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**Industrial Pollution Control Policies in China:
Evaluations and Recommendations¹**

cc: Mr Puff

A report submitted to

The United Nation's Industrial Development Organization

By

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April, 2002

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Executive Summary

China has undertaken several significant industrial development policy reforms since 1978, notably, the promotion of small and medium industrial enterprises in the rural areas and the state-owned enterprises reform. Most of those reforms have had or will have strong implications to China's environment. China has also undertaken a comprehensive reform on its industrial pollution control policies or more broadly the environmental policies. This reform has also had significant implications in both industrial development and environmental qualities in China.

This report is intended to provide a comprehensive review of major issues in industrial pollution control policies and their enforcement as well as a review of environmental consequences of development policies China has adopted since 1978. Recommendations are provided on how to improve the industrial pollution regulatory system and its enforcement and how to improve the work on evaluating environmental consequences of industrial policies, or more broadly called, the strategic environmental assessment (SEA) of development policies. However, this report is not intended to provide a complete review of China's industrial pollution control policies and the enforcement; only those major issues, where the environmental protection work can be significantly improved if the issues are solved, are identified and reviewed, and recommendations on how to solve them are provided.

The regulatory approaches currently used in China generally include command and control measures, economic incentives and information strategies. The command and control approach is a widely used, primary regulatory instrument to industrial pollution control in China. The use of it has contributed to China's industrial pollution control achievement. While there are still many issues associated with the use of this approach in terms of improving the effectiveness and efficiency such as the lack of completeness and detail in regulation, the major issue considered in using the command and control approach in China is in local enforcement, which has been generally regarded as weak.

The weak environmental enforcement has been largely due to that the enforcement work has been significantly intervened by other government departments and that the local environmental departments are part of local government bodies. Measures need to be developed to put environmental pressures on the shoulders of government leaders, such as mayors. Therefore the first recommendation for strengthening local environmental enforcement work is to make government leaders accountable for environment in their jurisdictions. One potentially effective approach is to disclose their environmental performance to the public. The second recommendation is to enact an administrative penalty law. This can make environmental enforcement work less vulnerable to the possible interventions of other government departments which usually have higher rankings than environmental bureaus in government structures. And the third recommendation is to clearly define property rights of companies or firms and to separate enterprises from government bodies. This would make law enforcement much easier.

Pollution levy has been a long-used economic instrument to industrial pollution control in China. Studies have shown that this is an effective, even though marginally, policy instrument to which industrial polluters did respond. To better use this approach, China needs to have a comprehensive reform of the levy system. Studies have been conducted on how to reform the policy, a trial, new program has been implemented in three municipalities. While there are many problems associated with the current pollution levy system, the most important issue is that the charge rates are too low. Specific recommendations include: charging on all major pollutants; charging on all discharges no matter whether they are meeting discharge standards; increasing the charge rates; allowing variations in different areas. China should establish the new levy system as soon as possible, based on the three municipal trials of the new levy formula.

Information approach is a relative new instrument a government can use in battling on industrial pollution, which has a great potential to contribute into China's industrial pollution management. Studies have shown the necessity and the feasibility of employing this approach in China. Zhenjiang city of Jiangsu province and Hohhot city of

Inner Mangolia have been trying a program called the environmental performance disclosure program which discloses polluters' environmental performances to the public and solicits public pressures in order to make polluters to abate pollution. It has been generally evaluated as successful. This is a cost effective way to provide stronger incentives for environmental entities to improve their environmental performances. Based on the two pilot disclosure programs sponsored by the World Bank, China needs to summarize experiences and trial new programs in other areas in the short run and establish a national level disclosure program in the long run.

There are millions of small and medium industrial enterprises (SME), mostly located in the rural areas, which have most of the time escaped the industrial pollution control regulations enacted in China. These enterprises are normally called "township and village industrial enterprises, or TVIEs. These TVIEs are discharging more than 50% of industrial pollutions into the environment. Because of their unique nature and location, appropriate approaches have to be developed to the control of their pollution, even though Chinese government has made a great effort into it.

Generally speaking, any efforts which can improve the work of environmental regulation and enforcement in China, such as capacity building for enforcement, financial support, better legal documents, etc. can help control rural SME pollution. Specific recommendations in this respect include:

- 1) Strengthening local environmental monitoring and enforcement authorities;
- 2) Integrating the consideration of industrial development zones into local small town development plans;
- 3) Promoting pollution management consulting businesses for SME;
- 4) Promoting public participation in local community-based environmental management.

Environmental impact assessments (EIA) have been widely practiced in China on construction projects. However, they have not been significantly applied to government

policy development, nor been used to evaluate government policies ex-post. Strategic environmental assessments of development policies are considered very important activities, which can promote the integration of environmental consideration into government development decision-makings. However the capacity of conducting the SEA work is very weak currently in China; capacity building in this respect is considered the most pressing work. China needs to organize more workshops and conduct studies so that SEA methodologies can be well developed and comprehended, and technical requirements can be detailed out. It is also necessary to enact SEA laws or regulations which should require explicitly proper auditing and public participation, etc..

Chapter 1

Industrial Pollution and Policy: An Overview

Rather than providing a comprehensive evaluation of China's industrial pollution regulatory system, this report intends to provide in-depth reviews on several selected regulatory issues where practical recommendations can be made to the Chinese government, as well as to the international communities. Before focusing on specific policy issues, this introductory chapter first presents an overview of the status of industrial pollution control in China.

1.1 Air Pollution

Air pollution in China is mainly caused by coal burning, and the major pollutants are particulates and SO₂. The total soot and SO₂ emissions in China have been increasing since the early 1990's, and the *industrial* soot and SO₂ emissions increased during 1991-1995 and then began to decrease since 1998. In 1998, some small industrial enterprises with heavy pollution were closed by the government, and some large and medium enterprises did not produce at their full capacities. As a result, the total emission in 1998 dropped significantly from the year before. To be specific, in 1998 the total emission of SO₂ was 20.9 million tons (including 15.9 million tons from industrial sources and 5 million tons from household sources), and the total emission of soot was 14.6 million tons (including 11.8 million tons from industrial sources and 2.8 million tons from household sources), which decreased by 7.8% and 7.7% respectively from the year of 1997 (see Table 1-1). The rates of dust removal of exhaust from burning of industrial fuels increased by 6.3% from 1991 to 1998 and the treatment rate increased 15% during the same period (see Table 1-2).

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

to the statistical data of pH values of precipitation in 106 cities, the annual average pH value varies from 4.7 to 7.47, among which 40% of the cities have a pH value lower than 5.6, while in southern China the percentage is about 70%.

With the rapid urbanization process and the increase in population and vehicle numbers, some of the large and medium sized cities begin to show some mixed characteristics of pollution of coal soot and vehicle exhaust. Generally speaking, air pollution in northern cities is more severe than southern cities. The total suspended particulates (TSP) concentration in the northern cities is higher than that of the southern cities. On average the concentration of TSP in the North is nearly twice the concentration in the South. SO₂ concentration and TSP concentration of both northern and southern cities are presenting a decreasing trend, however, which shows the effectiveness of measures to control urban air pollution in China. The NO_x concentration of southern cities is basically stable, though with a slightly increasing trend. As for northern cities, NO_x concentration began to decrease year by year after reaching a peak in 1993. (see Table 1-3, Figure 1-1 and Figure 1-2). In 1999, among the 338 cities for which statistics are available, 33.1 % meet the Level II National Air Quality Standard, and 137 cities cannot even meet the Level III Standard. Generally speaking, the urban air quality in China now is a little bit better than that of 1998; air qualities in some cities have been improved, even though they still suffer serious air pollution problems.

1.2 Water Pollution

Although the Chinese economy has been developing very 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 treatment rate and the rate of discharges meeting the State Standards increase year by year. In comparison with that of 1991, the treatment rate of wastewater from industrial enterprises above county level increased by 24.7%, reaching 88.2%, and the rate of discharges of industrial wastewater meeting the State Standards increased by 16.7%, reaching 67.0% in 1998 (see Table 1-4). The pressure on water environment is released to

a certain extent, even though water pollution is still in a severe status. The industrial and sanitary wastewater discharge was 4×10^{10} tons in 1999, including 2×10^{10} tons of industrial wastewater and 2×10^{10} tons of sanitary wastewater. The amount of sanitary wastewater exceeds that of the industrial wastewater for the first time in 1999. The total COD discharge in 1999 was 13.89 million tons, and the COD discharges in industrial wastewater and sanitary wastewater accounted for 49.8% and 50.2% of total COD discharge respectively.

According to the water quality data of the 7 main river systems in 1991 and 1998, Liao River, Hai River and Huai River were polluted seriously, while Pearl River and Yangtze River were only slightly polluted, and the water quality in these two rivers are basically good. 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. The 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 and red tides break out frequently. Fishery resources in some important waters are destroyed and the number of species is decreasing.

1.3 Solid Wastes

Solid waste pollution is another severe problem that affects environmental quality, not only taking up lands but also causing air, water and soil pollution. In the 1990's, the quantity of industrial solid waste increased year by year and remained around 6.5×10^8 tons (see Table 1-6). In 1998 the total industrial solid waste quantity was 8.0×10^8 tons, including 6.4×10^8 tons from industrial enterprises above county level, which accounted for 80% of the total. Industrial solid waste discharge was 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 were far less than those of the enterprises above county level. The amount of solid waste being recycled and reused was 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 was still higher than the level of 1993 (see Figure 3). In the big cities of China, the municipal solid waste generation rate is about 1 kg per capita per day, and the 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 for solutions.

1.4 Pollution Damages

Coming with China's high-speed economic growth are frequent pollution accidents. According to incomplete statistic figures, such accidents caused a total economic loss of about 700 million Yuan from 1993 to 1997. Water pollution takes the largest share of the total loss caused by pollution accidents; air pollution accidents ranked the 2nd and solid waste accidents are the lowest (see Table 1-7).

Acid precipitation is one of the major factors that affect ecological environment of China. Acid rain causes hazards to agriculture, forestry, live farming, fishery, architecture, cultural relics and human health, bringing tens of billions Yuan of economic losses. According to researches on acid precipitation and its effects on ecological environment in China, SO₂ 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 accounts for 4% of the total production and values 3.7 billion yuan (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, which accounts for 4% of the total forest area and 6.5% of timber forest. Acid rain causes the reduction in timber production of 1 million m³, of which the economic loss is about 0.6 billion yuan and the estimated forest ecological loss is about 5.4 billion yuan (see Table 1-8).

The estimation of air pollution and water pollution losses in monetary terms has been carried out in recent years. Different estimation methods lead to significant variance in estimation results, however. In the World Bank report of “Clear Water and Blue Skies: China’s Environment in 2020”, the willingness-to-pay approach and the human capital method were adopted to estimate the losses caused by air and water pollution in China (see Table 1-9). From the data we can say that pollution is in a severe status and is affecting economic development and human health seriously.

Generally speaking, the environmental problem in China is still very serious. In some places, local environmental pollution has become factors that restrict economic development and social stabilization and threaten human health. A clear understanding of the environment state and the trend in development is very important for implementing the sustainable development strategy.

1.5 Development of Pollution Control Policies

The development of pollution control policies in China can be divided into three stages. The first-stage pollution control policies emerged when the environmental pressure increased to a certain degree in the late 70’s and early 80’s. However, the pollution problem had become more serious. The second-stage of pollution control policies emerged in mid 80’s, which focus on the innovation of production process control and the improvement of energy efficiency, such as the policy of clean production. Although they did not replace the first-stage pollution control policies, they had become the main body of environmental policies and the more effective measures to control the pollution. Similarly, the third-stage pollution control policies emerged in the 90’s, which

adjusted the production structure and consumption structure and integrated the pollution control with the economic development. All these pollution control policies emerged in different period have been combined together to prevent, control and restore the environment.

1.5.1 First-stage pollution control policies

The Environmental Responsibility System It originated from the environmental responsibility system of mayors and developed to be suitable for reforms in the separation between the government and the enterprises and the simplification of administration as well as the decentralization. It is an administrative system which is responsible for the environmental quality according to the law and is implemented by all local government and polluting enterprises. This system establishes the major responsible persons, responsibilities of a region, a department and even a unit to control the pollution, applies the objectively, quantitatively and systematically administrative methods, and takes the environmental protection, a basic national policies, as the behavioral criteria of leaders at all level to push the environmental protection widely and deeply.

Urban Quantitative Audit System This system evaluates the technological change in industrial pollution control and prevention of enterprises, the central treatment of pollution, and the construction of infrastructure. It intends to strengthen the leadership, the increase the financial investment, the technical and scientific advancement and the legal construction as the guarantee condition.

Pollution permits system. It is a direct control measure on the pollution sources based on total pollution load. Its intention is to promote polluters to meet the emission standards of pollutants by investigating their own pollution behavior, distributing the financial capacity and using the best practical technologies.

System of time-limited treatment. This system is to solve those prominently environmental problems. Annually the master plan at the national level is made for a

series of time-limited projects. Under the guidance of the master plan, the corresponding local governments make instructions and compulsive measures of treatment deadlines for those projects.

System of centralized pollution treatment. To promote economic efficiency, this system defines both administrative measures and technical means to encourage centralized pollution treatment facilities.

Pollution levy system. This system was developed to enforce pollution discharge standards. Consistent with the principle of “polluters pay”, it promotes pollution control measures which are economically efficient. Detailed discussions can be found in Chapter 3.

System of environmental impact assessment (EIA). It adjusts the relationship between economic development and environmental protection of human beings by the rights and obligations of main bodies with legal relationship. China is planning to enact an EIA Law that will expand the EIA work onto development planning and policies.

Three Synchronizations System. It requires that pollution control facilities should be designed, constructed and operated with the production processes. It is to prevent the new pollution discharges, which matches with the EIA system to control the construction projects which emit pollutants exceeding the standards. It fully embodies the guideline of “pay more attention on pollution prevention”.

1.5. 2 Second-stage pollution control policies

1) Technical reconstruction of enterprises

The government requests and guides the technical reconstruction of enterprises in the pollution control and treatment. These enterprises are requested to reduce their pollution through two approaches: one is to renovate technologies, change the old production

processes into one with less pollution or even without pollution; and second is to recycle the wastes in order to alleviate the pollution.

2) Cleaner Production

The cleaner production is currently advocated in the world. In fact, the idea of the cleaner production was involved in China's environmental policies in the early stages, which was one of the reasons why the cleaner production was rather easily accepted. The cleaner production was formally put forward and to be pushed in 1993. And then a series of activities were carried out: 1) the Auditing Handbook for Cleaner Production in Enterprises was compiled; 2) the national network on cleaner production was established; 3) the auditing of cleaner production was conducted in 200 enterprises in the whole country; 4) 5 demonstration projects on cleaner production was established; 5) SEPA promulgated Some Decisions on Implementing the Cleaner Production; and 6) more than 10 centers for the supervision and training on cleaner production at the local and ministerial level.

Compared to the large number of enterprises in the whole country, the enterprises which have implemented the cleaner production are only a few, which leaves a large space for the further development of environmental policies along the direction of the cleaner production. The cleaner production is one of the voluntary environmental policies in China. Enough attraction to the enterprises is the key to involve them into the voluntary process. In addition, the environmental problems are largely from the problems of development patterns. So, the cleaner production is essentially to solve the environmental problems through the changes of development patterns, which is one of the fundamental trends of environmental policies in China.

The extensive economic growth mode in long-term has caused more investment, less output, higher consumption, and greater waste, as well as more and more obvious problems in insufficient resource supply and environmental pressure. At the same time, the economic losses caused by such kind of growth mode are higher and higher. In

addition, with the improvement of public environmental awareness, the investment in the environmental control and treatment increased largely, but the pattern of the environmental control and treatment is mainly the end-of-pipe treatment, which is so difficult for enterprises to unify the environmental benefits and economic benefits. The cleaner production could solve these problems, because it aims the improvement of the use rate of natural resources and energy and the reduction of pollutant emission and could unify the environmental benefits and economic benefits. The cleaner production is the first-rank pattern, so Chinese government vigorously sparkplug it. In order to implement the cleaner production widely, the legal instrument will be used for it.

The Committee of Environment and Resource in National People's Congress entrusted the State Economic and Trade Committee to draft out the Law on Cleaner Production of P. R. China and then organized experts, entrepreneurs to have a discussion on it. After the Draft Law on Cleaner Production was finished, it was submitted to the related departments of State Council and local governments for suggestions and comments. After the investigation, argumentation, modification, and complete changes on the draft law in one year, it was formally submitted to the Committee of Environment and Resource in National People's Congress. Till June 2001, the draft with new comments has been returned and will be modified according to those comments.

The four principles that the Draft Law of Cleaner Production adhere to are that the resources should be used reasonably, the economic benefit and the environmental benefit should be unified, the enterprises should be the main body of the cleaner production, and the encouraging policies should be combined with the restricting policies.

In other countries, the cleaner production is also steered by the government and adopted by enterprises voluntarily. So, China should bring the market mechanism into play. When the Law on Leaner Production is being drafted, the economic instrument should be paid the largest attention to in order to let enterprises implement the cleaner production. The preliminary suggestions on policies are as the following: the first is the encouraging measure on credit, such as providing a preferential loan by the financial

department for the cleaner production project; the second is the financial policy, such as providing the fund support with less interest to those demonstration projects on leaner production and establishing cleaner production fund to support the research and development of technologies on cleaner production and the government's purchase of goods which meet the standards of cleaner production; the third is the favorable tax policy, such as the reduction or exemption from tax on enterprises with technologies, production process, equipment or products which have been in the list of National Cleaner Production Guiding Catalogue; the fourth is the environmental management, such as firstly using the pollution levy in the cleaner production project and establishing the check system on the reduction of total pollutants by the cleaner production enterprises and the pollution permitting system; the fifth is to encourage the establishment and implementation of cleaner production planning and auditing system; and the sixth is to establish the system on honor and encourage for cleaner production and periodically publicize the list of advanced enterprises with cleaner production.

In developed countries, there are many favorable policies and regulations encouraging the cleaner production, but there is no any Law on Cleaner Production. Now China is the first in the world to formulate the Law on Cleaner Production in order to accelerate the implementation of cleaner production.

3) Environmental Label and ISO14000

The Environmental Label is another voluntary policy, which started from 1993 in China. It is given to products without pollutants in order to encourage the public consumption of the environmentally sound products. This policy is a win-win policy, which could encourage the production of the environmentally sound products and improve the competition of such kind of enterprises in the market by the flag of environmental protection. Therefore, this policy is of strong rallying point. By the end of 2000, there have been 222 enterprises and 704 products that obtained verification of Environmental Label.

In 1997, ISO14000 certification was introduced into China, as a new content of China's environmental policies. It is used for auditing and verifying of enterprises. It issues the certification for enterprises that could meet the ISO14000 requirements, which is helpful for the competition in the international market. By the end of 2000, SEPA has approved and awarded five developed zones respectively in Suzhou, Dalian, Jin Qiadun of Shanghai, Tianjin and Wuxi as the National Demonstration Zone on ISO14000, and there are 17 ISO14000 certification centers, 90 consulting centers and 1 training center.

4) Synthetic use of wastes

It's an economically incentive policies to encourage enterprises to reuse the wastes, which was carried out earlier. Its concrete provisions are the following: the profits of reusing wastes will exempt from the tax in five years; the government will give the preferential treatment on the purchase and price to those products from synthetic use of wastes; the cost of occupying and using the fix assets---pollution control facilities---will be derated; the construction tax will be exempted from the pollution control engineering projects using enterprises' own fund and environmental subsidy or the moved construction projects due to the pollution, while the preferential loan can be applied from banks according to the related regulations; and the enterprises reusing wastes can use the wastes of other enterprises free of charge.

1.5.3 Third-stage pollution control policies

The environmental problems resulted from the economic development and the solution of environmental problems should also be relied on the economic development. The integration between environment and economy should be the necessary approach to solve the environmental problems in the 21 century.

1) Structural adjustment

Since mid 1990s, China has started a new stage with the structural adjustments, which includes the industrial structure, ownership structure, organizational structure and etc.. The industrial structure adjustment is the nodus of China economic development due to the overstock of primary products in iron and steel, chemical and textile sectors with heavy pollution and the lack of high-tech products. The adjustments of industrial structure have helped to solve the pollution problems from the headstream of production process. In addition, the implementation of stock-share system has reduced the pollution.

2) Energy control policy in Shenyang

The energy control policy was put forward at the first time by the government of Shenyang city in May 1999. It is a compelling policy to push the use of clean energy so that the Environmental Bureau of Shenyang can supervise the departments related to the real estates, constructions in urban areas, materials, and coal. After the adoption of this policy, the total suspended particulate decreased 22.3% in November to December 1999 than the same period in 1998.

3) Strategic environmental assessment

China will implement the strategic environmental assessment according to the new Act on Environmental Assessment, which is planned to enact in 2002. More detailed discussions will be provided in Chapter 6.

Table 1-1 Air Pollutant Emission

	Total SO ₂ Emission ^a (k T)	Total Soot Emission ^a (kT)	Total Industrial Exhaust Emission ^b (10 ⁸ m ³)	Industrial soot Emission ^b (k T)	Industrial SO ₂ Emission ^b (k T)	Industrial Dust Emission ^b (k T)
1991	16,220	13,140	84,750	8,450	11,650	5,790
1992	16,850	14,140	90,310	8,700	13,240	5,760
1993	17,950	14,160	93,420	8,800	12,920	6,170
1994	18,250	14,140	97,460	8,070	13,410	5,830
1995	18,910	14,780	107,480	8,380	14,050	6,390
1996	/	/	111,200	7,580	13,640	5,620
1997	23,460	18,730	113,380	6,850	13,630	5,480
1998	20,910	14,550	110,810	6,800	12,100	5,060

a Total emission of all enterprises nationwide (excluding Town Village-ship Enterprises) ;

b Total emission of industrial enterprises the county and above level.

Source: China Environment Yearbook 1992-1998, China Environmental Science Press.

Table 1-2 Emission and Treatment of Exhaust from Burning of Industrial Fuels and Industrial Process

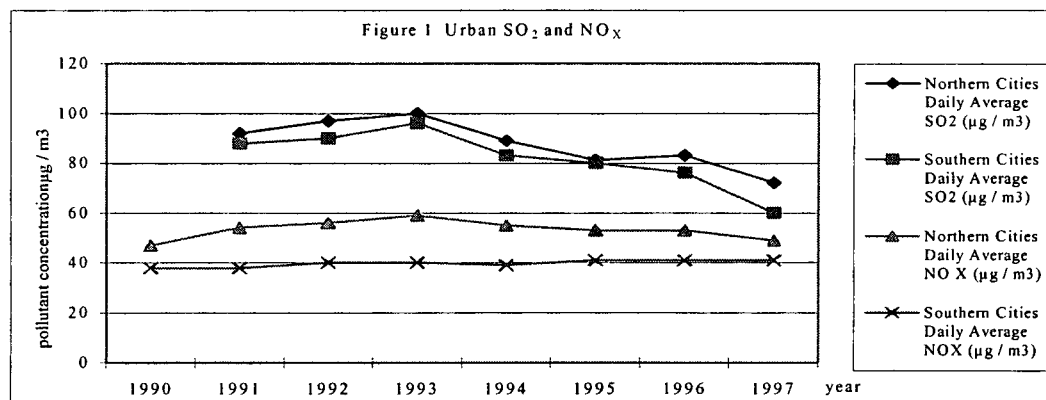
Year	Exhaust from burning of industrial fuels (10 ⁸ m ³)	Rate of dust removal of exhaust from burning of industrial fuels (%)	Exhaust from industrial process (10 ⁸ m ³)	Treatment rate of exhaust from industrial process (%)
1991	53650	85.2	31000	64.8
1992	57900	85.7	32400	68.9
1993	60000	86.2	33380	70.1
1994	61800	88.6	35660	71.8
1995	66950	89.7	40530	70.8
1996	70000	90.0	41180	75.0
1997	70900	90.4	42460	79.4
1998	68180	91.5	42090	79.9

Source: China Environment Yearbook 1992-1998, China Environmental Science Press

Table1- 3 Air Pollution in Chinese Cities

Year	Northern Cities Daily Average SO ₂ ($\mu\text{g}/\text{m}^3$)	Southern Cities Daily Average SO ₂ ($\mu\text{g}/\text{m}^3$)	Northern Cities Daily Average TSP ($\mu\text{g}/\text{m}^3$)	Southern Cities Daily Average TSP ($\mu\text{g}/\text{m}^3$)	Northern Cities Daily Average NO _x ($\mu\text{g}/\text{m}^3$)	Southern Cities Daily Average NO _x ($\mu\text{g}/\text{m}^3$)
1990	/	/	475	268	47	38
1991	92	88	429	225	54	38
1992	97	90	403	243	56	40
1993	100	96	407	251	59	40
1994	89	83	407	250	55	39
1995	81	80	392	242	53	41
1996	83	76	387	230	53	41
1997	72	60	381	200	49	41
1998	56	(National Average)			37	(National Average)

Source: Official Report on China Environment Status, 1990-1999, SEPA



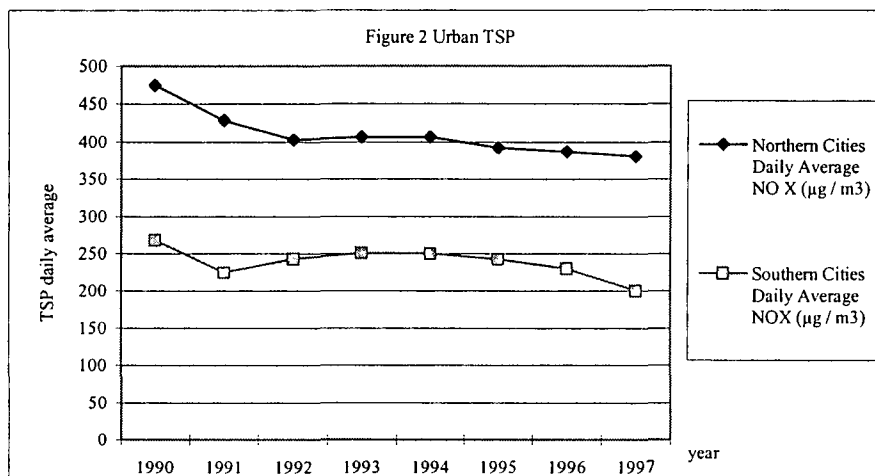


Table 1- 4 Discharges, Treatment of Wastewater from Industrial Enterprises above County-level and Discharges Meeting the State Standards

Year	Total Discharges of Industrial Wastewater (million tons)	Industrial Wastewater Treatment Rate (%)	Percentage of Industrial Wastewater Discharge Meeting the State Standards (%)
1991	23590	63.5	50.1
1992	23385	68.6	52.9
1993	21950	72.0	54.9
1994	21550	75.0	55.8
1995	22190	76.8	55.4
1996	20590	81.6	59.1
1997	18830	84.7	61.8
1998	17120	88.2	67.0

Source: China Environment Yearbook 1992-1998 China Environmental Science Press.

Table 1-5 Proportions of Seven Main Rivers Meeting Different Water Quality Standards

year Standards Water System	1991			1998					
	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 SEPA: Official Report on China Environment Status, 1991,1999

Table1-6 Industrial Solid Waste Generation, Reuse, Treatment and Discharge

Year	Generation ^a (10 ⁴ ton)	Reuse (10 ⁴ ton)	Reuse Rate ^a (%)	Storage (10 ⁴ ton)	Disposal (10 ⁴ ton)	Discharge ^a (10 ⁴ ton)	Accumulated Storage (10 ⁴ ton)	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 and above Industrial Enterprises

Source: Report on Environmental Statistic data , 1991-1998, SEPA.

Table1- 7 Pollution Accidents

	Number of Accidents	Direct Economic Loss (10 ⁴ yuan)	Number of Air Pollution Accidents	Economic Loss of Air Pollution Accidents (10 ⁴ yuan)	Number of Water Pollution Accidents	Economic Loss of Water Pollution Accidents (10 ⁴ yuan)	Number of Solid Waste Pollution Accidents	Economic Loss of Solid Waste Pollution Accidents (10 ⁴ yuan)
1993	2761	21690	888	9870	1431	6068	72	255
1994	3001	12630	986	1700	1617	10460	58	88
1995	1996	9938	732	1304	1022	5750	70	62
1996	1446	16930	585	860	677	15180	39	127
1997	1992	8366	752	1300	986	3790	55	74

Source: Environmental Statistic Data Yearbook, 1994-1998, Environmental Science Press

Table 1-8 Economic Loss on Forest Caused by Acid Precipitation in 7 Eastern Provinces (in 10⁶ 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
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Source: *Research on Acid Precipitation and its Ecological Effects in China*, China Research Academy of Environmental Science, 1996

Table1-9 Air and Water Pollution Loss Estimation (in Million US Dollars)

Issue	Willingness-To-Pay Value	Human Capital Value
Urban Air Pollution	32343	11271
Premature Death	10684	1597
Morbidity	21659	9674
Days of Restricted Activity	3842	3842
Chronic Bronchitis	14092	2107
Other Health Effects	3725	3725
Indoor Air Pollution	10648	3711
Premature Death	3517	526
Morbidity	7131	3185
Lead Pollution (Children)	1622	270
Water Pollution	3930	3930
Medical Expense	1988	1988
Agriculture and Fishery Loss	1159	1159
Water Shortage	783	783
Acid Rain	5046	5046
Destruction on Forest and Farming	4364	4364
Timber Loss	271	271
Ecology System Loss	411	411
Total	53589	24228
Percentage of GDP	7.7%	3.5%

Source: *World Bank, Clear Water and Blue Sky: China's Environment in 2020*, China Finance and Economy Press, 1997.

Chapter 2

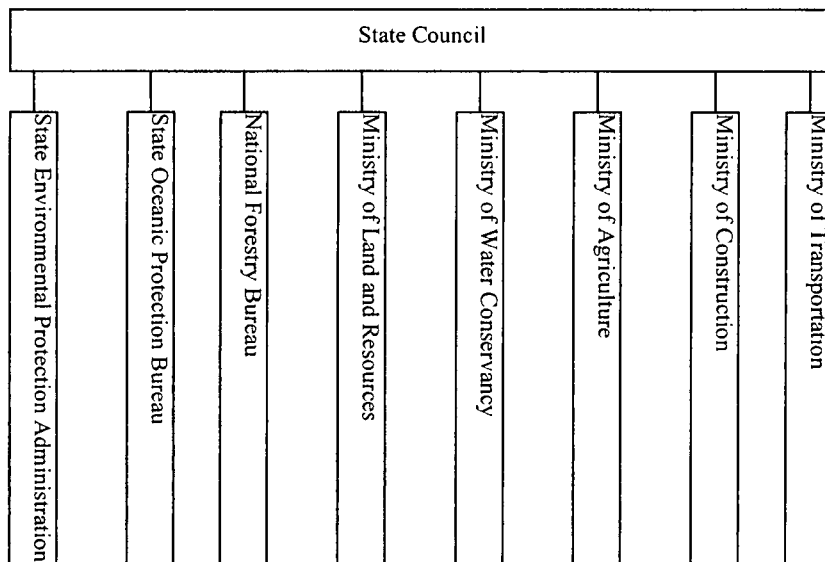
Command and Control Policies: The Issue of Enforcement

2.1 Introduction

The command and control approaches have been widely used in this world to regulate industrial pollution. The most popular regulatory approach employed in China is of command and control. In China, the enforcement system is made up of the administrative departments, the justice departments and the social organizations. The law makers and supervision departments are People's Congress and its standing committee at all levels, which mainly stimulate the environmental protection law and supervise the government's enforcement. The government is responsible for the enforcement by using their administrative rights. The justice departments are responsible for the justness of enforcement. The social organizations including individuals promote the realization of enforcement by the public supervision and environmental litigation.

It is stipulated in the Environmental Protection Law of People's Republic of China that the administrative departments of environmental protection of the State Council supervise and manage environmental protection work in the whole country, and the environment-related departments of local authorities at county and above levels supervise and manage environmental protection work in their administrative regions. The state oceanographic administrative department is responsible for the supervision of harbor and fishery administration; the environmental protection department of army troops and police, transportation, railroad, and airport at every levels implement the supervision management of environmental protection in the corresponding field; the administrative department of land, mineral resources, forestry, agriculture and water resources at the level of county or above are responsible for the supervision and management of different resources (Table 2-1).

Table 2-1 Organization of Environmental Enforcement



China has a comprehensive industrial pollution control regulatory framework. While regulatory system still needs improvement, the enforcement of the regulations has been regarded as the bottleneck of China's pollution control system. The phenomenon that firms did not comply with regulations is very serious. Several factors contributed to this phenomenon, which include imprecise definition of regulatory articles, weak enforcement institutions, insufficient training of local regulators, low environmental awareness of the public, etc. In 1996, the State Council issued a decree called the Decisions on Several Environmental Protection Problems. In the document, it is pointed out that the appointment of administrative manager of local environmental protection should get approval from an upper level environmental administrative department. This has played a certain role in strengthening the environmental law enforcement, but there are still many problems to be solved.

This chapter analyzes several major issues in environmental law enforcement in China, including institutional, administrative, personnel management, financial and instrumental, etc. This chapter also provides several recommendations on how to improve the enforcement work in China.

2.2 Enforcement Issues

2.2.1 Institutional Issues

The major institutional issues in the environmental law enforcement in China are that the local environmental enforcers can not perform their duties based on law requirements and that the responsibilities of local environmental supervision department are not clearly defined or understood.

In terms of enforcement, SEPA issued Provisional Approaches and Procedures of Environmental Supervision in 1990. In the Decision on Further Strengthening Environmental Protection Work issued by the State Council in December 1990, the requirement of strengthening capacity building of environmental supervision was put forward. But it did not make clear the independent role of environmental supervision.

In China's administrative system at present, the local Environmental Protection Bureau is a part of the local government. Under this administrative system, the enforcement work by the local EPB is either directly or indirectly hindered by the local government. Local governments are more prioritizing the economic growth and ignoring the environmental protection.

Local EPBs are responsible for the routine supervision and management of these polluters. Firms should meet the national standards of pollution discharge under the management of local environmental protection bureaus. Some small firms that are heavily polluting should be denied of registration when their making application for a business permit according to the law of environmental protection. But in order to rejuvenate and stimulate the local economy, these enterprises either make a detour to escape the supervision of local environmental protection department by asking officials of other departments to write a document to permit to begin the project. Some local governments even set up an umbrella to protect those seriously polluting firms which perhaps are important to the local economy, by prohibiting the environmental enforcement agencies to collect fees and fines. These actions have lead to non-

compliance by the polluters and the start of some projects which damage the environment. Only when the pollution is very serious can the local environmental protection agency inspect and impose fines.

All these examples show that the prime reason for the weak enforcement of environmental regulations lies not in a malfunctioning system of environmental protection agencies, but more in the lack of power in the local politics that prevent well-willing local environmental protection bureaus from achieving their environmental targets.

Box 2-1 Nationwide Inspection of Environmental Protection Laws Enforcement

On March 12 of 1993, the State Council promulgated the Notice about Implementing Activities to Strengthen Environmental Protection Laws Enforcement and Cracking Down on Illegal Behaviors, making it clear that the focus of environmental protection in the following years would be on the full use of legal measures and media to reinforce environmental protection law enforcement and supervision, implementation of powerful measures to disseminate and supervise the enforcement of environmental protection laws, and cracking down of the those behaviors that have caused serious pollution and ecological damages. The Committee of Environmental and Resources Protection under the People's Congress, which was established in March 1993 during the 8th Meeting of the People's Congress, had implemented inspection of environmental protection law enforcement as the prime task after its establishment. The inspection, which was carried out by the Committee of Environment and Resources Protection under the People's Congress and the Committee of Environmental Protection under the State Council and provincial people's congress, have been implemented for a continuous 3 years from 1993 and have already inspected 23 provinces and autonomous regions.

Source: Zhang Kunmin, Environmental Management.

2.2.2 Administrative Management

In many cases, regulators themselves are also the objects of regulation. Some firms are owned and operated by the government. The policy of separation of firms from government administration has not been fully achieved in reality, and a large number of firms are still subordinated to the government and hence do not function as real independent market entities. Because the government worried about the national economy and the people's livelihood, unemployment, and social stability, it cannot easily decide to shut down the heavily polluting firms. So once an enterprise is threatened to be closed down because of failure to comply with environmental regulations, a different department of the government – typically the economic or development planning department would intervene with the enforcement of environmental regulation by the local EPB.

Some entrepreneurs or managers of firms hold a position in the committee of party, people's congress or in the local government. These people have dual roles, which forms a new barrier to successful enforcement, since it is difficult for local EPB to inspect and enforce those firms when they violate the environmental law.

During the transition periods, the government enforcement function has not been fully separated from the business function. For example, in some Economic and Technological Development Zone, the environmental offices shared the same staff with the Development Office. Although this kind of institutional arrangements sometimes provides advantages in simplifying procedures and increases work efficiency to attract foreign investment, this institution may lead to ineffective environmental management. In effect, in these cases firms can examine and approve their projects by themselves. The supervision and enforcement just becomes a superficial paper work.

As the power of city government was transferred to a lower level and the economic benefit was taken as one of the most important indicators of directors' achievements, those directors at the local make their great efforts to maximize their economic benefit at the cost of ecological and environmental damages. For example, Shanghai's Baoshan District government approved some polluting joint ventures for the

economic reason. However, the heavy pollution has caused many conflicts between the residents and enterprises. Shanghai Jinhong Metal and Chemical Material Ltd was established without implementing the system of “Three Synchronization” in January 1996. In 1998 and 1999, this enterprise mixed the 25 tons wastes into the construction refuse and household garbage and illegally dumped into the household garbage piles of environmental sanitation agency. Under the pressure of local residents, the municipal environmental monitoring center tested the waste refuse of this enterprise and found its illegal emission. The local EPB stopped its illegal behavior and asked it to adopt some environmental measures including 48, 000 RMB fine before 31 July 2000. Now, the enterprise has stopped its production and sent the rest 20 tons waste refuses to the special treatment center of dangerous wastes.

2.2.3 The Personnel Management

At present, the performances of the governors or regulators of different levels are mainly evaluated by economic indicators. This evaluation criteria press the local officials towards quick, short-term economic success, instant benefits and short-term actions. In order to obtain high productivity and high economic growth, the well-being of future generations is sacrificed. Even some persons who know the seriousness of pollution excuse the “develop first and control later” and have no regard for the environmental protection.

2.2.4 Internal Problems with Local Enforcement Authorities

In the field of environmental protection, the multi-department and multi-layer system of enforcement is carried out in China, which combined the integrated management and separated management. Under this system, there are too many enforcement departments, so the functions are not concentrated, leading to ineffectiveness of enforcement.

In the meantime, besides implementing the enforcement of examination and approval, check and acceptance, penalty, etc., environmental protection administrative departments should play the role of planning and coordinating and inspecting of environmental-related activities of other 13 administrative department, like the police and forestry departments. But there are no detailed regulations on how to inspect and supervise other departments and this cause the vacancy in the practical enforcement. The police and other departments are busy conducting their own business and don't carry out their responsibility of enforcement of environmental protection, while the administrative department of environmental protection can not succeed in not only supervising these departments, but also carry out the authority of enforcement.

In addition, the function of authority of enforcement between the administrative department of environmental protection and other related enforcement department are not clearly defined, and this leads to disputes. All these severely affect the efficiency and effectiveness of enforcement.

In order to put the establishment of environmental standards in order, SEPA has agreed with State Administration of Quality and Technician Supervision (SAQTS) on 19 April 2001 that all the environmental standards will be established according to the related laws and coded by the SAQTS.

2.2.5 Lack of Enforcement Tools

In the law and regulation of environmental protection, there are clear requirements of the firms and individuals to bear some responsibilities related to environmental protection. There are also some bans on activities damaging environment. These mandatory regulations are necessary to protect the environment on which humans depend. And all the peoples and the whole society should obey these mandatory regulations. But there are no corresponding legal responsibilities in the general laws or there are no detailed implementation regulations. So when firms or individuals violate the

rules or regulations, the environmental protection departments can not enforce the law effectively in reality.

In the meantime, according to the environmental protection law, the administrative department of environmental protection at all levels should be responsible for the environmental quality under their jurisdiction. But the law and regulation does not provide EPBs with the powers to shut down enterprises, to suspend accounts of enterprises, to detain people offending environmental regulations or to confiscate their property. This is in contrast to the taxation and commercial and industrial departments, who have these powers. All these result in weak enforcement of environmental protection.

2.3 Lessons from the U.S.

As discussed before, various policy instruments for pollution control have been developed in China, which are similar to those in developed countries, such as Netherlands, France, and Germany. These instruments include:

- Standards: emission standards, exposure standards, process/equipment specification
- Charges: effluent charges, user charges, administrative charges
- Subsidies: investment subsidies; R&D subsidies; waste reduction subsidies

Governments or others take actions to achieve compliance within the regulated community. Enforcement by the government usually includes: Inspections to determine the compliance status of the regulated community and to detect violations; negotiations with individuals or facility managers who are out of compliance to develop mutually agreeable schedules and approaches for achieving compliance; legal action, where necessary, to compel compliance and to impose some consequence for violating the law

or posing a threat to public health or environmental quality; compliance promotion (e.g., educational programs, technical assistance, subsidies) to encourage voluntary compliance.

China needs to experiment and develop a variety of programs to improve its environmental enforcement efforts, as discussed in last section. Some experiences of the United States in enforcing its environmental regulations may provide some lessons for China to reform existing enforcement practices and to experiment some new measures. The enforcement of municipal wastewater treatment requirements in the United States, described in the appendix, is one of those experiences.

The U.S. EPA used to establish specific effluent limitations for municipal wastewater treatment plants in the 70's and 80's that must provided a minimum of secondary treatment. The U.S. EPA provided substantial federal funding to municipalities for construction of municipal wastewater treatment facilities, but the enforcement program was unsuccessful. The major reasons are that, similar as in China, the U.S. EPA readily extended deadlines for compliance and the U.S. EPA and the states were reluctant to enforce against municipalities that had not received federal grants to build new facilities. Under the pressures of the U.S. Congress and the public, the U.S. EPA and the states created a work group in 1982 to develop a new strategy for dealing with municipal noncompliance. This strategy was a sharp contrast to previous policies: enforcement would now be the key tool to achieve compliance, and all municipalities were expected to comply regardless of whether or not they had received federal financial assistance. This new policy — the National Municipal Policy (NMP) — became effective in January 1984. The policy was backed by amendments to the Clean Water Act that greatly restricted the conditions under which extensions could be granted. The amendments allowed no extensions beyond July 1, 1988. A list of noncomplying facilities was developed, and the U.S. EPA and the states pursued enforcement against them. By 1987 almost 80% of all NMP facilities (including major and minor facilities) were under an enforcement order, either administrative or judicial. The NMP was a highly successful program targeted at 1,478 facilities, many of which were very large. Over 71% of these 1,478 facilities came into compliance by the July 1, 1988, deadline for achieving required

treatment. The NMP brought the total population of major treatment plants in compliance to 90%. The NMP owed its success almost entirely to direct enforcement efforts. Before the NMP was implemented, municipalities typically believed that compliance was achieved by acquiring grant funds. Permittees believed that the availability of federal funding was a key part of determining whether the federal government and the states would enforce the regulations. Enforcement actions did not follow a consistent pattern until the National Municipal Policy was developed.

Compared with the poor enforcement power of enforcement agencies at local level in China, the environmental enforcement of U.S. is much more powerful. In the U.S., EPA enforcement officials work closely with the Department of Justice and some EPA officers even have criminal arrest powers. Virtually every environmental law in the U.S. includes criminal provisions. Some of these criminal provisions are designed to ensure truthful self-reporting, while others apply to the polluting activity itself.

Just like in the United States, China local governments are responsible for environmental qualities in their jurisdictions. The US experience of the partnership program between US EPA and local environmental authorities may be another good lesson that China environmental authorities, especially SEPA, should know.

The national environmental performance partnership system (NEPPS) of the United States, described in more detail in the appendix, is a set of basic principles jointly developed by EPA and States. These principles include increased use of goals and indicators, environmental performance agreements, self-assessments, differential oversight, public outreach, and joint evaluations. Strong state performance is rewarded with substantially reduced oversight, freeing up EPA resources to deal with cross-boundary issues and supply more technical assistance to states in need. Each state and its EPA regional office will agree on the set of measures that the state or EPA will collect and report during the year. There are three basic kinds of measures being used in tracking the progress of environmental programs: environmental indicators, "business" performance measures, and program performance measures. Across all measures there are also two general classes of measures: "outcome" measures which show results in the

environment or changes in behavior in the regulated community, and "activity" measures which track the various kinds work done to achieve the desired outcome. The states and EPA are making a determined effort to focus on "outcomes" as much as possible, while tracking essential activities for internal management purposes.

2.4 Recommendations

2.4.1 A Comprehensive Reform of the Enforcement System

A comprehensive reform is necessary in order to improve the environmental enforcement work in China. Special attention should be paid to the following aspects:

a. Strengthening Environmental Supervision

According to the international experiences, the supervision on environmental enforcement should be strengthened by the institutional reform completely. The environmental enforcement agencies should be empowered with the right of independent enforcement. The function of supervision departments should be expanded from fee collection to overall inspection. The procedure of supervision should be standardized, such as the standardized label, uniform and document of enforcement. Professional quality of supervisors should be improved through training and providing modern equipments.

While a new construction project is set up, the environmental concerns should be fully incorporated. Veto authority of environmental protection department should be strengthened in order to effectively regulate and possibly prevent new pollution sources from the very beginning.

b. Promotion of the Separation of Firms from Administrative Authority

The functions of government and enterprises are not separated in some areas and their respective responsibilities are mixed, which lead to enterprises short of competitive vigor and which is also the source of weak environmental enforcement. So it is a must to

deepen the reform of economic system, promote the changes of government's functions, allocate the economic management function carefully according to principle of managing the macro economy while readjusting the micro conditions for enterprises to operate under.

c. Revising Environmental Protection Law and Improving the Enforcement

The state should amend the Environmental Protection Law of the People's Republic of China and other regulations of environmental protection as soon as possible and integrate the authority of the enforcement of environmental protection and concentrate the right of enforcement of environmental protection that scattered in the other departments into one administrative department.

d. Strengthening Enforcement Instrument

When the state and local government modify and issue new regulations for environmental protection, the law should empower the administrative department of environmental protection with some powerful enforcement instruments, like the instruments used by the taxation department and the industrial and commercial departments.

In the meantime, it is necessary to continuously elaborate the legal responsibilities of environmental protection. Firstly, the detailed practical implementation regulation should be made, according to the general provisions of Environmental Protection Law. It should be stipulated in the Law that the corresponding punishment would be implemented if the target groups violate the mandatory provisions. Those enforcement departments, which abuse or cannot carry out their responsibilities according to the law, should be punished, according to relevant law. Secondly, the current penalty system should be improved. There is a shortcoming in that the current system emphasizes on the punishment of enterprises incompliant with national standards and regulations, paying little attention to the punishment of individuals, like governors and managers of firms. So it is necessary to establish a rational punishment system, which punishes both the enterprise and the individuals.

2.4.2 Environmental Performance Indicator System of Local Government

As did in the United States' NEPPS, China SEPA can develop an environmental performance indicator system for provincial governments, municipal governments, county governments, businesses, as well as individuals. Ways such as public disclosure can be designed and implemented in China to take advantage of performance information so that incentives can be provided for local governments to effectively enforce environmental laws.

Appendix: 2.1 Enforcement Experiences in the United States

Enforcement² is the set of actions that governments or others take to achieve compliance within the regulated community and to correct or halt situations that endanger the environment or public health. Enforcement by the government usually includes:

- Inspections to determine the compliance status of the regulated community and to detect violations.
- Negotiations with individuals or facility managers who are out of compliance to develop mutually agreeable schedules and approaches for achieving compliance.
- Legal action, where necessary, to compel compliance and to impose some consequence for violating the law or posing a threat to public health or environmental quality.
- Compliance promotion (e.g., educational programs, technical assistance, subsidies) to encourage voluntary compliance.

Non-government groups may also become involved in enforcement by detecting noncompliance, negotiating with violators, commenting on government enforcement actions, and where the law allows, taking legal action against a violator for noncompliance or against the government for not enforcing the requirements.

²Source: INECE website. The International Network for Environmental Compliance and Enforcement (INECE) provides broad and international perspectives about environmental enforcement. See “Principles of Environmental Enforcement” by The International Network for Environmental Compliance and Enforcement (<http://www.inece.org/Printext.htm>)

In addition, certain industries such as the banking and insurance industries may be indirectly involved in enforcement by requiring assurance of compliance with environmental requirements before they will issue a loan or insurance policy to a facility.

In some countries, societal norms of compliance have been a powerful force compelling compliance with any form of legal requirement. A system that relies on social norms for enforcement may not be effective in every situation and may become vulnerable to abuse if societal norms break down over time. This possibility has stimulated new consideration internationally of the need for dedicated enforcement programs within government and non-government organizations.

I³

Under the Federal Water Pollution Control Act of 1972 and subsequent amendments, the U.S. EPA established specific effluent limitations for municipal wastewater treatment plants. In general, municipal wastewater treatment plants must provide a minimum of secondary treatment. During the 1970s and much of the 1980s, the U.S. EPA provided substantial federal funding (up to 85% of the capital costs) to municipalities for construction of municipal wastewater treatment facilities. The enforcement program was unsuccessful. Two factors contributing to the failure were:

- The U.S. EPA readily extended deadlines for compliance.
- The U.S. EPA and the states were reluctant to enforce against municipalities that had not received federal grants to build new facilities.

The U.S. Congress and the public became increasingly concerned about the problem and, as a result, the U.S. EPA and the states created a work group in 1982 to develop a new strategy for dealing with municipal noncompliance. This strategy was a sharp contrast to previous policies: enforcement would now be the key tool to achieve compliance, and all

³ Excerpted from USEPA, National Environmental Performance Partnership System (NEPPS) Website; <http://www.epa.gov/ocirpage/>

municipalities were expected to comply regardless of whether or not they had received federal financial assistance. This new policy — the National Municipal Policy (NMP) — became effective in January 1984.

The policy was backed by amendments to the Clean Water Act that greatly restricted the conditions under which extensions could be granted. The amendments allowed no extensions beyond July 1, 1988.

With the initiation of the NMP, enforcement by the U.S. EPA and the states became the single most effective tool to bring the municipalities into compliance. A list of noncomplying facilities was developed, and the U.S. EPA and the states pursued enforcement against them. By 1987 almost 80% of all NMP facilities (including major and minor facilities) were under an enforcement order, either administrative or judicial. After this point, all municipalities subject to enforcement action that had not started construction were dealt with primarily by judicial action, since these facilities would be incapable of meeting the July 1, 1988, compliance deadline. By the second quarter of 1988, almost 20% of all NMP major facilities were subject to judicial referrals. On average, NMP facilities received 1.5 state or federal enforcement actions. This means that almost all NMP facilities have been under some sort of enforcement action.

The NMP was a highly successful program targeted at 1,478 facilities, many of which were very large. Over 71% of these 1,478 facilities came into compliance by the July 1, 1988, deadline for achieving required treatment. As of that date, NMP facilities were removing an estimated 1.053 million more kilograms per day of conventional pollutants and 6,800 more kilograms per day of toxic pollutants than in 1984.

The NMP brought the total population of major treatment plants in compliance to 90%. Even more impressive were the resulting environmental benefits. By 1984, 95% of the total sewage processed in the United States was receiving secondary or better treatment, affecting 108 million people. Some 650 (43%) of the 1,478 targeted facilities contributed to known water quality problems and, consequently, were required to install advanced wastewater treatment technology. Of these facilities, 525 facilities, affecting an

estimated 8,000 stream miles (12,800 stream kilometers), met the July 1988 deadline because of the NMP.

The NMP owed its success almost entirely to direct enforcement efforts. Before the NMP was implemented, municipalities typically believed that compliance was achieved by acquiring grant funds. Permittees believed that the availability of federal funding was a key part of determining whether the federal government and the states would enforce the regulations. Enforcement actions did not follow a consistent pattern until the National Municipal Policy was developed. The NMP program was successful largely because of several elements in the enforcement plan:

- First, a team of U.S. EPA managers and staff was specifically assigned to make the effort succeed.
- Second, the media, public, and the Administrator of the U.S. EPA supported the NMP.
- Third, the media gave wide coverage to enforcement initiatives and penalty results.
- Fourth, a unified state/federal policy was established at the outset and the states generally supported the strong enforcement measures.
- Fifth, the program established a fixed universe of facilities to target and tracked individual facilities on a case-by-case basis, continuing to pressure facilities until compliance was reached.
- Sixth, there was a clear statement and follow-through on the policy that there was no link between grant funding and statutory compliance.

All these factors produced a strong and effective enforcement presence. The NMP set examples and precedents through federal and state enforcement actions and through favorable rulings on important cases. These cases and the significant penalties associated with them permanently altered the commonly held attitude that it was improper for the

U.S. EPA and the states to enforce against municipalities. For the first time, enforcement actions and penalties became realistic expected responses to noncompliance, and this created the possibility of future benefits from deterrence among municipalities.

II⁴

The national environmental performance partnership system (NEPPS) of the United States is a set of basic principles jointly developed by EPA and States. These principles include increased use of goals and indicators, environmental performance agreements, self-assessments, differential oversight, public outreach, and joint evaluations. This system is primarily designed to offer greater state flexibility in well-run delegated programs. EPA and States work together, each according to their strengths: 1) Directs scarce public resources toward improving environmental results; 2) Allows States greater flexibility to achieve those results; 3) Enhances accountability to the public; and 4) Develop joint environmental goals and priorities, and measure progress in terms of "outcomes" instead of "beans." Strong state performance is rewarded with substantially reduced oversight, freeing up EPA resources to deal with cross-boundary issues and supply more technical assistance to states in need. Through this program, EPA is not relinquishing its national standard-setting or enforcement authorities, but is seeking to work jointly with state agencies to achieve national goals and standards in the most efficient way.

NEPPS was proposed because of the following three reasons: 1) The size, scope, and complexity of providing environmental protection dictates that EPA and the states find more efficient, complementary approaches; 2) Most major environmental statutes are designed to be delegated to states with the necessary infrastructure and capacity to implement and enforce the programs; and 3) As resources become scarce and environmental problems become more complex and diffuse, national goals, state and local needs, and the respective capabilities of federal, state, and tribal actors all need to be recognized and utilized fully.

⁴ Excerpted from USEPA, National Environmental Performance Partnership System (NEPPS) Website; <http://www.epa.gov/ocirpage/>

Each state and its EPA regional office will agree on the set of measures that the state or EPA will collect and report during the year. There are three basic kinds of measures being used in tracking the progress of environmental programs: environmental indicators, "business" performance measures, and program performance measures. Across all measures there are also two general classes of measures: "outcome" measures which show results in the environment or changes in behavior in the regulated community, and "activity" measures which track the various kinds work done to achieve the desired outcome. The states and EPA are making a determined effort to focus on "outcomes" as much as possible, while tracking essential activities for internal management purposes.

Environmental indicators are viewed as the best, if long-term, way to measure meaningful progress in improving human health and the environment. All states participating in the new system are expected to use these measures to the fullest as a way of focusing program priorities on desired outcomes, and as a useful way of communicating results to the public. These indicators are expected to add a new and important dimension by helping to articulate long term objectives and showing whether EPA and the states are making progress against those objectives.

Business performance measures are intended to capture behavior in the regulated community as they take actions to prevent or reduce health and/or environmental risks. In a sense, these are nearer term outcomes which can be measured by environmental agencies to gauge whether programs are having the desired effect. Some enforcement and compliance measures, such as compliance rates for individual businesses or industrial sectors, fall into this category.

Program performance measures are those measures identified by each program as the outcomes or activities which best reflect whether a program is being implemented as designed. In the past, these have been heavily weighted toward activity measures. Although it is recognized that there will always be a need for activity measures, EPA and the states are trying to strike a better balance between outcome and activity measures under the new system.

Through this program, states can have many advantages in dealing with its environmental problems. These advantages include: 1) Greater time directed to discussing environmental challenges and solutions instead of process; 2) Much stronger state role in setting environmental priorities; 3) Reduced EPA oversight for strong state programs; 4) Improved measures of progress for tracking and communicating environmental outcomes; 5) Shift from real-time to after-the-fact reviews, where strong state program warrants; 6) Reduced reporting of activity measures, especially where more meaningful outcome measures have been substituted; and 7) Clear definition of how EPA will assist state.

Although enforcement is ultimately the government's responsibility, the government does not necessarily initiate all enforcement activity. In some instances, private parties are given the right to initiate enforcement actions through the administrative agencies or the courts. This dual enforcement approach has several advantages. Private citizens who are directly affected by pollution might be better situated to detect environmental violations in their neighborhoods. The private enforcement is less costly. If the government enforcement agencies lack of funds, the private enforcement could fill in the gaps. Under these circumstances, the information of polluters' performance should be accessible easily by the private sectors or communities.

Chapter 3

Economic Incentives: Pollution Levy System

3.1 Introduction

The economic instruments practiced in China mainly include pollution levy, emission trading and subsidies. The emission trading remains an experimental program currently in China and it is still unclear whether it can play an important role in promoting industrial pollution reduction. After many years of practicing subsidies, Chinese government has correctly been moving toward reducing subsidies to industrial firms for pollution abatement. At this stage, pollution charge has been an important policy tool for China to use to efficiently and effectively regulate industrial pollution.

The levy program has been implemented in China for about 20 years. It has helped provide incentives for industrial firms to abate pollution, and a better use of this instrument in the future can improve the effectiveness and the economic efficiency of China's industrial pollution regulatory system. This chapter presents a review of the levy program and provides recommendations in order to improve the system.

3.2 The Chinese Levy System

The levy system began its operation in the early 1980's. It has been implemented in every county in China to date. In terms of scale, it has no peers in this world. Table 3-1 shows the levies collected from 1992 to 1998 in China.

The pollution levy of China is composed of (1) levies from emissions above standards, (2) levies from wastewater discharge, (3) "four small pieces" (a. Fees due to the rising of environmental standards. In order to encourage the polluters to meet the emission standards, it's regulated that the levy on the polluters will be increased by 5% annually if the polluters could not meet the emission standards since the third year. b.

Double charge. The Law of Environmental Protection requests that the “three synchronous steps” system is implemented to new investments, be it completely new, renovating or enlarging projects. If those projects, which have been put into production under the “three synchronous steps” policy, still emit pollutants above the concentration standards, the pollution levy charge rate will be doubled. c. Penalty for late fee payment. The pollution fee is charged monthly or quarterly. If the polluter could not pay on time, the penalty will be paid at the 1/10000 increase rate of the pollution fee per day after the deadline. D. Compensatory penalty. The polluters that try to falsify or escape from the inspection will be punished.) and (4) pollution levy from SO₂ emission. The levies on wastewater discharge and SO₂ emission follow the principle of “charging on any pollution emission”, whereas all other charges are non-compliance fees levied on emissions above standards.

The percentage of pollution levy from emissions above standards in the total pollution levy income has declined from 76% in 1992 to 53% in 1998; but the percentage of pollution levy from wastewater discharge only ranged from 3.54% to 7.03%; the “four small pieces” has gradually increased from 20% in 1992 to 31% in 1998; and the SO₂ levy has also swiftly increased from 3.6% in 1996 to 10.5% in 1998 (see Fig 3.1).

The characteristics of China’s current pollution levy system include the following:

- **The above-standard levy is the major part of the total levy collected.** The State Council issued the Provisional Measures on Pollution Levy in February 1982, which stipulated that polluting enterprises should pay the pollution levy when the concentration of their emissions were above the national standards. The Law of Water Pollution Prevention and Control was issued in 1984, which made similar requirements.
- **Wide coverage of the levy system.** At present, China has carried out the pollution levy on 113 pollutants in 5 types of media: water, air, noise, solid waste and radioactive waste in all provinces except Taiwan. The coverage of the levy system

has expanded from the state-owned enterprises to the town-village industrial enterprises and the tertiary sector.

- **Charges based on a single pollutant.** The Provisional Measures on Pollution Levy stipulates that among the wastewater, waste air and waste residues discharged by enterprises, if more than two harmful substances are discharged from a same discharge outlet, the pollution levy should be collected based on the pollutant for which the highest total levy has been calculated. For example, if an enterprise is discharging pollutants A and B both in excess of their allowed concentrations, with the levy on pollutant A assessed at 100,000 RMB and the levy on pollutant B assessed at 150,000 RMB, the payment to be made by that enterprise is 150,000 RMB and is not the sum of the amounts assessed at each individual pollutant (in this example 250,000 RMB).
- **Change from concentration-based to volume-based.** At the beginning, the pollution levy was designed as the pollution levy from pollutants above standards, which are the concentration standards. However, with the development of economy, the total emission volume increases and the pollution situation is very serious. To solve such problems, the charge based on the total discharge volume of wastewater has started for the polluters which has met the discharge standards since 1993 and the charge rate is 0.05 RMB per ton. Then, since 1 July 1998, the pilot work on pollution levy based on the total emission volume started in Hangzhou City, Zhengzhou City and Jilin City and now has generally spread out so that the primary effects has been achieved, such as the rising of the fund to control the pollution and the great attentions of enterprises to improve their environmental performance. For example, The Pilot Scheme of Pollution Charges based on Total Discharge Volume in Hangzhou City is jointly formulated by Environmental Protection Bureau, Price Control Bureau and Finance Bureau and then is approved by the Municipal Government to carry out. The Municipal Government established a special team led by the Vice Mayor. The new standards of pollution levy were started from late August of 1998. By the end of December of that year, 9328 enterprises had paid their pollution levy and the total amount is 38.29 million RMB. Compared to that in 1997,

the average increase rate of the pollution levy is about 45% in industrial enterprises, 79% in the service sector, and 127% in the construction sector.

- **Double levy on new sources.** The original intention of China's pollution system is to solve those old industrial pollution sources and encourage the emissions to meet the standards. If some pollution sources still cannot meet the emission standards after the pollution levy has been charged for 2 years, the pollution levy standard will increase each year by 5%. The Law of Environmental Protection requests that the "three synchronous steps" system is implemented to *new* investments, be it completely new, renovating or enlarging projects. If those projects, which have been put into production under the "three synchronous steps" policy, still emit pollutants above the concentration standards, the pollution levy charge rate will be doubled.
- **Change from environmental grant to loan.** The pollution levy has not only intensified the environmental management, promoted the industrial pollution control, speeded up the self capacity building, but also provided a reliable fund channel for the industrial pollution control. However, the use of the pollution levy has some problems, such as the appropriation, overstock, low efficiency and decentralization of fund. To solve for this problem, the environmental grant to the polluted enterprises is reformed to loan in July of 1985, which improved the use efficiency of fund and the responsibilities of enterprises, ensured the special use of pollution levy and achieved some experiences in environmental fund accumulation.

3.3 Effectiveness Analysis

There are two functions associated with the pollution levy system. One function is to provide an economic incentive for industries to abate pollution. Econometric analyses have shown that this function is marginally effective because industrial pollution discharges and emissions did respond to the levy prices. But the achievement of the pollution levy system has been small or modest because the charge rate of the levy system has been low. The other function of the system is to collect fees to finance other environmental programs. The achievement in this respect is significant.

Providing financial supports to pollution control and treatment programs. After the pollution levy is paid to the national treasury, it is designated as an environmental fund outside of the national financial budget and has achieved a lot of benefits by using it under the supervision of financial departments at all levels. From 1992 to 1998, China has totally invested 23.1 billion RMB of pollution levy to the environment protection, among which 9.6 billion RMB was used for pollution control and treatment, and 630 million for comprehensive control and treatment, with an increasing trend year by year. 57.41% of total pollution levy from 1992 to 1998 has been used to pollution control and treatment, mainly to treatment of pollution sources (see Table 3-3).

Promoting the integrated use of industrial wastes as well as the management and operation. As an example of economic benefits other than the reduction of environmental damage, the profit from the comprehensive utilization of “three wastes”(waste water, waste gases and waste residues) has increased from 2.82 billion RMB in 1992 up to 5.66 billion RMB in 1998.

Promoting the development of environmental protection. According to regulations, 20% of the pollution levy collected and the “four pieces” can be used by environmental authorities for purchasing monitoring apparatus, equipment, and small-scale infrastructure and also for environmental dissemination and education. From 1992 to 1998, the pollution levy used in self-capacity building of environmental protection system is up to 9.83 billion RMB, accounting for 42.61% of the total revenues from the pollution levy. The institutions of environmental protection system at all levels have increased to 9937 in 1998 from 7227 in 1993. The actual staff has increased to 112626 in 1998 from 81373 in 1993 (see Table 3-3).

3.4 Major Problems and Barriers

Based on the existing literatures, interviews with local EPBs and some experts, and field trip to Jiangsu, Zhejiang and Gansu during 2000, we found the following major problems and barriers.

The existing pollution levy system has played an important role in stimulating the emission reduction, promoting the pollution control, saving and using resources and energy comprehensively, as well as promoting the development of the whole environmental work. However, the establishment and development of pollution levy system was not able to separate from those impacts of the international and domestic situations, the domestic economic system, the public awareness, the economic development level and especially the economic endurance of enterprises at that time. So, many matters have influenced the pollution levy implementation.

The existing pollution levy was designed at the beginning of 1980s with the specific function to promote enterprises to meet environmental standards. So, the pollution levy was based on the volume of pollutants above those standards and was mainly used to subsidize the pollution control of those enterprises, which paid the pollution levy. It should also be emphasized that the pollution levy system has never been the only action available against enterprises that do not comply with environmental standards – also administrative actions were and are possible, including enterprise closure. Hence the framework of pollution levy system is centered on the pollution levy charged from pollutants above standards. The system is not based on the notion of compensation for environmental damages as a result of the polluting activities. Looking at the system from a contemporary perspective, this system has not been able to conform to the need of environmental protection. There is a need to reform the pollution levy system based on the practical experiences in the past years, and based on the notion that the pollution levy should be charged (1) based on the total emissions volume and (2) with its incentive power in mind.

3.4.1 Problems with the Levy Standards

The low levy rates. The pollution levy standards in attached table of *Tentative Provision on Pollution Levy System*, which was issued by the State Council in 1982, were far lower than the unit price of pollutants' treatment. At that time, the pollution levy played an

active role in the environmental management, taking into account the fact that China was not far developed economically, and that hence enterprises could not be saddled with large costs. These considerations led to low charge rates, which has helped in making the pollution levy system develop smoothly in China.

However, inflation since 1982 has eroded the real value of the pollution charge rate even further. The pollution levy increased 2.13 times from 1986 to 1995, but its percentage of total industrial output decreased from 0.16% to 0.04%. The price index was 18.5% in 1987-1991 and up to 21.6% in 1993. This has reduced the incentive effect of the pollution charge, and has also eroded the significance of the pollution levy system as a source of funding for pollution control investments. Many enterprises prefer to pay the pollution levy for the “right to pollute”, rather than to construct pollution treatment facilities. This is one of the most important reasons why it has not been possible to effectively improve the environmental quality status in many years.

Charges based on a single pollutant. As discussed above, the *Tentative Provision on Pollution Levy System* provides that the pollution levy from one source should be collected according to the single pollutant for which the calculated pollution levy is the highest. This levy system is not favorable for promoting the pollution control of pollution discharging units. Firstly, it easily leads to a short-sighted behavior of pollution discharging units in selecting treatment technologies, that is, it can make pollution discharging units just consider the treatment of the single pollutant that currently determines the total pollution levy to be collected while ignoring the possibility of integrated treatment approaches for various pollutants. Referring to the example discussed above to illustrate this element of the Chinese pollution levy system, the enterprise will only consider investment in pollution control options that reduce the emissions (concentration) of pollutant B. Secondly, after the pollutant with highest concentration is treated, the pollutant that now has the highest concentration still will be charged. This will tend to limit the effort of enterprises to cut down on pollution – in the example used above, the enterprise will lose the incentive to reduce the concentration of pollutant B when the amount to be levied on pollutant B would fall below 100,000 RMB,

since then the concentration of pollutant A would determine the actual payment to be made. Again, this affects the incentive impact for the pollution discharging units to control the pollution.

Above-standard charge. The pollution levy is only fit for the early stage of the environmental protection. With the increase of pollution discharging units, the regional environmental quality still tends to deteriorate, even if all pollution-discharging units can meet the standards in this region. The reason is that the total emission in this region still exceeds the regional environmental capacity. This shows that the above-standard charges have not been suitable for the current situations. So, the approach to combine the pollution levy based on their concentrations with that based on the total emission volume should be adopted according to different pollution media. It is a good beginning of this combined approach that was tried out in Hangzhou, Zhengzhou and Jilin since 1 July 2000. The pilot process of pollution levy system based on total emission volume in Jilin fully embody the four characteristics (four transformations) of pollution charges, especially in the aspect of charges by the multi-pollutants which a certain achievement has been achieved by great effort. In the cooperation of price departments and financial department, the range of pollution charges has been so effectively expanded that the units been charged increased 10% and the total charges increased 48.4%. Through the pilot work, the strength of pollution control in Jilin has been further improved and the environmental quality has been improved distinctly. The concentration of TSP in Jilin declined from $0.51\text{mg}/\text{m}^3$ to $0.44\text{mg}/\text{m}^3$ and the concentration of SO_2 is declined from $0.08\text{mg}/\text{m}^3$ to $0.06\text{mg}/\text{m}^3$; the COD in Jilin section of Songhua River declined from $7.80\text{mg}/\text{l}$ to $7.31\text{mg}/\text{l}$.

3.4.2 Problems with the Use and Management of the Levy Funds

With the increase of pollution levy, the use of it increased from 1992 to 1998 (shown in Fig.3.2). From Fig 3.2, it can be seen that the pollution levy funds used in “controlling of pollution sources” and “others” increased, but that all other items just changed a little. Amongst all items, the “others” item is used to refer to the self-capacity

building of environmental protection system to for example monitor emissions. The growth rate of this “self-capacity building” item exceeded that of the use of funds for “controlling pollution sources”. With the transformation of the economic system in China, the limitation of old policies and implementation problems are becoming more prominently visible, mainly showing in the management and usage of pollution levy.

Ownership of the funds. One interpretation has been that the pollution levy funds should be owned by the pollution discharging units, which has greatly impeded the reform of the use and the collection of levy.

Allocation of levy within the management system. The pollution charge is collected by the local EPBs and then allocate by the local financial departments. This means the revenue allocation of pollution fees haven’t been through the central financial departments, which reduced its controlling function on pollution levy in the macro level.

Use of the funds. Before 1988, the pollution levy is mostly allocated to the pollution discharging units to control their pollution in the form of subsidies without any repayment. Since then a reform has taken place in which enterprises can apply for a *loan* on the basis of a proposal for an investment to reduce pollution. However, local authorities have the right to waive the need for repayment of (part of) the interest and/or the loan principal. Great efforts should be make to limit the volume of exemption of the principal, to increase the interest rate of the environmental loan and to decrease the percentage of usage in self-capacity building in the environmental protection system in order to change the status.

In addition, the pollution charges are managed by the administrative instruments instead of by the taxation system so that it is not avoidable that the administrative intervention from various departments and the illegal use of pollution levy are serious.

Management of the funds. Due to the levy revenue is not managed through the financial system, but through the administrative system according to the different interests of

different provinces and cities, which undoubtedly caused the chaos of pollution levy management and the disharmony of the environmental protection system. For example, some local government has arranged the environmental pollution levy not according to regulations but according to what they like so that some enterprises could not get necessary fund support to control their pollution. The percentage of pollution levy which should be used for pollution control is speculated to the capacity building of EPBs. According to the regulations, the percentage should be return to enterprise is 80%. However, according to the interviews in local EPBs, this percentage usually is lower than 80% and even lower than 50%. Not only have the pollution control of enterprises been delayed, but also the incentive instrument is lost. So, it's really necessary to reform the institutional of fund management, such as change the pollution fee into environmental tax gradually.

Allocation issues of “four pieces.” The distribution of “four pieces” is one of the rather disputed issues of the pollution levy system. The “four pieces” has increased so quickly that its percentage in the total pollution levy has also grown annually in recent years due to the increase of pollution charge enforcement through laws. According to the existing pollution levy policies, the “four pieces” are mainly governed and used directly by the local EPBs to finance part of their operations. So, it's unavoidable that the local EPBs are very interested in charging the “four pieces”.

Benefits of using the pollution levy. According to the existing system of using the pollution levy funds, its allocation proportion had been determined before the pollution levy was collected. It directly linked the payers with the users of pollution levy, which must not only cause the decentralized use of pollution levy. A misunderstanding, which the pollution levy fund for pollution control was taken as the steely constraints on investments, made the enterprises using the levy fund would not minimize their costs on the pollution control. The free offer of levy fund to enterprises would heavily affect the improvement of efficiency in the use of levy fund.

Lack of standards to evaluate the use of pollution levy. The effects of using the pollution levy were mainly evaluated by the comprehensive economic benefits of pollution control and treatment according to the old understanding. However, the economic benefits are the standard to evaluate the traditional production projects instead of rules to evaluate effects of using the pollution levy.

Decentralization of levy use among environmental institutions. The decentralization on the right of pollution levy use in local EPBs affects the integrated benefits of investments. So, the Special Foundation of Pollution Control and Treatment should be established and the responsibilities should be newly divided.

3.4.3 Problems with Implementation of the Levy System

The weak monitoring capacity of local EPBs. Many EPBs at the county level have a weak monitoring capacity or no monitoring capacity at all, therefore they can not provide monitoring data necessary for implementing the pollution levy system and collect charges. At present, the local EPBs only can monitor the key pollution sources and have no monitoring capacity for some medium-sized and small-sized enterprises and remotely located TVIEs. These EPBs can only adopt a system of self-reporting. Although part of the enterprises are able to monitor their emissions, some of the enterprises under the self-reporting system adopt the pollution coefficient method to estimate their pollutants volume; others even blindly fill in the pollution amounts and report to the local EPBs. In that last case, the self-reported pollution volume has little relation with the real emissions, but the local EPBs lack the capacity to supervise these enterprises completely and check their reporting.

Incomplete collection of the pollution levy. Estimated according to the existing pollution charging standards, the current system is still not collecting the fee at a full scale. For example, the SO₂ pollution levy of “two control areas” in 1998 only amounts to 19.54% of what should be charged. The reasons are: first, some enterprises can not afford their pollution levy because their economic situation are not good; secondly, some

enterprises pay less (or not at all) because of the intervention from local administrative officers to local EPBs; thirdly, the enforcement by local EPBs is not strong enough, which is related to the problem of insufficient staff, staff of low qualifications, and lack of monitoring capacity and equipment. Amongst these, it is the administrative intervention that is the major cause of the incomplete collection of the pollution levy.

Weak capacity of environmental supervision department. First, as also indicated above, the staffing of the EPBs is insufficient; the behavior of polluters can not be inspected on time, which affects the comprehensive implementation of pollution levy system. Secondly, the enforcement instruments of environmental supervisors should be improved, because with outdated communication equipment, transportation vehicles and monitoring equipment it can not investigate illegal pollution behavior accurately and on time. Needless to say, this negatively affects the implementation of pollution levy system. Thirdly, the lack of qualified staff influences the correct implementation of the system.

Meanwhile, according to the pollution levy system, the pollution levy of all pollution units under the county level should be the responsibility of the EPBs at the county level. However, the work on pollution levy will gradually increase with the development of TVIEs. Therefore, the number of environmental supervisors should be increased and the qualification and enforcement instruments to ensure that the pollution levy can be carried out smoothly. The training for the supervision should be given in the whole country, especially those at the county level who will do the practical work. The automatic equipment should be provided to improve the efficiency and accuracy of environmental supervision.

3.5. International Experiences

Pollution charge has been one of the principal economic instruments for environmental management in OECD countries, countries in transition as well as developing countries. Different systems have their own characteristics which are usually determined by the countries' complicated political decision-making processes. In terms

of air pollution charge system design, Canadian air pollution levy is based on a permitted emission volume. If the actual emission is lower than the permitted emission level, the rate can be lower. If the actual emission is higher than the permitted emission level, the new license should be reissued and the charge should be modified accordingly. The pollution charge of France is based on a prescriptive device and the charge is aimed to redistribute the income. The income from pollution charge is subsidized to the investment for pollution abatement of those devices that are charged. The charge on SO_x in Japan is based on the actual emission and its rate is very different in different regions. The levy collected is used to compensate for the health damage. The charge on NO_x in Sweden is based on the actual emissions of thermoelectricity producers whose capacity are above 10MW and production is above 50GWH. Because the fixed costs of monitoring are too high, the smaller devices have not been charged. The NO_x emitted from devices that have been charged accounts for 6.5% of total emissions in Sweden. If the actual emissions have not been measured, a standard emission rate is adopted. According to the production of final energy, all incomes from pollution charge will be return to the devices being charged at the same year. Therefore, the final effects of income are zero, but redistribute the income of those plants with high emissions and those with low emissions. The abatement of emissions in 1992 is up to 30%-40%, which is above the anticipated level of 20%-25%.

With regard to water pollution charge system design, the wastewater discharge fee in Australia is charged according to the discharge volume permitted by the license in South Australia Province of Australia and the Hunting Water Company (HWC) also charges the wastewater discharge on small commercial enterprises. In Belgium, the pollution load is measured based on pollution equivalents (BOD, COD, TSS, N, P, toxic substance, nutrition load and heavy metals). Columbia province and Quebec province in Canada charge the pollution fees according to the pollution load and the rate ranges according to the toxicity of pollutants. In Germany, the wastewater charge has played an important role in protecting the water quality since it was introduced into this country in 1976. The charge rate is made up of ingredients (COD and heavy metal) on pollutant list. If the pollution sources are proved to abide the standards, the charge rate can reduce 75%.

Successful stories about pollution charge can be found in many developed countries and some developing countries. A successful story can be found in Netherlands⁵. In an effort to reduce wastewater at industrial sources, the Dutch government introduced a license system and effluent charges. For instance, the country's 1970 Pollution of Surface Waters Act requires that all non-licensed discharges into surface waters be prohibited and that polluters must pay for their discharges. The charges are implemented and managed by water boards, self-governing bodies of surface water users responsible for water management. The rate of effluent charges has risen sharply since its introduction, for example, from FL 1.1 per population equivalent in 1969, to FL 27.9 in 1980, and to FL 55.1 in 1990. The results of this set of policies are remarkable. For example, the total amount of industrial wastewater discharge dropped by 73 percent between 1969 and 1990 while industrial production was booming during the same period. Meanwhile, a large amount of revenue has been raised through the charges. (FL 1.3 billion or about 0.5 percent of total government revenue in 1990). This revenue provided a substantial resource for financing the construction and operation of sewage treatment plants.

The Netherlands' case contrasts with the Chinese experience in that the actual charge rate in Netherlands increases with time while the Chinese charge standards have not been changed for a decade, which makes the Chinese system less effective.

The Colombia case⁶ can also provide a lesson for China. Colombia experienced a lamentable lack of success with traditional regulation, and contamination of its air and water long went practically unchecked. In a strong attempt to break with the past, the country designed a charge system. Analysis of abatement costs concluded that a charge of

⁵ Note: The unit on which effluent charges are levied is the "population equivalent" (PE), which is roughly equivalent to the water pollution emission by one individual. One PE is equal to 60g biological oxygen demand per day. Sources: 1. Bressers, H. 1995. "The Impact of Effluent Charges: A Dutch Success Story." In M. Janicke and H. Weidner, eds., *Successful Environmental Policy: A Critical Evaluation of 24 Cases*. Berlin: Ed. Sigma. 2. Jansen, H.M.A. 1991. "West European Experiences with Environmental Funds." Institute for Environmental Studies, Amsterdam, the Netherlands.

⁶ Source: World Bank, 1999, *Greening Industry: New Roles for Communities, Markets, and Governments*, A World Bank Policy Research Report.

US\$100 per ton would reduce industry's organic emissions by 80%. However, the program began by charging only US\$28 per ton for organic waste as well as \$12 per ton for total suspended solids. These charges were considered high enough to bite, but not so costly as to provoke hostility from industry. After six months the BOD discharges reduced by 52% and TSS fell by 16%.

The Philippines has recently introduced a mix of new environmental policies to ensure that the rapid economic growth of the country is environmentally sustainable⁷. These instruments complement the traditional command and control system by using market forces (environmental user fees), public disclosure of information, and engagement of the public through community participation in environmental management. After three years of preparation with support from the World Bank the Philippines started implementing its environmental user fee in January 1997 with the first batch of industries paying a fee based on their assessed pollution load. Under the system, activities that utilize environmental resources by discharging wastewater are required to pay a fee for every unit of pollution they discharge. This is in addition to meeting the existing discharge standards specified in the regulations. Implementation of the system is gradual. During the first phase the program covers only one pollutant (biological oxygen demand) and one medium (water), one geographic area (the lake water shed of Laguna de Bay under administration of the Laguna Lake Development Authority (LLDA) a government corporation), one group (industry) and within this group only major polluters in five industrial sectors representing nearly 90 percent of the total water pollution discharged in the lake. The government builds on the experience of this first phase to mainstream the program throughout the country and across sectors and media. In particular, the Department of Environment and Natural Resources hopes to use the results in drafting the legislation required for applying user fees outside the LLDA area. Revenues from the environmental user fee will be used for water quality management programs and to strengthen the existing monitoring and enforcement capability of the LLDA. Twenty percent of the revenues are being shared with local government units in

⁷ Official brief by Secretary V. Ramos, Department of Environment and Natural Resources, the Philippines.

the program area. To ensure a continuous funding of administrative costs, polluters pay a small flat fee in addition to the variable fee.

3.6 Recommendations

Improve the levy standards. The existing pollution levy standards were formulated according to different principle of costs and fees in different period and stages. Due to limitations caused by subjective and objective factors such as the economic development level and the public environmental awareness, the pollution levy standards are incomplete and low. According to the current price level, the pollution levy standards only account for about 50% of the operation costs of pollution treatment facilities (note that this does not include the investment in the treatment facilities) and in some cases charges are even not up to 10% of treatment costs.

The reform of the pollution levy standards should be based on the actual needs of the harmonic development of the environment and economy, the general goal of environmental protection to determine the general framework of pollution levy standards and to formulate the new pollution levy standards which aims at the pollution control and environmental improvement, and is technically feasible, scientific, reasonable and simple to be easily implemented, according to the principle of compensating the environmental damage, the principle of exceeding the abatement cost and the principle of charging the same price to the pollutants with same quantity and quality.

The charge rate should be adjusted according to the inflation rate per year to ensure the incentive instrument to play the roles that were intentioned to. And it should be adjusted by multiplying a coefficient according to different regional situations.

Strengthen the levy enforcement capacity. In the practice of pollution levy for many years, a system with environmental supervisors who took the pollution charge as the major instrument has been formed. These environmental supervisors specially engage in the spot supervision and management of pollution sources. However, the number of

environmental supervisors is, in relation to the several hundreds thousand industrial pollution sources and several hundreds of pollution discharge pipes, not quite suitable for their responsibilities in implementing the pollution levy system and conducting environmental supervision and its enforcement instruments. Moreover, the quality of the environmental supervisors still needs to be improved.

Reform the fund use. The existing system of “Special Fund for Special Use” allocated the public resources without considering the rate of cost-benefit or cost-effectiveness. Although the pattern to share the financial income is not avoidable, it’s still possible to adopt measures encouraging the more effective allocation of environmental levy. The most important measure is to separate the project investments from their pollution levy. The pollution levy should comply with the PPP (“Principle of Polluter Pay”). In order to make the pollution levy more attractive for enterprises, the government should establish the National Environmental Fund according to the best practical patterns of OECD. The fund system should support those projects, which are consistent with environmental priorities and could maximize the net environmental benefit or minimize the pollution abatement cost. The procedure to choose those projects should be transparent and creditable. And it’s very necessary to strengthen the capacity of enterprises, local EPBs and municipal service institutions to prepare and evaluate such kind of projects.

In addition, the following proposals is expected to be implemented in the near future: 5% of total revenue is suggested to allocate to SEPA and to be one source of National Environmental Fund (NEF); 10% of total revenue is suggested to allocate to provincial EPBs and to be the source of Provincial Environmental Fund (PEF); Other 85% fund goes to financial departments of municipal and county governments, mainly subsidizing the interest of pollution fund. Financial departments and EPBs should strictly manage the pollution levy as an earmarked fund and the right for EPBs to allocate the fund should be reduced with the process of fiscal reform.

Table 3- 1 Pollution Levies from 1992 to 1998 (unit: 10⁴ RMB yuan)

Year	1992	1993	1994	1995	1996	1997	1998
Total pollution levy							
(=1+2+3+4)	239453	268013	309757	371280	409592	454336	490192
1. Subtotal pollution levy							
from emissions above							
standards	182577	194555	215534	248692	262260	284014	260117
<i>1.1 of which from waste water</i>							
<i>above standards</i>	118673	122838	132197	150365	155135	164194	163746
<i>1.2 of which from waste gas</i>							
<i>above standards</i>	50859	56021	64498	74297	67212	67682	65491
<i>1.3 of which from waste solid</i>							
<i>above standards</i>	3079	3746	3199	4846	3743	5015	4394
<i>1.4 of which from noises</i>							
<i>above standards</i>	8930	11930	15551	19019	21413	24417	26410
<i>1.5 of which from radioactive</i>							
<i>wastes above standards</i>	1037	20	89	166	183	151	77
2. Subtotal from wastewater							
discharge	8485	12637	20046	25384	28791	30521	28281
3. Subtotal from “ four							
pieces”	48389	60821	74177	97204	118542	139799	150285
4. Subtotal from SO ₂ emission					14575	22553	51510

Sources: China Environmental Yearbook, 1993-1999, China Environmental Yearbook Press.

Table 3-2. Expenditure of Pollution Levy Fees from 1992 to 1998 (unit: 10⁴ RMB yuan)

Year	1992	1993	1994	1995	1996	1997	1998
Total expenditure							
(=1+2+3+4)	196225	212830	239292	318506	396085	458200	486142
1. On treatment of pollution sources	118627	120763	115471	103017	141823	169939	194141
<i>1.1 of which Load exempt from interest</i>				27306	35138	43000	39619
2. Environmental Load				66851	79363	83548	68072
3. Subsidies on comprehensive control and treatment	9675	7101	7881	7192	9264	11752	10150
3. On expenditure on apparatus and equipment	10390	11430	14735	19934	20349	22375	23007
4. Others	57930	73535	101205	121512	145286	170586	190772

Sources: China Environmental Yearbook, 1993-1999.

Table 3-3 The Role of Pollution Levy in the Sewage Treatment and Capacity Building of EPBs in China

Year	1993	1998
Volume of sewage treatment plants (million tons)	734	2930
Total investment of sewage treatment plants (billion RMB)	1.49	12.42
Annual operational cost of sewage treatment plants (billion RMB)	1.07	0.46
Number of Environmental protection institutions	7227	9937
Number Environmental staff	81373	112626

Fig 3.1 The Structure and Trend of China's Pollution Levy from 1992 to 1998

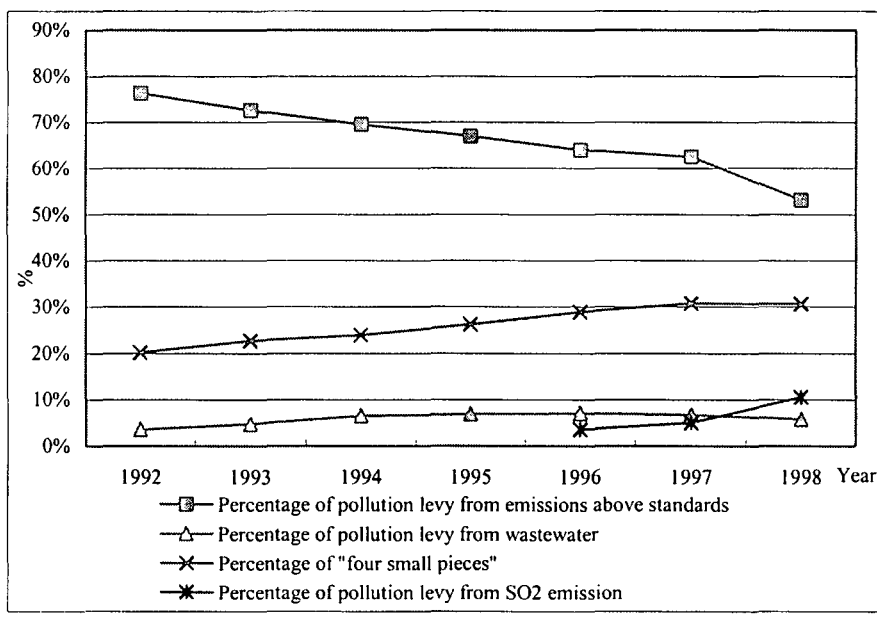
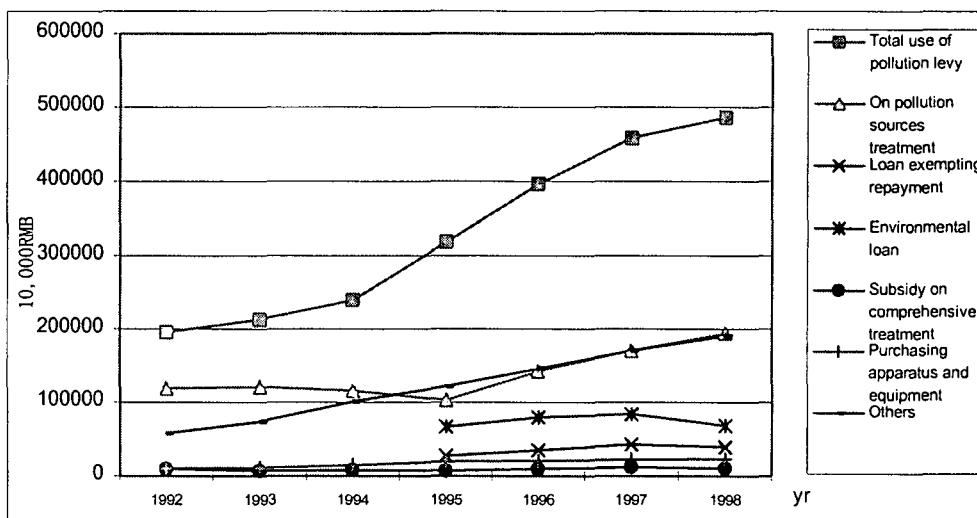


Fig. 3.2 Usage of Pollution Levy from 1992 to 1998 in China



Chapter 4

Information Approaches: Disclosure of Industries' Environmental Performances

4.1 Introduction

Disclosing industries' environmental performance information to the public is a new instrument that is under experimentation by a couple of Chinese municipal governments to provide incentives for industrial firms to control pollution. Several other municipalities are also considering to adopt this instrument and it can potentially be promoted as a national pollution control program, given the advantages of this approach and the complementary nature of this program to the current practice of China pollution control regulatory system. This chapter reviews both China and international experiences of using this information approach to pollution control, and discusses the feasibility of employing this approach in China.

4.2 The Information Approach and International Experiences

The use of information approach to industrial pollution control has been regarded as the third wave in the history of industrial pollution control. The first wave is the use of command and control measures (C&C measures), when the government regulates on pollution and achieves the goal of pollution control and environmental protection. People found later, however, that C&C measures often induces unnecessary socio-economic losses, therefore the second wave of economic measures for pollution control came into being as a consequence. The use of economic measures increases the flexibility of pollution control and improves the socio-economic benefits of pollution control. Its use is complementary to the measure of command and control, making the existing measures more cost-effective.

Still, the problem of pollution is not yet being solved, and the main reason is high operational cost of C&C measures and the economic instruments, which is especially the

case in developing countries, where imperfect legal systems, insufficient environmental protection funds and inadequate human resources had greatly decreased the effectiveness of pollution control system.

The information approach refers to the disclosure of information of environmental performance of various polluters through media. It's a new measure of environmental management after the C&C measures and economic measures. Along with the economic development and the improvement of living standards, people are paying more and more attention to the environmental quality. The mechanism for public participation in environmental management is getting developed gradually. The right for being informed of environmental quality is becoming acceptable to the public and laws. On the other hand, along with the establishment of the system of modern enterprises in China, the environmental performance of enterprises have become an important part of integrated image of enterprises, and also a crucial factor to determine whether an enterprise will win in the severe market competition. Therefore, it is a powerful stimulating tool to publicize the environmental performance of enterprises and related environmental information, to let people know, inspect and evaluate their pollutant emission status and pollution control status.

The disclosure strategy can both impose pressure and provide appraisal for industrial pollution control through community, public and market. A proven effective approach with a low operation cost, the public information approach can provide strong incentives for industries to control their pollution.

The effectiveness of information approach can be found from practices of various countries. The exact definition of information approach may vary from one to another, however, the design and implementation of these approaches can be of great values when China is trying to promote and develop technically reliable, politically viable and economically practical methods. As we always point out, no universal approaches can be applicable in all the countries. Whenever approaches are applied in China, necessary modifications are unavoidable.

Using information disclosure to control industrial pollution has been practiced in both developed and developing countries. While the rationale is similar, the formats taken are quite different. Presented in the following are several reviews and cases practiced in the United States and other countries⁸. The Indonesian case is similar to the ones implemented in Zhenjiang and Hohhot. China can also promote the approach adopted in the U.S.

Understanding Information Disclosure from Economic Perspectives

Information approaches to environmental protection may be defined as policy instruments that influence the behavior of firms and individuals through the dissemination of information on inputs, production processes, and the environmental consequences of final products. Some information approaches rely purely on voluntary reporting, while others have mandatory reporting. The environmental information embodied in these approaches has economic value to consumers, individuals, scientists, academics, and state and local government officials even in the absence of any changes in emissions by firms. Consumers may gain utility from assurances that products are manufactured in ways approved by the federal government. Individuals can make more informed decisions about where to live and work. And scientists and academics gain new sources of data that can be used in research on health, business management, and the environment.

After reviewing many of the United States' unique experiences with information disclosure methods, it is suggested that at least two factors be important in evaluating the incentive structure of information disclosure rules. First, the information should be accurate and credible. Perhaps the best information would be based on measured data and standardized criteria and provided or verified by an independent source, but few programs meet these ideals. Second, the information must be made available to the right

⁸ More cases can be found on World Bank's website www.worldbank.org/nipr.

people, at the right time, and in a format accessible to participants in an economic transaction. Unfortunately, not all information policies take note of these considerations.

Information Disclosure In the United States⁹

US state information programs tend to base data on materials accounting and thus partially address the concern of data reliability. The New Jersey and Massachusetts programs seem to be well regarded and well-used. Proposition 65 places the burden of proof on industry, which has incentive effects on firms similar to that of requiring more reliable data. Data collected as the result of Proposition 65 are well-used. Experience with labeling schemes indicates that they are more likely to influence behavior if they are accompanied by promotional activities that target retailers and consumers. In many cases, the label itself is only one element of a larger effort to promote the use of environmentally friendly products. As a result, it may be difficult to isolate the incentive effect of a label from that of related promotional activities.

Information disclosure has been a powerful tool for reducing pollution. Over the past decade, the Toxics Release Inventory, for example, shows that sources have substantially reduced the amount of substances listed in the inventory that they release into the environment. Because the TRI requires only the reporting of information, actions taken by sources to reduce pollution are voluntary and in all likelihood relatively low cost.

The Emergency Planning and Community Right-to-Know Act (EPCRA), signed into law in 1986, was the first law to mandate chemical information disclosure in U.S. federally. EPCRA requires states and local agencies to develop emergency plans for chemical accidents and requires companies to notify these agencies in the event of an accidental release of a hazardous substance. It further requires companies that make, store or use certain chemicals to submit material safety data sheets (MSDSs) to these agencies. And EPCRA establishes the Toxic Release Inventory (TRI), an inventory of the amount of certain chemicals released into the air, water, land, or transferred off-site. Facilities

⁹ For details, see the appendix 4.1.

covered by TRI must report releases of each of the listed chemicals and chemical categories for which it manufactures over 25,000 pounds per year, or otherwise uses over 10,000 pounds per year. Facilities are covered if they have 10 or more full-time employees and belong to a listed set of industrial sectors. There are over 600 TRI-listed chemicals. The report should be carried out annually, including corporation name, release of toxic chemicals, emission frequencies and direction of emission, which are to be reported to the public. According to the statistics, this measure had obviously played an active role in reducing the toxic emission to the environment. It is reported by the USEPA that TRI releases have decreased substantially, from 2.96 billion pounds in 1988 to 1.61 billion pounds in 1995- a 45.6 percent decrease. In order to strengthen and consolidate this measure, USEPA further implemented the expansion of the TRI, named 33/50 in Feb. 1991. The program prescribed that by 1992 emissions of 17 kinds of toxic chemicals will reduce by 33%, and 50% by 1995. USEPA planned to achieve this goal by the principle of voluntary participation. In the first, they invited 555 key polluting companies to participate and sent invitation letters to 5000 companies for explanation and propaganda. In the end, it turned out that 1300 companies took part in the 33/50 program. In 1994, these companies reduced 757 million pounds of emission in total, exceeding 50% of the total emission, and achieved its goal in advance for one year.

Securities and Exchange Commission Disclosure Requirements in the United States is another example. Section 14(a) of the Securities Exchange Act of 1934 empowers the Securities and Exchange Commission (SEC) to require disclosure by publicly owned companies "as necessary or appropriate in the public interest or for the protection of investors." To date, the SEC has interpreted this statement to require the reporting of information that would be deemed important by investors. The number of large companies disclosing environmental information in SEC Form 10-Ks is increasing. Among Standard & Poor's 500 companies, 322 submitted environmental information in 1990 as compared to 217 companies in 1988. The incentive effect of these disclosure requirements is not known. However, evidence indicates that information on the environmental performance of companies is of interest to investors.

Environmental Performance Awards in the United States is also a good example. EPA and numerous state and local governments periodically issue awards for environmental behavior they deem to be exemplary. To the extent that such awards generate positive publicity, they could encourage environmentally friendly behavior. In California, for example, 305 businesses won awards under the Waste Reduction Awards Program (WRAP) in 1995. Winners received certificates of recognition from the Integrated Waste Management Board as well as the right to use the WRAP logo to publicize their waste reduction achievements. The California EPA announces winners each year.

In Texas, Governor's Awards for Environmental Excellence are issued for the following categories: large business; large technical business; non-technical, small business; government, civic, and non-profit organizations; education; youth organization; media; agriculture; individual; and special. These awards are part of the Clean Texas initiative under the Waste Reduction Act of 1991.

Indonesia's PROPER program¹⁰

Most developing countries are hampered in their pursuit of sustainable development by lack of information, institutional capacity, and funding. In these countries sophisticated instruments such as taxes, charges, and tradable permits often cannot work well. Therefore, there is a need for appropriate, innovative, and cost-effective environmental policies and programs. Indonesia's public disclosure program is an example of this. Faced with acute pollution problems, shortage of environmental protection funding, and weak enforcement of regulations, the Indonesian government has experimented with a program for rating and publicly disclosing the environmental performance of Indonesian factories. The aim of the program is to have a low-cost but effective means of putting public pressure on factories and providing incentives for factories to adopt cleaner technologies. The pressure, through public disclosure, on factories with poor environmental performance is applied by the government, the community, and the market.

¹⁰ Source: World Bank (2000)

With the help of the World Bank, the Program for Pollution Control, Evaluation, and Rating (called PROPER) was introduced to the public in June 1995. Based on the government's evaluation of its environmental performance a plant is assigned a color rating (gold, green, blue, red, and black) by PROPER. A blue rating is given to factories that are in compliance with national regulatory standards, gold is reserved for world-class performers, and black for factories that have made no attempt to control pollution and are causing serious damage. Green and red are in between. In the pilot phase of PROPER, 187 plants were rated. 115 of these plants were rated as red and 6 as black. Red and black plants were privately notified and given until December 1995 to improve their performance. Preliminary results show that PROPER has a positive impact on factories' environmental performance. By December 1995-the time of full disclosure-the number of black plants had been reduced from 6 to 3, and the number of red plants from 115 to 108.

The measures of information disclosure are being promoted in many countries in different forms. The World Bank has been, or is helping several countries establish similar programs¹¹.

4.3 Chinese Practices

China has been practicing information disclosure strategies in several areas of environmental protection. One is to disclose urban environmental qualities; the other is on plant-level environmental performances. This chapter is focusing on industries. Two programs are discussed in the following: awards to good performers and color rating and disclosure of environmental performance in Hohhot.

Awards to Good Environmental Performers

China has been practicing the public disclosure strategy in industrial pollution control since a long time ago. The evaluation and comparison of excellent enterprises in

¹¹ More can be found on the web: www.worldbank.org/nipr

terms of environmental protection have been practiced by the State Environmental Protection Administration (SEPA) since 1989. In the process, with the recommendation of local environmental protection bureaus and field inspection of provincial environmental protection bureaus, a Panel of Evaluation and Assessment consists representatives from related divisions of the SEPA, the State Environmental Monitoring Station of China and other ministries will examine the recommended candidate enterprises one by one elaborately. In the end, enterprises passing the examination will be awarded the title of 'National Advanced Enterprises in Environmental Protection' and will obtain certificates accordingly. By 1997, this assessment and comparison has been conducted for 6 times, and there are over 500 enterprises had won the honor.

In 1996, SEPA re-examined the advanced enterprises awarded in 1989 and 1990, and some 183 enterprises were kept for the honor with an effective period of 4 years. 8 enterprises were judged as unsatisfactory with the standards, which were deprived of their titles of advanced enterprises.

No study has been conducted on the effectiveness of this program in terms of providing incentives for industrial firms to control pollution. The general impression is that the incentives have been very little if there is any.

Hohhot Industrial Environmental Performance Rating and Disclosure

In 1999, the State Environmental Protection Administration and the World Bank has launched a program called GreenWatch in China. Two cities, Hohhot and Zhenjiang, have been selected to establish pilot programs. For the Hohhot case, the system was jointly designed by the Chinese Research Academy of Environmental Sciences and Hohhot Environmental Protection Sciences Institute, with the help from the Development Research Group of the World Bank.

The essential content of environmental information disclosure work in Hohhot City is the establishment of a performance indicator system of enterprises and the disclosure

of the rating results to the public. The enterprises report the information of their environmental performance to environmental authorities, and the environmental authorities as well obtain information from enterprises through monitoring and inspection. After the environmental authority gets the information, it will process the information so that the information could be understood and accepted by the public. The role of the news media is to publicize the information, which is a very important step in environmental information disclosure. The news media obtain information to be publicized from the government and publicize the information to the public, including the subjects on which information is disclosed, the enterprises. (see figure 4.1)

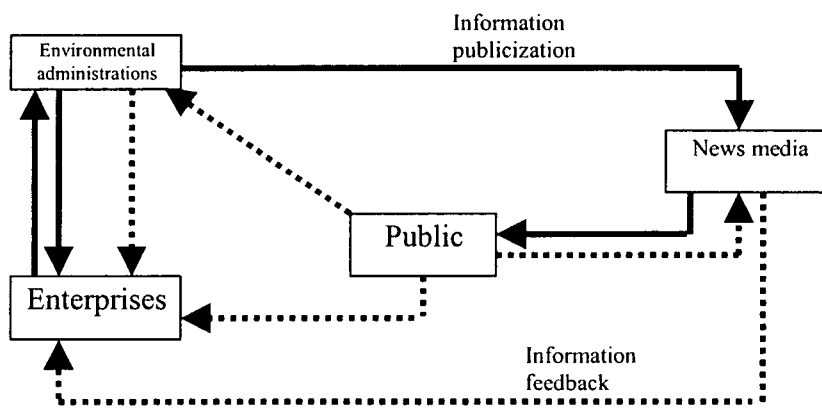


Figure 4. 1 Flow chart of information disclosure in Hohhot City

In Hohhot’s environmental information disclosure program, all heavily polluting point sources, both industrial and non-industrial, are selected as a targeting group. The indicator design takes consideration of the following two aspects: First, the content of environmental information disclosure should reflect the differences of environmental performance between different polluting sources in order to form the difference of environmental credit between different polluting sources. Only by this means can the polluting sources with poor environmental credit improve their environmental performance. Second, the contents and forms of environmental information disclosure should be easy to be understood and accepted by the public, according to the public understanding of environmental problems and giving people direct and deep impression so that it is easy for people to judge and to form public opinion. To this end, a five-color

system for environmental performance rating of enterprises is designed. Green color indicates the best environmental performance. The second best is Blue; then Yellow, and Red and Black. The reason that Green is selected for the best performance is that Green as an environmental label has long been accepted by the public, while Blue is the basic requirement of people to environmental quality, Yellow is a warning color, and Red is a color representing non-compliance with the regulation, indicating that the environmental performance of the enterprise does not meet the basic requirements. Black means that the enterprise does not take any efforts to improve the environment. Enterprises belonging to this last category should be closed in a limited time.

The rating of environmental performance of the enterprises in Hohhot City and its implication are summarized in table 4-1. Environmental performance rating of different enterprises, i.e., the colors, are indicators of the eventual content of environmental information disclosure. The structure of indicators of environmental performance of enterprises includes indicators of basic situation, pollution performance indicators, environmental impact indicators, and environmental management indicators. With respect to industrial enterprises, there are also indicators of cleaner production, which mainly refer to the status of the enterprise to implement cleaner production and ISO14000 certification. With respect to institutions, there are indicators about civilized and healthy institutions, which refer to whether or not the institution has been rated as advanced unit of environmental protection or civilized unit.

In the environmental performance rating in Hohhot City, indicators of pollution emission and environmental management are selected as the primary indicators for the evaluation of environmental credit rating. This is closely related to the data availability and evaluation standards. Determination of the evaluating standards of environmental credit is also restricted by the information of environmental performance of the enterprises. Pollutants selected are SO₂, soot and COD, which are regulated in the 'one control and two meeting standard'. At the same time, it is closely related to the focus of EPB of Hohhot City.

In the first environmental information disclosure of enterprises in Hohhot City, there are 107 enterprises selected, among which 56 are industrial enterprises and 51 units are non-industrial entities. Statistics of the results are shown in Table 4-2. The results of

evaluation basically reflect the actual situation. Data used is monitoring data from the environmental monitoring station in 1999. Results show that black enterprises, with all three pollutants exceeding discharge standards, only accounts for a small proportion which is about 10%. If these enterprises make no efforts for treatment after the environmental information disclosure and have no better performance at the second round of environmental information disclosure, they should be closed. Among both enterprises and institutions, red ones occupy the largest proportion, being as high as 66.1% in enterprises. It demonstrates that there are still much work to do in promoting the polluting sources to meet the standards. These enterprises that still did not meet the standards are the primary objects to be stimulated by environmental information disclosure. And they should be promoted by pressures from the public and society to meet the standards soon. If the standards of evaluation remain unchanged and the pollutants emission can meet the standards after their work, their color will change to Yellow or even Blue, and their environmental performance will be acknowledged and praised. In the first round of evaluation, the number of “Blue” enterprises (and institutions) is comparatively small, and the amount of “Green” enterprises is even zero. This is related to the prevailing poor environmental performance of enterprises in Hohhot City. To date, there is no enterprise in Hohhot City that passes the certification of ISO14000, so there is no enterprise in the Green category. Two enterprises and 9 institutions with sound environmental performance were rated as Blue. This established a model for other companies while posing pressures to themselves. Under the pressure of keeping their Blue rating, these units will have to take efforts to further improve the internal management mechanism so as to gain better credit.

With respect to enterprises, different environmental performance ratings can have significant impacts on their public and market reputation. Therefore, the enterprises care much about the environmental information disclosure. The enterprises need to have a profound understanding of the evaluating standards of environmental credit rating. They sometime raise questions about the monitoring data and the status of environmental supervision that are used by the environmental management authorities to evaluate the environmental credit. This demands more of the environmental management work. Disclosing environmental performance of enterprises and publicizing their environmental

credit rating in newspaper, TV and broadcasting do have great effects on enterprises. They all began to look for the gaps between themselves and better ones, taking efforts to control pollution, improving their environmental performance, and trying to get better rating in the next round of evaluation.

Similarly, environmental information disclosure provides the incentive to the pollution control and management activities of the environmental management authorities to switch from a passive mode to an active one. In Hohhot's 'one control and two meeting the standards' campaign in 2000, environmental information disclosure has played an important role. If the enterprise cannot meet the proscribed standards, it will be listed on a blacklist and has to complete treatment within a certain time. This to certain extent promotes the enterprises that cannot meet the standards to implement pollution control actively, and also relieved the pressure of environmental management authorities in pollution control.

Besides, implementation of environmental information disclosure can significantly improve environmental information work. Environmental information disclosure in Hohhot City makes the environmental management authorities master the environmental information of enterprises in time, which provides the information basis for implementation of other environmental management systems and related policies and regulations and makes environmental decision-making more scientific and reasonable.

Implementation of environmental information disclosure can improve the public awareness on environmental protection also. Publicizing the evaluation process, standards and results to the public in an easy-to-understood and vivid way is the precondition for public participation. At the same time when the public studies and understands the process of environmental information disclosure and carry out environmental complaint and visiting, they will also raise their environmental awareness. This has been perceived by Hohhot EPB officers.

4.4 Discussion and Recommendation

It is feasible to adopt the information disclosure approach in China's industrial pollution control. There is a sufficient legal and policy basis and a strong public support

to this approach, and enterprises do care about their environmental reputations. Some enterprises fear neither critics from government authorities nor the penalty fined by environmental administrative agencies, but they fear that news media expose their poor environmental performance.

The level of public environmental awareness in China is getting higher and higher. The Social Survey Institute of China (SSIC) carried out an investigation in Beijing, Shanghai, Tianjin, Guangzhou, Chongqing, Wuhan and others in 1999, and successfully investigated 785 urban residents. Among the issues of punishment of corruption, enforcement of legislation, control of commodity prices, equity issues, and environmental protection, the last one was rated as the second most that most concerned the respondents, only next to punishment of corruption. With respect to the environmental protection, 66.3% and 28.9% of investigated people expressed to be very concerned and comparatively concerned respectively.

China has maintained a good database of plant level environmental information through the practice of the pollution charge system. Data quality and quantity are sufficient for rating plant environmental performance. After its establishment over 20 years ago, the task force of environmental monitoring in China is getting more and more developed, monitoring devices have reached certain scale, and the monitoring capacity has been significantly improved.

Environmental information disclosure, especially environmental information disclosure in enterprises and institutions, is still in its initial stage in China. Practices in Hohhot City and Zhenjiang City accumulated many valuable experiences for the promotion and formation of the system nationwide.

Local governments' support is the key for establishing a public information program. Environmental information disclosure is a governmental activity, and therefore, the governmental authorities participate and organize the whole process. Government's involvement is the precondition for environmental information disclosure to be successful in China.

The target group of an information disclosure program should include all major polluters in the region. This will be helpful both to the establishment of evaluating standards and to the functioning of environmental information disclosure. Whether or not

the evaluation procedure is scientific and reliable is very important for the success of an environmental information disclosure program. Each region can establish the procedure that suits the local circumstance. Meanwhile, the procedure should be continuously revised and improved according the specific situation and experiences gained in practices. The procedure is also the standard for enterprises to implement control measures. The procedure should be simple, objective and scientific.

It was suggested that the results of environmental information disclosure be publicized every half year. If the period is too short, there will be no clear improvement of environmental performance of enterprises; while if the period is too long, it will be difficult for public supervision, and then there will be less pressure to the enterprises. As a very important measure of environmental management, environmental information disclosure must be standardized and be integrated into the existing system of environmental management gradually.

To summarize, the environmental information disclosure approach, as a new measure for environmental management, is still at its initial, experimental stage in China. Previous experiences both in China and other countries have shown that this measure can be a cost-effective and efficient tool for environmental management. This is an important complement to the current system of environmental management in China.

Table 4-1 Criteria of rating environmental performance

Color	Meaning	Description	Criteria
Green	Best practice	The environmental performance of the enterprise meets with international standards; the enterprises adopt cleaner production technology.	The enterprise passes the certification of ISO14000, or it is rated as civilized enterprise
Blue	Good performers	The environmental performance of the enterprise significantly exceeds the national and local environmental standards, meeting the requirements of the environmental administrative authorities.	Soot, SO ₂ and COD emissions of enterprise meets the requirements of total emission control (emission concentration is lower than 60% of emission standard)
Yellow	Warning	Environmental performance of the enterprise can meet national and local environmental standards, partly meeting the requirements of environmental management.	Soot, SO ₂ and COD emissions of enterprise meets the requirements of standards of emission concentration, but not the total load control.
Red	Bad performers	The enterprise can not fully meets the national and local environmental standards; environmental performance is poor and cannot meet the requirements of environmental management.	At least one pollutant among in soot, SO ₂ and COD cannot meet emission standards
Black	One of the worst	The enterprise seriously violates national and local environmental standards, with extremely poor environmental performance, causing severe damage to environmental quality.	Emission concentration of soot, SO ₂ and COD all does not meet the national concentration standards

Table 4-2 Results of environmental performance rating in Hohhot City

Number of enterprises			Number of institutions			Total		
Color	Number	%	Color	Number	%	Color	Number	%
Green	0	0	Green	0	0	Green	0	0
Blue	2	3.6	Blue	9	17.6	Blue	11	10.3
Yellow	11	19.6	Yellow	20	39.2	Yellow	31	29.0
Red	37	66.1	Red	19	37.3	Red	56	52.3
Black	6	10.7	Black	3	5.9	Black	9	8.4
Total	56	100	Total	51	100	Total	107	100

Appendix 4.1

Environmental Information Disclosure Experiences in U.S. ¹²

The earliest attempts at pollution control used approaches such as emissions standards, mandated reductions in emissions, or requirements that sources adopt particular control measures or technologies. After the most obvious and easily remedied pollution problems had been addressed, it became evident that the traditional regulatory approaches to pollution control would be excessively costly, incapable of achieving all environmental objectives, or both.

A second approach to pollution control responded to these limitations of traditional regulatory approaches by harnessing the forces of the market. These mechanisms included tradable permits, emission fees, deposit-refund systems, subsidies, and performance bonds. In most cases, they have complemented traditional regulatory remedies, but in some instances they are developed as stand-alone measures.

Although market-based approaches have helped improve the cost effectiveness of environmental regulation, the problems of pollution regulation have not been fully solved. Environmental regulators are burdened by the vast number of harmful substances that need to be controlled if environmental goals are to be achieved. Furthermore, they find that market-based mechanisms have limits in terms of the sheer numbers of substances that can be controlled and the modes of behavior that can be encouraged.

In response to these difficulties, pollution control policy evolved to provide information as a mechanism for making employees, shareholders, and customers of businesses active participants in the regulatory process. Information disclosure strategies are timely for at least three reasons.

First, environmental regulators need more regulatory tools (as noted in the previous paragraph). Second, the means by which information is collected, processed, and disseminated are rapidly falling in cost. Third, with rising incomes and better education, the demand for environmental information by workers, shareholders, and consumers is increasing.

In the product market, consumers may react to environmental labels by buying “environmentally-friendly” products, even when they cost more. Some export markets for products may be effectively closed to firms until they achieve ISO (International Organization for Standardization) certification. Purchasers of intermediate products increasingly are concerned about a host of issues regarding their manufacture, such the raw materials used (e.g., virgin timber, recycled materials) and the environmental performance of the supplier. In the labor market, firms with better environmental records may be viewed as more attractive places to work, making it possible for them to hire more talented or productive employees. In the capital market, shareholders and lending

¹²Source: USEPA, 2001, The United States Experience with Economic Incentives for Protecting the Environment, EPA-240-R-01-001

institutions increasingly are concerned about the prospect of future environmental liability for pollution harms caused by a firm. Hence, firms with better environmental records may be rewarded with better access to, and a lower cost of, capital.

The collection and public availability of information on environmental performance has proven to be a strong incentive for sources to reduce their emissions of pollution. The incentive derives from a number of factors. For example, when companies collect emissions information, they learn about the nature and magnitude of their emissions. When such information is made easily accessible to the public, workers and local communities have a much better idea of the environmental risks they face, so they are more prone to support or demand actions to reduce emissions. When a source's emissions are shown to decline over time, the source often reaps the benefits of better relationships with its employees and with the local community. Finally, in some cases a proven, long-term record of environmental stewardship makes a company's products more desirable to consumers.

The disclosure of environmental performance information is much more common today than a decade ago. Although some information is disclosed voluntarily, other information must be released to the public as required by statute. Information approaches have been used in environmental protection on both the state and federal levels. The National Environmental Policy Act is considered to be the first disclosure-type program in USA. The two best-known laws mandating the public disclosure of environmental information are the Toxics Release Inventory provisions of the federal Community Right-to-Know Act and California's Proposition 65. Other forms of information reporting include environmental impact assessments, product labeling, environmental performance awards, Securities and Exchange Commission (SEC) environmental reporting requirements, and disclosure requirements for lead paint and radon when homes are sold.

State information programs tend to base data on materials accounting and thus partially address the concern of data reliability. The New Jersey and Massachusetts programs seem to be well regarded and well-used. Proposition 65 places the burden of proof on industry, which has incentive effects on firms similar to that of requiring more reliable data. Data collected as the result of Proposition 65 are well-used. Experience with labeling schemes indicates that they are more likely to influence behavior if they are accompanied by promotional activities that target retailers and consumers. In many cases, the label itself is only one element of a larger effort to promote the use of environmentally friendly products. As a result, it may be difficult to isolate the incentive effect of a label from that of related promotional activities. One of the main problems encountered by environmental seal-of-approval schemes is the lack of agreed-upon criteria for assessing environmental friendliness. While seals of approval may be relatively easy for consumers to understand, they risk not only lacking agreed-upon standards but also oversimplifying complex environmental issues.

OSHA MSDS sheets have been criticized as overly lengthy and complicated. FTC Guidelines for Environmental Marketing are intended to prevent false or misleading use of advertising claims such as "environmentally friendly," "degradable," and "recyclable."

Experience with energy-efficiency labeling demonstrates the limitations of information that is perceived to be unrealistic, such as the fuel economy labels on automobiles before the 1985 revisions, or confusing, such as the Energy Guide labels on appliances.

SEC-mandated environmental disclosures by firms increasingly are used by investors as indicators of proactive management, legal liability, or risk at particular firms.

In all, information disclosure has been a powerful tool for reducing pollution. Over the past decade, the Toxics Release Inventory, for example, shows that sources have substantially reduced the amount of substances listed in the inventory that they release into the environment. Because the TRI requires only the reporting of information, actions taken by sources to reduce pollution are voluntary and in all likelihood relatively low cost.

U.S. Toxic Chemical Emission Information Database and 33/50 Program

The Emergency Planning and Community Right-to-Know Act (EPCRA), signed into law in 1986, was the first law to mandate chemical information disclosure in U.S. federally. EPCRA requires states and local agencies to develop emergency plans for chemical accidents and requires companies to notify these agencies in the event of an accidental release of a hazardous substance. It further requires companies that make, store or use certain chemicals to submit material safety data sheets (MSDSs) to these agencies. And EPCRA establishes the Toxic Release Inventory (TRI), an inventory of the amount of certain chemicals released into the air, water, land, or transferred off-site. Facilities covered by TRI must report releases of each of the listed chemicals and chemical categories for which it manufactures over 25,000 pounds per year, or otherwise uses over 10,000 pounds per year. Facilities are covered if they have 10 or more full-time employees and belong to a listed set of industrial sectors. There are over 600 TRI-listed chemicals. The report should be carried out annually, including corporation name, release of toxic chemicals, emission frequencies and direction of emission, which are to be reported to the public. According to the statistics, this measure had obviously played an active role in reducing the toxic emission to the environment. It is reported by the USEPA that TRI releases have decreased substantially, from 2.96 billion pounds in 1988 to 1.61 billion pounds in 1995- a 45.6 percent decrease.

In order to strengthen and consolidate this measure, USEPA further implemented the expansion of the TRI, named 33/50 in Feb. 1991. The program prescribed that by 1992 emissions of 17 kinds of toxic chemicals will reduce by 33%, and 50% by 1995. USEPA planned to achieve this goal by the principle of voluntary participation. In the first, they invited 555 key polluting companies to participate and sent invitation letters to 5000 companies for explanation and propaganda. In the end, it turned out that 1300 companies took part in the 33/50 program. In 1994, these companies reduced 757 million pounds of emission in total, exceeding 50% of the total emission, and achieved its goal in advance for one year.

Securities and Exchange Commission Disclosure Requirements in the United States

Section 14(a) of the Securities Exchange Act of 1934 empowers the Securities and Exchange Commission (SEC) to require disclosure by publicly owned companies “as necessary or appropriate in the public interest or for the protection of investors.” To date, the SEC has interpreted this statement to require the reporting of information that would be deemed important by investors.

The SEC requires disclosure of environmental liabilities that could have a “material” impact on the company’s financial or competitive position, information that would be important to investors. Companies also must report individual environmental enforcement proceedings that are expected to cost more than \$100,000 as well as environmental litigation that might have significant financial impact on the company. SEC access to information submitted by companies to EPA enables it to verify company disclosures on Superfund sites, RCRA sites, and federal enforcement actions. The SEC is authorized to require companies to revise their filings in case of inaccuracies. In the past, the Commission has written to companies to inquire why the companies did not disclose certain environmental information in their filings.

The number of large companies disclosing environmental information in SEC Form 10-Ks is increasing. Among Standard & Poor’s 500 companies, 322 submitted environmental information in 1990 as compared to 217 companies in 1988. The incentive effect of these disclosure requirements is not known. However, evidence indicates that information on the environmental performance of companies is of interest to investors.

Environmental Performance Awards in the United States

EPA and numerous state and local governments periodically issue awards for environmental behavior they deem to be exemplary. To the extent that such awards generate positive publicity, they could encourage environmentally friendly behavior. In California, for example, 305 businesses won awards under the Waste Reduction Awards Program (WRAP) in 1995. The Target department store chain won awards at 2 distribution centers and 90 stores for recycling and their efforts to minimize waste, activities that have resulted in a 75% reduction in garbage. Winners received certificates of recognition from the Integrated Waste Management Board as well as the right to use the WRAP logo to publicize their waste reduction achievements.

The California EPA announces winners each year. The 1999 winners include Autrey Museum of Western Heritage, Cagwin & Dorward Landscape Contractors, Investec, Kraft Foods Inc. Visalia, Memorial Hospitals Association, Pebble Beach Company, Straus Family Creamery, Swinerton & Walberg Company, Trips for Kids/Re-Cyclery, and Unisys Corp.

In Texas, Governor’s Awards for Environmental Excellence are issued for the following categories: large business; large technical business; non-technical, small business; government, civic, and non-profit organizations; education; youth organization; media; agriculture; individual; and special. These awards are part of the Clean Texas initiative

under the Waste Reduction Act of 1991. In the large technical business category, Lockheed Martin Tactical Aircraft Systems was the 1995 winner. The company has also received awards from EPA for reducing emissions of ozone-depleting chemicals and VOCs. It has also received the EPA Regional Administrator's Environmental Excellence Award for Excellence in Hazardous Waste Minimization Program Development.

Chapter 5

Rural Industrial Pollution Control: Call for New Strategies

5.1 Introduction

While the industrial pollution control policies practiced in China were mostly designed for urban and state owned industrial enterprises, millions of relatively small, non-state owned enterprises which are mostly located in the countryside have successfully escaped the scrutiny of the government pollution regulatory system. This chapter reviews the pollution discharge and control practices of those so-called Township-Village Industrial Enterprises (TVIEs). First the current situation of TVIE pollution and characteristics of TVIEs' environmental performance have been presented and the major reasons for the heavy pollution are analyzed. TVIE pollution control experiences are summarized and recommendations are also provided to further control TVIE pollution.

5.2. TVIE Pollution

5.2.1. Water Pollution

During the period of 1989 to 1998, water pollution load of TVIE's in China experienced a rapid increase first and then a decrease. (see table 5.1) As it is shown in table 5.1, discharge of wastewater from TVIEs increased from 2.7 billion tons in 1989 to 5.9 billion tons in 1995 by 120%. The proportion of TVIEs wastewater discharge in national total also increased from 9.6% to 21.0% by 11.3%. After 1995, the discharge of wastewater from TVIEs has showed a decreasing trend, reducing to 3.8 and 2.9 billion tons in 1997 and 1998 respectively, while its share in national total also decreased to 16.9% and 14.7% respectively.

COD emission in wastewater from TVIEs increased from 1.77 million tons in 1989 to 6.10 million tons in 1995, increasing by 245%; its share in national aggregate discharge also increased from 18.95% to 44.27%, by 25.4%. After 1995, COD discharge from TVIEs has also showed a decreasing trend, reducing to 4.07 million tons and 2.92 million tons in 1997 and 1998 respectively; its share in national aggregate of industrial wastewater discharge decreased to 37.93% and 36.45% respectively.

In general, water pollution load from TVIEs accounts for 1/3 in the national aggregate in 1998. TVIEs are mostly located along small rivers. There are many cases that one plant, such as a paper manufacturing enterprise, can pollute one river seriously. In this regard, prevention and control of wastewater from TVIEs are of significant importance to Chinese rural environment and human health.

5.2.2. Air Pollution

From table 5.2, we observe that TVIEs' emissions of SO₂ and soot first increased, and later on decreased. This is just as observed for the water case, but the overall extent of these changes is smaller than in the case of water. Emission of SO₂ is within the range of 400 million tons, and its share in total industrial emission of SO₂ is around 24%; the extent of change of soot emission is a little bit larger than that of SO₂ emission, and is between 5 and 9 million tons, accounting for 42-50% of national aggregate of industrial soot. Dust from TVIEs also showed an increase at first, followed by a later decrease, while its extent of change is larger than those of SO₂ and soot. Dust emissions were 4.70 million tons in 1989, which increased to 13.253 million tons by 1995, (an increase of 180%), while dust emissions dropped to 8.15 million tons in 1998.

The TVIE share in dust emissions was 35.88% of the national total of industrial dust in 1989. The TVIE share increased to 67.47% in 1995, and dropped to 61.70% in 1998. Generally speaking, as for the relative importance of TVIEs to SOEs as a source of SO₂, soot and dust, TVIEs are an important source for the industrial dust, a less important source for soot, while TVIEs are not very important as a source of SO₂.

5.2.3. Generation and discharge of solid wastes

From table 5.3, we find that generation and discharge of industrial solid waste from TVIEs first increased, and later on decreased. Generation of industrial solid waste from TVIEs increased from 1.8 billion tons in 1989 to 3.8 billion tons, increasing by 110%; its share in national aggregate of industrial solid waste also increased by 13.5 from 23.40% to 36.89%. In 1997, generation of industrial solid waste from TVIEs reached the amount of 4.01 billion tons, accounting for 37.9% of national aggregate of solid waste. From 1998 onwards, the generation of industrial solid waste began to decrease, and reduced to 1.6 billion tons. Its share in national aggregate also decreased by 20%. Discharge of industrial solid waste from TVIEs increased from 77.08 million tons in 1989 to 175.84 million tons in 1995, increasing by 128%, its share in national aggregate of industrial solid waste also increased from 69.54% to 88.69%, increasing by 19.15%. After 1995, discharge of industrial solid waste has showed a downward trend, decreasing to 168.63 million tons and 50 million tons in 1997 and 1998 respectively, while its share in national aggregate of industrial solid waste was 91.59% and 71.43% respectively. Control of industrial solid waste plays an important role in control of industrial solid waste nationwide.

5.3 Characteristics

General Comparison: Are TVIEs more polluting than SOEs? It seems that TVIEs are more polluting than SOEs, at least from people's general impression's perspective. Are the situations really true? We have calculated the pollution loads of water, air and solid wastes pollutants per Gross Industrial Output Values(GIOVs) in recent years for TVIEs and SOEs (table5.8). The results have shown that the pollution load per GIOVs for TVIEs is much less than that of SOEs. And the pollution load from 1988 to 1995 is decreasing. Generally speaking, SOEs are more polluting than TVIEs, in terms of pollutants generated per industrial output value produced.

Load distribution: A positive correlation can be found between pollution load and economic density (output value per km² land area) of TVIEs, and a negative correlation exists between discharge per unit of output value and economic density of TVIEs. That is to say, higher economic density of rural industry in a region is accompanied by higher total pollution load and lower discharge per ten thousand yuan of output value (see table 5.4).

Regional distribution: According to the levels of economic development in rural industry, three areas can be classified in China: developed eastern region, relatively developed middle region, and underdeveloped western region. In general, water pollution of rural industry in eastern region is serious with the wastewater discharge accounting for 54.9% of national aggregate of rural industry; solid waste pollution of rural industry in western region is heavy with the discharge accounting for 45.9% of national aggregate, while pollution pattern in the middle region is not obvious.

During the past decade, the number of industrial pollution sources in the eastern region has increased by about 3 times as much as before; the number of industrial pollution source in the middle has increased to more than doubled as much as before, while the amount in the west has increased by 50% or so. But output value increase of pollution source enterprises in the eastern and western regions almost is the same, both increased by ten times. It means that as for average scale of new pollution source enterprises, that of eastern region is comparatively large while that of western region is small.

High discharge intensity: Despite the low ratio of total wastewater discharge from rural industries in the total national industrial wastewater discharge, the proportion of pollutant discharge in the wastewater is very high, with COD accounting for 44.3% of national aggregate, volatile phenol 65.4%, suspension 47.9%, heavy metal 42.4%, and arsenic 63.3%. It indicates higher discharge intensity and bigger negative environmental influence of the rural industry than that of state enterprises with the same wastewater discharge.

Sector Structure of TVIE pollution: The sector distribution of the industrial pollution loads of China's TVIEs is relatively concentrated. Water pollution is dominated by organic pollution. Main sectors contributing to COD pollution are pulp and paper manufacturing with a share of nearly 70%, followed by the food processing sector (dominated by breweries), textile (dominated by dyeing), chemical materials and leather manufacture.

Air pollutant loads are mainly concentrated in non-metal mineral manufacturing. In China, TVIEs account for a big share of non-metal mineral manufacturing, i.e. manufacturing of construction materials such as cement and bricks. In 1998, 230.25 million tons of cement were produced by TVIEs, accounting for 43% of the national aggregate production, while most the TVIEs used outdated kilns. Bricks are dominantly produced by TVIEs and the production reached 2433.3 billion pieces in 1998. Non-metal mineral products manufacturing is also a large energy consumer, so as for industrial dust, soot and SO₂, non-metal mineral manufacturing is also a large polluter. Some sectors that are large users of coal. As for solid waste pollution, the pollutant load are mainly concentrated in mining sectors, such as mining of coal, ferrous-metal, non-metal and ferrous metal.

Deficiency of funds: Because most TVIEs were established with very little initial investments, outdated technologies were installed. It was almost impossible for them to get sufficient funds to abate pollution. The limited funds available to the state environmental authorities had been mostly spent on urban pollution treatment in the past.

Outdated technology: It is impracticable for TVIEs to raise funds by themselves and carry out cleaner production with advanced technology and devices in one step.

Weak management: Many projects have been carried out without approval of "three simultaneousness steps" and environmental impact assessment has been undergone less than required. Difficulties exist in paying discharge fee and implementing punishment

efficiently. Statistics indicate that the discharge fee from TVIEs accounts for about one tenth of national aggregate of discharge fee, which is below the share of pollution from TVIEs in the national aggregate.

Weak environmental protection consciousness: The environmental awareness of local government is low, and the local protectionism disturbs the environmental management of TVIEs. The role of China's TVIEs in local economic development is mainly reflected in its contribution to the finance of the local government. To a large extent, especially in the poorer regions, TVIEs are the backbone for local public finance. Some local officials do not have strong environmental awareness; they merely seek economic growth and ignore the pollution caused by TVIEs. According to the surveys and interviews made recently by the experts of Policy Research Center for Environment and Economy of SEPA, in certain cases, when local EPBs charged the pollution levy or banned TVIEs whose discharge widely exceeded environmental standards, the local government interfered on behalf of the TVIEs or even posed pressures on local EPBs' enforcement, which further diminished the effectiveness of environmental management of TVIEs.

5.4 Government Management

TVIEs are managed by the Bureau of TVIE in the Ministry of Agriculture. The Bureau of TVIE has a division of environmental protection, which manages the environmental protection of towns in the whole China. Meanwhile, SEPA has a division in the Department of Pollution Control, which is responsible for the environmental protection in urban and rural areas.

China's state-owned enterprises are managed by different sector departments of State Council. After the sector structure reform, the planning economy has been changed into the market economy and the sector-based management structure has been cancelled so that the enterprises could be put into the market. Local state-owned enterprises has been responsible for their profits and losses and managed independently. The state-owned enterprises have now been carrying through the reform of property right system and

gradually carried out the stock share system. China is empowering the local governments for plant management, and current practices have shown that such kind of mechanism is effective.

The environmental management of TVIEs is mainly managed by the EPBs at the county level. However, there are only few independent county EPBs in county governments and most environmental functions are carried out by county bureaus of construction and environmental protection. There are few monitoring centers at the country level and towns with environmental institutions.

In 1995, 520 projects related to TVIEs should have been carried out the environmental assessment, but actually only 382 have been carried out, which amounts to 72.62%. In the same year, 406 projects should have been carried out the “three synchronicity”, but actually only 272 ones have been carried out, which amounts to 67%.

While there is no much regulatory effort spent on TVIE pollution control in the past, China did pay serious attention on the TVIE pollution issues. The shut down of 15 types of small TVIEs is one example. In 1996, the State Council issued “Decisions on several issues about environmental protection,” requiring the closing down of enterprises that are heavily polluting and are not economically efficient. Local governments at all levels banned, closed and suspended 15 kinds of enterprises with heavy pollution, including small paper mills(output below 5000tonnes/year), leather factories(output below 30,000hides/year) dyeing factories(below 500 tonnes/year) and chemical, electroplating, asbestos and other factories with antiquated polluting technologies. Conforming to the strategy, 74,168 enterprises with heavy pollution should be banned, closed and suspended, including 51,786 banned, 19,664 closed and 2,718 suspended. Table 5.7 lists the industrial structure of these enterprises. Share of small heap gold dressing works, small heap sulfur works, small tanneries, small paper mills and small heap lead and zinc works are among the biggest .

Statistics and survey of ten provinces and cities were gained by SEPA in 1996. In all TVIEs of the ten provinces and cities, 43,653 “fifteen small enterprises” should be banned, closed or suspended, sharing 0.57% of the total, 0.9% of personnel aggregate, 0.89% of gross output value of all TVIEs in 1995, and 1.06% of profits tax aggregate in 1995. Closing down these enterprises may cut down 1004 million tons of industrial wastewater, 291,000 billion Nm³ of industrial exhaust gases and 17.99 million tons of solid wastes. Calculated nationwide, discharge of industrial wastewater, exhaust gases and solid waste will respectively be reduced by 5%, 0.5% and 2.9%.

64,083 of those small enterprises had been closed down by May 31st, 1997, making up 86.4% of all “fifteen small enterprises” that should be closed. The measure, which is shutting down of heavy polluted small enterprises, has efficiently controlled the environmental pollution conditions caused by TVIEs.

In addition, due to overall treatment of “three rivers and three lakes”, enterprises are required to meet discharge standards. Also national investment in environment protection increased, pollution treatment has been gradually put into effects by some TVIEs.

Box 5.1:

Experiences of Dawang City of Shandong Province in TVIE Pollution Control

Dawang City is national demonstration city for TVIE development and is listed in the top-one-hundred cities. In 1999, GDP of Dawang City was 5.4 billion RMB and the input to environmental protection accounted for 2% of GDP. There are 1319 TVIEs with 24000 employees, accounting for 46% of the total population of the city. In 1998, the output of TVIEs reached 4.17 billion RMB Yuan. The contribution from TVIEs to economic growth was playing a leading role.

In the early 1980s, the environmental damages caused by TVIEs in Dawang city were very heavy. The municipal government formulated a strategic development plan aiming for sustainable development. The government encouraged small villages to invest

together and established large enterprises with advanced technologies but less polluting loads. In 1999, there were 5 enterprises with gross output values more than RMB 5000 million. Some relevant policies were issued in order to reduce the adverse environmental effects, such as industrial restructuring, technology innovation and upgrading. In order to ensure the economic growth sustainable, the municipal government encouraged the TVIEs adopting advanced technologies with less pollution. The municipal government set up a fund to guarantee corporation of those enterprises which have adopted technological innovation and cleaner production. They also paid much attention to the role of research and development. Early 1992, Hua Tai group, a large paper-making enterprise in Shandong province, established an institute of paper-making technologies. This institute conducted some studies on paper-making technologies and paper-making wastewater treatment technologies. As a result, one of the paper products from Hua Tai group was awarded as national high-tech product with good environmental outcomes.

5.5 International Experiences¹³

TVIEs are generally small and medium-sized enterprises (SME), mostly located in the countryside. Worldwide, SME is generally a sector which is largely ignorant of its environmental impacts and the legislation that governs it, oblivious of the importance of sustainability, cynical of the benefits of self-regulation and the management tools that could assist it in tackling its environmental performance, and difficult to reach, mobilize or engage in any improvements to do with the environment.

While traditional regulatory approaches are difficult to be applied to SMEs, voluntary environmental management initiatives have been explored to serve the environmental needs of SMEs. The environmental management tools have been including environmental management systems (EMSs), environmental auditing, environmental indicators, life-cycle assessment, environmental labeling, eco-balance

¹³ Reference: Ruth Hillary, 1997, Small and Medium-sized Enterprises and the Environment: Business Imperatives, Greenleaf Publishing.

analyses, environmental reporting, within-plant environmental policies, etc.. While applying these tools to SMEs, the following factors should be paid special attention: 1. They should be inexpensive; financial support through funding is essential. 2. One should be sensitive to the limitations of SMEs in terms of human resources, skills, etc. 3. They should be locally based. 4. Flexibility is a crucial issue when assisting firms to improve their environmental management.

While these environmental management tools are not employed extensively for SMEs, there are many success examples. A Malaysian firm Perusahaan Pelindung Getah (PPGM) developed a set of indicators in response to ISO14031. The firm employs about 100 staff and manufactures medical rubber gloves, producing about 8 million per month. The company has set itself the following environmental targets and has developed indicators to track its progress towards meeting them: total compliance with legislation, zero public complaints regarding its operations, minimal adverse environmental effect, rejected gloves to be less than 5% of the total produced, and the level of extractable protein in the gloves to be less than or equal to 0.1 milligram extractable protein per gram of rubber. The indicators developed include: management performance indicators – annual total cost of implementing environmental programs, number of environmentally related complaints received per year, and number of effluent samples analyzed monthly not complying with regulatory standards; operational performance indicators – number of pieces of gloves rejected in relation to the total number of pieces of gloves produced per month, extractable protein level of glove measured in milligrams of extractable protein per gram of rubber, quantity of zinc in kilograms discharged to the receiving watercourse per month, COD load in kilograms discharged to the receiving water course per month and quantity of dried sludge in kilograms produced per month; and environmental condition indicators – incidence of protein allergy associated with the use of rubber gloves by sensitized individuals and changes in the quality of surface water upstream and downstream of the factory's effluent discharge point.

A German SME, the Augsburg Worsted Yarn Spinning Mill, founded in 1836, uses the eco-balance tool to analyze its material and energy flows in order to identify areas for

improvement in its operations. The most important data resulting from the eco-balance is converted into relevant environmental indicators. The company's indicators reveal that since 1994 it has realized a number of cost savings by improving its resource efficiency. For example, the spinning bobbins and transport packaging returned to the company by customers are cleaned, checked and repaired by members of a local community project for later re-use by the company. This re-use saves the company around L10,000 per year. Technical improvements to machinery and the increased motivation and awareness of the staff regarding environmental matters have led to significant reductions in the loss of raw materials. This loss was reduced from 6.7% in 1993 to 4.8% in 1995 which resulted in savings of over L40,000. In total, over L100,000 per year has been saved by measures implemented on the basis of the company's eco-balance.

Studies have also been found on pollution control in informal sector in Mexico¹⁴. A city with over one million permanent inhabitants, Cd. Juárez is home to approximately 350 traditional kilns which are principally fired with scrap wood. Collectively, these kilns are a significant area-wide source of air pollution. In Cd. Juárez, a number of factors make it politically difficult to require brickmakers to bear the full costs of pollution control. Brickmaking is a significant source of employment, providing over 2,000 jobs directly and 150 jobs indirectly in transportation and wholesaling. In addition, most brickmakers are impoverished. In 1989, the municipal environmental authority in Cd. Juárez initiated a project aimed at convincing traditional brickmakers to substitute clean-burning propane for dirty fuels. This strategy is best thought of as clean technological change since adopting propane involves significant set-up costs and significant changes in the production process.

Participants in the Brickmakers' Project used a broad range of policies to promote propane adoption. First, they subsidized various costs associated with adoption. Second, Project leaders worked to put in place and enforce process standards prohibiting the use of dirty fuels. In 1992, the municipal government banned the use of certain fuels. To

¹⁴ Sources: Allen Blackman, 2000, *Informal Sector Pollution Control: What Policy Options Do We Have?*, Resources for the Future, Washington, DC

facilitate enforcement, the new administration relied on peer monitoring. A telephone hotline was set up to register complaints about brickmakers violating the ban. Enforcement teams with the power to jail and fine violators were dispatched in response to complaints. Project organizers also encouraged local trade unions and neighborhood organizations in communities surrounding brickyards to pressure brickmakers to switch to propane. The brickmaker organizations affiliated with the dominant national political party (the PRI) were in general quite cooperative, enforcing strict rules on permissible fuels in some brickyards. Third, it initiated a campaign to raise brickmakers' awareness of the health hazards associated with dirty fuels. Finally, Project leaders tried to reduce competitive pressures for brickmakers to use cheap dirty fuels by intervening in the market for bricks. In March 1993, they helped to negotiate an agreement among leaders of all of the major brickmakers unions to establish a price floor high enough to allow all brickmakers to use propane.

The high-water mark of the Brickmakers' Project probably occurred in the fall of 1993 when according to most estimates at least 50% of the Brickmakers' in Cd. Juárez were using propane albeit in (slightly modified) inefficient traditional kilns. However, during the early 1990s, Mexico's state run petroleum company was in the process of phasing out long-standing subsidies on propane. As propane prices continued to rise in 1993 and 1994, key participants in the Project began to defect: the municipal government relaxed the ban on burning debris, brickmakers began abandoning propane in droves, brickmaker organizations increasingly dropped out as they were undercut by competitors using dirty fuels, and construction companies and the federal workers' housing agency gave up the pretense of boycotting "dirty" bricks. By 1995, only a handful of brickmakers were still using propane.

Although the diffusion of propane among the brickmakers in Cd. Juárez was limited and temporary, it nevertheless represents a significant achievement in view of the obstacles involved, especially the drastic reduction in propane subsidies. Which of the broad range of strategies employed by the Project were responsible? Statistical analysis of survey data suggests that three factors played a key role: peer monitoring applied by

neighbors and local organizations affiliated with the city government, a growing awareness of the health risks associated with burning dirty fuels, and subsidies to the costs of propane equipment and training. Efforts to introduce new energy efficient kilns and to intervene in the market for bricks were obviously ineffective.

While those international experiences may not be able to provide direct solutions to China's environmental problems associated with the TVIEs, some of the environmental management tools for SMEs listed above can certainly provide a guideline for innovations in China.

5.6 Conclusions and Recommendation

The environmental pollution of TVIEs in China is a rather serious issue, which caused tremendous damages to human health, agriculture production and the environment. The governments of towns have the right to control TVIEs and they weighed more on economic development than on environmental protection. Due to the property right reform of TVIEs, which separates the ownership of TVIE from the town governments, the environmental performance of TVIEs has been getting better.

No pollution control regulations have been made specifically on TVIEs so far in China. Policies practiced for TVIE pollution control are adapted from those policies originally designed for SOE pollution control. SEPA should modify the existing industrial pollution control regulations to take into considerations the new natures of all industries with different ownership, location, sector, and scale, etc.

While regulatory approaches should be soon designed to provide external intervention on TVIEs' pollution control, tools for internal intervention such as providing management, information and technical services are also very important to complement regulations. Promoting environmental services to TVIEs is especially important given their unique natures in terms of small scale, lack of skills, lack of funds, old technology,

etc. A new, comprehensive and sustainable strategy for TVIE pollution control is called for.

Table 5.1 Trend of water pollution discharge in the 1990's

Item	Unit	1989	1995	1997	1998
Total Wastewater	100 Million tons	278.83	280.88	226.7	200.4
Of county level and above	100 Million tons	252	222	188.3	171
	100 Million tons	26.83	58.88	38.4	29.4
Of TVIEs	%	9.62	20.95	16.94	14.67
TVIE Share					
COD total	10 thousand tons	934	1378	1073	801
Of county level and above	10 thousand tons	757	768	666	509
	10 thousand tons	177	610	407	292
Of TVIEs	%	18.95	44.27	37.93	36.45
TVIE Share					

Source: China's Environmental Statistics, Survey of pollution sources of TVIEs in China

Table 5.2 Trends of industrial air pollution emission in 1990's

Items	Unit	1989	1991	1995	1997	1998
Total SO ₂	10 thousand tons		1552	1846.1	1772	1594
Of county level and above	10 thousand tons		1165	1405	1363	1210
	10 thousand tons	360	387	441.1	409	384
Of TVIEs	%		24.94	23.89	23.08	24.09
TVIE Share						
Total Soot	10 thousand tons		1490.17	1687.5	1265	1179
Of county level and above	10 thousand tons		845	838	685	680
	10 thousand tons	543	645.17	849.5	580	499
Of TVIEs	%		43.29	50.34	45.85	42.32
TVIE Share						
Total Dust	10 thousand tons	1310	1334.1	1964.3	1505	1321
Of county level and above	10 thousand tons	840	579	639	548	506
	10 thousand tons	470	755.1	1325.3	957	815
Of TVIEs	%	35.88	56.60	67.47	63.59	61.70
TVIE Share						

Source: China's Environmental Statistics, Survey of pollution sources of TVIEs in China

Table 5.3 Trends industrial solid waste in 1990's

Item	Unit	1989	1995	1997	1998
Total Generation	10 thousand tons	76708	102162	105849	80000
Of county level and above	10 thousand tons	58759	64474	65749	64000
	10 thousand tons	17949	37688	40100	16000
Of TVIEs	%	23.40	36.89	37.88	20
TVIE Share					
Total Discharge	10 thousand tons	11084	19826	18412	7000
Of county level and above	10 thousand tons	3376	2242	1549	2000
	10 thousand tons	7708	17584	16863	5000
Total TVIEs	%	69.54	88.69	91.59	71.43
TVIE Share					

Source: China's Environmental Statistics, Survey of pollution sources of TVIEs in China

Table 5.4 Relationship between discharge aggregate and economic density of TVIEs in 1995

	Eastern region		Middle region		Western region	
		Ratio (%)		Ratio (%)		Ratio (%)
Number of pollution sources (ten thousand)	48.3	39.7	39.8	32.7	33.6	27.6
Gross output value (100 m yuan)	14940.5	77.6	2822.6	14.7	1497.3	7.8
Economic density (10000yuan per km ²)	37.35		5.67		0.54	
Discharge of waste water (100 m tons)	32.50	54.9	17.7	29.9	9.0	15.2
Discharge of COD (10000 tons)	289.6	47.4	229.1	37.5	92.5	15.1
Discharge of SS (10000 tons)	315.2	42.1	302.0	40.3	132.2	17.6
Discharge of SO ₂ (10000 tons)	227.0	51.5	117.5	26.6	96.6	21.9

Discharge of soot (10000 tons)	351.4	41.1	333.8	39.3	164.3	19.3
Discharge of (10000 tons)	75.	56.6	388.1	29.3	187.1	14.1
Discharge of solid waste 10000 tons)	2618.8	14.9	6898.9	39.2	8066.5	45.9

Table 5.5 Relationship between pollution discharge per output value and economic densities of TVIEs in 1995

	Eastern region		Central region		Western region	
Gross Industrial Output Value (10 ⁸ yuan)	14940.5		1497.3		2822.6	
Economic density (10 ⁴ Yuan/ km ²)	37.35		5.67		0.54	
	Discharge (10 ⁴ tons)	Discharge per output value (10 ⁴ tons/10 ⁴ yuan)	Discharge (10 ⁴ tons)	Discharge per output value (10 ⁴ tons/10 ⁴ yuan)	Discharge (10 ⁴ tons)	Discharge per output value (10 ⁴ tons/10 ⁴ yuan)
Industrial wastewater	32.50	0.0022	9.0	0.0060	17.7	0.0063
COD	289.6	0.019	92.5	0.062	229.1	0.081
Suspended Substances	315.2	0.021	132.2	0.088	302.0	0.107
SO ₂	227.0	0.015	96.6	0.065	117.5	0.0416
Soot	351.4	0.024	164.3	0.11	333.8	0.118
Industrial dust	75.	0.0050	187.1	0.125	388.1	0.137
Industrial solid waste	2618.8	0.175	8066.5	5.39	6898.9	2.44

Table 5.6 Regional distribution of TVIEs

	eastern region				middle region				western region			
	1989		1995		1989		1995		1989		1995	
		share %		share %		share %		share %		share %		share %
NPS (10 ⁴)	16.24	5.67	48.3	39.7	18.91	6.37	39.8	32.7	21.96	14.4	33.6	27.6
GIOV (10 ⁸ yuan)	1408.1	36.6	14940.5	77.6	305.5	28.5	2822.6	14.7	149.2	42.4	1497.3	7.8

* NPS: number of pollution sources; GIOV: gross industrial output value

Table 5.7 Sector distribution of "fifteen small enterprises"

Sector	Number of enterprises that should be banned, closed and suspended	% of total
Paper mill with yield below five hundred tons	6362	8.57
Dying plant with yield below five hundred tons	493	0.66
Small tannery	8288	11.17
Heap coking	16737	22.57
Heap sulfur	1835	2.47
Heap arsenic	54	0.07
Heap mercury	160	0.22
Heap lead and zinc	7032	9.48
Heap oil refinery	4341	5.85
Heap gold dressing	23072	31.11
Heap pesticide	106	0.14
Heap bleaching and dyeing	1026	1.38
Heap electroplating	4082	5.50
Heap asbestos products	405	0.55

Heap asbestos products	21	0.02
Others	214	0.29
Total	74168	100

Table 5.8 pollution load comparison between SOE and TVIE

	1995		1997		1998	
	SOE	TVIE	SOE	TVIE	SOE	TVIE
GIOV (at 1990 constant prices) (billion RMBYuan)	1821	2989.8	1961.8	3101.1	1882.7	3871.1
wastewater disposal(BT)	22.2	5.9	18.8	3.8	17.1	2.9
COD amount (MT)	7.7	6.1	6.7	4.1	5.1	2.9
SO2(MT)	14.1	4.4	13.6	4.1	12.1	3.8
Soot (MT)	8.4	8.5	6.9	5.8	6.8	5
Industrial dust(MT)	6.4	13.3	5.5	9.6	5.1	8.2
Solid waste generated (MT)	644.7	376.9	657.5	401	640	160
Pollution load /output value						
wastewater disposal (BT/Billion Yuan)	0.012191	0.001973	0.009583	0.001225	0.009083	0.0007491
COD (MT/Billion Yuan)	0.004228	0.00204	0.003415	0.001322	0.002709	0.0007491
SO2(MT/Billion Yuan)	0.007743	0.001472	0.006932	0.001322	0.006427	0.0009816
Soot (MT/billion Yuan)	0.004613	0.002843	0.003517	0.00187	0.003612	0.0012916
Dust(MT/Billion Yuan)	0.003515	0.004448	0.002804	0.003096	0.002709	0.0021183
Solid waste (MT/Billion Yuan)	0.354036	0.126062	0.335151	0.129309	0.339937	0.0413319

Chapter 6

Environmental Impact Assessment of Industrial Development Policies

This chapter reviews major industrial development policies implemented by Chinese government after 1978, summaries China's work on environmental impact assessment of investment projects and the concept and the practice of strategic environmental assessment (SEA) of industrial development policies in the world. Then recommendations on how to improve the capacity of conducting strategic environmental impact assessment on development policies in China are provided.

6.1 Environmental impact assessment of industrial policies in China

6.1.1 Industrial policies developed during the years 1978-1985

1. Policy on developing agriculture with great efforts

Since reforming the structure of people's commune, the Household Responsibility System has been established in the rural areas of China starting from 1978. The Chinese farmers output was stimulated considerably and agriculture developed rapidly. But the role of agriculture as a source of non-point source pollution became more and more serious due to overuse of fertilizer and pesticide.

2. Speeding up industrial development

The central government's decision about speeding up industry's development was issued by the Third Plenary Session of the Eleventh Central Committee in 1978. It clearly stated that fuel, power and raw material industry and transportation should be in the

priorities. In 1979, it stated that the light industry should be supported. In 1979, the Fifth Plenary Session pointed out that exports should be stimulated.

After 1978, the industrialization process became more rapid. The development followed an extensive way, with high consumption of raw materials and resources and heavy pollution. When the industrial policies were promoted, environmental protection was not paid attention to, so pollution became more and more serious.

3. Technological policies for upgrading industrial structure

In 1978, the government formulated the National Science and Technology Development Plan for the years 1978-1985. Because of acceleration of science and technology, some measures were beneficial to environmental protection. But the trend of deterioration of environmental quality still continued.

4. Policy on industrial geographic distribution

In 1979, the Special Economic Zones were established in eastern coastal areas in China, like Shenzhen, Shantou and Xiamen, etc. During the development of special economic zones, environmental protection issues were paid close attention to, which resulted in fairly light pollution.

Since 1983, the shares of agriculture, light industry and heavy industry in GDP have been gradually stabilized. Simultaneously, all three sectors grew at a fast pace.

6.1.2 Industrial policies of the year 1986-1990

1. Industrial structure policies

Agriculture was put in top priority in China in this period due to food security concerns, etc. Because of overuse of fertilizer and pesticide, agriculture expanded

considerably as a source of non-point source pollution. But this was not the main kind of pollution at that time. Energy and raw materials industries were promoted in this period. Transportation and telecommunication also became a development priority.

With the development of energy industry and raw material industry, the problem of acid rain expanded considerably. Due to the development of the construction and building industry, dust became the main pollution source in the urban areas.

After 1985, Chinese economy entered the initial stage of rapid development. In 1985, GDP was RMB89.64 billion. In 1990, GDP reached RMB185.48 billions, two-fold the 1985 GDP level. In 1986, some effective policies were put into practice to develop the economy, but these caused environmental pollution and ecosystem destruction. During this period, the second national environmental protection conference was held. In the meeting, the environmental protected was regarded as the basic national policy.

2. Policy of industrial organization

In 1986, the State Council issued the “Decision on Some Issues of Further Promoting the Intersectoral Economic Links”. It changes the economic developing model that was large and whole, small and whole, which means no matter large or small enterprises or organizations have their own complete departments that should be shared by various social units.

This policy was beneficial to increase the utilization rate of energy and resources and increase pollution abatement. But it was not powerful enough to change serious pollution trends.

3. Policy of industrial technology

In 1988, the Torch Plan and The National Trial-manufacture Plan of New Important Productions were worked out.

The technical policies were beneficial to reduce pollution discharges. Nevertheless, pollution was still serious. During this period, the 3rd national environmental protection conference was held, during which the environmental management was strengthened.

6.1.3 Industrial policies of the year 1991-1995

Since 1990s, Chinese industrial policy has been at a mature stage. A series of policies were formulated, such as the Present Industrial Policy's Outline by the State Council in 1989; the Automobile Industrial Development Policy and Plan for next ten years and the Eighth Five-Year Plan Outline; and the National Industrial Policy's Outline of 1990s.

The implementation of these industrial policies further helped the rapid growth of the Chinese economy. The mechanical industry, the electronic industry, the petrochemical industry, the automobile industry and the building industry became designated as the pillars in the national economy.

During this period, the Chinese economy increased at the rate of 10% per year. At the same time, environmental pollution was serious. But as China strengthened its environmental management system and carried out its sustainable development strategy, environmental pollution did not increase in strict proportion to economic growth. To tackle the environmental pollution, China conducted industrial pollution source investigation and surveys and formulated the Green Engineering Plan, which opened the prelude to the control of environmental pollution in large scale.

6.1.4 Industrial policies of the year 1996 to present

In March of 1996, the Outline of National Economy and Social Development Plan of the Ninth Five-Year Plan and the Long Term Development Targets of 2010 were approved by the National People's Congress. It's general targets of the industrial

structure's adjustment is to emphatically strengthen the construction of infrastructure such as agriculture, water conservation, energy, transportation and telecommunications, to encourage the pillar industries, to develop the high technology industry, to adjust the textile industry and actively develop the tertiary industries by means of the market mechanism and government control and adjustment.

The industrial policies were changed. When formulating the policies, environmental concerns began to be incorporated into the decision-making process. The State Environmental Protection Administration formulated the policy that resulted in the shutting down of the "Fifteen Types of Small Scale enterprises", (small scale enterprises in 15 selected industrial subsectors), such as small iron smelting enterprises, small paper mills, small chemical enterprises, and so on. It was approved by the State Council and became a key environmental policy. After 1996, the industrial policy's formulation was on the base of environment and economy's coordinating development and the sustainable development strategy.

1. Policy of industrial organization

"Focusing on large enterprises and making small ones flexible" was the major principle during the industrial structure's adjustment.

During the Ninth-Five-Year period, especially after the meeting of the Fifteenth National Congress of the Communist Party of China, the central government carried out the policy of "Focusing on large enterprises and making small ones flexible" in the process of state-owned enterprises' reform. So-called focusing on large enterprises means that the government put emphasis on the reform of the 120 trial enterprise groups and 521 important enterprises, which account for the main share of the national economy. The state-owned economy' quality and international competitiveness was targeted to be improved in order to further promote the industry's upgrading and restructuring. So called "Making small ones flexible" means that from actual conditions, these kind of small enterprises would be made more flexible by various ways, such as reorganization,

alliance, annexation, share cooperation, tenancy, contraction operation, sale and bankruptcy.

According to this policy, the industrial departments put major efforts in the adjustment of the enterprise's organizational structure. At the core of advantage and by means of marketing economy, they promoted a batch of large competitive enterprises and groups to reorganize and grow. While the departments also paid attentions to small enterprises' development and led them to link with large enterprises and the new industrial relationship between the large and the small industries were formed for reasonable working division and efficient cooperation, so that the new industrial organization framework was built in the new economic developing period.

Since enterprises were small, it was difficult for them to achieve economies of scale. And the enterprise's competitiveness was weakened. By now, there are only one Chinese industrial enterprise in the list of the first Five-Hundred enterprises in the world. Abroad, the largest refinery's production capacity is 30 million tons per year. The biggest productive force of single series is 12.5 million tons per year. But in China, the production capacity of the largest oil refinery is less than 10 million tons per year. And there are 170 oil refineries which productive force is less than 1 million tons per year. It is well known that small oil refineries have relatively high energy-consumption and cause serious pollution. Furthermore, they account for about 77% oil refineries.

There are several hundred small copper, aluminum and zinc smelting works. China has 8453 cement enterprises. Among them, only 576 enterprises' production capacity is more than 200,000 tons per year, but 4452 enterprises' production capacity are less than 50,000 tons per year with the backward technology, serious pollution and unstable quality. The average production capacity of cement works is 56,000 tons per year. But in Japan and Korea, the average production capacity is 2,340,00 and 4,580,00 tons per year respectively.

2. Policy of industrial structure

The development of the tertiary industry was promoted (Table 6-1). With the development of transportation and trade, major efforts were put in the promotion of the information, finance, tourist, district service and intermediary services sectors so as to increase the services contribution to the national economy.

It is well known that the tertiary sector is very clean. The industrial structure of other countries also shows that China's tertiary sector must amount to more percentage of GDP (Table 6-2). At the end of this century, the supply exceeds the demand in China. Under the excessive circumstance, it is necessary to develop the tertiary industry, not only for the economic development but also for the environmental pollution control in China.

3. Regional development policies for the industrial sector

The Great Western Development Program will promote the economic development in the middle and western region of China. The infrastructure construction is be speeded up, major efforts should mainly made to the reasonable exploitation of water resources and water conservation. Another major aspect of the Western development Strategy is to change the development style from a resource-dependent mode to a market-guided mode.

To do well in the ecological and environmental protection and construction in deed, to develop the high-technology industry, and further to expand the opening to foreign countries in order to improve investment circumstance.

For a long time, the traditional thought in the west China has been development depending on increased use of the West's resources. This traditional way of thinking can not continue. It is clear that in the market, the main factors to determine what to produce and how to develop is the market demand, not resource supply. The cost of industry depending on resource will increase because it is difficult to increase benefit when resource is exploited to some degree. In an area, if the industry depending on resource

had been the pillar for a long term, the economy would decline resulting from resource exhaustion.

After China's accession to WTO, on one hand, international funds will strongly ground against west side's industry; on the other hand, more raw material will be imported into the east China, such as iron, petroleum, oil and other mineral productions, core and so on. So, to promote west area into marketing economy and open circumstance, China must put efforts to cultivate industries' competitiveness. And the core is to speed up state-owned enterprises' reorganization and reform and strengthen exploiting human resource.

The shift from extensive development mode to intensive one.

The extensive development mode has been the basic way in some areas of west regions for a long time, which has damaged resource and ecological system. During the exploitation in western regions, the human resources and the environmental protection will be very important to sustainable development. While the needs of our generation are satisfied, our next generation's welfare should not be compromised. First of all, people should protect those resources that could be imported from abroad. If some resources could be imported at a low price, people should not exploit domestically. For example, the petroleum oil shall be regarded as a strategic resource and its exploitation should be reduced. The development should not be like the exploitation of wasteland. The strategy to improve the ecological and environmental quality and to make a perfect living environment shall be included as one of key contents.

Now, the ecological construction is one of the most important tasks, which includes the transformation from cultivated lands to forestlands and grasslands. But this is not enough. In countryside, farmers who lose lands maybe not pleased with nation's allowance and some farmers will depend on town-owned enterprises to improve their life. So, regarding the whole economy of west regions, the main thinking should be the promotion of industrialization process in a sustainable way.

4. Policies on industrial technologies

Policy of industrial technology is related with many other industries in the national economy. We take several examples, which affect the overall situation.

• **Policy of clean production**

Clean production is popularly initiated in the world. In China, the thought of clean production has been reflected in the environment policy for a long time. It is the reason why clean production is easy to be accepted. China promoted the clean production from the early of 1990s. And in 1993, clean production was defined as the important measure against industrial pollution in the meeting of the 2nd national industrial pollution prevention meeting. After that, a series works have been done: 1) compiled enterprises' auditing handbook; 2) established national network; 3) launched clean production's audition in 200 enterprises; 4) built 5 demonstrating projects; 5) the State Environmental Protection Administration issued Decision about promoting clean production; 6) founded guiding and training centers in about 10 areas and departments.

However, the percentage of enterprises that have been implementing the clean production is limited, which left large space to deepen this policy. As mentioned above, China's environmental problem is due to the extensive development model. In other words, the clean production is to change the production process method so as to resolve environmental problem. It is one of the basic directions of Chinese environmental policies.

• **Policy of technical innovation**

Now, the development of science and technology is accelerated increasingly and the cycle of technology and production is shortening. Our society is stepping into a time of technical innovation that will be of special value.

To put more efforts to proceeding enterprise's technical innovation. In 1996, the State Economic and Trade Commission and the State Science and Technology Commission started technical innovation programme. The targets within 15 years included that, a new technical innovation system should be developed to be harmony with the socialistic market system and the modern enterprise's development plan; large enterprises with major products and ability to exploit key technologies had a high market share at home and abroad; the technical innovating ability should be greatly improved and key systematic designs of technologies should be mastered; and the technical progress should become as a major factor to improve economic quality and efficiency, and lay a solid base to achieve the third strategic goal of economic development. In 1998, the State Economic and Trade Commission carried out 528 innovation projects and 10 Ninth-Five-Year projects on significantly technical instrument research and localization to support new products' development. To improve the large enterprises' abilities in competitiveness and innovation, the State Economic and Trade Commission did trials in Shanghai Steel, Jiangsu Ship and the other 4 enterprises. A batch of competitive enterprises appeared, such as Hairer and Fangzheng.

In 1999, China strengthened technical innovation and issued Temporary Regulation of Beijing New Technical Development Zone. It will carry out the following activities.

Firstly, to turn scientific and technical achievements into productive force through marketing mechanisms and to give great encourage in finance and tax, so that high technology enterprises, such as network companies, could grow up. In Haidian district, the government innovated and reformed its management system and sustained excellent legal circumstance. The development zone's office first dredged the productive factors' circulating web, especially the channels of resource, so as to reach efficient distribution of all factors.

Secondly, with the chance that the national banks adjusted credit structure and reduced bad loan's proportion, to recommend a batch of high technology projects to the banks and assist them to assess and select projects in the beneficial principle.

Thirdly, according to the enterprises' demand and market development, to cultivate agencies and facilitate the information flow among enterprises, governments and research institutes.

Additionally, a high technology enterprise appraisal center founded by the State Statistical Bureau and another four departments leads the enterprises' development by propagandizing appraisal index and results.

Generally speaking, the new governmental management agency is just like a brainpower switch in the regional network. The favorable factors will be introduced into the network and the unfavorable factors will be refused. It plays an important role in organization, construction and maintenance while building the regional network.

Beijing will greatly encourage high technology industries. Some traditional industries, such as the chemical industry and the iron and steel industry, will be adjusted. It is beneficial for the environment to develop new technology industries.

- **Policy of technological upgrading**

From 1990, the State Economic and Trade Commission carried out reforming program toward the key industries and enterprises, which increase investment in the technical innovation and speed up enterprises' reform. In 1998, with the target of quality breed and efficiency, the State Economic and Trade Commission implemented the central government's policy of expanding domestic demand and speeded up the technical transformation. In 1998, 23 batches of special plans and 2 batches of technical transformation plans were made out, 620 engineering projects of Phase Two of the reforming program and the first batch of key industrial products' adjustment projects started. The total investment was RMB 470 billion. It played a great role in improving product quality, adjusting product structure and expanding domestic demand. Centering on the technical plan practice, each province and autonomous region strengthened

coordination with banks and financial departments so as to make sure the capital could be in procession in time. The metallurgical industry eliminated open-hearth furnace and improved continuous casting ratio. The technical transformation increased the technological level of iron and steel industry.

In China, the industrial average technical level is far behind that of developed countries. The statistics shows that the technical economical character of 1/3 facilities are fairly advanced. There is only about 18% major products in pillar enterprises can reach the international technical level in 1990s. Compared with advanced countries, China still has a long way to go. For the gaps between China and the advanced countries, it is fairly small in agriculture and consumer goods industry, larger in industry of production means of non-mechanical and electrical equipment, transportation and service industry, the largest in mechanical and electrical industry especially the basic mechanical and electrical industry. For example, there are 102 dry production lines with the capability of 700 tons per day in the present cement industry, only 7.1% of the total production capacity. Among them, there are 11 lines with the capability of 4,000 tons per day, only 2.2% of the total production capacity. In 1997, the output of open-hearth furnace with high energy consumption was 8.9% of the total output in iron and steel industry, but its continuous casting ration was only 60.7%. However, the ration was 80% at the world average level, 96.6% in Japan, 94.7% in America, and 96% in Germany. Chinese large and medium-sized iron and steel enterprises consumes 965Kg of standard coal to produce 1 ton of steel, but only 650-750Kg of standard coal according to the world advanced level.

- **Policy of eliminating backward technology**

In 1999, the State Economy and Trade Commission selected six industries as the focal points in industrial structure adjustment: 1) textile industry and coal industry, which the State Council emphasized to lift people out of poverty; 2) building material industry, iron and steel industry, which need policy support; 3) automobile industry and petroleum chemical industry, which have great relation with other industries and can expand

domestic demand. In 1998, the commission issued two regulation documents, which clearly defined the structure adjustment target in the iron and steel industry and building material industry in the last three years of Ninth-Five-Year period and supplied responsible policies and measures.

To avoid repeated construction, quicken structure adjustment, promote equipment and product upgrade, the State Economy and Trade Commission got approval from the State Council and issued a list of eliminating backward production power technology and product (First phase). The list was put into practice from Feb. 1, 1999. It remarked China's great progress in preventing the repeated construction at a low level and quickening industrial structure adjustment.

To resolve pollution problems resulted from industrial structure, the State Environmental Protection Administration and other related departments asked the State Council in 1998 to issue a notice of eliminating fifteen types of small enterprises with serious pollution. In that year, about 60,000 small enterprises were eliminated. And pollution was alleviated.

6.2 Strategic Environmental Assessments and International Practice

Over the last few decades, project-level EIA has been rather successful in terms of integrating environmental considerations into project decision-making process¹⁵. Strategic Environmental Assessment (SEA) is now taking this approach one step further toward plans, policies, programs (PPP) etc. SEA uses positive prevention, when making developing strategy, considers all aspects related with environment and adjusts the strategy. It can forecast and prevent some problems when the strategy is carried out and make the best strategy by comprehensive consideration of environment, economy and sociality. SEA is implemented by the national institutes and the government. It can make objective and comprehensive environmental assessment through departments' corporation experts and public participation.

¹⁵ Chris Wood, 1997: SEA - The way forward; in: Environmental Assessment, Volume 5, Issue 3

As a top-down strategy, SEA helps to promote sustainable development by identifying the potential environmental consequences of policies, plans and programmes on par with, and at the same time as, consideration of their economic and social implications¹⁶. As a “pro-active” toolkit, SEA is an important step towards integrated decision-making, and focuses more on maintaining a certain level of environmental quality than on mitigating the impacts (of projects).

Due to the wide range¹⁷ of strategic decisions to which SEA can be applied, SEA processes vary in scope and form far more than those used in EIA of projects. Therefore, although the components of SEA and EIA are broadly similar, there are inevitable differences – both procedural and methodological - between SEA and EIA.

An increasing number of countries and international organisations undertake SEA of policies plans and programmes, but their systems vary widely in their provisions, requirements, scope of application, procedures and methods¹⁸. A recent workshop in Christchurch revealed, that the implementation of SEA is still not sufficiently co-ordinated with other initiatives and sector frameworks. It furthermore concluded that SEA seems accepted at the level of plans and programmes but is hardly applied at the level of policies. Reasons expressed were: the "vagueness" of policies and the reluctance of policy makers to disclose their intentions.

Internationally, there seems to be a certain degree of consent that there can be no single model or approach to SEA, but there should be a mutually agreed set of non-dogmatic principles addressing a) content, and b) procedural requirements of SEA. SEA will therefore have to be conceived as flexible and adaptive tool, which is dress-cut to the specific decision/decision making procedure (Table 6-3).

¹⁶ Department of the Environment, Transport and the Regions (DETR): Strategic Environmental Appraisal, Report on the International Seminar, Lincoln, 27-29 May 1998

¹⁷ From broad policies to specific plans; from geographical regions to specific industrial sectors or social issues

Interest and debate about SEA are growing rapidly. A number of recent workshops on SEA have surfaced differing opinions about its nature and scope (e.g. workshops organized by the International Association for Impact Assessment in New Orleans, USA, in 1997, and in Christchurch, New Zealand, in April 1998; and by the UK Department of Environment in Lincoln, UK, in May 1998). One school of opinion holds that that SEA should focus mainly on environmental issues; another takes the view that it should provide a sustainability focus and cover social and economic aspects as well environmental ones. It is also argued that SEA at the policy level requires a different methodological approach to SEA at the program and plan level. However, there is broad consensus that there can be no one 'blueprint' approach to SEA and approaches will need to be developed and tailored to suit conditions, institutional realities and political circumstances in individual countries.

There is a debate on the suitability of SEA in developing country contexts where there is growing evidence that EIA is not working well¹⁹. Often the reasons are not so much technical ones, as issues of lack of political and institutional will, limited skills and capacity, bureaucratic resistance, antagonism from vested interests, corruption, compartmentalized (e.g. sectoral) organizational structures and lack of clear environmental goals and objectives. Undoubtedly, these structural problems will loom large as constraints to the introduction of SEA. In addition, there are many issues regarding the use of SEA in industrial countries that are unresolved and, more seriously, glossed over in promotional literature.

Some countries and international organizations are preparing SEAs, or considering doing so. To date, formal provision for undertaking SEA has been confined largely to industrial countries (e.g. Australia, Canada, the Netherlands, New Zealand, UK, USA) Except for the requirements of lending and donor agencies, particularly the World Bank, experience with SEA in developing countries is limited, but there is evidence of much

¹⁸ DETR, 1998

¹⁹Dalal-Clayton D.B., Sadler B. (1999): Strategic Environmental Assessment: A Rapidly Evolving Approach. Environmental Planning Issues No.18, International Institute for Environment and Development, London

wider use of SEA-type processes (proximate approaches). In the countries of Central and Eastern Europe, there is increasing experimentation with formal procedures for SEA.

Table 6.3 provides a summary of status of SEA conducted. Three detailed cases are presented in the appendix. Undoubtedly, SEA can achieve some results which are beyond conventional EIA. These results could provide decision-makers and the public with effluent information in environmental management. If applied suitably, SEA could play an important role in a transitional economy of China.

6.3 EIA and SEA in China: Current Situation and Problems

6.3.1 Current situation

In the last 20 years, the Chinese government has given high priority to policies on resource conservation and pollution control. The measures adopted so far have been quite impressive, especially since China started its economic reform in 1978. 1997/8 brought not only new legislation on environmental protection, but also improved environmental standards.

Despite the achievements made since 1979 and the fact that EIA – at least at the project level - is now firmly routed in the decision making process, there remain several problems, which constrain the effectiveness of the regulatory system and environmentally sound decision-making. These problems relate not only to the lack of financial resources and the inadequate institutional capacities, but also to the weak enforcement of regulations and the poor co-ordination between local and central government.

This situation requires new approaches, methods and tools for Environmental Assessment (EA) which are in line with the shift from a planned to a market system, and which will have to integrate more and more market based policies and economic incentives to reach the environmental objectives and goals. New initiatives are on their

way. Key-issues in this context are the imperative to develop in a more sustainable way and to facilitate integrated approaches to decision making.

Within the EA family, the Chinese government has assigned SEA an important role in bridging the gap towards a more integrative and sustainability oriented planning and assessment approach. SEPA is in the process of drafting a new law on EIA which is expected to be issued in 2001. The new law will give special emphasis to the impact assessment of policies.

Administrative structure/new responsibilities

After the reform of Chinese government administration in 1998, the number of government ministry-level bodies has been reduced from 40 to 29, and 50% of government employees had been slated for elimination from government payrolls within three years. Amidst this massive effort to cut central government administration, the environmental protection administration emerged as "bureaucratic" exception: with the political awareness at high level and significance of the environmental problems facing China, it was up-graded to ministerial status, and renamed as State Environmental Protection Administration (SEPA). One of the functional adjustments in reform was to cut down the formerly well-known State Environmental Protection Commission (SEPC), and transfer its functions to SEPA.

With the recent restructuring of government, the position and responsibilities of SEPA have been enhanced. One of its new duties is to assess the environmental impact of economic policies and development plans. This implies using an integrated decision making approach to reduce the negative environmental impacts of policy implementation. SEPA urgently needs to prepare the ground for the introduction of SEA (including legal aspects) and to devise appropriate methodologies and approaches.

Economic Development Policies

Ever since the beginning of China's open door policy, economic growth was impressive and has played an important role in the increase of living-standards. Past economic and development policies focused on economic development, and paid very little attention to the environment and eco-system conservation. As negative side-effect of the economic boom, China has experienced degradation in environmental conditions.

Furthermore, the shift towards a more market-oriented system of production and consumption has resulted in a lay-off of a large numbers of employees through a process of rationalisation and increase of productivity on the one hand, and a shut-down of polluting factories and production sites in view of improving the environmental conditions on the other hand.

Based on this experience, China's decision-makers have concluded that economic and development policies/strategies need to be better co-ordinated with environmental protection in the future. Polluting activities have to be controlled from the very beginning. The recent policy of closing down polluting and economically unfeasible production sites will be continued, but this has to be closely linked to mitigating measures in view of the kick-back on the unemployment situation in China – a win-win situation is difficult to achieve.

Within China's economic planning system, the State Council and the State Development Planning Commission (SDPC) play an important role in defining the main direction of economic development policies (macro-economic policies). They set the framework for subsequent sector (economic) development policies (micro-economic policies). In principle, all the important economic and development policies should be carefully evaluated, not only internally within the relevant economic agencies themselves, but also in consultation with SEPA and Committee of Environment, Resources and Planning (CERP).

Today, this principle is still poorly implemented. Furthermore, SEPA and CERP lack scientific and practical approaches and methods to assess the impacts of policies. With

regard to an early and more integrated assessment of China's economic development policies as well as mitigating the impact of so called "urgency-policies"²⁰, SEPA shall carry out an SEA of these (macro and micro) economic policies. Table 6-4 shows the main laws and regulations regarding EIA program in China.

By now, a set of integrated technical guidelines of EIA on the construction project has not formulated and the individual guideline is still not perfect. The industrial EIA's standards include a Standard of Civil Airport's EIA and a Standard of railway's EIA. The State Environmental Protection Administration is now making other industrial technical guidelines and standards. The good EIA's guideline is one of the basic guarantees for its efficiency. The technical guideline can standardize EIA's content, method and document and reduce adverse effect on the efficiency, which is resulted from the people's professional quality. Besides of guidelines for different factors and developing actions, to check environmental impact report (EIR) also needs technical guideline and checking standard, so as to reduce subjective bias and improve standardization and justice when checking EIR.

SEA is EIA's international developing trend. It expands EIA's scope from projects to legislation, policy, plan and other macro actions. It is the major way to promote sustainable development. In China, EIA is mainly used in construction project. Although some regional exploiting projects have had EIA, EIA is not required for legislating and making policies.

*SEA of China's Automobile Industry Development Policy*²¹

Although very few cases on SEA in China have been seen in literature so far, there are some examples of SEA. The first is the SEA on the transformation of regional development strategy of Shanxi province in 1994 (from coal exporting only strategy to

²⁰ Policies which are formulated and implemented in reaction to urgent problems, such as the closing down of strongly polluting Township and Village Enterprises (TVE's)

²¹ Sources: Wei Li, 1999, Environmental Assessment Of Policies: A Practical Way Formulating An Environmentally Sound Administrative Structure, Paper Presented in International Geographical Union (IGU)'99, Switzerland

coal-electricity exporting strategy). The second is the SEA on the national legislation of hazardous chemicals pollution control in 1995. A survey was conducted among key officials in charge of hazardous chemicals production and administration in 12 government ministries/agencies. The SEA report based on the survey was submitted to the State Environmental Protection Administration (SEPA) to help reach an agreement in regard to the assignment of obligations and powers over hazardous chemicals pollution control between SEPA and the other 11 national departments. The third case, as described below, is the SEA of China's Automobile Industry Development Policy (CAIDP) in 1997. In addition, China amended the Act on Air Pollution Prevention and Control, which has been effective on September in 2000. The environmental impact assessment on the revised Act was conducted during the discussion process.

In order to promote the economic growth and meet the requirements of China's sustainable development, the national development policy framework was issued in 1992, in which the automobile industry was regarded as a national pillar industry. China's Automobile Industry Development Policy (CAIDP) was promulgated then by the State Council to bring the auto industry into a new development stage and become a major driving force of economic development. The basic objectives of CAIDP are: the total output of autos should meet the 90% domestic demand by year 2000; the motorcycle output should satisfy the domestic market with partial export; and the auto industry must become a pillar industry by year 2010.

With the growth of China's economy, the auto ownership in China has increased rapidly in middle and large cities at an average rate of 15% in the past 10 years. However, considering the auto quality, particularly the emission control technique, the domestically produced autos consume more gasoline and emit more pollutants. A rough estimation indicates that the emission factors of new cars in China is ten times higher than that in developed countries. Moreover, the poor road condition aggravates pollution situation. Therefore, the auto emission is contributing more and more to the urban air pollution. Taking Beijing and Tokyo as an example, the auto ownership in Tokyo in 1990 is about 4 million with yearly NO_x emission of 50 thousand tons, while the auto

ownership in Beijing is only 1 million in 1995 with yearly NO_x emission of 114 thousand tons.

The SEA focused on the emission projection and its policy implications. The result indicates that the auto ownership in year 2000 and 2010 under CAIPD will be 20 million and 44~50 million, respectively, among which the cars alone will reach 7.2~8.2 million and 24.8~29.8 million. The differences between “with technical improvement strategy” and “without technical improvement strategy” are listed in the Table 6-5.

Obviously, the implementation of CAIDP would aggravate the existing auto pollution in large inland cities and coastal economically developed areas, if effective countermeasures cannot be taken. The pollution pattern in metropolitan areas will change, which is usually dominated by coal burning. This kind of pollution is also a big contribution of acid rain. Unfortunately, no effective existing policies, regulations, and technologies are available for the country. The SEA provides a series of suggestions for the SEPA and related departments/industries. Cooperation among different agencies was promoted also.

6.3.2 Some Problems of China's EIA regulation

As it is mentioned above, China has a set of administrative legal system and also made technical guidelines. The combination of EIA system in the construction projects and “three simultaneous steps” system assures checking monitoring and the enforcement of EIA. The EIA's decision support system, which is being researched, will improve EIA's scientific efficiency. The certificate management system was established. That is the agencies and person, which conduct EIA, must have certification issued by SEPA.

There are some shortcomings in China's current EIA regulation.

- Lack of public participation. The procedures for EIA in China are largely based on EIA procedures established in Western countries. However, in China, there is

no public review of environmental assessment documents. The public can not participate in EIA process. Generally, it is not easy for the public to access EIA report. Lack of public participation is obvious shortcoming in the EIA program. It affects the EIA's quality to an extent. And it is difficult for EIA to bring its explanation and propaganda into full play, which can lead public into environmental protection. The United States Environmental Protection Administration (EPA) takes the public participation as one of the key parts in the EIA system. The World Bank and the Asian Development Bank put forward clear requirement for the public participation when conducting EIAs. It is the important chapter in the EIA report. In the law of EIA, which will be issued soon, there will be procedures and requirements about public participation.

- EIA's scope is relatively limited. Currently EIAs are mainly focused on investment projects. Although regional development plans are required to conduct EIA, practical guidelines are lacking. The Chinese EIA program emphasizes air and water quality, and to a lesser extent, noise. In many countries, including the USA, environmental impact statements cover a wide range of topics from traffic congestion, visual resource loss, ecosystem change, and cultural impacts to more traditional environmental engineering concerns such as air and water pollution and noise impacts.
- There are no standards and guidelines for checking the EIA report. This affects the objectivity and fairness while checking EIA reports. Therefore, EIA cannot be promoted smoothly because the following key elements of the system are lacking: 1) lack of an expert qualification certification system, 2) lack of an expert database would could conduct EIAs; and 3) lack of independence.

EIA's information resources are insufficient. For example, China has no national environmental database for EIA. This shortcoming of the EIA program affects its efficiency.

6.4 Suggestions and Recommendations

In order to improve EIA's effectiveness in China, the following suggestions should be considered.

1. To introduce SEA gradually through carrying out pilot studies. Based on international experiences and pilot studies, the technical guidelines for SEA can be prepared. The scope of the EIA could be expanded to include legislation, national key policies and regional development plan in order to incorporate environmental concerns into macro economic decision-making process gradually.
2. To formulate special law for EIA. This will result in an upgrade from administrative regulation to law, so that the EIA system will get a strong legal basis.
3. Public participation should be clearly required in the EIA laws and regulations. The public should be involved in the whole process of EIA including the sitting and environmental monitoring and the reports' examination. The public should have access to the EIA document through various ways, such as through news and media. Furthermore, channels should be established to give opinions on EIA.
4. To establish independent examination systems. The environmental departments should implement it and organize an examining commission with a certain term of office. And a system of the cognizance of experts in the examining commission also should be established. Then these experts will be divided into different group to examine the special EIA projects based on their specialty.
5. To prepare EIA's guidelines so as to form a full set of guidelines, which will be suitable in different situations including regional development.
6. To prepare EIA's examination standards so as to assure its standardization and fairness.

7. SEA is also new in the world. Information and experience exchanges are necessary. A training program is very much needed. China should send experts and decision makers to other countries to learn successful experiences on SEA. In the meantime, the expertise of other countries, especially those countries that SEA are relatively well developed, can be introduced into China.

Table 6-1 Chinese industrial structure of the year 1978-1997

Year	Composition of GDP		
	1 st industry	2 nd industry	3 rd industry
1978	28.1	48.2	23.7
1980	30.1	48.5	21.4
1985	28.3	43.0	28.4
1988	25.7	44.1	30.2
1990	27.1	41.6	31.3
1991	24.5	42.1	33.4
1992	21.8	43.9	34.3
1993	19.9	47.4	32.7
1994	20.2	47.9	31.9
1995	20.5	48.8	30.7
1996	20.4	49.5	30.1
1997	18.7	49.2	32.1

Source: China Statistical Yearbook (1998)

Table 6-2 Share of the tertiary industry in GDP: China and selected countries

Year	China	India	Indonesia	Philip	Thailand	S. Africa	Argentina	Developed country
1980	21	36	34	36	48	43	52	76
1990	31	40	38	43	48	51	45	
1994	32	42	42	45	50	65	63	
1995	31	42	41	46	49	64	63	

Source: International Statistical Yearbook (1997)

Table 6.3 Institutional Arrangements for SEA in a Number of Northern Countries²²

Country/Institution	Provision	Procedure	Responsibility
Western Australia	Environmental Protection Act 1986/93 allows for the EA of programmes, plans and policies. EIA has been applied to programmes and plans; more limited experience with respect to policies. No structural SEA procedure to new legislation, decisions of executive government or State budgets.	No formal requirements for SEA procedure; ad hoc determined by EPA.	The Environmental Protection Agency (EPA) determines form, content, timing and procedure of the assessment.
Canada	Cabinet Directive 1990 requires all federal departments and agencies to apply EA to policy and program proposals submitted for Cabinet consideration.	No formal requirements for SEA procedure; guidelines only.	Individual Ministers are responsible for assessment of the proposals generated in the departments and agencies.
Denmark	Administrative Order 1993 requires Bills and other proposals to Parliament to include an assessment of the environmental impacts in the documentation attached if they are expected to have significant impacts on the environment.	No formal requirements for SEA procedure; guidelines only.	Responsibility for SEA lies with the lead ministries; guidance is provided by the Ministry of the Environment.
European Commission	Internal communication of June 1993 requires screening and assessment of all future Commission actions (almost always strategic in character) and new legislative proposals if likely to have a significant effect on the environment. Draft SEA Directive 1997 issued.	No procedural or content requirements are set to allow for maximum flexibility Applies to plans & programmes only	Responsibility for the statement lies with the responsible Directorate General. Binding on member states if accepted.
Hong Kong	October 1992 govt. initiative requires all policy papers submitted to the Executive Council to contain an environmental implications section. This is also required for Information Notes issued by the govt., briefs recommending new legislation and all papers seeking funding for govt. works projects.	Limited guidance on the content of SEA reports.	The proponent agency is responsible for drafting an EIS and should consult the Environmental Protection Dept. at an early stage of the policy formulation.
The Netherlands	1987 EIA Act requires an SEA of a number of plans, programmes and sectoral policies.	For SEA the same (comprehensive) procedure applies as required for	Responsibility for SEA lies with the lead agency.

²² Sadler B. & Verheem R. (1996). Strategic Environmental Assessment: Status, Challenges and Future Directions. Ministry of Housing, Spatial Planning and the Environment, The Netherlands, and the International Study of Effectiveness of Environmental Assessment.

Country/Institution	Provision	Procedure	Responsibility
	<p>Dutch Ministry of Foreign Affairs has decided to use SEA - where appropriate – in its planning of development assistance.</p> <p>Since 1995, an environmental test is mandatory for draft legislation that might have significant environmental effects (not requiring a mandatory SEA under the EIA Act).</p>	<p>projects.</p> <p>The environmental test has minimal procedural and content requirements to provide for flexibility.</p>	<p>The environmental test should be carried out by the lead authority, with the mandatory involvement of the Minister of the Environment.</p>
New Zealand	<p>1991 Resource Management Act (RMA) requires the integration of environmental considerations in all policy statements and plans at national, regional and district levels prepared under the provisions of the Act.</p>	<p>Rather than establishing a distinct SEA process, the RMA aims at the integration of environmental issues in all stages of decision-making.</p>	<p>The consideration of environmental issues is the responsibility of the agencies responsible for the policy, plan or programme (national, regional and district authorities).</p>
UK	<p>No formal SEA provisions at the national level; local planning authorities are required to 'have regard to environmental considerations' in preparing their land use plans: a number of these have prepared SEAs for County Structure Plans.</p>	<p>No formal requirements for SEA procedure; 'good practice' guidance only.</p>	<p>Policy appraisal is responsibility of lead central government agency</p>
USA	<p>The US National Environmental Policy Act, 1969, requires EA for major federal actions significantly affecting the quality of the human environment, including programs, policies, procedures and legislative proposals.</p>	<p>SEA procedures are the same as for project EIA</p>	<p>EAs should be prepared by the agency at a point in the planning process when it can highlight potential environment problems and allow a wide range of alternatives to be evaluated.</p>
World Bank	<p>The system is policy-based, recommends use of sectoral and regional EA, e.g. where sector investment projects and loans through financial intermediaries involve numerous sub-projects. In some instances, sectoral EA is also used as a planning tool in the early stages of project preparation without a formal link to sub-project EA work.</p>	<p>The Bank's regional environment division for Asia (ASTEN) has developed standard procedures for sectoral EAs.</p>	<p>World Bank Divisions.</p>

Table 6-4 Main Laws and Regulations of EIA

Time	Law and regulation	Remark
1979	The law of environmental protection (trial)	It was the first time to require environmental impact assessment report for major investment projects
1981	The management measure of environmental protection for basic investment projects	Regulates the EIA's scope of application and working program.
1986-03	The management measure of environmental protection for investment projects	Further defines EIA's scope, content, limits of management authority and responsibility.
1989-05	Principle and measure of collecting fees for environmental impact assessment	
1990-06	Environmental management program of investment projects	
1993-01	Comments about further strengthening environmental protection management	EIA is required toward Regional development plan
1993	Regulation about checking the environmental impacts after the project has been implemented	
1993	Regulation about checking the environmental protection facilities in the investment project	
1998- now	Drafting Law on Environmental Assessment	Ongoing

Table 6-5 Predicted auto emissions of main pollutants in China (million tons)

Year	2000		2010	
	Without technical improvement	With technical progress	Without technical improvement	With technical progress
<i>NO_x</i>	<i>1.19</i>	<i>0.90</i>	<i>2.28</i>	<i>1.51</i>
<i>CO</i>	<i>14.12</i>	<i>8.74</i>	<i>24.76</i>	<i>11.41</i>
<i>THC</i>	<i>6.50</i>	<i>5.28</i>	<i>9.30</i>	<i>7.12</i>

Appendix 6.1 SEA in the Netherlands²³

SEA has been formally required in the Netherlands since 1987 for sectoral plans on waste management, drinking water supply, energy and electricity supply, and for some land use plans. The findings of these SEAs are reviewed by a special commission, and are generally subject to public consultation. A study carried out in 1990 by the Netherlands Commission for Environmental Impact Assessment provided an early indication of the success and failure of the country's SEA system to date. The study showed that a number of provincial waste management plans and provincial mineral extraction plans had been subject to SEA. These SEAs ranged from documents that provided a basis for concrete decisions to those that established only general strategic directions for action, with the latter predominating. The SEAs tended to be very comprehensive, often with much information that did not pertain to decision-making or made the documents too complex. These early SEAs were felt to have little influence on decision-making; a main reason for this appeared to be that the SEAs were drawn up only after a decision on the plan had already been taken. Many of the resulting plans failed to reach decisions other than long-term resolves'.

SEA system in Netherlands are currently being made that will substantially broaden its field of application and that will relate it more closely to the principle of sustainable development. The National Environmental Policy Plan of 1989 requires existing policy areas to be assessed to determine how well they fulfill the objective of sustainable development. The government will give an account of how the recommendations contained in the Brundtland Report are to be given substance in each ministry and area of policy. At the same time there will also be an assessment of the extent to which the instruments of the various policy areas contribute to effecting sustainable development. Exploratory work will, in any case, be carried out in the following areas of policy: physical planning policy, housing, technology, markets and prices, energy, science, traffic, fiscal policy, agriculture, justice/ enforcement, education, industry.

²³ Source: Riki Therivel, Elizabeth Wilson, Stewart Thompson, Donna Heaney, David Pritchard, *Strategic Environmental Assessment*, Earthscan Publications Ltd London, 1992

To implement this requirement, the government is establishing a methodology to determine a given policy's relevance to, and ability to contribute to the fulfillment of, sustainable development. This proposed methodology consists of a checklist for environmental aspects that may be considered with respect to sustainability, and a list of questions to be answered

It is also required that, 'for policy proposals which might have important consequences for the environment, information on these effects will be provided'. The implementation of this requirement is partially under way, as a 'section on the environment' must already be prepared for plans for civil aviation sites, drinking and industrial water supply, power supply, waste disposal and excavation, as well as for rural plans, some regional plans, and key national planning decisions establishing outline choices of location. This 'section on the environment' is a written presentation of the repercussions of the action on the environment. However, the Evaluation Commission on the Environmental Protection Act has recommended that these procedures be expanded to make the preparation of a 'section on the environment' mandatory for all policy plans with repercussions for the environment.

Appendix 6.2 SEA in the Ireland²⁴

As another case of SEA, the Irish environmental profile for inclusion within the national plan was prepared by the Department of the Environment in co-operation with other government departments and statutory agencies. Its objectives were to ensure compliance with the structural funds (CSF) regulations amended by the European Commission, and to provide the European Commission with the necessary information with which to evaluate the strategic impact of the plan and its development priorities.

²⁴ Sources: Riki Therivel and Maria Rosario Partidario, 1996, *The Practice of Strategic Environmental Assessment*, Earthscan Publications Ltd., London

The identification and scope of impacts and the description of the baseline situation followed the model set out in the Commission's aide-memoire. The procedures and methodology for prediction of likely impacts were ad hoc in nature, relying in the main on published studies and reports on either the state of the environment, or on the impact of certain economic sectors on the environment. In addition, developing environmental policy initiatives were fed into the development of the environmental profile with reference to how the implementation of many of the development sectors would be mitigated. The final environmental profile for the national plan was drawn together in a single chapter of the plan, which in nine pages gave a strategic overview of the environmental situation, the likely impact of the proposed development priorities, and a description of the legal and administrative framework in regard to environmental management in Ireland.

Concurrent with the beginning of the CSF negotiations, the Irish authorities began sending their proposed operational programs for each of the development priorities described in the plan itself. These documents set out in greater detail the objectives, strategies, specific measures and administrative means by which an individual development priority will be implemented.

The negotiation phase for the Irish CSF lasted approximately six months. During this time, it was sought to clarify as much as it could the environmental impact of the national plan and its development priorities. By the end of the process, a CSF document was produced which contained a revised description of the current environmental situation, a description of the likely impact of the proposed development priorities and mitigation measures where appropriate, a set of priority environmental objectives to be achieved in the context of the implementation of the CSF, arrangements for the association of the designated competent environmental authorities in the implementation of the development priorities, and the standard clause regarding the protection of the environment during the implementation of the CSE

The Irish CSF was formally adopted by the European Commission on 17 July 1994, and is now being implemented. In addition, nine operational programmes have been approved, reflecting the key development priorities described originally in the national plan and now within the CSF. Monitoring of the progress of the CSF and the operational programmes is accomplished through a series of monitoring committees: one for the CSF proper and one each for the individual operational programmes. Their membership includes a designated environmental authority, usually the Department of the Environment, and their duties include ensuring that measures co-financed by the funds are compatible with community environmental policy.

Appendix 6.3 SEA in South African²⁵

A good SEA example can also be found with Durban South Basin of South Africa. Apartheid planning has created the Durban South Basin's mix of heavy industry and residential land uses. Local communities have raised concerns over health and quality of life, while industry seeks sanction for a number of strategically important developments in the area. The need for the study was motivated by local communities in the Durban South Basin who, since the advent of democracy, have been mobilizing around environmental issues. The South Central Local Council and the Durban Metropolitan Council accepted their responsibility to resolve the conflict between industrial and local community needs that had been created by apartheid planning. They undertook this SEA as an integral part of their Local Agenda 21 programme.

The objectives of the study were to:

1. Produce a baseline assessment of the Durban South Basin identifying opportunities and constraints for future development;
2. Identify key strategic development criteria for current and future development;
3. Evaluate various types of future development in terms of their sustainability; and

²⁵ Department of Environmental Affairs and Tourism, South Africa, 2000, Strategic Environmental Assessment in South Africa

4. Develop a policy planning framework for sustainable development to guide management and planning in the Durban South Basin.

Five development options were assessed. They were the Existing Situation, the Mixed Use Option (combining housing and light industry), the Petrochemical Option, the Second Port Option and the Combined Second Port and Petrochemical Option.

The study recommended resolutions that the Durban Metropolitan Council, the South Central Local Council and the South Local Council should accept, in order to promote sustainable development in the Durban South Basin and the Durban Metropolitan Area.

- the future development of the Durban South Basin should be industrial.
- the local authorities promote industrial development in the Durban South Basin and build on developments such as the proposed port development, petrochemical expansion and associated downstream light industry and commerce. This should be undertaken within a pro-active planning and environmental management framework in order to ensure that regional benefits are maximized and that local costs to the biophysical, economic and social environment are minimized.
- in support of this policy, the relevant local authorities should commit themselves to implementing the strategic plan recommended in the SEA. This requires that they:
 - ◆ Establish dedicated institutional structures and project teams to address planning and management issues;
 - ◆ Prepare a development plan for the Durban South Basin in accordance with the recommendations of the SEA and local Integrated Development Plans; and
 - ◆ Implement those projects and actions that have been identified by the SEA as requiring priority attention, particularly infrastructure improvements and the need to reduce air pollution.

Three sets of Guiding Principles have been identified by the SEA which address the issue of sustainability at global, regional and local levels. These include:

- Principles of Sustainability as outlined by Agenda 21 and interpreted for the Durban South Basin which must overarch all development. In terms of the South African context these indicate a need for environmentally sustainable economic development.
- Durban Metropolitan Development Principles, which have been developed from the Durban Metropolitan Council's strategic vision for their future. These tend to focus on the needs of the Durban Metropolitan Area.
- Community Development Objectives that were established by the South Durban Community Environmental Alliance. These focus on the requirements of the communities in the Durban South Basin.

The use of principles developed at all three levels show where there is correlation and where decisions will have to be made to make the best of trade off situations. The development options were assessed against these principles.

Chapter 7

Summary of Recommendations

China has made great efforts to control pollutions from its industries. However, industrial pollution situation is still very serious in China, which strongly threatens both human health and the ecosystem. Policy reforms for both industrial development and environmental protection are urgently needed.

There are many areas in which the Chinese government can and should act in order to significantly improve its management of the interface of industry and environment. The following recommendations and actions are based on the preceding chapters, in which they are dealt with in more detail.

1. Strengthening the local enforcement of environmental regulations.

The weak enforcement of environmental regulations is largely due to the intervention on environmental enforcement by other government departments and the leadership of local environmental departments of local governments. Measures need to be developed to put environmental pressures and responsibilities on the shoulders of government leaders, such as mayors.

Therefore, the first recommendation for strengthening local environmental enforcement work is to make government leaders accountable for environmental quality in their own jurisdictions. One potentially effective approach is to disclose their environmental performances to the public.

The second recommendation is to enact administrative penalty law. This can make environmental enforcement work less vulnerable to intervention of other government

departments, which usually have higher rankings than environmental bureaus in government structures.

The third recommendation is to clearly define property rights of companies or firms and to separate enterprises from government bodies. This would make law enforcement easier.

2. Increasing the pollution charge rates

Chinese industries do respond to pollution charges with lower discharges under higher discharge charge rates. While there are many problems associated with the current pollution levy system, the most important issue is that the charge rates are too low. Specific recommendations include: charging on all major pollutants; charging on all discharges no matter whether they are meeting discharge standards; increasing the charge rates; allowing variations in different areas. China should establish the new levy system as soon as possible, based on the three municipal trials of the new levy formula.

3. Promoting the use of public information disclosure approach

This is a cost effective way to provide stronger incentives for environmental entities to improve their environmental performances. Based on the two pilot disclosure programs sponsored by the World Bank, China needs to summarize experiences and trial new programs in other areas in the short run and establish a national level disclosure program in the long run.

4. Devoting more efforts into rural small and medium industrial enterprises' (SME), or TVIE, pollution control.

Generally, any efforts which can improve the work of environmental regulation and enforcement in China, such as capacity building for enforcement, financial support, better

legal documents, etc. can help control rural SME pollution. Specific recommendations include:

- 5) Strengthening local environmental monitoring and enforcement capacities;
- 6) Integrating the consideration of industrial development zones into local small town development plans;
- 7) Promoting pollution management consulting businesses for SME;
- 8) Promoting public participation in local community-based environmental management.

5. Conducting strategic environmental assessments on industrial development programs and policies.

Specific recommendations include:

- 1) Organizing workshops and conducting studies so that SEA methodologies can be well developed and comprehended, and technical requirements can be detailed out;
- 2) Enacting SEA laws or regulations which should require explicitly proper auditing and public participation, etc.

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