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DILEMMAS IN POLLUTION CONTROL POLICY IN CONTEMPORARY CHINA*

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I Socialism and Pollution

It is true to say that only in the last few centuries has the ecological system in nature been disturbed seriously by the activities of mankind. Moreover, it is a fact that the phenomenon of environmental pollution has appeared chiefly in industrialized and urbanized capitalist countries. However, this should not necessarily lead one to conclude that environmental pollution is an inevitable outcome of the capitalism system.

This problem of the relation between the extent of environmental pollution and the economic system became an issue in Japan around 1970, at a time when environmental pollution was becoming a serious social problem. More specifically, experts in the field of environmental economics faced the following question: Can socialism, as a system promoting economic development, solve the problem of environmental pollution?

This topic was discussed at the International Symposium on Environmental Disruption in Tokyo in March 1970 and became an issue of worldwide debate (Tsuru, 1970). According to a brief summary by Tsuru (1972), the debate in the symposium as to how the difference in socioeconomic systems influenced the decision-making process on environmental pollution control was as follows. Both M. Goldman and E. Dahmen denied any relationship between environmental pollution and the economic system. Swedish economist E. Dahmen said that, "There is no evidence whatever that different economic systems are of any importance in this connection." Furthermore, the American economist M. Goldman said, "If the study of the USSR demonstrates anything, it shows that not private enterprise but industrialization is the primary cause of environmental disruption." The Soviet economist V. S. Semenov took strong exception to such a view. He pointed out that a socialist society could spell out the objectives of social action in relation to the specific stage of development of that society, and concentrate all the social forces and resources in accordance with priorities indicated by scientific planning. Moreover, he pointed out that it was clearly the case that "new, nondamaging production methods and products" (to use the terminology of Dahmen) could be developed much more easily under socialism, once that objective was set up.

This argument ended without any clear conclusion. However, the following

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studies on the state of environmental disruption in socailist countries such as USSR (Goldman, 1972, Volgyes, 1974), Eastern Europe (Volgyes, 1974, Miyamoto, *et al.*, 1980) and The People's Republic of China (hereafter referred to as "China") (Ui, 1976, Quen, 1980) showed clearly that the problems caused by environmental disruption in socialist countries are very serious. This means that we cannot today accept the view that there is no pollution in socialist countries (see, for example, Sakisaka, 1970) or that there is a significant difference in the extent of environmental pollution between socialist and capitalist countries (Toda, 1976, Nakamura, 1973). Once we recognize this fact, the issues on environmental pollution in socialist countires are as follows. Firstly, what mechanism causes environmental pollution in socialist countries? Secondly, is there a significant difference in the pollution control policy in socialist and capitalist countries? And if so why?

II On the Cause of Environmental Pollution in Socialist Countries

There are already many views proposed on the cause of environmental pollution in socialist countries. One view is that the cause is not to be found in the peculiarities of the social systems but rather in industrialization itself (Tatemoto, 1971). Another view emphasizes the low level of productive forces as the main cause of environmental pollution together with production-oriented economic management. Both views take the level of productive forces as the main cause of pollution. On the contrary, some economists insist that the production system is the main cause of pollution. For example, they point out that even in socialist countries, profit or surplus are sought within a certain extent and that production efficiency is sometimes a priority. Moreover, some suggest that the development of both industrialization and agriculture in their countries follow a development path similar to capitalist countries in the earlier stage. (Tsuru, 1970).

From another viewpoint, it is pointed out that there is a relationship between environmental pollution and immaturity of democracy or civil society. Miyamoto points out that the poor tradition of democracy, or the low level of cultural or political awareness of the people, can be the cause of environmental pollution, and he insists that nationalization can cause difficulty in pollution control in socialist countries unless the respective independence of the legislature, the executive, and the judicature, as well as local autonomy and freedom of speech, association, assembly and movement are respected. These are necessary because public intervention, that is, public investment and enterprise, often causes environmental pollution (Miyamoto *et al.*, 1982).

Many researchers have emphasized that pollution in a planned economy can be caused by targets set out by the bureaucracy, for example, in five-year plans. M. Edel (1973) points out that,

> "even a central planning apparatus with considerable power will not necessarily improve the relationship of the economy and the environment. Pro-

> blems arise both from the selection of goals by planners and from the incentives to induce compliance with plans. Central planning in Russia and Eastern Europe has not prevented environmental disruption."

Goldman (1972) suggests that one of the causes of environmental pollution in the USSR is that the Soviet economy is organized to achieve rapid economic growth at the expense of environmental preservation. Both the harmful effect of centralised bureaucracy through one-party dictatorship and the careerism of the leaders in the socialist bureaucratic system are considered as causes of environmental pollution in socialist countries (see, for example, Nakaoka, 1979). Other than these, there is a view that one of the causes of pollution is to be found in the introduction of "sophisticated" capitalist technology or commodities—for examples, pesticides (Ui, 1972).

To summarize the above discussion, we can clarify the alleged causes of environmental pollution in socialist countries as follows:

(1) the level of productive forces,
(2) the system of production,
(3) the extent of the maturity of democracy or civil society,
(4) the harmful effect of bureaucracy,
(5) the targets or priorities of economic planning.

From another point of view, what do Chinese researchers themselves recognize as the causes of environmental pollution in contemporary China? Zhou Fu Xiang points out the following six points as causes of environmental pollution in his article entitled "Environmental Protection and Economic Policy" (Zhou, 1982).

First, there is the ideological perception of economic planner. China recognizes environmental issues as an important part of the national economy. Accordingly, plans for environmental protection are included in the economic five-year plans. However, the proposals set up in the plans are put into practice by local enterprises. This means that economic and pollution control planning is not necessarily thought of within the same ideological framework as its application by local management.

Second, there is the mismanagement of the economy. In order to promote production while at the same time ensuring environmental protection, the management of the economy should take into consideration, in the process of production, both the relationship between the use rate of natural resources and their supply or recovery capacity, and the relationship between waste discharge and natural assimilative capacity. This leads us to the necessity of ecologically sound low or non-waste production technology. This poses a new constraint on the currently ongoing reorganization of technology.

Third, another cause of pollution is the low level of industrial technology in many fields. For example, the efficiency in the use of thermal energy is lower than 30% while the amount of dust is a few times higher than in foreign countries. Moreover, most of the production process in the chemical industry consumes water and electricity at a much faster rate, sometimes more than ten times the amount used in other countries,

although the efficiency in the use of raw material is much lower than elsewhere (about 1/3).

Fourth, there is the neglect of the importance of city planning. For example, the about 2,400 years old historical town of Suchou which is located on a beautiful riverside in Hunan and is called the "Venice of the Orient" has serious environmental pollution. About 500 factories are concentrated in and around the 28 km^2 town in order to gain access to water. Among these factories, 21 are chemical factories located around the town. Ten dye-work factories are in the center of the town and three silk-reeling plants are located upstream of the source of city water. Due to the mixture of residential, industrial and sightseeing areas, both chimneys and pagodas are located in the same areas, thus destroying the scenic landscape.

Fifth, one must note the insufficiency of urban public utility facilities. Since the sewer system is highly insufficient, the rate of treatment of urban waste-water is lower than 2%. More than 98% of urban waste-water is discharged into rivers or lakes without any treatment, causing serious environmental pollution problems.

Sixth, the development and use of natural resources is done in an irrational way.

Most of these causes are related to economic development policy, in particular to technological reorganization and urban development. Briefly speaking, this indicates that environmental policy in contemporary China, which should in theory overcome the dilemma between development and environment, should be thought of as part of economic policy.

III Environmental Pollution Problems in Contemporary China

In terms of water pollution, the amount of both industrial and household waste-water discharged into the environment is 30～40 million tons per day in China in 1980. Almost 2% of the waste-water, about 0.7 million tons, are treated in waste-water treatment facilities of which there are between 35 and 40 in the nation (Liu, T., 1981). The rest of the waste-water is discharged into rivers, lakes or sea without any treatment. 850 water spheres, which amount to 77% of the total 1,100 water spheres of rivers and lakes are polluted. Among these, 230 are very seriously polluted. It is considered that, if one waste-water treatment unit is needed for 10,000 people, more than 90,000 new facilities need to be constructed (Liu, T., 1981). Taking into account the enormous amount of funds necessary to construct waste-water treatment facilities, it is impossible for China to deal with water pollution only through these. In fact, coping with water pollution only by the expansion of the capacity of waste-water treatment facility without any control of pollution source is the equivalent of acquiescing to environmental pollution for the time being.

Around the Kua-chou Hu, in Shanghai, where there is a pleasure boat and a well-known dating place for young couples, about 8,000 factories are located here and about 5 million tons of both household and industrial waste-water are discharged. Therefore,

odor was detected for a total of 106 days in 1978, 148 days in 1979 and 150 days in 1982, in that area. Moreover, the level of presence is above standard for pollutants. Since pollution has become so serious, the City of Shanghai is counterploting a change of its source of drinking water, from Kua-chou Hu to another site upstream. However there is no water quality improvement plan other than the planned construction of a waste-water treatment facility for industrial and household waste-water as a countermeasure to water pollution.

Air pollution is also serious. The main source of energy in China is coal: it accounts for about 70% of total energy production (in standard coal). Around 80% of total energy is consumed by industry. The efficiency rate in the use of energy is about 28% and is quite low compared with Japan (around 50%) and Europe (around 42%) (Hishida and Wu, 1982). More than half of the factories which use coal have neither a dust collector nor sulphur emission control equipment. The smoke from the coal being used for heating is also a source of air pollution, especially in winter. Thus, air pollution is a very serious problem in both the metropolitan areas and inland industrial complex areas in China (Quen, 1980).

The amount of fallout of soot particles is about 10 million tons per year and the amount of sulphur oxide discharged into the environment is about 15 million tons per year in China (Wu, Z., 1981). By comparison, leaving aside the differences in the measurement methods, in Tokyo in 1973, the amount of fallout of soot particles was 11,827 tons per year and the amount of sulphur oxide discharged into the environment stood at 57,017 tons per year. China's levels are respectively 900 times and 250 times higher than Tokyo's for falling dust and discharged sulphur oxide. Although the total area of China is about 4,700 times as large as Tokyo, the area of both urban and industrial complexes where coal is used is very limited in China. The acreage under cultivation in China is 1.1 million km^2 and is only 12% of the total area. The acreage under cultivation per capita in China is 0.1 ha and is about twice as large as in Japan. In these circumstances, it is fair to say that pollution in China is not less serious than in Tokyo in 1973. In fact, the measurement data of air quality in some cities in China has supported this view, as shown in Table 1.

Typical Chinese pollution sources are the five types of small industrial enterprises called *Wuxiao Gongye* which were constructed by people's corporation in the rural area. These industries produce cement, iron and steel, chemical fertilizer, coal, and machinery. These factories were set up during the Great Leap Forward in the late 1950s and it is said that they were meant to use indigenous methods of ironworks (Kojima, 1975). Since those are very small factories and are not grouped together, there is no economy of scale in the treatment of waste-water or exhaust. Therefore, it is not easy to find an adequate solution for pollution control (Wu, F., 1981). The national meeting on pollution control policy in Wuxiao Gongye was held in Canton in the summer of 1983. In that meeting, it was concluded that the industries of Wuxiao Gongye are typical pollution sources in China and that it is very difficult to solve these types of pollution

Table 1. Current Status of Air Pollution in Some Cities in China

Pollutant	Average concentration in the air	
TSP (Total Suspended Particulates)	0.195–0.24 [mg/m³]	(a city in the northern part)
TSP	0.095–0.19 〃	(a city in the southern part)
TSP	80–160 〃	(Peking: in an hour)
TSP	150–200 〃	(Shanghai: 〃)
TSP	170–400 〃	(Wuhan: 〃)
TSP	190 〃	(Canton: 〃)
SO_2 (Sulphur Dioxide)	0.18–0.39 〃	
CO (Carbon Monoxide)	3–12 〃	
NO_x (Nitrogen Oxides)	0.04–0.22 〃	
O_3 (Ozone)	0.06–0.21 〃	
Pb (Lead)	0.10–0.60 〃	(ordinary city)
Pb	0.24–4.99 〃	(city with heavy traffic)
fallout of soot particles	30–70 [t/km²/month]	(heavily polluted city)

(data source) Author made this table from Tables 5 and 6 in Hishida and Wu (1982)

problems. Jing reports that, "although small-scale factories have given some services to farmers, they also cause problems. Firstly, environmental pollution. ———— an elderly farmer told the reporter, "in the past it was easy to get fish or shrimp near here, but now it has become very difficult to get them" " (Jing, 1983).

In the case of mercury pollution in Sung-hua Hu, which was reported by Japanese newspapers (see, for example, Asahi, 1980), Chinese researchers (Hao and Wang *et al.*, 1982) have revealed, of the extensive research, that the average content of mercury in fish was 0.74 mg/kg (minimum level 0.03 mg/kg—maximum level 3.24 mg/kg) and was equivalent to the average content of 0.73 mg/kg (minimum level 0.02 mg/kg—maximum level 2.40 mg/kg) in Minamata Bay in Japan in 1972. Moreover, it is reported that the mercury content in some water spheres exceeds the level of Minamata Bay (Wen, 1981). The source of mercury pollution in Sung-hua Hu an acetoaldehide factory in Chilin. A medical checkup was carried out on 400～500 people in downstream fishing villages. Although the fish were found to be polluted, fortunately all fish died, and nobody ate them. However, it seems that there is at least one patient who shows symptoms similar to the ones of the Minamata disease (Harada, 1982).

Other than these, environmental pollution by agricultural chemicals such as benzene hexachloride is also serious. The State Council ordered a stop in the production of benzene hexachloride and dichlorodiphenyltrichloroethane by March 1983, which is rather later than foreign countries (Tsukatani, 1983, Kunimatsu, 1984).

Since results of research on the effects of environmental pollution, including health damage, has not been published, the extent of the damage caused by pollution is not yet clear. However, the facts mentioned above lead us to conclude that unless China takes into consideration environmental protection as the main task in her economic

development policy, she could suffer fatal damage, comparable to what Japan experienced in the period of high economic growth.

IV Environmental Policy in Contemporary China

How and how quickly environmental pollution is overcome depends largely on what kind of countermeasure is taken when environmental pollution happens or is likely to happen. In this sense, it is meaningful to compare environmental policy in China with similar policies in some developing or capitalist countries.

Chinese environmental policy started from the Stockholm Conference on Human Environment in 1972, as did the same policy in developing countries. However, in the age of The Gang of Four, it is considered that although manufacturing and agriculture production decreased, environmental pollution became more serious (Yu, 1981). In the Constitution of the People's Republic of China, adopted in 1978, Subsection 3 of Section XI states that "the state protects environment and natural resources and it also prevents and eliminates pollution and other public nuisances." On the basis of what is set down constitutional, the Environment Protection Law (Trial Enforcement) (subsequently referred to as EPL) was promulgated in 1979. It is said that the EPL takes into account the best part of the various Environment Laws in the world. Since specific laws and regulations on environmental protection have been enacted after the promulgation of the EPL, it can be said that China has almost completed the legal system for the protection of environment.

The brief history of Chinese environmental policy is shown in Table 2, focusing on laws and regulations.

It is considered that the Chinese EPL is both socialistic and Chinese. The features of the EPL are summarized as follows (Song and Guo, 1982):

First, the socialistic features of the EPL:

(1) The policy on environmental protection of the Communist Party is called "The thirty-two Character Principles," which covers (1) overall planning, (2) rational allocation, (3) comprehensive utilization, (4) turning thing harmful into those beneficial, (5) reliance on people's initiative, (6) cooperation by all concerned, (7) protection of environment, (8) improving of people's welfare.[1] This is the essence of the EPL as well as the basic policy of the Communist Party on environmental protection.

(2) As long as China is a socialist state based on the common ownership of the means of production, environmental protection activities should be done under the principle of "good planning, overall distribution."

(3) "The Three Principles of Simultaneity" are enacted on the basis that prevention is important for environmental and resourcre protection and pollution control. The principles entail (1) designing of antipollution measures at the time when the con-

1) Each one of these eight items was spelled out in four Chinese characters, totaling 32. Thus, the guideline was called "The thirty-two Character Principles" (see Tsuru, 1985).

Table 2. Brief History of Chinese Environmental Policy (1972–1984)

Year	Item
1972	Stockholm Conference on Human Environment (China's head delegate, Mr. Tang Ke)
	National conference on the elimination of dust and smoke
1973	State Council sets up advisory group for environmental protection
	First nationwide conference on environmental protection (August, sponsored by the State Council)
	"Some Prescriptions on the Protection and the Improvement of Environment" (Trial Enforcement)
1974	"The Provisional Prescription on Water Pollution Control of Coastal Watersphere in the People's Republic of China"
	"The Report on the Control of Food Pollution"
	"Hygienic Standard for Manufacturing Firms in the People's Republic of China"
	"Trial Enforcement of Emission Standard of the Three Wastes in the People's Republic of China"
1978	The Central Committee of Communist Party recognized "the Gist of the Summary Report on the Activities of Environmental Protection." (This did clearly point out that environmental protection is one of the most crucial parts of national policies for economic development and for the "Four Modernization" and that pollution problems should be solved simultaneously with economic development.)
	The Constitution of the People's Republic of China is adopted in March 1978. The subsection 3 of Section XI of the Constitution states that "the state protects environment and natural resources, and it also prevents and eliminates pollution and other public nuisances." For the first time, the Constitution states clearly the obligation of environmental protection.
1979	Nationwide conference on environmental protection (March)
	Fifth National People's Congress adopted the Environment Protection Law, which states that "the duty of the Environment Protection Law of the People's Republic of China is to ascertain that the use of the natural environment is done rationally, to prevent and eliminate environmental pollution and ecological destruction, to create a clean and adequate living and working environment for the people, to protect human health and to promote economic development."
	"Forest Law in the People's Republic of China" (February)
	"Ordinance of Protection of Water Resources Propagation" (February)
	"Water Quality Standard for Irrigation" (December)
	"Water Quality Standard for Fishery" (December)
1980	"Noise Standard for Firms" (January)
	"The Notice on the Rigid Execution of "The Three Principles of Simultaneity" on major construction projects and in technological progress" (National Planning Committee, National Major Construction Committee, National Economic Committee and Environmental Protection Adivisory Group of the State Council)
1981	"The Provisional Law on Underground Water Resources Management in Peking" (January)

	"The Decision Relating to the Strengthening of Environment Protection and the Readjustment Period of the National Economy" (February) "Environment Protection and Management Law on Major Construction Project"
1982	"Air Ambient Quality Standard" (April)
	"Water Quality Standard for Seawater" (April)
	"Noise Regulatory Standard in Urban Area" (April)
	"Soil and Water Conservation Ordinance" (June)
	"The Provisional Law on Effluent Charge" (July)
1983	"The Marine Environment Protection Law in the People's Republic of China" (March)
1984	"Water Pollution Control Act in the People's Republic of China" (May)

struction of factories is planned; (2) construction of antipollution equipment at the time of construction of industrial plants, and (3) operating of antipollution equipment simultaneously with the operation of industrial plants.

(4) The principle of the combination of "carrots" for the accomplishment and "sticks" for failure is adopted. This means that administrative control of pollution should be combined with a popular mass control of pollution. Positive incentives, especially economic incentives such as tax reductions or tax elimination for a certain period on the products of a firm that sets up systems to reuse the "three wastes", are meant to encourage factories to take measures to conserve resources and protect the environment (Japan Comprehensive Institute and Institute of Industrial Economy, Chinese Academy of Social Science, 1982).

The Chinese features of the EPL are as follows:

(1) The promulgation and enforcement of the EPL is closely related to the task of the modernization of Chinese socialism. China faces the question of how to promote simultaneously both modernization and environmental protection. "The Three Principles of Simultaneity" are enacted on the basis not only that pollution control should be taken into consideration in the production process, but also that pollution control policy should take production into consideration.

(2) The EPL deals not only with pollution control but also with the conservation and rational use of natural resources and the ecological system and the creation of a better and healthy living and working environment. This means that China tries to protect the environment in a broader range and with a long-term perspective.

(3) China attaches importance especially to the protection of the natural environment. This is based on the recognition that the natural environment of China is getting worse, for example through water and soil erosion or the reduction of forest area and so on, although the protection of natural environment and resources is considered a base of development of the productive forces.

The enactment of the environmental laws mentioned above prompted a reorganization of the administrative structure of environmental protection. Since it is con-

sidered that both environmental protection and construction should be dealt with systematically, the EPAG (Environment Protection Advisory Group) and EPO (Environment Protection Office) which were established within the State Council in 1979, were reorganized and fused into URCEPD (Department of Urban and Rural Construction and Environment Protection). Furthermore, the Environment Protection Bureau was established in 1982 as part of the department (Asano, 1983). The structure of the Department is shown in Table 3.

The reorganization and arrangement of the administrative structure of environmental protection has also made steady progress at the provincial level and in self-governing bodies. The Chinese Association of Environmental Science (CAES) was organized in 1979. Within it, natural scientists are grouped in the Chinese Association of Environmental Technology and social scientists are organized in the Chinese Association of

Table 3. Organization of the Department of Urban and Rural Construction and Environmental Protection Bureau (URCEPB)

URCEPB
- National Survey Map Bureau
- Secretariat
- Office of Policy Analysis
- Personnel and Education Bureau
- Foreign Affairs Bureau
- Planning and Finance Bureau
- Labor and Wage Bureau
- Science and Technology Bureau
- Office of Earthquake Resistant Design Bureau
- Material Provision Bureau
- Building Management Bureau
- Environmental Protection Bureau
- Rural Construction Bureau
- Urban Park and Trees Bureau
- Urban Public Works Bureau
- Urban Housing Bureau
- Urban Planning Bureau

- Service Office Bureau
- Office of Care for Retired Leading Members
- Chinese Building Design and Information Corporation
- Chinese External Building Material Provision Corporation
- Chinese Housing Construction and Development Corporation
- Chinese Building Machinery Corporation
- Chinese Building Construction Corporation
- Chinese Environmental Monitoring Center
- Building Pavilion
- Chinese Society for Survey Map
- Chinese Association of Environmental Science
- Chinese Society for Architecture
- Chinese Building Industry Publisher
- Map Publisher
- Survey Map Publisher
- Chinese Institute of Urban and Rural Construction Economics
- Chinese Urban Institute of Public Works
- Chinese Urban Institute of Planning and Design
- Chinese Institute of Environmental Science
- Chinese Institute of Building Science

Environmental Management, Economics and Law (CAEMEL). These two were created 1980. CAEMEL, in its turn, was divided in three groups dealing respectively with environmental economics, environmental management and environmental law (Nomura, 1983). The first of these groups deal with topics such as how to measure the benefit of environmental improvement and what countermeasure could improve the environment at the least cost. The application of cost benefit analysis and input output analysis to environmental problems is under research (See for example, Si, 1982).

Thus, it is fair to say that the Chinese have learned from the experience of environmental policy in advanced industrialized, and polluted countries such as Japan, Western Europe and the United States, and that they have been looking for their own environmental policy. The following five institutions and principles are now realized in a concrete form and are more advanced even than in highly industrialized countries.

(1) The establishment of an institution for environmental assessment, and the enactment of "Environmnent Protection and Management Law on Major Construction Projects."

(2) The Three Principles of Simultaneity.

(3) The charge system and the enactment of "The Provisional Law on Effluent Charge."

(4) The recovery and reuse of the "three wastes", i.e., waste liquid, waste gas and waste slag.

(5) The principle of rational location ("rational location" is a type of location policy and includes measures to prevent the excessive growth of metropolitan areas.)

Thus, the question for Chinese environmental policy is whether these advanced institutions and principles can be effective under the current situation of planned economic development. If it is not effective, what then are the obstacles?

V Dilemmas between Development and Environment Protection

China faces, in fact, the old but still crucial problem, that is the contradiction between economic development and environmental conservation.

The most crucial task of Chinese environmental policy is how to mesh environment protection activity with economic planning. This task has become all the more crucial and urgent since the Twelfth National Congress of Delegates of the Chinese Communist Party because of the new goals to quadruple industrial and agricultural production by the end of this century. New directives on environmental protection have been issued since then. However, under the new economic situation, it might be necessary to revise the EPL enacted in 1979 (Nomura, 1983b).

The difficulty in harmonizing economic development and environmental protection is particularly clear in the three following aspects.

First, the remarkable development of small industries in rural area makes environmental pollution more serious, as was mentioned in Chapter 3. It is extremely difficult

to find a solution to this problem since the growth of these small-scale industries is crucial for the economic development of rural areas. The crucial point here is that there is no solution, at least under the present law. The EPL stipulates that economic planning should take into consideration the effects on the ecosystem, but that is not enough (Nomura, 1983b).

Second, it is extremely difficult to insure pollution control while encouraging technological improvement of individual firms. The Chinese environmental policy toward individual firms consists mainly in urging them to adopt pollution control equipment at the time when they improve their equipment. However, it costs too much to insure that this policy is applied to all individual firms which discharge pollutants into the environment at one moment. In fact, the existing policy applies only to firms that improve their technology. This implies that firms that delay technological improvements can with impunity continue to discharge pollutants into the environment. In this framework, pollution control can be achieved only if all firms upgrade their equipment. Furthermore, in spite of the campaign for promotion of both economic development and environment protection simultaneously, it is considered acceptable that pollution control equipment should not be installed, not only before technological upgrading but also before its comprehensive utilization is possible (Tang, 1981). This implies, in fact, that the effect of pollution control policy does not appear very rapidly.

Third, urban problems generated by economic development and rapid urbanization are very serious. In Shanghai, there are major problems in housing, transportation and environment protection. Since economic development generates urbanization as well as industrialization, environmental pollution in urban area becones serious. Although a fundamental reconstruction of the city is needed to solve pollution problem, it is not easy to adjust a tradeoff of expenditures between investments for living infrastructure and investments for the reconstruction of industrial technology.

Now, let us examine whether Chinese environmental policy is effective or not in facing these dilemmas, and whether its original philosophy can be really applied to concrete conditions or not. As mentioned in Chapter 4, it is necessary in this matter to pay attention to "The Three Principles of Simultaneity", to the "Environment Protection and Management Law on Major Construction Project" which establishes a concrete form of environmental assessment, and to "The Provisional Law on Effluent Charge" which establishes an economic disincentive eystem about the effluent of pollutants.

Article VI of the EPL (Trial Enforcement) states that the presentation of environmental assessment reports on the construction, reconstruction and expansion work by individual firms is required. The "Environment Protection and Management Law on Major Construction Project" enacted in 1981 is really a concrete application of this Article, specifying the kinds of "major construction projects" for which the assessment report is mandatory and items on which ex ante assessments are required.

There are two important features in this law (Asano, 1983). One is that it is not

required to obtain the local inhabitants' opinions in the process of environmental assessment. This is in contrast to Japan where one major reason why proposed environmental assessment law has never been passed in the Parliament is that there is disagreement on the role of public participation in the process of environmental assessment. To make the environmental assessment functions as an institution that adjusts tradeoffs between development and environment, it is necessary not only that the Environment Protection Division is authorized to examine and ratify the assessment report, but also that the process gets public consensus on the item, standards and results that should be included in the environmental assessment process. The second feature of this law is that the Environment Protection Division has the right to examine and ratify the project, and to undertake environmental assessments several times during the process of construction of major plants, from the stage of site selection and preliminary design to the completion of the building. The Division has the right to check major construction projects during construction, in the period of trial operation and even after the completion of construction (Asano, 1983) This is a crucial check to avoid making environmental assessment a "licence to develop." If environmental assessment is carried out several times during the progress of major construction, following proper items and standards of examination, the effectiveness of the environmental assessment through this law will improve greatly. But then, the question is how to manage the enormous cost necessary for undertaking such an assessment.

This law also stipulates that the three principles of simultaneity should be observed. However, the enforcement rate on these for the period from 1976 to 1979 is not very good. It is even getting worse, as shown in Table 4 (Liu, W., 1981). The cause of this deterioration is the large number of small projects that do not respect the three principles. Furthermore, even in the projects which observe the three principles of simultaneity, the operation rate of pollution control equipment is very low (Liu, W., 1981). The three principles of simultaneity is an excellent framework for pollution control instituted in China. However, to realize the principles in practice, there are several problems, such as the great increase in investment for individual firms (Tong and Huang, 1983). In this sense, the promulgation of the law alone cannot generate actual results without any complementary measure.

Table 4. The Enforcement Rate of "The Three Principles of Simultaneity" on Major or Middle Scale Project

Item / year	Number of projects	Number of projects enforcing "the three principles of simultaneity"	Enforcement rate (%)
1976	300	180	60
1977	308	175	57
1978	212	124	59
1979	390	163	42

"The Provisional Law on Effluent Charge" was put in force on July 1 of 1982. It is rather unique in the world in that it defines norms about the discharge of many pollutants on a nationwide scale. The cost for individual firms of not meeting the standards is given in Table 5. This system is to collect a charge from individual firms according to the amount of pollutants they discharge into the environment. The charge varies according to the kind of pollutant. This system's original purpose was to induce individual firms to reduce the amount of pollutants discharged at pollution source through economic disincentive. However, in fact, it does not seem to function very well.

First, since the amount of pollutant discharged, and the charge are calculated through density control, the firms are allowed to dilute pollutants into large amounts of water to reduce the concentration level of pollutants below the standard. Some cities, for example Shen Yang, are considering the establishment of new systems of air quality control based on the total amount of pollutants discharged. However there are not

Table 5. Norms for Collection of Charge

1. Waste Gas

Pollutants		Amount of emission exceeding emission standard (yuan/kg)	Emission concentration exceeding emission standard (yuan/m 3)
SO_2, CO_2, HS, fluoride, Cl, HCl, CO, NO_x		0.04	
H_2SO_4 mist, lead, mercury, beryllium compound			0.03–0.10
Dust	glass wool, slag dust, asbestos, aluminum compound	0.10	
	power plan dust, cement dust	0.02	
	steel dust, other dust	0.04	

Dust from Industrial or Heating Boilers*

Multiple of concentration exceeding standard	Ringerman concentration	Charge per fuel ton (yuan/ton)
≦4	class 2	3.00
4.1–6	class 3	4.00
6.1–9	class 4	5.00
9≦	class 5	6.00

*Steam locomotives and non-point sources are excluded from system for the time being. Since the charge on waste gas from thermal power plants and industrial or heating boilers is based on the norms for charge on dust for the time being, the charge for other pollutants are not collected.

2. Waste Liquid

(unit: yuan/waste-water lton)

Pollutants	Multiple of concentration exceeding standard				
	≦5	5–10	10–20	20–50	50≦
Mercury, cadmium, lead and lead inorganic compound, sexivalent chromium compound	0.15–0.20	0.20–0.30	0.30–0.45	0.45–0.90	0.90–2.00
Sulphide, oil, volatile phenol, aniline, fluorine and fluoride, copper, zinc, nitrobenzene, organic phosphorus, cyanide	0.10–0.15	0.15–0.20	0.20–0.35	0.35–0.60	0.60–1.00
SS (Suspended Solids), COD, BOD, pH*	0.04–0.06	0.06–0.10	0.10–0.15	0.15–0.20	0.20–0.30
Virus			0.08		

*Charge on pH is regulated on the basis that if pH value exceeds 6–9, a charge according to twice as ≦5 (0.04–0.06) must be paid for each additional 1 pH value.

3. Waste Slag

Pollutants	Dumped into water (yuan/ton)	Accumulation without wastewater or dust control (yuan/ton, month)	Accumulation without facility (yuan/ton, month)
Mercury, cadmium, arsenic, lead, cyanide, yellow phosphor, sexivalent chromium compound, other waste slag componding solible powerful or poisonous material	36.00	2.00	
Dust of thermal power plant*	1.20		0.10
Other industrial waste	5.00		0.30

*This is limited to the facilities operated before the promulgation of the EPL. Other facilities are regulated by the standards for "other industrial waste".
Translated from "The Provisional Law on Effluent Charge" published by Falu publisher (1982)

in place yet. Furthermore, if individual firms discharge more than one pollutant from the same overflow or stack, the amount of the charge is based only on the most poisonous material. This is not adequate as a measure to reduce the total amount of pollutants.

Second, there are some interesting facts on the attitude of individual firms to the charge system. Some individual firms do not want to pay the charge and some others report pollutant amounts that are not the actual amounts. This is caused not only by the ideological perception of the manager of individual firms on pollution control, but also by the inadequacy of the system for collection of the charges. A charge differs from a fine in the sense that charge are meant to induce individual firms to save resources and to reduce the amount of pollutants discharged. Thus, it is considered that the level of the charge should be set up slightly higher than the marginal pollution control cost of individual firms (Yang, 1981, Zhou, 1981). However, since it is not easy to

measure the pollution control cost of individual firms accurately before the operation, the adequate level of charge cannot be reached without a trial and error process. In fact, right now, it is not clear how the norms for collection of charge in pollutants in China is set up.

The third question is how to use the collected charge. In Shanghai, 45% of the collected amount is used to cover the administrative costs of pollution control in the district or prefecture and also to cover the cost of information campaign and education on environment protection and pollution control. The remaining 55% is used to subsidize individual firms for pollution control investments. In Canton, 20% of the collected amount is used to cover, (1) the purchase cost of equipment for the Canton Environmental Monitoring Center and Station, (2) the administrative cost of collecting charges and (3) the cost for research on pollution control technology. The rest is used to subsidize individual firms for pollution control investment.

In Canton, this charge system has been carried out since July 1 of 1982. As a result, in one year after that date, 8 million yuan was collected as a charge from about 500 factories all of about 1,300 factories which are potential pollution sources. It is surprising that more than 38% of factories were discharging pollutants into the environment in excess of the norms. Furthermore, it is more surprising that some individual firms are willing to pay charge.

This last fact can be explained by the firms' hope to obtain subsidies for pollution control equipment much higher than the charge to be paid. This strategy has been adopted by many individual firms that do not have enough money to install pollution control equipment. Moreover, it is sometimes pointed out that the facilities constructed by the subsidies are not always pollution control equipment but often are of a more general purpose. How to distinguish pollution control equipment from major construction facility is under discussion in China. It is under consideration in the Department of Metallurgical Industry to establish a new law entitled "The Provisional Law on the Definition of the Cost of Environmental Protection Measure." However, since definitions are ambiguous, it is not clear if facilities such as chimneys fall under pollution control equipment or under major construction facility. Right now such facilities are often subsidized as pollution control equipment although they are of a more general nature.

Most firms are owned by the state. Although, in theory, in such a system, a state policy should be more easily implemented because of a more direct state control of individual firms, in fact, up to the present, this control has brought up the opposite effect: the state has tried to ease its financial burden by encouraging individual firms to limit their pollution control investment. Furthermore, an even more crucial factor is to be found in the fact that the charge system, instead of really encouraging investments for pollution control, has functioned as a device leading to savings in pollution control investments. It works as follows.

Roughly speaking conventional economic theory tells us that unless individual

firms invest in pollution control equipment under the charge system, the price of commodity produced by the firms would increase and the product would then become less competitive in the market. Therefore, it seems logical to assume that the firms must be willing to invest in pollution control under the charge system. However, economic theory also tells us that there are some assumptions, such as perfect competition and full information on the condition of the exchange of commodity or service in the market economy, that are essential to this mechanism. Unless the economy satisfies these assumptions, the charge system can be transformed into a "licence to pollute" in the sense that individual firms can discharge pollutants into the environment once they pay the charge. As everybody knows, China is not a market economy but a planned economy, even though recently she has started to introduce some aspects of a market economy system. The major problem is that the demand of commodities is generally much higher than the supply. In this sense, the demand of most of commodities is inelastic to their price. Therefore, even if the price of commodities produced by individual firms would increase because of the charge, the demand for these commodities would never decrease. The charge system in China cannot be effective as a policy of encouraging individual firms' environmental protection activity unless some supplementary measure is carried out to modify the planned economy and allow a more flexible price system. Moreover, some authors have pointed out that hazardous materials should not be controlled by economic disincentive but by a direct regulatory system (Anderson *et al.*, 1977).

VI Conclusion

China is a developing country as well as a socialist country. Dilemmas arising between the necessities of development and environment protection became apparent as a confrontation between developing countries and developed countries in the Stockholm Conference on the Human Environment in 1972. Developed countries insisted that we should strengthen pollution control to protect "the only one earth" we have. However, critics from developing countries have pointed out that such an insistence would result in the suppression of most development plans in developing countries and in the maintenance, even the increase, of economic disparities between North and South (Tsuru, 1972).

There are in the world many examples of development plans that increased productivity in the short term by ignoring environment protection but gave no benefit in the long run. In this context, the rest of the world is extremely interested in the experiments now going on in China. People are wondering wheter China will succeed or not in devising an ecologically sound plan for development. The major source of problem for China in this matter is that the country must promote at the same time both environment protection and economic development, but that attaining the first goal is all the more difficult because the state has implemented a development plan

geared to high economic growth whose target is the four-fold increase in industrial and agricultural production by the beginning of the 21st Century.

Chinese environmental policy as an institution has integrated a growing worldwide experience in the matter to the Chinese original system. However, the goals and policies of environment protection are not necesarily adaptable to the system as it is and to the development stage of the Chinese economy. To repeat, this means that, unless some supplementary measure is carried out, the policy could result in the acceptance or even the encouragement of environmental pollution. As a result of this danger, as economic development proceeds in China, the environmental policy has to be reexamined even though the philosophy of ecologically-sound development plan remains.

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