental management by research and workshops on pollution control technology for wastewater, gas emission and solid wastes.

Secondly, the Japan-China cooperation programs promote the Center the capacity of providing support and service of environment information technology for national environmental management and decision-making of SEPA. The Center is the centrum of national environmental information systems, carrying out the following activities: technically guiding the national environment information system; collecting, storing, processing, analyzing and transmitting various environment information, providing information inquiring service; developing and promoting computer software of environment protection, carrying out technical training on environment information and environment information inquiring, technical exchange and cooperation domestically and internationally. And

Thirdly, the research and workshops on the environmental analysis, measurement and monitoring technology and standard samples in an extent strengthen research and develop new methods and techniques in the field, establish and promote standardized methods of analysis and provide service to the public. So it has model significance the whole country, and can promote the improvement of analysis, measurement and monitoring capacity and thereby promote the enhancement the capacity of environmental management all .the country.

Lastly, the Center has implemented some activities, including organizing and undertaking national communications activities on environmental protection; compiling teaching material;

producing TV programs and carrying out personnel training. And these activities impact in a degree the public's consuming preference and change their consuming model and promote the enhancement of environmental awareness of the public, such as the enterprisers, women and students. So it can promote the participation of different stakeholders, which is beneficial to the improvement of the environmental management in China.

In a word, being an important part of China APEC Environmental Protection, the Sino-Japan Friendship Center plays the role of bridge in regional environmental cooperation and international exchange. It is an ideal arena for carrying out environmental scientific research, technology development, information exchange and personnel training domestically and internationally. It promotes the improvement of the environmental management system in China from many sides. But the degree of the impacts needs to study further.

5.0 Assessment of socioeconomic impacts of Japan-China environmental cooperative programs and projects: a case study on the role of Sino-Japan Friendship Center for Environmental Protection

For the effective and comprehensive exchanges and cooperation between Japan and China in the field of the environment in China that has vast national land, Sino-Japan Friendship Center for Environmental Protection is expected to function as a comprehensive coordinating body.

At present, Sino-Japan Friendship Environmental Protection Center has brought its roles to show in guarding the research, training, monitoring and popularizing education and have achieved a series of results, which has thus won good appreciation from the State Environmental Protection Bureau and the Japanese government.

As above, we will take Sino-Japan Friendship Center for Environmental Protection as a case and give our assessments about the socioeconomic impacts of Sino-Japan environmental cooperative programs and projects.

5.1 National and local governments: institutional capacity and coordination

Over the past six years, Sino-Japan Friendship Center for Environmental Protection has carried out many researches of significance in the field of strategies and policies, such as

Environment and Trade, How to Control Industrial Pollution in Towns and suburbs, overall Decisions on Environment and Development, Comparative Research on the Environmental Policies of China and Japan, etc. Having provided the state with a lot of proposals and information for legislation of Environmental Law and relative policies the Center has now become a research base on environmental strategy and policies. The decision-makers of SEPA have obtained strong supports form Environmental policy research implemented by the Center.

The Center has provided some opportunities such as training course or oversea training to the province-level or municipal-level local officers who are in charge of environmental protection, which enrich their knowledge and capability in environmental administration, speed up the institutional building of local environmental administration department, and ultimately promote the development of environmental protection enterprise of China.

5.2 Poverty alleviation

As far as we know, there are no programs and projects implemented by Sino-Japan Friendship Center for Environmental Protection that have direct connections with poverty alleviation.

5.3 Technology transfer

Sino-Japan Friendship Center for Environmental Protection has made great achievements in enhancing the ability of environmental monitoring of China. In developing the technology of environmental monitoring, Sino-Japan Friendship Center for Environmental Protection have contributed a great deal of data materials and information on the prevention and treatment of water pollution and measures to be taken for acid rain control in the reaches of Huai River, Lake Tai, etc. Breakthrough achievements have likewise been made in the online monitoring for cases of emergency and ecological environment conditions. And in order to appropriately address the environmental problems emerging across China's vast land area, it is essential to expeditionally gather information on the environment of each city in view of sharing these information. While cities in China independently gather and analyze environmental information on the state of air pollution, etc., there is not yet a sufficiently developed network for the communication, sharing and utilization of such information. Having made the decision to assist the development of such a network, the Government of Japan commenced human resources development training in China in January 2000 and signed the Exchange of Notes for grant aid cooperation to assist the procurement of equipment required by the model cities. Sino-Japan

Friendship Center for Environmental Protection is expected to play a core role in this network. This has turned out, as we can see, to be a systematic work with the air quality to be reported daily in more and more cities in China.

In the training programs of the Center, which also have the goal of propagating technology transfer from Japan to China. Those trainees are utilizing the expertise and experience acquired through training after they return to China and strive to further transfer the acquired technology to their colleagues. By this means, the Center plays a bridge in promoting the advanced environmental protection technologies transfer from Japan to China.

5.4 Research capacity: policy & science

Japan made great contributions in improving the research capacity of Chinese environmental protection researchers. For example, only during the course of implementation of the Sino-Japan friendship environmental protection Center project phase 2, the Japanese government had offered a lot of support both in technology and funds, having dispatched in succession 19 experts to take up a long-tern working and 52 to work short in China and providing equipment worth of 125 million yen. In addition, it had also received over 30 persons to have further studies in Japan. The Center had made a promising achievement in the 74 items of cooperation between China and Japan.

The Japanese Government annually donates nearly 50 million Japanese yen (US$427,000) to the Center. In addition, the Japanese Government also provides financial support for training courses held at the Center on various environmental issues, the financial support has meant that more than 1,100 environmental protection staffs from all over China have been trained at the Center since 1994. Experts are also sent there from Japan to work with their Chinese counterparts on various environmental issues, currently there are five Japanese experts in the team, each of whom will spend two more years in China.

All these activities directly or indirectly help Chinese environmental protection researchers enhance their research capacity and improve the whole level of Chinese environmental protection researchers.

5.5 Broader participation of different stakeholders: individual citizen, NGOs,

private sectors, academia, media, and others.

Environmental cooperation between Japan and China is conducted not only between the two governments but also involves various implementation bodies, such as private enterprises, local governments, academics and NGOs. Japan-China Comprehensive Forum on Environmental Cooperation was first held in May 1996 to provide a forum for comprehensive dialogue to further promote collaboration between the parties concerned.

Department of Environmental Technology Exchange And Public Education of The Sino-Japan Friendship Center For Environmental Protection (its another name is Center for Environmental Education and Communications of SEPA) has implemented many projects recent years and made great contributions in appealing different stakeholders to join the environmental protection activities. For example, in order to popularize the education on a harmonious development between human beings and nature, it has set up a network for environmental education and carried out a series of Green Activity in schools, thereby having made an active contribution to the protection of the earth.

6.0 Conclusions and recommendations

Sino-Japan Friendship Center for Environmental Protection plays an important role in environmental protection field. It has made great achievements in enhancing institutional capacity of Chinese national and local governments, improving researching capacity of Chinese environmental protection researchers, promoting technology transfer to China, and appealing more broader stakeholders to participate the environmental protection activities.

Sino-Japan Friendship Center for Environmental Protection is expected to further through improvement of the facilities as well as through the energetic activities of experts and staff members to act as the base for environmental protection activities in China, covering wide-ranging areas from R&D to the gathering and analysis of information, formulation of strategies and policies, human resources development and education on environmental protection.

Aiming at the National Tenth Five-Year Plan for Environmental Protection, Sino-Japan Friendship Center for Environmental Protection should emphasis their works on providing high-quality support to the decision-making and enhancing the environmental management,

especially enhancing the research on environmental strategies and policies. Incorporating with those important policies of China such as: West China Development, Economic Structural Regulation, Entering into WTO and Improving the Living Environment Situation of Chinese People, the Center should study the strategic countermeasures and concrete policies of environment protection in China.

In order to implement a project efficiently and effectively, the formulation of a plan consistent with the beneficiary's needs is important. For this purpose, dialogue with a wide range of stakeholders who will be affected by the project is indispensable. In addition, the stakeholders will become able to participate in the project while sharing the same enthusiasm for its goals. Obtaining the participations of a wide range of stakeholders from the planning stage in this way contributes greatly to increasing the quality of project. So from now on, it will be necessary to attach even greater importance to the opinions and voices of the various stakeholders, and Sino-Japan Friendship Center for Environmental Protection should make greater endeavor to broaden participation of different stakeholders: individual citizen, NGOs, private sectors, academia, media, and others.

On the basis of good cooperation with SEPA, Sino-Japan Friendship Center for Environmental Protection should extend their cooperation with other government departments, such as State Development Plan Committee (SDPC), Ministry of Agriculture (MOA), State Forestry Administration (SFA), etc., because these government departments also have very tight relations with environmental protection enterprise in China.

In the process of economic development, pollution is a serious problem. Especially in the poor areas, in order to get more money and more resource, the environment is being destroyed. So In order to get a sustainable development in the poor areas in a long time, it is very important to protect the environment. While developing the poor areas, the Chinese Government pays close attention to the protection of the ecological environment. Poverty reduction by reliance on science and technology has helped to change the previous way of production by indiscriminate means at the expense of the ecology in poor areas. The Chinese Government specially emphasizes changing the people's ideas on the family in the poor areas. Because of above reasons, in the following programs and projects, Sino-Japan Friendship Center for Environmental Protection should considering combining poverty alleviation with environmental protection, which will be very helpful to the sustainable development of poor areas in China.

Environmental problems have emerged in many countries and some of them are global, for example desertification and deforestation. The depletion of the ozone layer and global warming have adversely affected every region on earth. To cope with environmental degradation on a global scale, numerous multilateral treaties on the environment have been concluded and China is party of most of these treaties. To effectively achieve the objectives of these treaties, it is desirable that China ratify and abide by them. However, during the course of implementing these treaties, China encounters some difficulties such as capital, technology and capacity, etc. So assistance to China is required for more effective enforcement of these treaties. Sino-Japan Friendship Center for Environmental Protection should make efforts to deal with complex global environmental problems.

Annex

List of important programs, projects and activities implemented by Sino-Japan Friendship Center for Environmental Protection in the recent five years.

Table 2: Important programs, projects and activities in 1997

Category of Projects/activities	Name
1.scientific research	
Water	Environmental monitor and analysis technology in east Asian area
	Study on waste water treatment technology by light catalyzing with Nami material
	GIS system developing in huaihe basin
	Study on waste water treatment technology in printing and dyeing industry
	Study on development and application of disperse civilian waste water cleaning equipment
	Study on filtering and optimizing the flow of middle-water treatment
	Waste water treatment in the gasworks
Air	Study on composition and source of the atmosphere grain
	Study on standard samples of SO_2, NO_X, CO, etc. in nitrogen

	The development of standard sample of acraldehyde
	Study on low-cost desulfuration technology in coal burning
	The standard of SO_2 measurement apparatus with electrolysis
Solid waste	Monitoring and assessment of PCBs burning base
	Study on dry sedimentation measurement technology
	Study on monitoring and assessment of gas producing from the process of garbage burying in Beijing
	Study on the method of testing plastic decomposable capability
	Synthetic assessment of plastic life cycle—reuse of waste plastic and international trade
Ecological system	Study on the policies of preventing degradation of agricultural ecological system
	The impacts of VTEs on the forest ecological system and relevant countermeasure
Others (analyzing, monitoring, standard samples, policies research, etc.)	The establishment of and research on the specially environmental MS storehouse
	Development and measurement of environmental standard samples
	The support project about chemical material measurement technology
	Study on the key technologies of pollutant gross control monitoring system
	Study on the technology course of monitoring Chinese environment
	Study on the index system of national environment model cities
	Environmental economic policies and international trade
	The economic analysis of sustainable development
	Econometrics and research on the environmental pollution lost in China
	Study on clean production policies
	Study on environmental policies in small town in China
2.Management service	Preparation for the documents of the fifth environmental monitor meeting in China

	Startup the registration of environmental management system auditor
	Startup and implementation of the accreditation work for environmental management system certification bodies in China
	Capacity building for the internet of information Center of SEPA
	Survey research on environmental protection of coal mines in villages and towns
	Soil glossary
3.publization and training	TV program “environmental protection is shoulder heavy responsibilities”
	The fourth China-Japan senior training class of air pollution control in China
	China-Japan technology cooperation workshop on the run and management of air quality automatical monitoring stations on the ground
	China-Japan training class of environmental pollution gross control and monitoring technology
4.academic activities (workshop, seminar, lectures, etc)	Seminar on environmental and economic policies towards sustainable cities in APEC
	The first environmental salon
	a course of lectures on the synthetical evaluation of environmental economy
	a course of lectures on automobile pollution control and ISO14000
	Workshop on the estimation and forecast of environmental pollution lost in China
5.International communion	The second period of China-Japan special technical cooperation plan
	International seminar on the eradiation environmental management
	International seminar on the experience of preventing air pollution
	International seminar on the research on the global environmental strategies
	China-Japan common research: the CO_2 emission analysis in transportation industry

	Training class about JICA environmental policies and energy saving experience
	Training class and the implementation of GLOBE plan
	China-Japan technology cooperation in the standard samples field
	China, Japan and US workshop on the environmental monitoring technology
	International seminar on the gross control technology
	China-Japan cooperation training class on the cleaning trough

Table 3: important programs, projects and activities in 1998

Category of Projects/activities	Name
1.scientific research	
Water	Study on the development of the software “the system of environmental Stat. monthly report”
	The development of GIS system in huaihe basin and release in internet
	Study on river code in environmental system in China
	The experience and demonstration meaning from the pollution treatment in huaihe
	The burning experiment of the mixture of black liquid and coal powder
	Feasibility research on the COD emissions gross control in plants
	The environmental impacts appraisal of waste water treatment plants in Xinji City of Hebei province
Air	The policy plan and strategy study on eliminating Methylbromine
	Study on composition and source of the atmosphere grain
	The shape analysis and quantification of air grain produced from the biomass burning
	Environmental monitor and analysis technology in east Asian area
	Smoke fluid-bed cycle in the boiler burning smoke
	Study on standard samples of SO_2, NO_X, CO, etc. in nitrogen
	The development of gas standard samples

Solid waste	Monitor and assessment of PCBs burning base subjected to Shenyang Research Academy of Environmental Science
	Study on Dry Deposition measurement methods in the north of China
	The environmental impacts appraisal of the Solid Waste Treatment Center in Economy and Technology Development Area in Tianjing
Ecological system	Study on the development of the multimedia demonstration system of the position and countermeasure of the ecological environment in China
	Study on the information system of ecological environment of the wetland in China
Others (analyzing, monitoring, standard samples, policies research, etc.)	The development of the survey system software about electromagnetism eradiation pollution source
	Technology guide for the environmental information code
	Study on the policies and measures of environmental protection in small town in China
	Study on the environmental policies system in transitional phase
	Study on the sustainable development index system of Chinese environment
	Study on the sustainable development index system in cities in China: theory and case study
	Study on the mechanism of the harmonious development of environment and economy
	The establishment of and research on the specially environmental MS storehouse
	Orthogonal least squares and its application in the environmental analytic chemist
2.Management service	The manual for standardization of environmental information (the first volume)
	The expert group meeting of standardization work of environmental information
	The preparation work for the project of the development of environmental information system in 100 cities in China

	The meeting facing the directors of environmental information Center in provincial level in whole China
	The compilation and propagation work of the program “caution ana of the ecological problems in China”
	The translation and edition of the suit of “the guidance materials for the environmental education in Japan”
	The copy work of environmental standard samples
	«Environment and Sustainable Development» (the thesis volume in 1997)
	Startup roundly the registration of environmental management system auditor
	Implementation of the accreditation work for environmental management system certification bodies in China
3.publization and training	Technology training facing province-level environmental information Center
	The second China-Japan workshop on environmental publication work in China
	The meeting on the environmental education in Asia
	China-Japan training class and popularization of ISO14000 environmental management standards
	Training on environmental protection knowledge to ISO14000 environmental management system auditor
	Training on auditing knowledge of environmental management system and relevant environmental protection knowledge
4.academic activities (workshop, seminar, lectures, etc)	Seminar on the expectation of Chinese environment in the 21st century
	The environmental knowledge contest facing the whole country’s middle school students
	Workshop on the China-Japan environmental cooperation of automobile exhaust problem
	China-Japan workshop on ISO14000 national certification system
5.International communion	Televising of «environmental weekly» cooperated with CCTV
	The second China-Japan environmental intercourse activity attended by callan

	The third China-Japan workshop on environmental education
	Green life action stepping into the 21st century
	The comparison of the measurement value of trace element in rivers
	China-Japan workshop on environmental measurement and environmental management
	Learn on development of environmental standard samples by going to America
	Attend IAF yearly session
	The second phase of China-Japan special technology cooperation plan
	Investigation of key fields of China-Japan environmental cooperation

Table 4: Important programs, projects and activities in 1999

Category of Projects/activities	Name
1.scientific research	
Water	Research on the GC analysis method of phthalic ester in waste water
	Environmental monitoring and management in east Asia area-monitoring and analysis for EDCs
	Water quality –formaldehyde environmental standard sample
	Water quality –total Beryllium (Be) environmental standard sample
	Measure the toxic and harmful volatility organic substance in water by GC/FID method
	Research on the problems about oil and mercury monitoring in water area of China and corresponding countermeasure
	Research on the sewage treatment technology and eutrophication contamination analysis method
Air	Research on the mensuration method of acid dry deposition in north of China

	Research on the organic ingredient and its resources of the atmospheric particulate matter
	Quantity and shape Analysis on the particulate matter from burning of bio-matter
	Research on the aerosol of yellow sand
	Respective mensuration of organic carbon, elementary carbon and carbonate in the atmospheric particulate matter
	The gaseous standard sample of SO_2, NO_x, CO, non-methane total hydrocarbon and benzene series matter in the nitrogen gas
	Research on the quality guarantee technology of acid wet deposition monitoring
	Research on the treatment technology of NO_x in the exhaust gas of diesel
Solid waste	Market investigation, environmental analysis and economic analysis on the importation and utilization of solid waste
	Research on the discharge regular pattern of dioxin from the life garbage combustion furnace and the control measure of it
	Research on the disposal and resourcelization technology of solid waste
Ecological system	Multimedia demonstration system of Chinese entironment situation and countermeasure
Others (analyzing, monitoring, standard samples, policies research, etc.)	Make the environmental standard samples
	Manufacture of PCBs standard sample
	Initiative design and research on the national environmental information network system
	Constitute the standard of environmental information classification and coding
	Research on the foreign trade development and environment strategy
	Research on the compatibility between foreign trade and environmental protection policies in China
	Comparative research on the Authorization system of environmental management system of China and Japan (2)
	Environment monitoring strategy of China in the 21st century

	The strategy framework and the policy plan for methylbromine control in China
	B-1 expanded project - analysis and design of city environmental information system
2.Management service	Development and maintenance of the website of “environmental protection in China”
	Daily management of “MeiFu” Chinese environmental education fund project
	Investigations and technology communications of environmental protection project that supported by Japanese government’s loan
	Meeting Service Center
	Investigation about the present status of province-level environmental information system
	Newsletters about the environmental protection projects supported by the 4th group Japanese government loan
3.publization and training	TV special subject program《Fight Against the Air Pollution》
	Training course about the international organic food certification inspector
	Seminar of city-level environmental information system construction
	The 3rd training course about national-wide environmental education work and movie-TV technology
4.academic activities (workshop, seminar, lectures, etc)	Expert group meeting about the standardization of environmental information
	Academic communion about the analysis technology of standard samples, dioxin and PCBs
	Report: 《China should constitute the long-term plan of sustainable development legislation system》
	Serial TV programs about environmental protection
	Compile the textbook《Environmental Education of Elementary School in the New Century》
5.International communion	“Air Quality Management of City: the Practice and Experience of EU and China ”International workshop
	East-Asia acid deposition monitoring network– acid deposition monitoring of the Chinese network

	The environmental samples of EU and the plan of international mensuration
	TV special subject program《Air Quality Management of City: Report from China》
	“The implementation and development of ISO14000”International workshop
	The outstanding environmental protection undergraduate delegation of HongKong come to Beijing for field trip and intercommunion
	Field trip: Study on the environmental management system certification of Europe
	Attend the annual meeting of the International Authorization Forum （IAF）

Table 5: Important programs, projects and activities in 2000

Category of Projects/activities	Name
1.scientific research	
Water	Research on the capillary gas chromatography method of hydroxybenzene in waste water
	Analysis method development and pollution investigation of the toxic and harmful organic pollution in water
	Water quality –sulphide environmental standard sample
	Water quality - kjeldahl environmental standard sample
Air	Quantity and shape Analysis on the particulate matter from burning of bio-matter
	Research on the fluorescence X spectroscopic analysis method for analyzing the source of the atmospheric particulate matter
	Monitoring method of waste gas and air at the time of destroy the chemical weapons- mensuration of dioxin
	Organic pollution Monitoring of the atmospheric particulate matter of the cities of North -China
	Research on the influence of yellow sand and sand storm to the atmospheric particulate matter in Beijing area

	Research on the treatment technology of NO_x in the exhaust gas of diesel
Solid waste	Investigation and Research on the disposal system of life garbage of Beijing city
	Research on the discharge regular pattern of dioxin from the life garbage combustion furnace and the control measure of it
	Research on the management system and policies of life garbage of the cities in China
	Research on the disposal and resourcelization technology of solid waste
Others (analyzing, monitoring, standard samples, policies research, etc.)	Research on the environmental management of city-a case study of DaLian
	Life cycle assessment of the energy chain of ShanDong province of China
	Update the WorldBank's report published in 1992 -《The Report of Environmental Strategy of China》
	Translation and publishing of 《Green Global Yearbook》
	Research on the open strategy of environmental service domain of China
	Research on the environmental Protection strategy of West China Development
	Research on the compatibility between foreign trade and environmental protection policies in China
	Research: "China borrow ideas from the pollution prevention administrator system of Japanese enterprise"
	Application research and development of GIS of the important valley
	Provincial-level GIS development
	City GIS development
2.Management service	Environmental impact assessment of "JinShao" key irrigation project of LiaoNing Province of China
	Building of satellite communications special network of SEPA
	Building of Evnironmental information network of 100 cities supported by grant-in-aid of Japanese government

	Investigation of 2000 China-Japan cooperation environmental development model cities project
	Registration of environment management system(EMS) auditors
	Consultancy service for ISO14001 certification
3.publization and training	《Environment and Trade》international training course and seminar
	China-Germany environmental protection international cooperation seminar
	National-wide middle-school and elementary school "Xerox Cup" environmental protection painting competition
	Produce a TV program《Environmental Protection Travelog of The United State》
4.academic activities (workshop, seminar, lectures, etc)	WTO and environmental protection international workshop
	Environment monitoring technology Workshop
	The ninth session of trading and environment working group
	State-owned enterprise reform, technology innovation and environmental protection symposium
	China-Canada Clean Production policies workshop
5.International communion	"Environmental education of citizen and environmental science development tendency in the 21st century" international workshop
	JICA research project - development present status of environmental protection industry in Japan and correlated policies research
	China-Japan technology cooperation – the training project of acid rain and SO_2 pollution control
	Attend the annual meeting of the Pacific Authorization Committee (PAC)
	Field trip: study on the regional environment management system (EMS) certification of Japan

Table 6: Important programs, projects and activities in 2001

Category of Projects/activities	Name

1.scientific research	
Water	Research on the capillary gas chromatography method of hydroxybenzene in waste water
	Degradation product of CFCs substitute – Research on method of environmental analysis about the influence of TFA to the water and the swamped land
	Water quality – nitrobenzene series environmental standard sample
	Water quality – methylmercury, ethylmercury environmental standard sample
	Water quality – herbicide environmental standard sample
Air	Accurate mensuration of mixed carbon particulate – accurate mensuration of elementary carbon
	SO_2, NO environmental standard sample of low-concentration in nitrogen gas
Solid waste	Research on the environmental security standard of roadbrick made from garbage
Others (analyzing, monitoring, standard samples, policies research, etc.)	Research on quality guarantee measure of the dioxin analysis lab
	Collection and selection of environmental analysis and testing method
	Constitute the national environmental standards
	Environmental information sharing and service network system
	Environmental impact integrated assessment of trade policies
	Research on the environmental Protection strategy of West China Development
	Life cycle assessment of the energy chain of ShanDong province of China
	Research on the influence of the financial crisis of southeast Asia to the trade liberalization of environmental products and service
	Research on the organization, function and mechanism of foreign environmental protection departments.
	Research: “China borrow ideas from the pollution prevention administrator system of Japanese enterprise”

2.Management service	Building and implementation of ISO14001 in Sino-Japan Friendship Center for environmental protection
	Building of Evnironmental information network system of China supported by grant-in-aid of Japanese government
	Management and Training of Green Schools
	Waste battery recycle activity
	Environment management information system of construction projects
3.publization and training	China-Japan technology cooperation – the training project of acid rain and SO_2 pollution control
	Business, Environment, Learning and Leadership (BELL) project
	Training course for the teachers of "global environmental education activity in China"
	Training for the auditors of ISO14000 environment management system
4.academic activities (workshop, seminar, lectures, etc)	Indoor air quality international workshop
	The 1st national environmental information technology and its application symposium
	The 2nd international workshop of the implementation and development of ISO14000
	Research and development of the general purpose internet flat for the purpose of environmental geography information issue
	Measurement capacity Comparative of different environment monitoring and analysis labs
5.International communion	Forum: "Dialogue of Environment and Development"
	China-Germany project: capacity building of SEPA
	China-Japan environmental investment and financing mechanism workshop
	WTO policies research and design workshop
	Environmental education network of China, Japan and South Korea

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