1.5 Industrial Waste Management

1.5.1 Industrial Waste Management based on Waste Management Law

a. Era of the Cleansing Law

Superseding the Wastes Cleansing Law of 1900, the Cleansing Law was enacted in 1954 and provided the framework for waste management up to 1970. This law prescribed the responsibility of local governments concerning the collection and treatment of municipal wastes. However, it was unclear about the responsibility for management of wastes discharged from industrial activities. Industrial wastes were still considered to be within the bounds of municipal waste cleansing activities by municipal governments. Under this law, mayors of municipalities were empowered to give orders to industrial waste discharging parties concerning collection and transportation methods, pretreatment methods for special wastes, and disposition at designated sites in order to manage industrial waste under the waste cleansing plans prepared under the responsibility of mayors[60]. It was possible for discharging parties to consign treatment/disposal to private operators, and no special license was required in order to construct such facilities and conduct treatment/disposal.

b. Characteristics of the Waste Management Law[61]

b.1 Structure of Industrial Waste Management

Up to the 1950s, because local governments undertook the landfill disposal of industrial wastes, industrial waste problems were hardly recognized as a major environmental pollution issue at all. However, in the 1960s, generation of industrial wastes increased enormously in parallel with high economic growth, and the management of industrial wastes almost overwhelmed the waste management capacity of local governments. Then, water contamination due to the flow of industrial wastes into public water bodies became a social problem. Moreover, due to the difficulty in securing landfill sites, industrial waste became an unmanageable problem for local governments.

In response to these conditions, the Waste Management and Public Cleansing Law (hereinafter referred to as the Waste Management Law) was enacted to coincide with the Water Pollution Control Law and the Air Pollution Control Law. This legislation defined industrial wastes and stipulated the clear responsibility of discharging parties to treat/dispose their wastes.

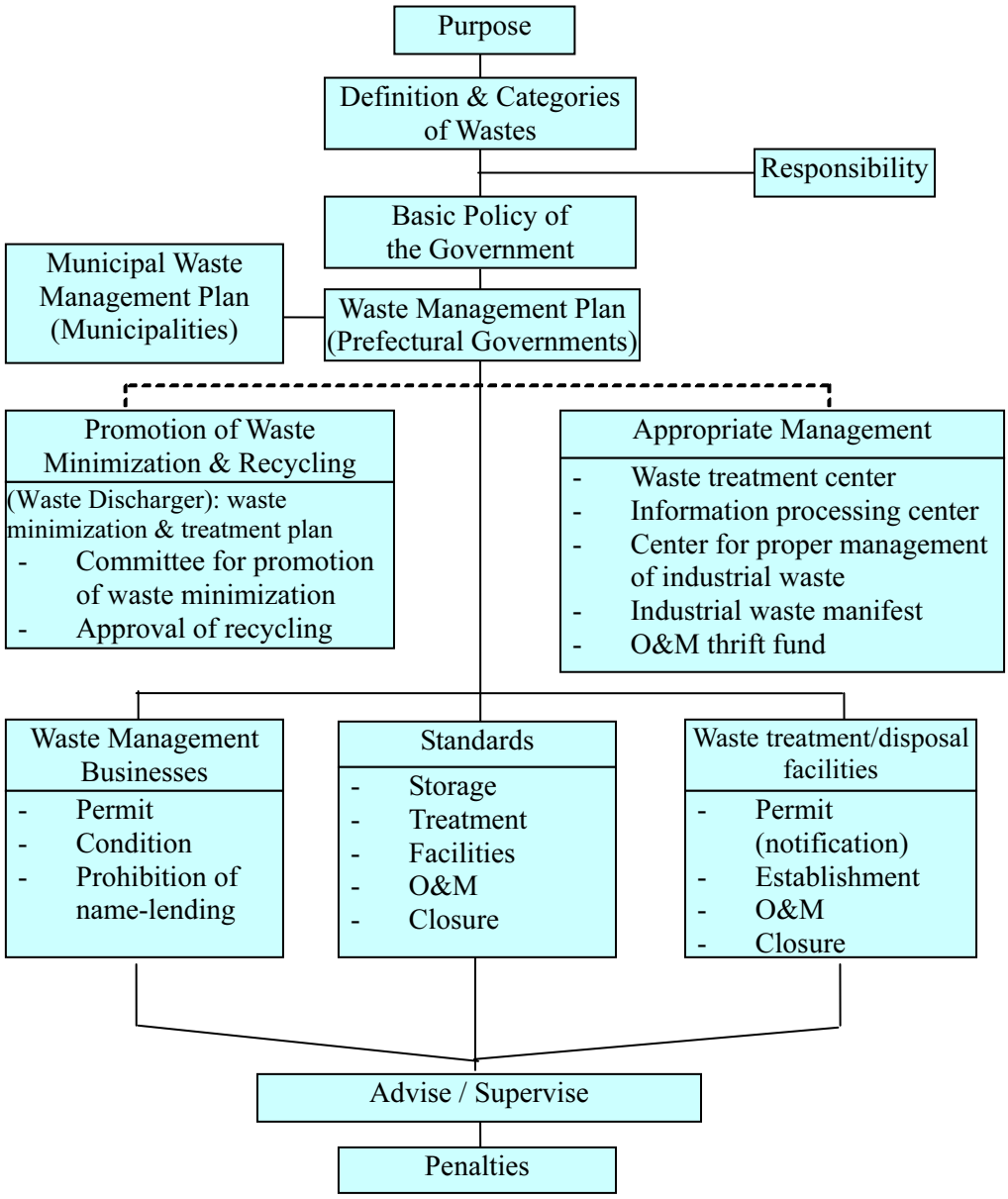
The framework for industrial waste management created by the 1970 Waste Management Law (and its subsequent amendment in 1976) was summarized as follows:

1. Definition of industrial wastes: “Out of wastes generated in line with business activities, industrial wastes shall be cinders, sludge, waste oil, waste acid, waste alkali, waste plastics and other wastes prescribed by cabinet order.”
2. Business operators must treat/dispose their own industrial wastes.
3. Discharging parties shall carry out waste treatment/disposal in conformance with technical standards for transportation/storage and treatment/disposal.
4. In cases of consigned treatment/disposal, consignment standards shall be conformed to.
5. Licensing of collection/transportation operators
6. Permission of treatment/disposal operators
7. Notification of treatment/disposal facilities

[60] Japan Center for Cities, *Keizai Shakai no Henbo to Seiso Jigyo*, 1969

[61] This section covers the Waste Management Law from 1970 to 1992. The law after the revision of 1992 is called the Revised Waste Management Law.

Figure 1.5.1 shows the overall outline of the Waste Management Law including revisions in 1991, 1997, 2000 and 2003.



Source: KOBAYASHI Yasuhiko, *Haikibutsu Seisaku Gairon*, Japan Environmental Sanitation Center, 2003

Figure 1.5.1 Summary of Waste Management Law

Figure 1.5.2 indicates the regulatory framework concerning treatment of industrial wastes. This mechanism has basically remained unchanged, except for the adoption of a licensing system for industrial waste treatment/disposal facilities following the large-scale revision in 1991.

In cases where discharging parties carry out treatment/disposal of industrial wastes, it is necessary to treat/dispose at "permitted facilities" according to "treatment/disposal standards." When treatment/disposal was consigned to other parties, it is necessary to consign to "permitted transportation operator and waste treatment/disposal operators" according to "consignment standards" and to carry out treatment/disposal at "permitted facilities" according to "treatment/disposal standards." Needless to say, carrying out treatment/disposal at non-licensed facilities is prohibited as illegal dumping.

Management that does not comply with the above requirements is viewed as improper. In such cases, prefectural governors issued improvement orders (revisions of disposal methods, and the like) or disposition orders (for example, in cases where problems arose or were likely to arise in terms of living environment protection, orders to take steps to remove or prevent such problems), and if these orders are violated, imprisonment or fines were imposed.

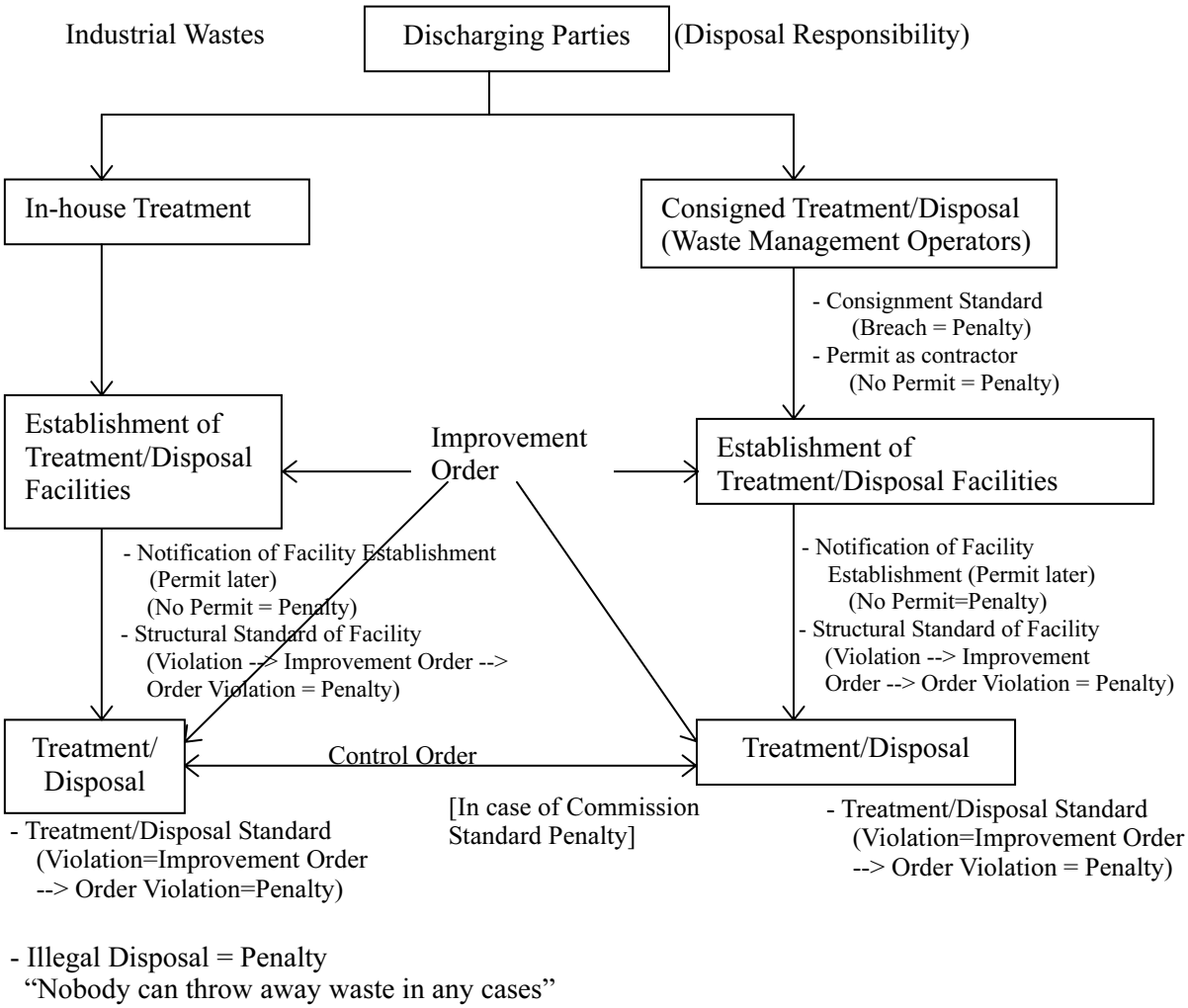


Figure 1.5.2 Framework of the Waste Management Law

b.2 Definition of Industrial Wastes

Wastes according to the Waste Management Law are defined as, "garbage, bulky waste, cinders, sludge, night soil, waste oil, waste acid, waste alkali, dead animal carcasses and other waste or unwanted objects in solid or liquid form (not including radioactive substances and objects contaminated by radiation)." Since valuable objects were not regarded as wastes, wastes were collected at low rates for recycling. However, since objects were non-recyclable in many cases, this became a cause of illegal dumping.

Concerning industrial wastes, those wastes generated in the course of business activities are prescribed as follows according to the type of substance and emission source: cinders, sludge, waste oil, waste acid, waste alkali, waste plastics, waste paper (paper pulp industry, newspaper industry, publishing industry, and the like), waste wood (timber industry, wood product manufacturing industry, pulp manufacturing industry, and the like), waste fibers (textile industry), animal and plant residues (foodstuffs, medical supplies, perfume industry),

waste rubber, waste metal, waste glass, waste ceramics, slag, rubble arising from removal of work pieces, animal night soil (live stocking), animal carcasses (live stocking), dust collected by facilities designated under the Air Pollution Control Law, and the treated residues of all the above industrial wastes.

An important feature of the definition of industrial wastes is that industrial wastes are first prescribed by the law and cabinet order, and remaining items are regarded as general wastes. This definition of industrial wastes is given in order to clarify the scope of treatment responsibility of disposing parties. However, such a method of establishing the definition of industrial wastes first and treating all other items as general wastes is rarely adopted in other countries.

At first, there was no provision concerning hazardous wastes. However, waste oil, waste acid and waste alkali, which are classified as hazardous wastes in other countries, were also included under the definition of industrial wastes. Although there was no classification of hazardous wastes in Japan, this was not wholly inappropriate because separate treatment standards were established for industrial wastes including hazardous substances. Still, the classification of hazardous wastes was prescribed in revision of the law in 1991.

b.3 Landfill Disposal Regulations

Landfill standards for industrial wastes were set as follows in 1977[62].

Table 1.5.1 Standards for Landfilling of Industrial Waste

Landfill type	Structure of Landfill Site	Types of Waste
Not allowed in landfill		Waste acid, waste alkali, waste oil
Controlled Landfill	Enclosure, retaining walls and dams, water- leakage preventive measures such as liner, leachate collecting facilities, gas control facility, leachate treatment system	Waste stream except mentioned below
Least Controlled Landfill	Enclosure, retaining walls and dams	Plastics, rubble, waste rubber waste, metal scraps, waste glass
Strictly Controlled Landfill	Enclosure, rainwater inflow preventive measures, totally enclosed by concrete	Industrial wastes including hazardous substances.

The difference between controlled and least controlled landfills is wholly determined according to the potential for water related pollution caused by leachate. For example, it is possible that rubble, plastics, waste rubber and waste ceramics, and the like can be disposed in least controlled landfills as wastes with no potential for water pollution.

In reality, problems arose because industrial wastes that should have been taken to controlled or strictly controlled landfills were taken to least controlled landfills instead where costs were cheaper.

[62] When Waste Management Law was enacted in 1970, there were only two types of landfills – strictly control type and controlled landfill type. In 1977 a ministerial ordinance establishing technical standards for final disposal site which was issued for both general and industrial waste. At the same time, the Waste Management Law was revised, and landfill types were further divided -- controlled landfill type, least controlled landfill type, and strictly-controlled landfill type.

b.4 Characteristics of Industrial Waste Management

The main feature of industrial waste management under the Waste Management Law was that dischargers of industrial waste were held responsible for treatment/disposal based on the assumption that they would implement proper treatment/disposal. However, this does not mean that all dischargers treat/dispose of waste in the proper way. For this reason, it is necessary for local governments to monitor discharging parties and make sure they conduct proper treatment/disposal. Nonetheless, it is nearly impossible for them to have complete grasp control of each type of industrial waste from every single discharging party.

The biggest problem impeding proper treatment/disposal was that the Waste Management Law permitted industrial waste dischargers to consign waste management as a whole to collection/transportation operators in batches, and also allowed re-consignment of the treated waste to other operators for the final disposal[63].

Other problems with the Waste Management Law were the licensing of collection/transportation operators and treatment/disposal operators and the system for notifying industrial waste disposal facilities. Collection/transportation licenses were open to more or less anybody providing they satisfied certain qualification requirements. Concerning the waste management business, even if an operator is penalized under the law, it could obtain permission to start the business again in 2 years so long as it satisfied the technical standards. The looseness of this standard made it very easy to enter the waste management business, and organized crime groups took advantage of this little barrier to entry[64].

Meanwhile, concerning waste disposal facilities, simply submitting notification was deemed sufficient because the licensing system was adopted for the treatment/disposal operators. Because regulations were only applied to landfills over a certain size, least controlled landfills of less than 3,000 m^3 and controlled landfills of less than 1,000 m^3 (so-called mini landfills) were not regulated[65].

Other problems at the start of the Waste Management Law were that open burning and other treatment methods by unlicensed operators went unnoticed and that flows of industrial wastes after undergoing reloading and passing through storage were unclear.

c. Strengthening of the Waste Management Law

As the quantity of waste increased and also underwent qualitative changes, it became difficult to secure disposal sites and other treatment/disposal facilities and various problems such as the improper management (illegal dumping, and the like) of waste started to appear. In response to these issues, the law underwent revisions in 1991, 1997, 2000 and 2003 in order to drastically revise waste management procedures. Details of the amendments are described below.

Whereas inappropriate treatment in the past was largely viewed as a problem on the side of waste management operators, the revised law placed more emphasis on the waste management stance of consignors and aimed to strengthen the treatment/disposal responsibility of discharging parties. Whereas in the past dischargers were not affected by measures taken in cases of inappropriate treatment/disposal by treatment/disposal operators, following the revision to the law, discharging parties became the subject of disposition orders in cases of inappropriate waste management concerning manifests[66].

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63 Comment by Mr. KOBAYASHI Yasuhiko, Chairman of the Japan Environmental Sanitation Center

64 KITAMURA Yoshinobu, *Sangyo Haikibutsu heno Hoseisaku Taio*, Daiichi Hoki Shuppan, 1998

65 Established by the government ordinance in 1977. Provision of a condition for landfill space was removed in the revision of 1997

66 The first disposition order was issued for the illegal waste dumping site in Aomori Prefecture in 2003, which shocked many waste dischargers.

The central government explained that a sound waste management market would be established by this amendment, with a market mechanism which encouraged superior disposers, and low quality disposers would be "dumped into the dustbin"[67].

The Law concerning Regulation of Organized Crime and Crime Profits, and the like (the Organized Crime Control Law) was enacted in 1999, which was linked to the revision of the Waste Management Law in 2000, so that lending of street names, unlicensed establishment of waste treatment/disposal facilities and illegal dumping were also targeted for control. The revised law also strengthened crackdown on violators by requiring the preparation of a plan to promote measures against environmental crime[68].

c.1 Responsibility of Waste Dischargers

In order to strengthen existing policies, the following regulations were added to the criteria for the case of consigning waste management by dischargers.

- Waste dischargers should entrust waste management to operators who have appropriate permission for the collection/transport or treatment/disposal of each waste item.
- Dischargers should make contracts for collection/transport and treatment/disposal separately when they outsource both collection/transport and treatment/disposal.
- Dischargers must develop and check manifests to ensure appropriate waste management.
- Items to be described in the contract document for consigning waste management are listed.

Also, dischargers were added to the target of order for restoring status quo in case of improper management.

c.2 Classification of Hazardous Wastes

The new classification of specified controlled industrial wastes was established as hazardous wastes, and standards were established concerning their treatment, collection, transportation and storage.

c.3 Introduction of the Manifest System

Waste dischargers became obliged to use the manifest (industrial waste management slip) system when undertaking the consigned transport, treatment or disposal of industrial wastes. They also became required to take measures in order to ensure appropriate collection/transport and treatment/disposal and confirm actual final disposal.

c.4 Strengthening of Regulations on Industrial Waste Management

The industrial waste management licensing system was revised to a renewal system and additional requirements concerning the annulment of licenses were added so that it became possible to revoke licenses in cases where operators' capacity did not meet standards or when there were violations. Furthermore, an additional requirement was that operators could not be linked to organized crime group members. Moreover, standards for consigning waste were strengthened with the adoption of compulsory written contracts.

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[67] From an interview with YOSHIDA Hideto, a leader of the Waste Management Team of the Water Environment Division under the Life Hygiene Department of the Ministry of Health and Welfare, "Kankyo News", June 14 2000 publication

[68] KITAMURA Yoshinobu, "Haikibutsu Shoriho 2000 nen Kaiseiho no Totatsuten", *Jurist*, No.1184, 2000

c.5 Strengthening of Regulations on Industrial Waste Treatment/Disposal Facilities

Installation of industrial waste treatment/disposal facilities was revised from a notification system to a licensing system. Applicants for facilities installation became required to conduct an environmental impact assessment, and local governments publicly announce that the application form was filed and make the application forms available for public inspection. As a requirement for licensing, appropriate consideration of environmental protection in surrounding areas was added. Also, conditions concerning the annulment of licenses in cases of disposal violations were added. Moreover, confirmation procedures for the abolition of final disposal sites were introduced.

In the cabinet order amendment of 1997, conditions regarding the minimum area of controlled disposal sites and least controlled disposal sites were removed.

c.6 Restoration of Status Quo in Cases of Inappropriate Disposal

Disposition orders concerning the restoration of status quo in cases of inappropriate treatment existed before the revision. However, their application was limited to parties conducting illegal dumping. Following revision of the law, nevertheless, application of restoration order is expanded to the following parties:

- Waste discharger that failed to comply with consignment standard
- Waste discharger that did not issue manifest or provide manifest with false information
- Parties (including dischargers) that failed to take appropriate measures in cases where they failed to send copies of manifests

A system is established whereby the Minister of the Environment set up a fund that was composed of contributions from industry with designated corporations, and payments were made to prefectures that worked to restore the status quo of disposal sites.

c.7 Treatment/Disposal Methods

Treatment/disposal standards for were strengthened by establishing standards with respect to collection, transport, treatment and recycling.

With the revision of the law, open burning became prohibited except when incinerating waste according to waste treatment standards (Article 16-2). In other words, open burning is prohibited, although this does not extend to bonfire in daily life. Strengthening of this regulation mainly targeted treatment operators. Cases of open burning had been increasing due to the difficulty in constructing new treatment facilities, and this became a major concern in terms of nuisance to neighboring residents and inappropriate treatment/disposal. Up to this time, the authorities could not issue orders to unlicensed operators and other parties outside the scope of treatment/disposal standards, and even if improvement orders could be issued to prevent open burning, it was very difficult to crack down on violators repeating the same violation in different places. This revision not only prohibits open burning but also makes this activity liable to direct punishment.

c.8 Strengthening of Penalties

Table 1.5.2 shows the main strengthening of penalties. It can be seen that penalties were made much more stringent than before revision of the law.

Table 1.5.2 Strengthened Penalties by the Revision of Waste Management Law

	After the Revision	Before the Revision
Unauthorized Operation Violation to operation suspension and/or restoration orders	- Imprisonment of 5 yrs or less - Fine of 10 million JPY or less with or without imprisonment	- Imprisonment of 3 yrs or less - Fine of 3 million JPY or less with or without imprisonment
Illegal dumping of Waste including attempt	- Imprisonment of 5 yrs or less - Fine of 10 million JPY or less with or without imprisonment	
Transfer or take over of facilities without permit	- Imprisonment of 3 yrs or less - Fine of 3 million JPY or less with or without imprisonment	
Violation of entrust consignment Violation of improvement order	- Imprisonment of 3 yrs or less - Fine of 3 million JPY or less	- Imprisonment of 1 yr or less - Fine of 1 million JPY or less
Violation of ban on open burning of waste	- Imprisonment of 3 yrs or less - Fine of 3 million JPY or less with or without imprisonment	
Exportation without verification	- Imprisonment of 3 yrs or less - Fine of 3 million JPY or less with or without imprisonment	
Violation of mandate relating to industrial waste manifest	- Fine of 500,000 JPY or less	

Note: For illegal dumping of waste generated through business activities, such business entity will be fined up to 100 million JPY.

Whereas inappropriate treatment in the past was largely viewed as a problem on the side of treatment/disposal operators, the revised law placed more emphasis on the waste management stance of consignors and aimed to strengthen the waste management responsibility of discharging parties. Whereas in the past dischargers were not affected by measures taken in cases of inappropriate treatment by treatment operators, following the revision to the law, discharging parties became the subject of disposition orders in cases of inappropriate treatment concerning manifests[66].

The government claimed that this revision to the law would lead to the establishment of a sound waste management market by enabling the market mechanism to develop treatment/disposal operators with good practices and weed out the malicious operators[69].

c.9 Public Involvement

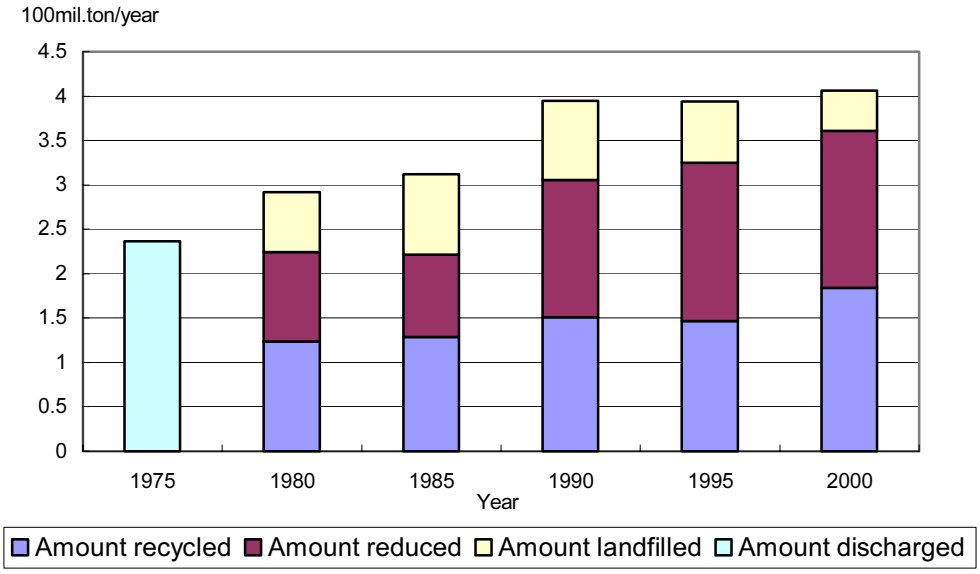
The revision of the law included a new provision that enables the central and local governments establish a corporation, to which private companies can invest, and designate it as waste management center empowered to treat/dispose industrial wastes and also construct, improve, maintain and manage facilities for performing such treatment/disposal.

[69] From an interview with YOSHIDA Hideto, a leader of waste management team of the water environment division under the life hygiene department of the Ministry of Welfare, “Kankyo News”, June 14 2000 publication

1.5.2 Industrial Waste Management System

a. Actual State of Industrial Waste Treatment

As may be gathered from Figure 1.5.3, which shows the estimated amount of industrial waste discharged and actual amount of waste recycled and disposed[70], the discharged amount of waste increased from 1975 to 1990, after which it remained almost the same throughout the 1990s. The final disposal amount has increased from 1980 to the beginning of the 1990s, but decreased since then. The amount of waste recycled also increased from 1980 to 1990.



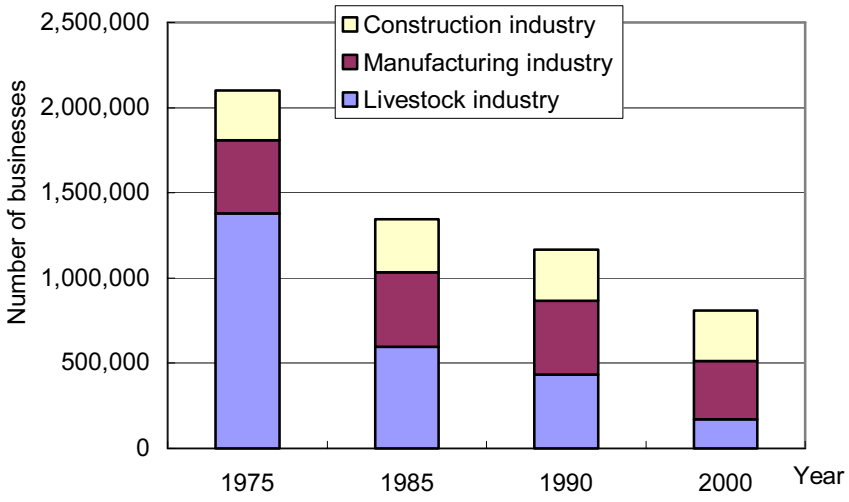
Note: There is only the amount of waste discharged for 1975. For other years, waste discharged is total of amount recycled, reduced, and landfilled.
Source: Ministry of Health and Welfare, *White Paper on Health and Welfare*, and Ministry of the Environment, *White Paper on Sound Material-Cycle Society*

Figure 1.5.3 Trend in Amount of Industrial Waste Discharged or Disposed (1975-2000)

Industrial waste dischargers consist of operators in the livestock industry, manufacturing industry, construction industry, mining industry, public utility industries and service industries, and the like, of which, the three main sectors of dischargers are livestock, manufacturing and construction. As shown in Figure 1.5.4, whereas the number of business establishments was 2,000,000 in 1975, it had fallen to 800,000 by 2000 largely due to reduction in the number of livestock farmers.

The number of manifest slips issued in 1993 was 14,178,000, of which 2,081,000 sets were for hazardous industrial wastes (special control industrial wastes). Approximately 50% of these hazardous industrial waste manifest slips, excluding infectious wastes, were purchased by discharging parties, whereas almost all the purchasers of manifest slips for industrial wastes, other than hazardous industrial wastes, were treatment/disposal operators[71].

[70] Industrial wastes include animal waste and sewage sludge. The figure indicates estimation based upon prefectural actual condition survey.
[71] SUZUKI Yukichi, "Haishutsu Kigyo to Shorigyo no Jittai – Sangyo Haikibutu Tekisei Shori wo Mezasite", *Jurist*, No.1055, 1994, p.65



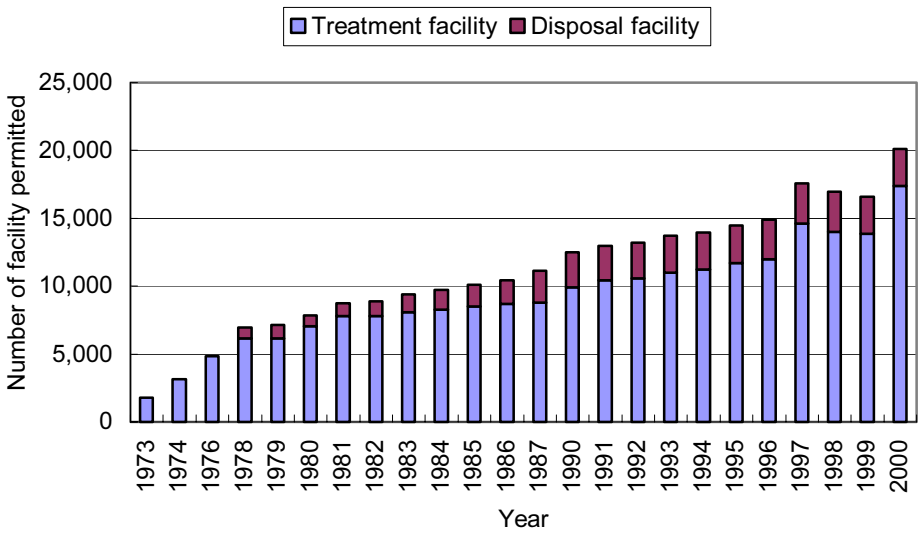
Source: Ministry of Internal Affairs and Communications, *The 53rd Japan Statistical Yearbook 2004*

Figure 1.5.4 Number of Business Entities in Livestock, Construction, and Manufacturing Industries (1975-2000)

b. Construction of Treatment/Disposal Facilities by Business Operators and Treatment/Disposal Operators

b.1 Industrial Waste Treatment/Disposal Facilities

The industrial wastes discharged in 1990 amounted to approximately 4 billion tons, of which 900 million tons were landfilled. Treatment/disposal facilities are needed in order to appropriately treat/dispose such massive amount of industrial wastes. Notifications (licenses from 1992 onwards) of industrial waste treatment facilities were extremely few in the start of the 1970s, but the number picked up from 1980, when it reached 7,157, and continued rising every year until it reached 20,098 in 2000.



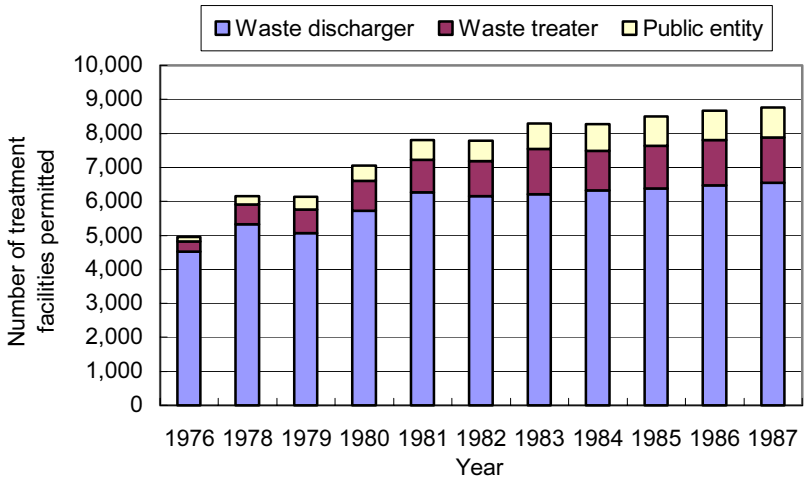
Source: Ministry of Health and Welfare (for the data in the fiscal year 1998 and thereafter, Ministry of the Environment), "Status of Discharge and Treatment/Disposal of Industrial Wastes", each fiscal year

Figure 1.5.5 Number of Permits Issued for Industrial Waste Treatment/Disposal Facilities (1973-2000)

Many treatment facilities were sludge dehydration plants, but the number of incineration facilities started increasing from the late 1990s and reached 5,304 by 2000.

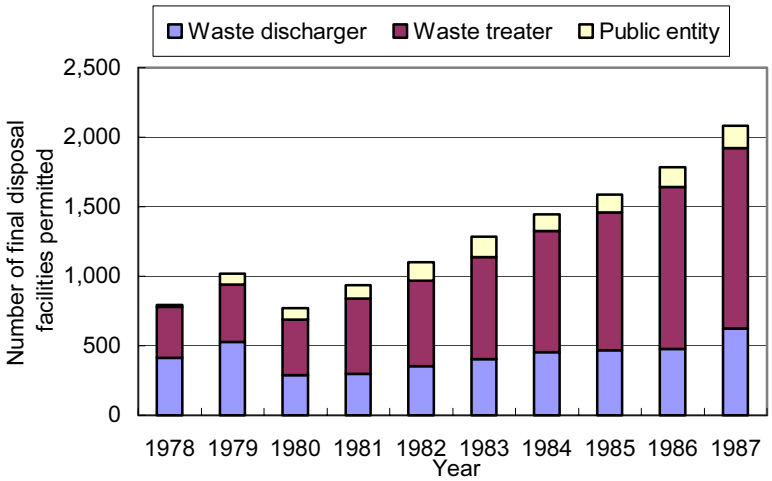
Most of industrial waste treatment facilities were operated by discharging parties themselves as shown in Figure 1.5.6. Data only exist for the period from the late 1970s to the 1980s; nonetheless, it is supposed that this trend basically remained unchanged. The increase in the number of facilities here was due to increased installation by treatment operators.

The reverse situation was true with respect to landfills. As indicated in Figure 1.5.7, only a few landfills were owned and operated by discharging parties themselves, whereas most sites were operated by waste management operators. The increase in the number of disposal site facilities was wholly due to installation by waste management operators. Although no data exist for 1990 onwards, it is thought the same trend continued.



Source: Ministry of Health and Welfare, "Status of Discharge and Treatment/Disposal of Industrial Wastes", each fiscal year

Figure 1.5.6 Number of Permits Issued for Treatment Facilities by Entity Type (1976-1987)



Source: Ministry of Health and Welfare, "Status of Discharge and Treatment/Disposal of Industrial Wastes", each fiscal year

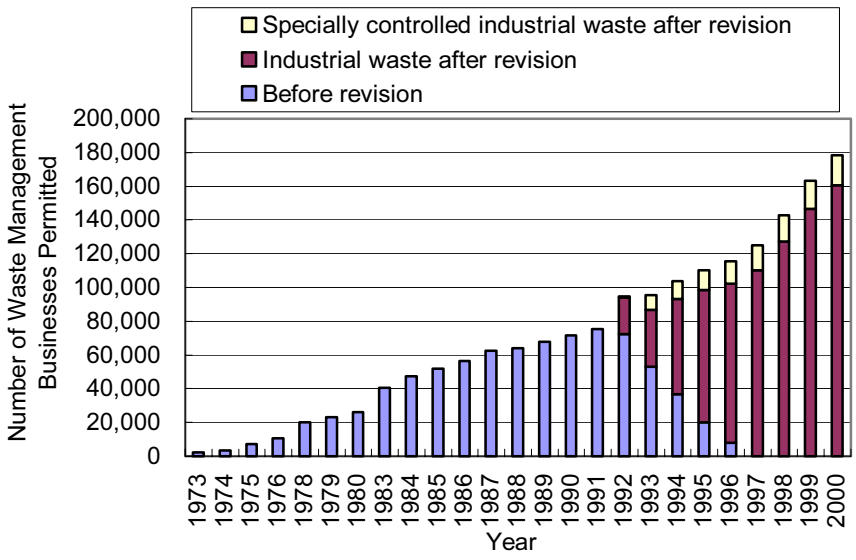
Figure 1.5.7 Number of Permits Issued for Landfill Facilities by Entity Type (1978-1987)

c. Waste Management Operators

The number of licensed industrial waste management operators in 1973 was only 2,398. Subsequently this number increased to approximately 40,000 in 1983 and about 70,000 by the time of amendment of the law in 1991. It has continued increasing since then and was approximately 180,000 in 2000 [72]. Most of these licenses were granted to collection/transportation operators, which accounted for 94% of the total in 2000. The number of treatment/disposal licenses was 10,480 in 2000, but 85% of these were held by operators implementing treatment only.

As reflected in these figures, entry into the waste management sector was still almost completely free of obstruction even though requirements for obtaining licenses were made more stringent in recent years. Even now, it may be said that the Waste Management Law adopts an open market policy with respect to industrial waste management.

It is reported that almost all collection/transportation operators are micro enterprises with only a few collection vehicles. Even in the treatment/disposal sector, SMEs account for the largest proportion. Only around 10 operators have an annual turnover of more than 10 billion JPY. As for market size, assuming that the amount of industrial waste consigned to waste management operators is 200 million tons[73], and the cost of treatment/disposal including collection and transportation is between 10,000-20,000 JPY per ton, the market would be 2-4 trillion JPY while the annual turnover per operator still works out at around 10-20 million JPY[74]. The industrial waste management market is extremely large, and it can also be shown that the number of operators entering the sector is high too.



Note: Number of permits issued for waste management businesses are total of waste collection/transport and treatment/disposal operators.
Source: Ministry of Health and Welfare (for the data in the fiscal year 1998 and thereafter, Ministry of the Environment), "Status of Discharge and Treatment/Disposal of Industrial Wastes", each fiscal year

Figure 1.5.8 Trend in Number of Permits Issued for Waste Management Business (1973-2000)

[72] Ministry of the Environment, "Status of Establishment of Industrial Waste Treatment/Disposal Facilities and Permission for Industrial Waste Treatment/Disposal Business in 2000"
Data before 1978 are from NARITA Kimiaki, "Sangyo Haikibutsu Shorigyosha no Jittai nitsuite (1)", *Sangyo to Kankyo*, Vol.7, 1981, pp.86-95

[73] ISHIWATA Masayoshi, *Sanpai Connection*, WAVE Shuppan, 2002

[74] Average disposal fee is thought to range from 10,000 to 20,000 per ton. Industrial waste disposal market occupies 0.4 to 0.8% of Japanese GDP (approximately 50 trillion JPY).

The following table shows the mode of management and number of employees of waste operators. We can see that micro operators are the most common. In order to encourage industry's voluntary efforts to promote appropriate treatment/disposal, the government took the initiative in organizing industry associations in each prefecture, but such organizations still did not exist in some prefectures as of 1985[75]. Upon surveying associations in 13 prefectures, it was found that only around 10% of waste management operators had become members.

Table 1.5.3 Business Forms and Sizes of Waste Management Operators (as of April 1, 1985)

(Unit: business(es), %)

Individuals	Corporations (Capital: 10,000 JPY)					Total
	0 - 99	100 - 499	500 - 999	1,000 - 4,999	5,000 & more	
5,269 (32.6)	989 (6.1)	3,333 (20.7)	2,255 (14.0)	3,229 (20.0)	1,059 (6.6)	16,134 (100)

Note 1: Data from Survey by Management and Coordination Agency
2: Numbers in parenthesis ( ) indicate composition ratio.
Source: Management and Coordination Agency, "Current Status and Problems of Waste Treatment/Disposal and Recycling," 1987

Table 1.5.4 Number of Employees by Waste Management Business Type (as of April 1, 1985)

(Unit: Business(es), %)

Individuals				Corporations						Grand total
1 - 2	3 - 4	5 and more	Total	1 - 3	4 - 9	10 - 19	20 - 99	100 and more	Total	
2,500 (47.4)	1,275 (24.2)	1,494 (28.4)	5,269 (100)	2,467 (22.7)	3,976 (36.6)	2,861 (26.3)	1,374 (12.7)	187 (1.7)	10,865 (100)	16,134

Note 1: Data from Survey by Management and Coordination Agency
2: Numbers in parenthesis ( ) indicate composition ratio.
Source: Management and Coordination Agency, "Current Status and Problems of Waste Treatment/Disposal and Recycling", 1987

d. Treatment/Disposal Systems with Public involvement

The Waste Management Law was enacted in 1971. However, due to the lack of development of waste treatment/disposal operators, the number of treatment/disposal facilities conforming to the law was not enough. Although the responsibility for industrial waste management rest with private operators, there were problems that could not be resolved through treatment/disposal by waste dischargers and treatment/disposal operators alone. Therefore, local governments started to promote development of industrial waste treatment/disposal facilities with public involvement from the viewpoint of local environmental protection. The pioneer of this effort was Osaka City in Osaka Prefecture, which established a waste management public corporation and initiated landfill disposal services in 1971. In response to this, the central government started to examine the possible establishment of an Industrial Waste Management Public Corporation (a government-affiliated corporation) in 1973, although this proposal was not brought to realization.

[75] Management and Coordination Agency, "Current Status and Problems of Waste Treatment/Disposal and Recycling", 1987

Because the situation regarding local industrial waste management remained harsh, local governments looked into industrial waste management activities with public involvement, and the number of public involvement schemes increased from 6 (including those in the planning stage) in March 1973 to 23 prefectures and 18 cities by 1980. However, in view of the OECD guiding principle of Polluter Pays Principle, it was difficult to obtain consensus for investment by public funds and public involvement in management works that could essentially be performed by the private sector. Meanwhile, in response to the continuing problem of local industrial waste management and the increasing difficulty of constructing treatment/disposal facilities, the 1991 amendment to the law made it possible for each prefecture to establish a single industrial waste management center. In 2000, there were 77 cases of public involvement and 16 of them were regarded as above centers.

Furthermore, in order to promote the stable supply of industrial waste treatment/disposal facilities and the appropriate treatment/disposal of industrial wastes, the Law concerning Construction of Specified Facilities for Industrial Waste Treatment/Disposal was enacted in 1992. As a result, a system was set up whereby a corporation designated by the Minister of the Environment guaranteed liabilities incurred in the borrowing of funds necessary for construction of industrial waste treatment/disposal facilities.

e. Administration and Police Systems

e.1 Systems at the Prefectural Level

Prefectures and ordinance-designated cities were responsible for the following functions under the Waste Management Law.

- Formulation of industrial waste management plans
- Advice and guidance for discharging parties and their contractors.
- Permission and guidance (later licensing) for industrial waste treatment/disposal facilities
- Permission of industrial waste collection, transportation, treatment or disposal operations
- Supervision of discharging parties and contractors.

With the commencement of these administrative functions concerning industrial wastes, work involving licensing, receipt of treatment/disposal facility applications and supervision of facilities, gained a reputation for being extremely tough. It was said to be the area of work that prefectural employees most wanted to avoid. Since criminal syndicates were involved in the industrial waste management sector, some employees were regularly subjected to threats[76].

The most challenging work is monitoring. Prefectures assigned personnel to local offices and public health centers in order to do this work. The number of employees engaged in industrial waste administration was reported to be around 3,000 (including employees combining duties) in 1998. The administrative cost of industrial waste management was roughly estimated at 30 billion JPY per year[77]. Unlike monitoring of emission gas and wastewater, which entailed concentration checking at factory outlets, monitoring of industrial waste was much harder because it involved checking whether or not storage and consigned treatment/disposal were complied with technical standards, as well as whether or not industrial waste treatment/disposal facilities were maintained properly. Also, it was necessary to check the final disposal and hazardousness of industrial waste. At the start of the 1970s, facilities requiring determination of hazardous risk mainly consisted of facilities

[76] There was a criminal case that a worker at a waste disposal company assaulted a manager of the Industrial Waste Management Division, Chiba Prefecture. There was also another case that an employee of a waste disposal company murdered a staff of a local government because the staff refused to give expediency for it.

[77] Kankyo Eisei Shisetsu Seibi Kenkyukai, *Nihon no Haikibutsu 2000,* Japan Waste Management Association, 2000, p.83. The number was about 3,140 in 1988 according to *Nihon no Haikibutsu 1991*.

treating emission gases and wastewater from processes dealing with hazardous substances, but linkage of this with related air and water quality monitoring work was not always achieved.

In particular, monitoring of illegal dumping was the most trying operation. This is because there was no way of knowing where illegal dumping was taking place. For this reason, as indicated in Table 1.5.5, the monitoring system was strengthened and links with police and private sector organizations were reinforced.

Table 1.5.5 Status of Monitoring Task Force for Illegal Dumping
(Trend in number of monitoring officers)

Fiscal Year	1996	1997	1998	1999	2000	2001
Monitoring officers (persons)	624	630	673	761	828	926
of which policepersons	10	17	33	58	79	97
Entrusted monitoring persons	185	243	267	287	376	488
of which retired policepersons	33	67	74	95	138	174
Volunteer monitoring persons	1,499	1,787	2,177	2,324	2,861	3,143
Entrusted monitoring committee members (person day)	334	541	1,091	5,783	14,431	19,245

Source: Ministry of the Environment, "Commission Report on Prevention of Illegal Dumping and Restoring to the Status Quo", 2002

e.2 Police Involvement

Following enactment of environmental pollution-related legislations in 1970, the Security Division of the Police Agency appointed detectives in charge of environmental pollution crimes, assigned pollution control sections and inspectors in major prefectures, and established ways to deal with pollution crimes. Equipment and materials for analysis in order to conduct investigations were also provided. Furthermore, in 1974, an environmental pollution section was set up in the Security Division of the Police Agency, and investigators and equipment were assigned to all prefectures.

Planned investigations have been carried out since 1974. In particular, in order to identify illegal dumping sites and arrest violators, it was necessary to carry out nighttime surveillance over the long term. Since 1990, illegal dumping has been a major problem on a larger scale and over a wider area, quick and wider collaboration and planned investigation have becme needed even more acutely.

1.5.3 Occurrence and Conflicts

a. Occurrence of Illegal Dumping

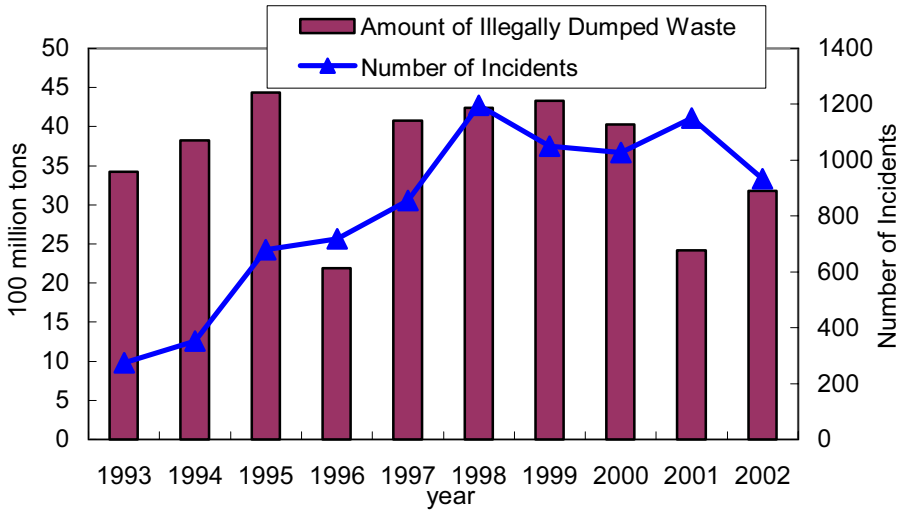
As a result of the Waste Management Law of 1970, industrial wastes that previously required self-treatment mainly came to be consigned to private treatment/disposal facilities. This led to a sudden upsurge in the industrial waste management industry as described above.

Since an almost completely open market policy was adopted with respect to industrial waste management under the Waste Management Law, the sector was deluged with large numbers of small-scale operators conducting collection/transport and treatment/disposal. As a result, it became difficult for the governments to monitor new entrants to the sector.

Illegal waste dumping also arose because of the difficulty of administrative controls over the sector. Although there are no data on the actual number of illegal dumping cases, the amount of illegally dumped waste was monitored from the latter part of the 1970s. The amount of illegally dumped waste in 1978 was approximately 500,000 tons and remained

around this level until 1985; however, it jumped suddenly between 1988-1991, and it reached 2,100,000 tons[78] in 1991.

This situation was brought by discharging parties that did not appropriately fulfill their responsibilities in disposing of industrial wastes via the market, and their behavior was a cause of the market failure.



Source: Ministry of the Environment, "Status of Illegal Dumping of Industrial Waste", Kankyo Eisei Shisetsu Seibi Kenkyukai, *Nihon no Haikibutsu 2000*

Figure 1.5.9 Changes in Illegal Waste Dumping
(volume and number of incidents, 1993-2002)

The amount of illegal dumping that was identified by the Police Agency is shown in Table 1.5.6.

Table 1.5.6 Amount of Illegally Dumped Waste Identified by National Police Agency

Year	1983	1984	1985	1990	1991	1992	1993
Amount of Illegally dumped waste (thsnd. tons / yr)	316	366	241	1,899	2,098	1370	1450

Source: 1983 – 1985: Management and Coordination Agency, "Current Status and Problems of Waste Treatment/Disposal and Recycling", 1987
1990 – 1993: Management and Coordination Agency, "Current Status and Problems of Waste Management", 1995

Despite the fact that regulations on consigning waste management by waste discharging parties were made more stringent under the revision to the law in 1991, the waste management sector in reality continued to be a free market. Operators who provided poor quality but cheap services had a better chance of surviving than those who provided high quality services, so the environment suffered as a result.

One opinion was that this problem was brought about by the system of granting licenses to waste management operators based on the assumption they would conduct proper

[78] Kankyo Eisei Shisetsu Seibi Kenkyukai, *Nihon no Haikibutsu 2000*, Japan Waste Management Association

management. In reality, illegal dumping was viewed in terms of the following loopholes in the legal structure:

- When discharging parties consigned their industrial waste to waste management operators, it was possible for treatment operators to re-consign to other operators. Illegal dumping occurred via treatment facilities.
- Dischargers consigned waste to the cheapest operators, who were desperate to secure orders in the midst of fierce competition from rivals.
- If waste was reloaded and transported from reloading and storage facilities, it was not possible to keep track of responsibility.
- Because treatment operators did not want to lose customers, they accepted more waste than they could handle and re-consigned the surplus. It was not possible to penalize discharging parties in such cases.
- Once waste was disposed of in landfills, there was no way of knowing if it was taken out from them.
- It was almost impossible to crack down on open burning of wastes. It was impossible to penalize improper waste management by unlicensed operators under the Waste Management Law.
- Since penalties were light, some waste management operators thought they have only to pay fines and continued dumping illegally.

At landfill disposal facilities[79], it was extremely difficult to monitor and check whether wastes were handled according to treatment/disposal standards based on the characteristics of the waste, so the situation surrounding the treatment/disposal of wastes was very opaque.

[79] Controlled type landfill is a type of disposal facilities that accept general wastes other than industrial waste that are to go to strictly controlled type landfills or least-controlled type landfills. The controlled landfills are to have seepage control facilities as well as leachate control facility that treat leachate to a level the effluent discharged to public water body. Least-controlled landfill type is a type of landfill with facility to prevent fly loss and outflow of waste that are physically stable and do not pose threats to the environment. The type of waste going to the least-controlled landfills are; construction waste, plastics, rubbers, metal scraps, and glasses. Strictly-controlled landfill type is a facility that is shielded with concrete and have covers to prevent rain water to seep into the landfill. Hazardous wastes are to be disposed in this type of landfill.

Illegal Waste Dumping

Source: Ministry of the Environment, *2003 White Paper on Sound Material-Cycle Society*

b. Derivation of Soil Contamination Problems

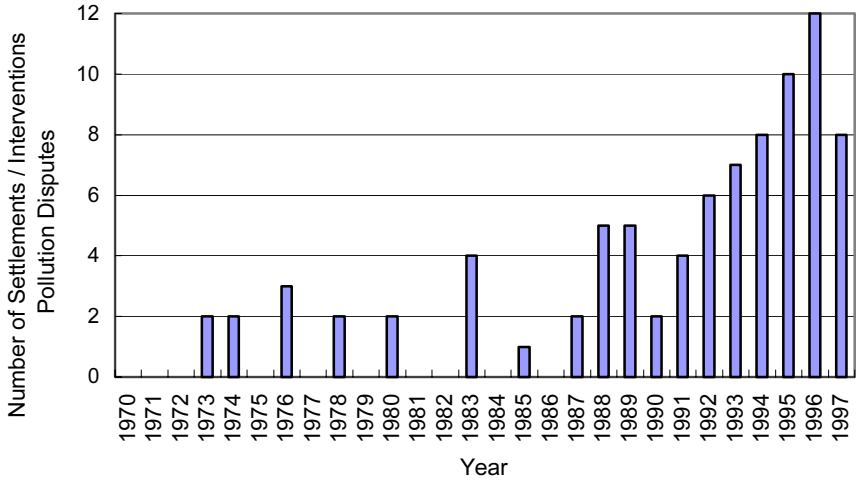
It was only natural for factories to dispose of industrial wastes such as particulates, sludge and slag within their own premises in the 1960s, and this practice remained lawful even after enforcement of the Waste Management Law in 1971. Furthermore, even following establishment of technical standards for landfills based on the cabinet order amendment of 1976, landfills with capacity of less than 1,000 m^3 were exempted from application of the standards and requirements concerning the notification of facilities.

Not enough consideration was paid to the fact that leakage of chemical substances and disposal of wastes on a factory's own premises would lead to soil contamination. The concept of soil contamination did exist, but this was limited to contamination of farmland by toxic metals, so little attention was paid to soil contamination in urban areas. Problems of soil contamination were brought into focus in line with the conversion of industrial land into residential land, and the Soil Contamination Countermeasures Law was eventually enacted in June 2001.

c. Conflicts

Illegal waste dumping, inappropriate management of waste treatment/disposal facilities, and traffic pollution caused by dump trucks overloaded with industrial waste eventually triggered opposition from local residents living around treatment/disposal facilities.

Out of 820 mediation and arbitration cases brought before prefectural environmental pollution boards of review between 1970 and 1997, 85 cases were related to wastes, albeit not just industrial waste treatment/disposal facilities. Nevertheless, the number of such cases has clearly been increasing in recent years[80].



Source: Environmental Dispute Coordination Commission, "Practice Kogai Funso Shori Ho: Dai 14 kai Haikibutu ni kansuru Kogai Funso Jiken nitsuite", *Chosei*, No. 14, 1998

Figure 1.5.10Changes in Number of Pollution Disputes Settlements/Interventions (1970-1997)

Moreover, between 1975 and 1995, 27 court cases were filed calling for the suspension of construction or operation of waste treatment/disposal facilities[81]. Most of these actions were related to municipal waste treatment/disposal facilities, while only three pertained to industrial wastes. In recent years, however, the number of cases brought against

[80] Environmental Dispute Coordination Commission, "Practice Kogai Funso Shori Ho: Dai 14 kai Haikibutu ni kansuru Kogai Funso Jiken nitsuite", *Tyousei*, No. 14, 1998

[81] Environmental Dispute Coordination Commission, "Haikibutsu Shori Shisetsu wo meguru Funso Jirei", *Tyousei*, No. 4, 1996

construction and operation of industrial waste treatment/disposal facilities has been increasing, and more and more judgments are resulting in defeat for the authorities. For example, in the case calling for cancellation of prefectural permission to construct industrial waste treatment/disposal facilities in Odawara City, Kanagawa Prefecture, Yokohama District Court ruled that the prefecture's action was illegal in November 1999.

Local opposition movements to the construction of industrial waste treatment/disposal facilities sprung up everywhere and made it more and more difficult to install facilities. The National Liaison Conference of Municipalities on Industrial Waste Problems[82], made up of 31 municipalities (currently 39) confronted with industrial waste problems, was established in 1998. According to this conference, the number of issues and disputes arising over industrial waste treatment/disposal was 500.

In some cases, citizens have come out in opposition to the construction of industrial waste treatment/disposal facilities following implementation of citizen referendum[83]. Many prefectures now require that facilities constructors obtain citizens' acceptance when they construct new industrial waste treatment/disposal facilities[84].

1.5.4 Compliance with the Law

Conditions of authorities for implementing on-the-spot inspections and other efforts in the early 1970s immediately following enactment of the Waste Management Law will be discussed in Section 1.8.4.

a. Licensing Review of Operations

When prefectural governors reviewed the capability of parties applying for permission to carry out industrial waste management, they also examined accounting basics.

According to a survey implemented by the Management and Coordination Agency with respect to account reviews in 30 prefectures, it was found that 27 implemented reviews according to balance sheets and the like. In specific terms, only 1 prefecture analyzed and assessed the operating efficiency of management capital concerning profitability. Also, 10 prefectures claimed difficulty in determining whether or not accounting basics were in place, claiming that the Ministry of Health and Welfare didn't indicate specific review methods and that skilled management analysis personnel were not assigned and so on[85].

Table 1.5.7 Inspection Status for Basis of Accounting Information for Waste Management Permitting

	Need inspection for basic accounting information				No inspection being processed because of difficulty in judging	Ground Total
	Using inspection table	Require necessary documents per applications and inspecting		Total		
			of which making a judgment is hard			
Number of Prefectures	1	26	7	27	3	30

Source: Management and Coordination Agency, "Current Status and Problems of Waste Management", 1995

[82] http://www.c-i.co.jp/sanpai/right.html

[83] Mitake Town in Gifu Prefecture, Kobayashi City in Miyazaki Prefecture, Yoshinaga Town in Okayama Prefecture

[84] About 89 local governments in 2002. Ministry of the Environment, "Actual Condition Survey of Administrative Guidance regarding Establishment of Waste Treatment/Disposal Facilities in Prefectures and Ordinance-Designated Cities", 2002

[85] Management and Coordination Agency, "Current Status and Problems of Waste Management", 1995, p.66

b. Monitoring, Guidance and Compliance

Monitoring and guidance work includes collecting reports from and conducting on-the-spot inspections at discharging parties and contractors. These are basic actions to ascertain the facts about violations.

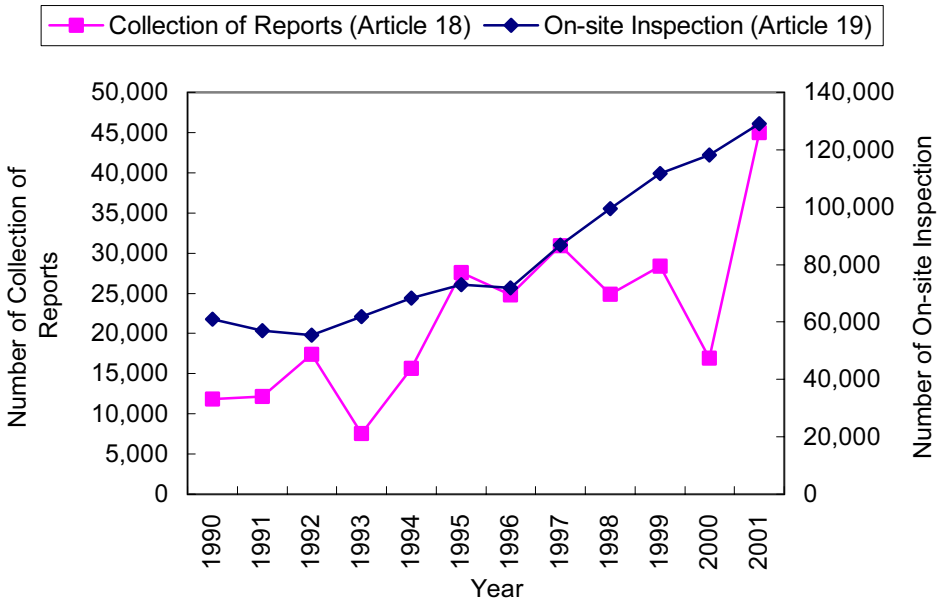
In the above survey of 30 prefectures, only a limited number were found to be implementing planned on-the-spot inspections as of 1993.

Table 1.5.8 Formulation of Annual Plans for On-site Inspections

	Annual plan formulated		No annual plan formulated	Implementing according to the plan	Total
		of which, specifying major industry or facility			
Number of Prefectures	20	6	12	8	30

Source: Management and Coordination Agency, "Current Status and Problems of Waste Management", 1995

Figure 1.5.11 shows data from 1990 onwards, and from this it can be seen that particular effort was put into on-the-spot inspections in recent years.



Source: Ministry of the Environment, "Status of Establishment of Industrial Waste Treatment/Disposal Facilities and Permission for Industrial Waste Treatment/Disposal Business in 2000"

Figure 1.5.11 Numbers of Report Collections and Spot Inspections (1990-2000)

Monitoring of waste management is mainly carried out to check the following four points; 1) whether or not parties behaved illegally, 2) whether or not technical and maintenance standards were complied with in facilities, 3) whether or not qualifications were breached, and 4) whether or not licensing conditions were complied with.

In monitoring of industrial waste treatment/disposal facilities, facilities plans and maintenance plans are checked for conformance, the management capacity of installing parties is ascertained, and compliance with licensing conditions is checked. Also, it is confirmed whether or not waste treatment/disposal standards and storage standards are satisfied.

Business operators paid attention to direct environmental pollution such as air pollution and water pollution, but they were ignorant of the routes taken by their industrial waste before it was disposed of, and little awareness of the secondary pollution caused by such waste[86].

In a survey conducted by the Administrative Inspection Bureau, Management and Coordination Agency, which targeted compliance with the Waste Management Law at 91 dischargers and 119 industrial waste management operators, it was found that 36 dischargers and 68 operators (104 enterprises in total or 49.5%) were in noncompliance.

Table 1.5.9 Compliance Status of the Waste Management Law (1993)

(Unit: businesses, %)

Category of business entity		Number of surveyed businesses	Items to be complied										
			Collection/ transportation	Treatment standard	Storage standard	O&M of facility: Facility technical standard	O&M of facility: Operation and maintenance standard	Entrust standard	Record keeping	Manifest	Facility permits	Engineering manager	Person in charge of treatment
Waste discharging		91 (36)	4 (0)	91 (1)	91 (12)	5 (0)	5 (1)	91 (26)	78 (16)	63 (16)	23 (1)	22 (2)	58 (3)
Industrial waste treatment business	Treatment	62 (34)	45 (1)	62 (1)	62 (1)	62 (0)	62 (2)	62 (0)	61 (17)	60 (13)	62 (3)	50 (4)	55 (0)
	Final disposal	57 (34)	44 (0)	57 (1)	-	57 (1)	57 (20)	47 (25)	57 (8)	48 (16)	57 (5)	57 (3)	53 (0)
	Sub-total	119 (68)	89 (1)	91 (4)	62 (1)	119 (1)	119 (22)	109 (50)	118 (25)	108 (29)	119 (8)	107 (7)	108 (0)
Total		210 (104) [49.5]	93 (1) [1.1]	182 (7) [3.2]	153 (13) [8.5]	124 (1) [0.8]	124 (23) [18.5]	200 (76) [38.0]	196 (41) [20.9]	171 (45) [26.3]	142 (9) [6.3]	129 (9) [7.0]	166 (3) [1.8]

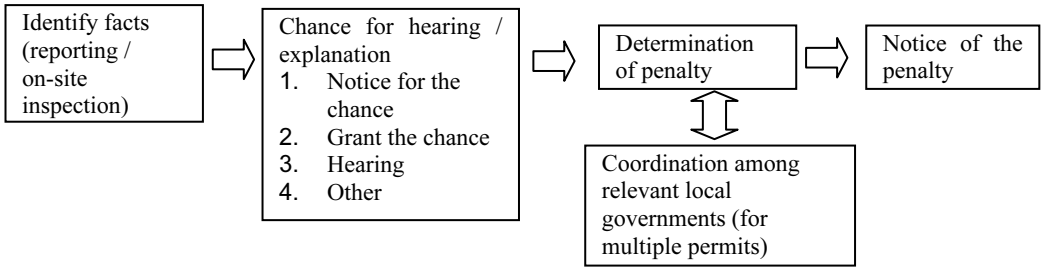
Note 1: Based on data from Survey by the Management and Coordination Agency
2: For industrial waste treatment businesses, businesses with intermediate and final disposal facilities were extracted, but those businesses that have permits for collection / transportation or treatment are also surveyed.
3: Numbers in parenthesis ( ) indicate number of businesses that violated the Waste Management Law.
4: Numbers in brackets [ ] indicate ratio of violation.
Source: Management and Coordination Agency, "Current Status and Problems of Waste Management", 1995

c. Administrative Disposition of Violators

In cases where violations were found upon making the above checks, administrative penalties such as the revoking of licenses and suspension of operations for operators, and revoking of licenses and issue of improvement or suspension orders for treatment/disposal facilities are imposed. Improvement orders are issued in cases where waste treatment/disposal standards were violated. In cases where treatment was not complying with the standards, it is possible to issue restoration orders. These steps are collectively referred to as administrative disposition. With respect to prohibited open burning violations and illegal dumping, the filing of criminal complaints is also the responsibility of administrative authorities.

The Figure 1.5.12 shows an example of the procedural flow of administrative disposition in the waste management sector.

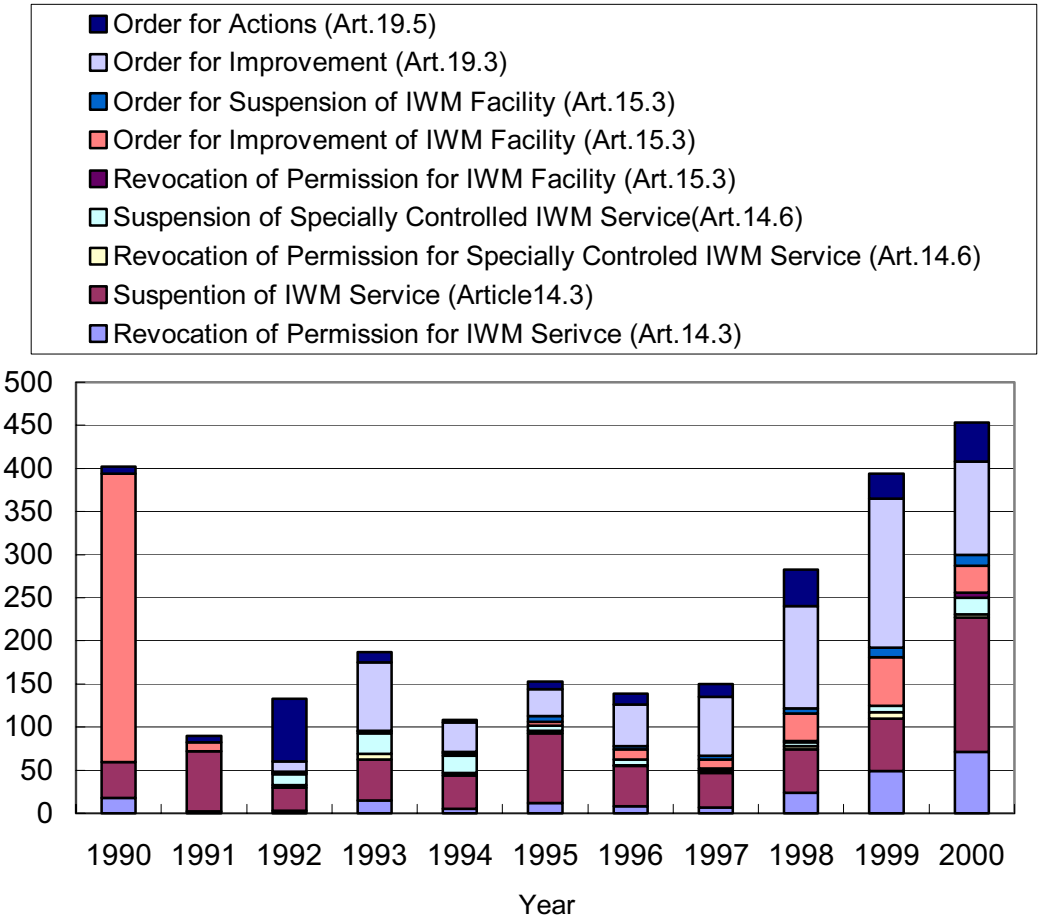
[86] HISHIDA Kazuo, "Sangyo Haikibutsu Shoriho no Mondaiten to Kongo no Kadai", *Kagaku to Kogyo*, Vol.29 No.9, 1976, p.89



(Opportunity for hearing/explanation is not necessary for other administrative penalties)

Figure 1.5.12 Procedure for Administrative Dispositions regarding License of Waste Management Operators

Figure 1.5.13 shows the recent situation regarding implementation of administrative disposition. Cases of administrative disposition have been increasing in recent years. In particular, there have been a large number of cases where licenses were revoked.



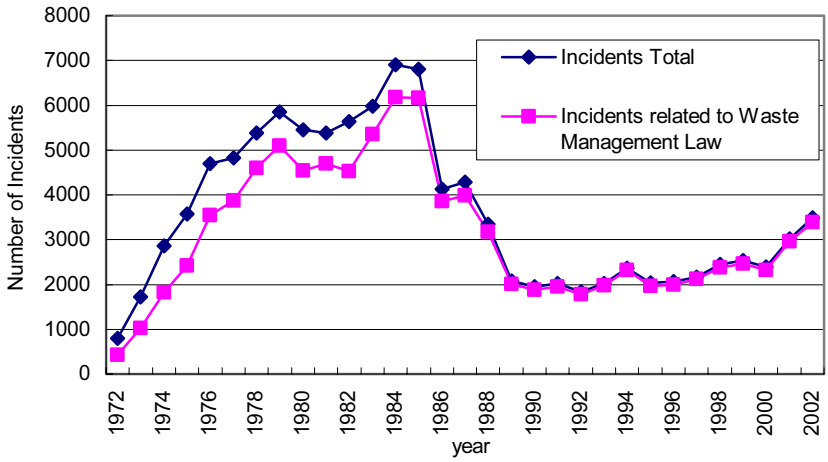
Source: Ministry of the Environment, "Status of Establishment of Industrial Waste Treatment/Disposal Facilities and Permission for Industrial Waste Treatment/Disposal Business in 2000"

Figure 1.5.13 Shifts in Status of Imposed Administrative Dispositions (1990-2000)

d. Exposing Environmental Crimes

Police authorities established procedures for investigating and vigorously exposing environmental crimes. The number of arrests increased as the investigation framework was developed. As is indicated in Figure 1.5.14, more than 90% of these arrests were related to the Waste Management Law. The number of arrests and exposures peaked at around 6,000 in 1984-1985 but fell to approximately 2,000 in 1988, after which it generally remained steady[87]. In recent years, more effort was put into investigating illegal dumping, and the number of arrests increased as a result. However, because methods of illegal dumping have become more ingenious in recent years, it has become necessary to conduct investigations with greater planning and organization.

Out of 2,965 arrests in 2001 for offenses of the Waste Management Law, 1,343 (98%) were related to industrial wastes. As for the reasons behind arrests, there were 669 illegal dumping cases, 248 violations of consigning standards and 158 unlicensed treatment/disposal, and 350 other cases[88].



Source: National Police Agency, *Police White Paper*, 1973 - 2003

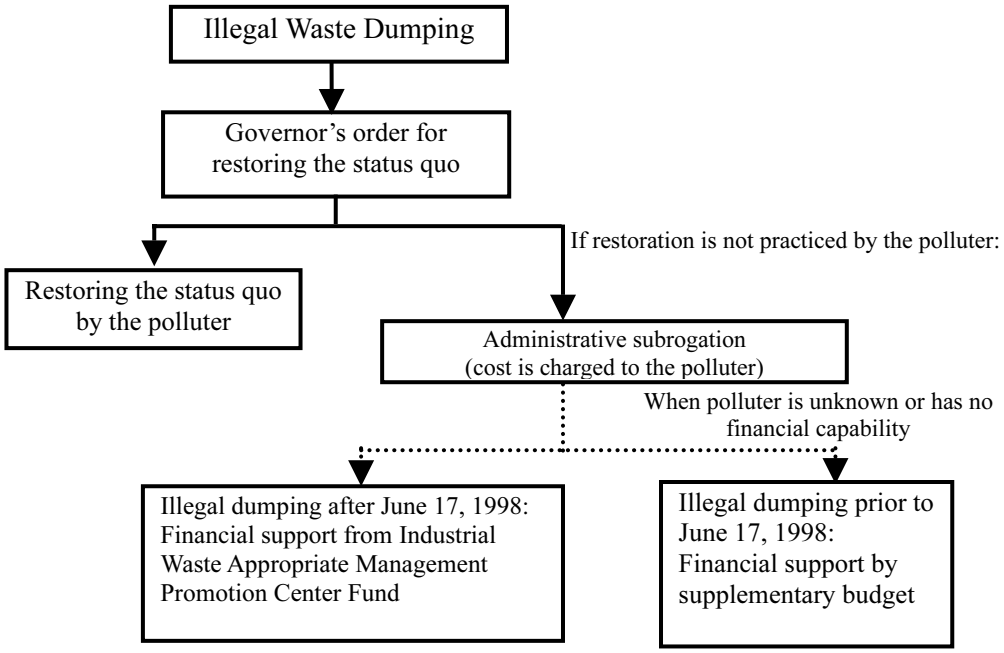
Figure 1.5.14 Shifts in Number of Environmental Offences (1972-2002)

1.5.5 Measures for Restoring the Status Quo after Illegal Dumping

a. Administrative System for Status Quo Restoration Works

Following the frequent occurrence of illegal waste dumping cases, residents in affected areas made increasing calls on central and local governments to restore the status quo during the 1990s. In response, under a revision of the Waste Management Law in 1997, status quo restoration disposition orders for improper treatment/disposal operators were widened in application to include parties that did not submit manifests or submitted false manifests, and prefectural governors became empowered to carry out immediate administrative subrogation. Moreover, in cases of administrative subrogation when disposing parties are unknown or do not possess the financial resources, a new fund scheme for providing subsidies was set up. The scheme is indicated in Figure 1.5.15.

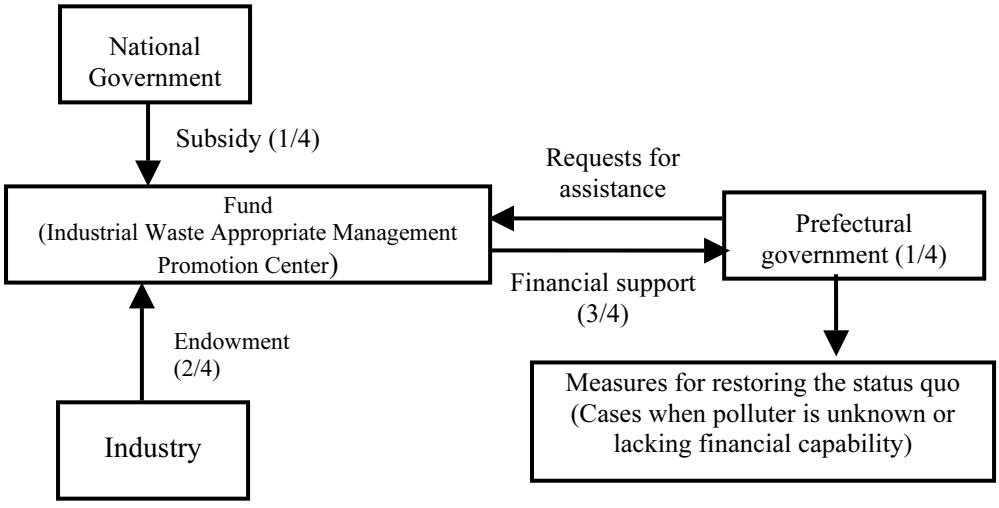
[87] National Police Agency, *2002 Police White Paper*. Note that the number of the environmental crimes includes ones of other normal waste management.
[88] Ministry of the Environment, *2002 White Paper on Sound Material-Cycle Society*



Source: Japan Industrial Waste Management Foundation, "Jigyo Keikaku 2002"

Figure 1.5.15 Framework of Restoring the Status Quo of Illegally Dumped Site

Concerning illegal dumping after June 1998 when the amendment of 1997 was enforced, 3/4 of status quo restoration costs were issued from the fund of the center for proper industrial waste treatment, which was created under government funding and industry contributions, and the remaining 1/4 was borne by the prefectures[89]. Figure 1.5.16 illustrates this scheme.



Source: Japan Industrial Waste Management Foundation, "Jigyo Keikaku 2002"

Figure 1.5.16 Support System for Restoring the Status Quo of Illegally Dumped Site by Administrative Subrogation after June 17, 1998

[89] Waste Management Promotion Foundation, "Sangyo Haikibutsuto Fuhotoki Genjyo Kaifuku Shien Jigyo no Genkyo", 2003

In contrast, when illegal dumping occurred before the amendment to the law, 1/3 of the necessary cost of restoring the status quo was granted from the fund of the center for proper management of industrial wastes created under government funding, while 2/3 were borne and executed in proxy by the prefectures.

b. Promotion of Status Quo Restoration Works and Enactment of the Special Measures Law

Ever since the status quo restoration works scheme was executed, projects utilizing the scheme have been developed every year with the following results.

Table 1.5.10 Status Quo Restoration by Administrative Subrogation

Unit: million JPY

	Illegal dumping after June 1998			Illegal dumping prior June 1998		
	# of incident	Financial aid	Total cost	# of incident	Financial aid	Total cost
1998	-	-	-	6	1,230	3,690
1999	3	9.9	13.2	4	120	350
2000	4	487	649	9	380	1,140
2001	4	305	406	3	174	523
2002	8	175	234	5	395	1,185

Source: Data from the Proper Disposal Promotion Center at the Waste Management Promotion Foundation

Concerning illegal dumping after the amendment of the law, since it was necessary for prefectures to bear 1/4 of total works costs, financial constraints meant that they were unable to embark on costly subrogation.

Furthermore, in cases of illegal dumping before the amendment, it was necessary for prefectures to bear 2/3 of total works costs when subrogating work. This was a major burden for prefectural governments and deterred them from subrogating work even when restoration of the status quo was required on illegal dumping sites.

In particular, in the cases of the Teshima incident around the Seto Inland Sea and the case of illegal dumping on the border of Aomori and Iwate prefectures, the costs required for status quo restoration were massive, and it was obviously difficult to cover them from the fund alone.

Against this background, the Special Measures Law for Removal of Impediments Caused by Specified Industrial Wastes was enacted in 2003 with the aim of promoting status quo restoration on past illegal dumping sites. This legislation proposed to subsidize status quo restoration works by prefectures or cities with public health centers and to approve the flotation of bonds.

1.6 Energy Policy

As indicated in Figure 1.6.1 through Figure 1.6.3, improving the efficiency of energy use is one of the means of controlling air pollution since emissions of sulfur dioxides, nitrogen dioxides and particulates are reduced when energy consumption is reduced. In Japan, industrial pollution -- mainly through air pollution -- was greatly improved. This section takes a general look at the situation regarding industrial energy use as well as energy policy, and reviews the framework of energy policies based on the Law concerning the Rational Use of Energy.

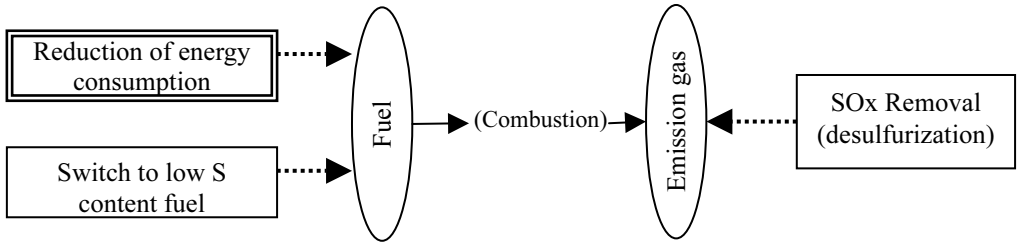


Figure 1.6.1 Improving Energy Use Efficiency for Reduction of Sulfur Oxides

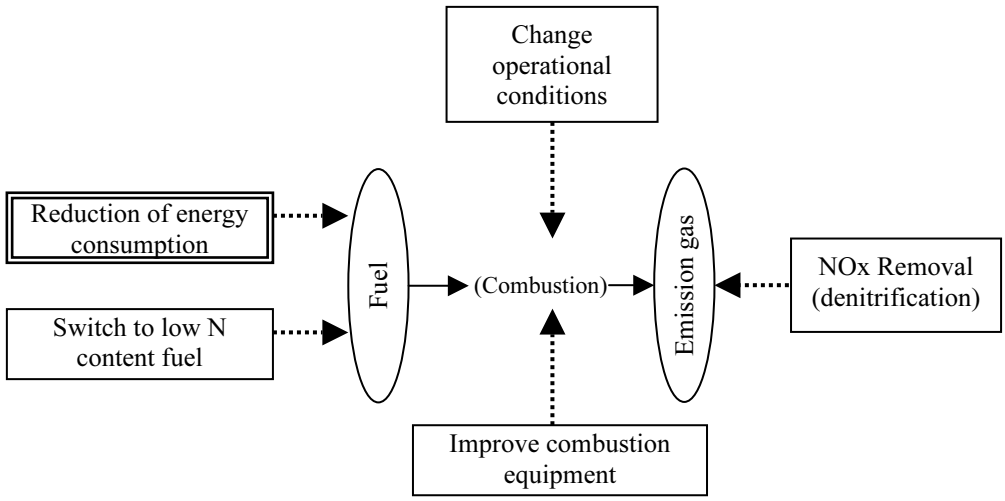


Figure 1.6.2 Improving Energy Use Efficiency for Reduction of Nitrogen Oxides

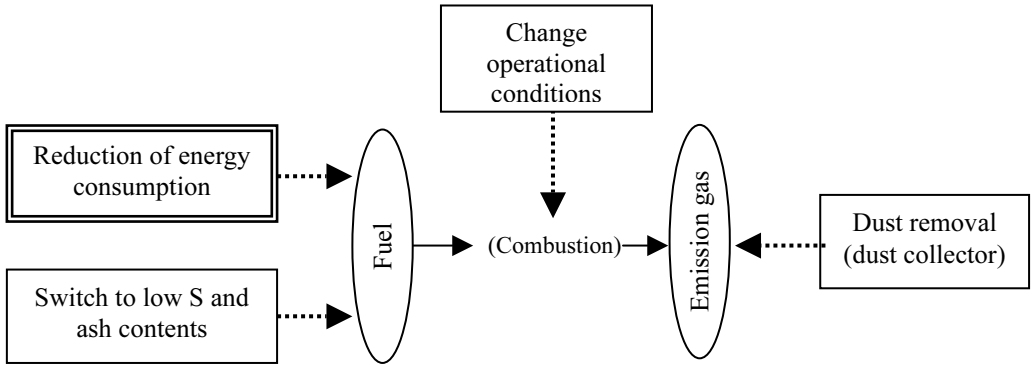


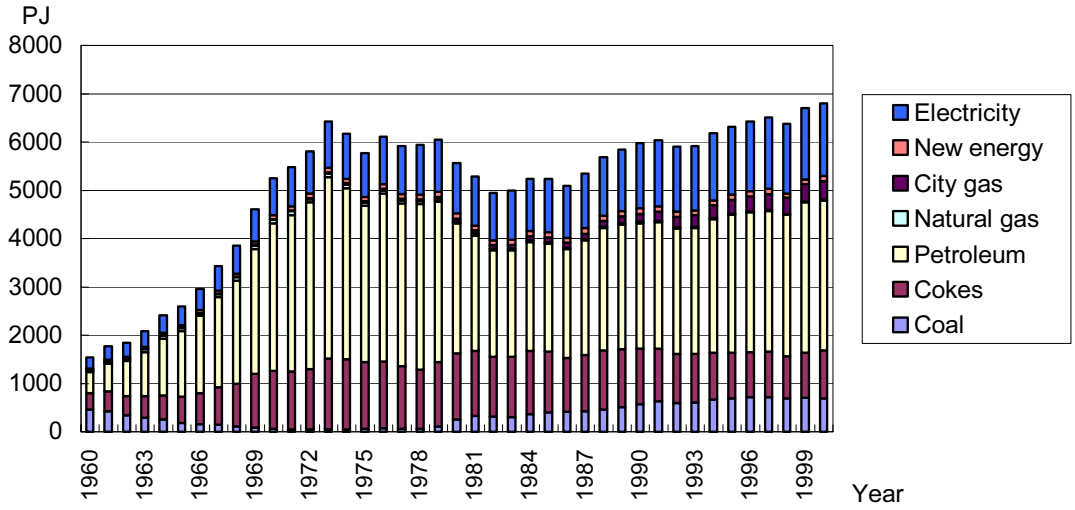
Figure 1.6.3 Improving Energy Use Efficiency for Dust Reduction

1.6.1 Industrial Energy Use

a. Changes in Energy Consumption in Manufacturing Industry

Energy use in the manufacturing sector displayed consistent rapid growth up to 1974, in line with the postwar reconstruction and ensuing industrial development. After the first oil crisis in the end of 1973, however, consumption decreased due to an increase in the crude oil price, followed by that in energy prices. Energy consumption still kept declining during 1979-1983 after the second oil crisis in 1979. However, total energy consumption has been increasing due to low energy prices following the heavy fall in the crude oil price in 1986 and the appreciation of strong yen.

The composition of energy in the manufacturing sector had already shifted from mainly coal to oil as of 1965. Just after WWII, Japan was largely dependent on coal and hydropower to provide electricity. However, the major consumers of coal in the iron and steel industry and cement industry switched from coal to fuel oil during the 1950s since coal was no match for oil in terms of both cost and convenience of use. Between 1965 and the first oil crisis at the end of 1973, oil consumption had continued to increase until it accounted for approximately 60% of all energy use; nevertheless, after the second oil crisis, the ratio of oil consumption fell back to around 45%. Also in the wake of the second oil crisis, coal consumption made a recovery because of cheap prices and advances in available technology, and it accounted for more than 10% of all energy consumption in 1995.

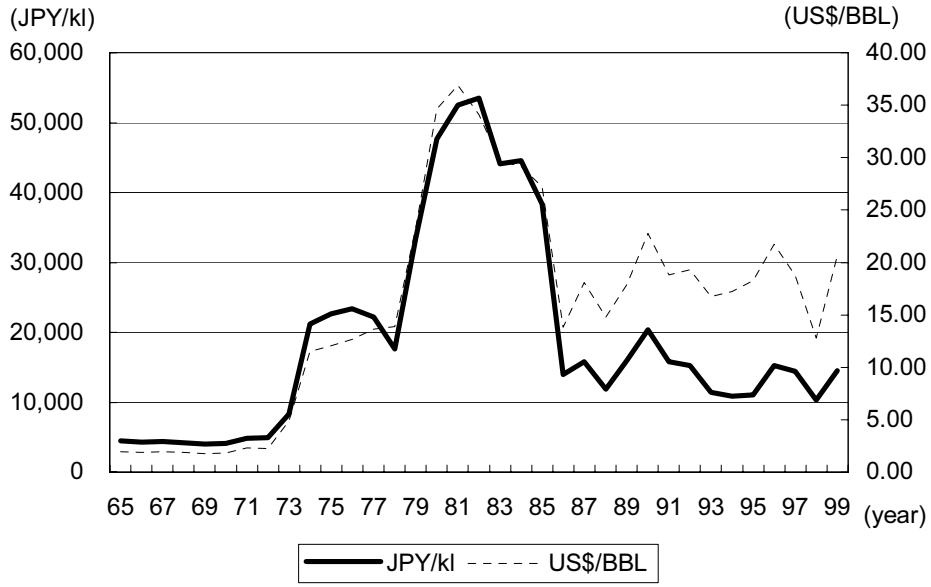


Source: Agency for Natural Resources and Energy, *2001 Comprehensive Energy Statistics*

Figure 1.6.4 Changes in Energy Consumption in Manufacturing Sector (1960-2000)

b. Changes in Price of Crude Oil

The price of crude oil remained steady during the 1960s by large-scale oil production. However, it skyrocketed by approximately four times following the first oil crisis in 1973. For a number of years after that, worldwide oil consumption stagnated and over-supply of crude oil was even experienced at one point. Nonetheless, following the second oil crisis started in the fall of 1978, the price once more leaped by almost 3 times between 1979 and 1980. Following this, in response to a major fall in oil demand following the jump in the price of crude oil, OPEC abandoned its official retail price in 1985, and this resulted in the price of crude oil falling by approximately 1/2 in dollar terms by the following year. Furthermore, in Japan, because of appreciation of the yen following the Plaza Accord of 1985, the price of crude oil in yen terms fell to approximately 1/3 of its 1985 price.



Source: Institute of Energy Economics of Japan, *2001 Energy and Economic Statistics*

Figure 1.6.5 Changes in Prices of Crude Oil Importation (1965-1999)

1.6.2 Energy Policies

The energy situation and government energy policies in post-war Japan are summarized in Table 1.6.1.

Table 1.6.1 Transition of Energy Policies in Japan

Period	Energy Situations and Policies
1945-51 Occupation era	The coal priority production policy [90] was employed for the reconstruction of the country's economy. Increase of coal production by public-private partnership was planned.
1952-61 Reconstruction era	The coal recession just after the Korean War obliged the country to rationalize the coal industry while keeping the coal-centered energy policy. The country aimed at an economy independent of US aid and special procurement demands.
1962-72 Rapid economic growth era	The focus of the Comprehensive Energy Policy was to supply an inexpensive and stable source of energy. The main energy source in the country shifted from coal to oil (oil-centered policy). The country promoted rationalization of the coal industry which had fallen into a structural recession. In order to a secure stable oil supply, the government controlled the oil refining capacity and oil production plants with the principle that oil should be refined in a place where the oil was consumed.
1973-78 From the 1st Oil Crisis to before the 2nd Oil Crisis	Experiencing threats of oil supply cut during the first oil crisis, the country's energy policy put importance on securing a stable energy supply, especially oil. The government started research on and development of energy saving technologies and new energy.

[90] One of the strategies to spur the nation's economy to recovery, by investing limited money and raw materials into basic material production. For example: using imported heavy oil for steel production, using the increased steel for colliery production, and then using the increased coal production for steel manufacture. By repeating this process, the strategy intended to recover the coal and steel production.

Period	Energy Situations and Policies
1979-85 From the 2nd Oil Crisis to the Plaza Accord	The focus of energy policy was shifted to introduction of an alternative energy to oil after the steep rise in crude oil price during the second oil crisis. The government set a goal for supplying alternative energy to oil and established the New Energy Development Organization (at present, New Energy and Industrial Technology Development Organization) to develop technologies to achieve that goal. The government established the special account system to finance activities to develop technologies.
1986 - Era of the Global Environment and Deregulation	The global warming issue was identified in 1988, and the government put importance on energy conservation and shift to non-fossil fuels. Deregulation was started for energy industries, mainly in the electric power industry whose industrial structure and pricing system used to be tightly regulated by the government because of its public nature.

Source: Agency for Natural Resources and Energy (ed.), *The History and Prospect of the Energy Policies*, 1993
Japan Society of Energy and Resources (ed.), *Energy and Resource Handbook*, Ohmusha, 1997

1.6.3 Energy Conservation Policies Prior to the Law concerning the Rational Use of Energy

a. Enactment of the Heat Management Law

In Japan, the Heat Management Law, which aimed to promote the effective use of fuel and heat from fuel combustion in factories and business establishments and to contribute to the conservation of fuel resources and rationalization of enterprises, was enacted in 1951.

The Heat Management Law stipulated specific sectors and factories using a certain amount of heat as designated heat management plants and ordered them to report the previous year's fuel consumption. The factories were required to estimate fuel consumption in the current year and conditions of fuel-using equipment to the Minister of International Trade and Industry, as well as to publicly disclose consumption levels of fuel and heat per unit of industrial production. Furthermore, the law required designated heat management plants to appoint persons holding the national heat manager qualification as heat managers and to maintain records on quantities and types of fuels, heat management equipment and conditions of heat use. The Heat Management Law thus provided the basic foundation for the Law concerning the Rational Use of Energy that was enacted in 1978.

b. Reduction of Oil and Power Consumption at the Time of the First Oil Crisis

The restriction on oil production that was adopted by Arab nations in 1973 led to reduction in oil supply to Japan. In response to this, the Guideline on Emergency Oil Countermeasures was adopted by Cabinet decision on November 16, 1973 in order to prevent socioeconomic confusion and minimize the impact on citizens' lives. This guideline proposed to conduct special administrative guidance on oil conservation for major enterprises in industries using large amounts of oil as well as sectors deeply connected to them. Administrative guidance, based on the administrative guideline for oil and energy conservation in the private sector (November 19, 1973), was carried out about major enterprises in the following industries to help them reduce oil consumption to 90% of the previous year's level by December 1973:[91]

> Iron and steel industry, automobile manufacturing industry, heavy electric machinery and domestic electrical appliance manufacturing industry, petrochemical industry,

[91] In detail, we calculate quantity by using the following formula. $C=C_{73Oct} * C_{74Dec}/C_{74Oct}$
C_{73Oct}=The amount of all petroleum product consumption at October 1973.
C_{74Dec}=The amount of all petroleum consumption at December 1974.
C_{74Oct}=The amount of all petroleum consumption at October 1974.

automobile tire manufacturing industry, chemical fiber manufacturing industry, aluminum refining industry, non-ferrous metals refining industry (excluding aluminum refining), cement manufacturing industry, paper and pulp manufacturing industry

Also, concerning electricity consumption, guidance was provided to major consumers with peak contract capacity of 3,000 kW or more to reduce their power consumption in December 1973 to 90% of the level it was in October the same year. Since no improvement was observed in the tight oil supply and demand situation, the above reduction deadline was extended from January 16, 1974 to the end of February, by which time the reduction in oil consumption was 13% and the reduction in power consumption was 20%.

c. Energy Conservation Campaign after the First Oil Crisis

Following the first oil crisis, the government established the headquarters of the campaign to save resources and energy in 1974 and stipulated the following measures with respect to industry within the report concerning conservation of energy consumption (oil and electric power, and the like) in the industrial, government and private sectors (December 1974):

1. Targeted reduction of oil and electricity consumption in company's administrative and management departments was to be 10% compared to pre-oil crisis levels, and major consumers were required to provide reports on consumption levels in every quarter.
2. In order to ensure thorough oil and electric energy saving in company production departments, basic units of average energy consumption in main sectors were to be widely publicized, and enterprises instructed to set and strive for the attainment of improvement targets. Also, major consumers were to be made to submit energy conservation plans including projections of energy consumption from January to March 1975 and improvement targets for unit energy consumption in advance, and also required to report on performance and receive guidance at the end of the said period.

Furthermore, in March 1976, the headquarters adopted a report about the future advancement of energy conservation policies, and in this the following measures were added with respect to industry:

1. Improvement targets for energy consumption in the production departments of enterprises were to be based on reference to reports submitted by the Advisory Committee for Energy.
2. The target period for compilation of energy conservation plans and reports regarding major consumers were to be one year.
3. Concerning SMEs, provision of diagnostic guidance on energy management technology, improvement in flow of information about energy conservation technology, and promotion of installation of energy saving equipment under loans by the Japan Development Bank.

Some additional measures taken were efforts made in the government sector, energy conservation in the civil sector, the setting of energy conservation months, and so on.

1.6.4 The Law concerning the Rational Use of Energy

a. Background of Enactment

A report titled "the long-term provisional prospects for energy supply and demand" by the supply and demand department of the Advisory Committee for Energy in June 1977 pointed out that current energy policy would not be sufficient to prevent major energy shortages. The energy conservation target for 1985 was raised from 5.5% to 10.8% (lower than the level in 1973), and this was further raised to 13.5% by 1990. The energy conservation subcommittee of the Advisory Committee for Energy examined specific ways to realize this

target and in November 1977 compiled the "necessity and issues of energy conservation policy." This report proposed the establishment of legislation and related ordinances for the promotion of energy conservation including revision of the current Heat Management Law in order to vigorously promote energy conservation policies, the financial support and tax measures for energy saving capital investment, the promotion of diagnostic guidance, education, and technical development in the area of energy conservation through establishment of the energy conservation center.

b. Objectives and Outline of Legislation

Following publication of the report concerning "necessity and issues of energy conservation policy" by the energy conservation subcommittee of the Advisory Committee for Energy, the Law concerning Rational Use of Energy (hereafter the Energy Conservation Law) was enacted in June 1979. It aimed to encourage energy use rationalization measures in plants, buildings and mechanical equipment and to promote general energy conservation, with the objective of securing effective utilization of fuel resources in accordance with the internal and external socioeconomic environment surrounding energy.

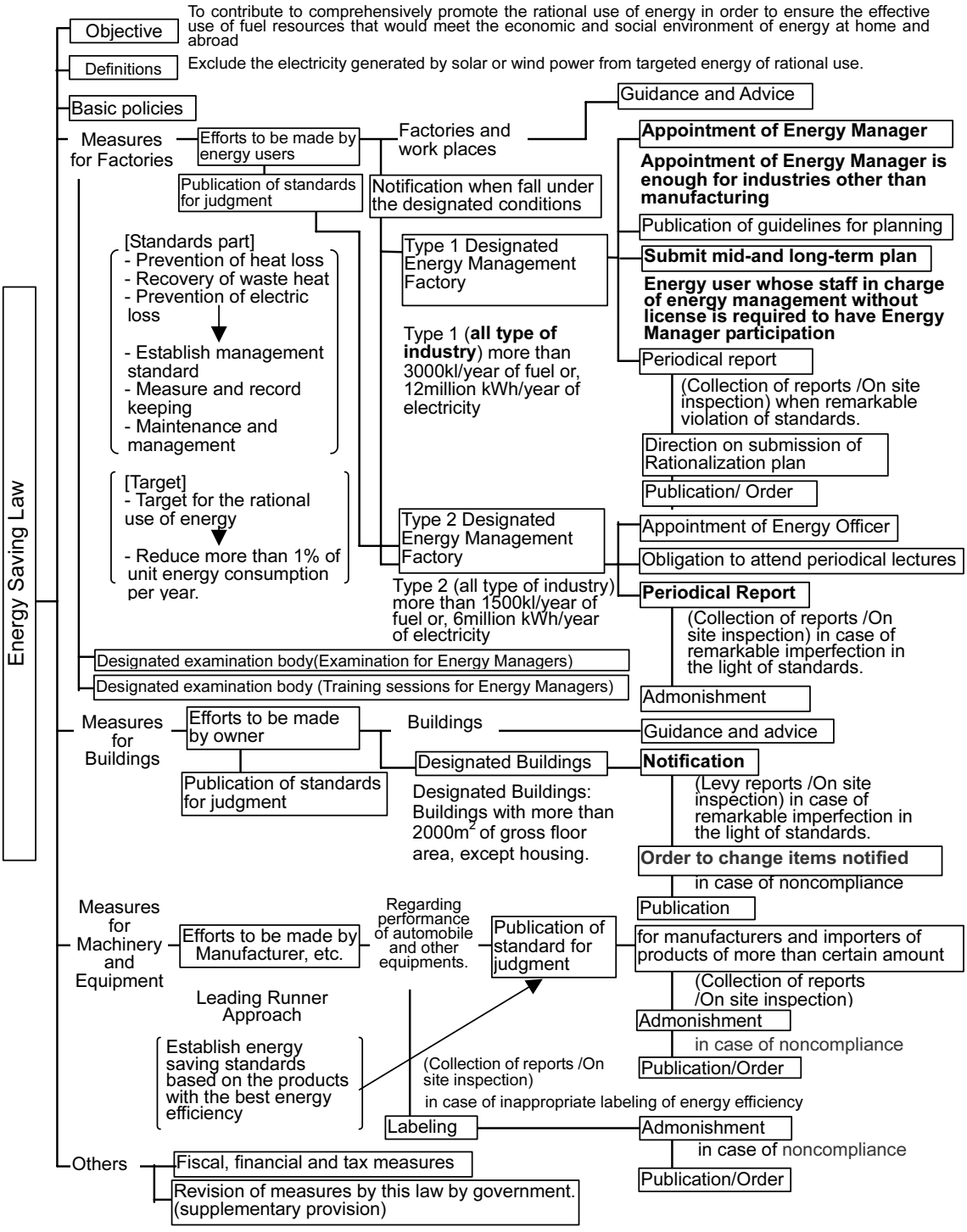
Furthermore, in response to growing concern over the impact of mass energy consumption on the environment, the law underwent revision in 1998 in order to better contribute to effectively securing fuel resources. Figure 1.6.6 shows the structure of the Energy Conservation Law following revision.

c. Energy Conservation Standards in Factories

As for energy conservation effort standards (officially called operator judgment standards concerning rationalization of energy use in factories), the notification by the Ministry of International Trade and Industry stipulated management, measurement/recording, maintenance and inspections for the following seven items:

1. Rationalization of fuel combustion
2. Rationalization of heating and heat transmission
3. Prevention of heat loss through radiation and conduction, and the like
4. Recovery of waste heat
5. Rationalization of heat conversion to motive energy
6. Prevention of electricity loss through resistance, and the like
7. Rationalization of electricity conversion to motive energy and heat, and the like

Concerning items 1, 3 and 4 above, standard air ratios in boilers and industrial furnaces, standard values for heat insulation in industrial furnaces, and standard values for waste heat recovery rates were established, while control standards were established for the other items in order to promote rationalization of energy use. Also, in order to gauge how far rationalization of energy use is being achieved under each item, it was required that fuel supply quantities, temperature of heated objects and heat loss, and the like be measured and recorded and that equipment should undergo maintenance and inspection.



Note: Bold letters mean revised items.
Source: Editorial Committee for Pandect of Energy Saving (ed.), *Pandect of Energy Saving 2004/2005*, Tsusan Siryo Shuppannkai, 2004

Figure 1.6.6 Schematic Diagram of Revised Energy Saving Law

d. Energy Conservation in Designated Energy Management Plants

Designated energy management plants at first referred to factories with fuel consumption of 3,000 kl/year or more and electricity consumption of 12,000,000 kW/year or more in the manufacturing, mining, electricity supply, gas supply and heat supply sectors. However, in 1999, this was changed to type-1 and type-2 designated energy management plants.

Table 1.6.2 Designated Energy Management Factories and Their Types

Annual Energy Consumption		Industrial Sectors	
Fuel	Electricity	Manufacturing, Mining, Electricity Supplying Business, Gas Supplying Business, Heat Supplying Business	All industries except those mentioned in left column.
3,000 kl or more	12 million kWh or more	Type 1	Type 2
More than 1,500 kl and less than 3,000 kl	More than 6 million kWh and less than 12 million kWh	Type 2	Type 2

As of the end of March 2001, the numbers of Type 1 and Type 2 designated energy management plants were as follows.

Table 1.6.3 Current Situation of Designation of Energy Management Factories

	Type 1	Type 2
Heat related	2,607 factories	2,186 factories
Electricity related	3,511 factories	5,503 factories

Designated energy management plants were required to perform the following duties, and if their energy use rationalization was extremely inadequate or where they did not comply with instructions to prepare rationalization plans and so on, their names were disclosed to the public and they were subject to orders and penalties (fines).

1. Promote rationalization of energy use in line with criteria indicated in the energy conservation standards in factories.
2. Appoint energy managers from those who possess energy manager certificates and notify the authorities of appointments (joint appointments for multiple plants not allowed).
3. Submit annual reports on conditions of fuel use, and the like in plants to the competent minister.

National examinations to confer the qualifications required by energy managers in designated energy management plants were instituted by the Energy Conservation Center in 1984.

1.6.5 Promotion of Energy Conservation by the National Government and Enterprises

In order to support the voluntary energy conservation efforts of business operators, the Special Measures Law on Promotion of Business Activities concerning Rationalization of Energy Use and Utilization of Recycled Resources (the Energy Conservation and Recycling Support Law) was established in 1993 and underwent revision in 2003. This reinforced financial and tax support measures including debt guarantees, interest subsidies and preferential tax measures, and also strengthened support for SMEs.

Beside the provisions of the Energy Conservation Law, it adopted measures such as subsidies, low interest loans, preferential tax treatment, assessments for energy conservation and technical assistance, training programs, information dissemination, recognition of excellent energy saving cases and personnel contributing to energy saving in order (1) to encourage industry to adopt and disseminate technologies and facilities contributing to energy saving, and (2) to promote the R&D of energy saving technology. The contents of these measures are summarized in Table 1.6.4.

Table 1.6.4 Energy Saving Measures Implemented by National Government for Industrial Sector

	Measures / policies	Contents of the measures / policies	Target	Implementing body (year started)
Financial aid	Support for rationalization of energy use for business	Subsidize maximum of 1/3 cost of saving facilities with high cost-performance (2003: Maximum 0.5 billion JPY)	All industries Following businesses were supported. • Energy saving businesses that are designated by mid and long term plan in Energy Saving Law • Energy saving businesses that are designated in environmental voluntary action plan by Japan Federation of Economic Organizations • SMEs that installed high efficiency industrial furnaces • ESCO[92] for office buildings	NEDO (1998-)
Preferred tax (National Tax)	Special depreciation for acquiring energy saving facilities	Allow special depreciation for 1/4 specified energy saving (1980: 1/5, 1982: 18% and 1987: 14%)	At first, 13 facilities, such as heat exchangers and waste heat boilers, were targeted, and later, targeted facilities were changed and renewed.	Competent tax office (1978 - 1988)
	Special depreciation and tax reduction for acquiring energy saving facilities	When acquiring designated energy saving facilities or alternative energy facilities, a business could choose one of the following. 1. Tax reduction by 7% of standard acquisition price (basic price for calculation) 2. Special depreciation that can amortize 30% of acquisition price with normal depreciation	Tax reduction covers only small and medium companies Tax reduction and special depreciation cannot be applied at the same time.	Competent tax office (1981 -)
Preferred tax (Local Tax)	Fixed asset tax reduction system for energy saving facilities	For three years after acquiring energy saving facilities designated by the notice, taxation for standard of fixed asset tax was decreased to 2/3. (Changed to 3/4 in 1981, 4/5 in 1983, 5/6 in 1987.) In 1989, the name of this measure was changed and it was abolished in 1991.	At first, 13 facilities, such as heat exchangers and waste heat boilers, were targeted, and later, facilities were changed and renewed.	Local governments (1979 - 1991)

[92] ESCO is the abbreviated name of Energy Service Company. ESCO is the business that saves energy as private corporative activities and offers energy service comprehensively to clients.

	Measures / policies	Contents of the measures / policies	Target	Implementing body (year started)
Low interest rate loans	Promotion of energy conservation industry	Apply special interest rate for 50% of the cost of project that would reduce conservation of energy equivalent to 100 kl of oil annually	Large companies 1. Measure that increases energy efficiency for more than 20% by introducing additional equipments to recover waste energy, like waste heat, or installing new equipment to improve energy efficiency 2. Installation or improvement on approved equipment, facility in factory or business establishment by the company that is approved by the law on rational use of energy & natural resources	Development Bank of Japan Okinawa Development Finance Corporation
	Development of Co-generation system	Loan for specified co-generation system and incidental facilities with policy interest rate		Development Bank of Japan Okinawa Development Finance Corporation
	Promotion of efficient use of energy	Financing at special interest rate for acquiring energy saving facilities	Small and medium corporations	Japan Finance Corporation for Small Business (1978 -) National Life Finance Corporation (1980 -) Okinawa Development Finance Corporation
	Promotion of Special high efficiency energy consumption installation	Financing at special interest rate for fund to replace old-type industrial furnaces, or to install additional facility to enhance efficiency	Small and medium corporations	Japan Finance Corporation for Small Business National Life Finance Corporation Okinawa Development Finance Corporation
Technical advice	Advice for installing advanced energy saving technology	-Energy saving diagnosis by experts -Measuring energy load -Information disseminated on introduction of energy saving facilities at free of charge	Large size business establishment, local governments	NEDO

	Measures / policies	Contents of the measures / policies	Target	Implementing body (year started)
Technical advice	Diagnosis for factories' energy savings	-Energy saving diagnosis by experts -Measuring energy load -Information disseminated on introduction of energy saving facilities at free of charge	Medium-size factories where annual electricity use was 6-12 million kWh, or fuel annual use (heavy oil and gas) was 1,500-3,000 kWh	Energy Conservation Center
	Promotion of installing facilities for rational use of energy	Information disseminated by energy use rationalization advisors at SEM support center in each prefecture at free of charge Dispatch energy use rationalization experts to factories (pay: 12,400 JPY/ person)	Small and medium corporations	Japan Small and Medium Enterprise Corporation
Development of human resources	Certification for energy managers	Implement national examination	Workers who have more than one year of working experience about energy use rationalization	Energy Conservation Center (1979)
		Implement energy management workshop (Successful participants of the training are certificated as energy managers)	Workers who have more than three years of working experience in energy use rationalization	Energy Conservation Center (1978)
	Training for energy managers	Implement new lectures and training of personnel to increase quality	Training to increase the ability of people to become energy managers	Energy Conservation Center (1998)
Provision of information	Database on energy conservation	-Magazine articles about energy savings -Cases at factory -Energy saving cases overseas -Reference books -Publicize database in monthly magazine "Energy savings" and web-page	Those who have access to Internet	Energy Conservation Center
	Publish monthly magazine "Journal of Energy conservation"	Edit and publicize magazines that introduce 1) Trend in administration, 2) Information about laws 3) Technological information and knowledge 4) Heat and electricity management	People who promote energy saving in division of industry and business	Energy Conservation Center (1948)

	Measures / policies	Contents of the measures / policies	Target	Implementing body (year started)
Awareness Raising	Seminars for energy savings	Co-host seminars for energy saving with SMEs support centers in prefectures. The seminar aims to deepen understanding and knowledge of participants on needs for energy conservation.	Small and medium corporations	Japan Small and Medium Enterprise Corporation
Awards	Awards given for energy management contributors	Promote energy management by giving awards for people who recognized and understood the importance of energy saving, promoted in energy management, and whose achievement is exceptionally outstanding.	Individuals	Energy Conservation Center (1980)
	Awards given for factories with excellent energy management	To rationalize energy use and secure effective use of fuel and electricity, Energy Conservation Center gives award to factories and business establishments who make effort to promote energy management and whose influence was significant and who can be role model to other companies.	Factory or business establishment	Energy Conservation Center (1981)

Source: Energy Conservation Center (ed.), *Sho Energy Binran 2002,* Tsusan Shiryo Chosakai, *Pandect of Energy Saving 1994*

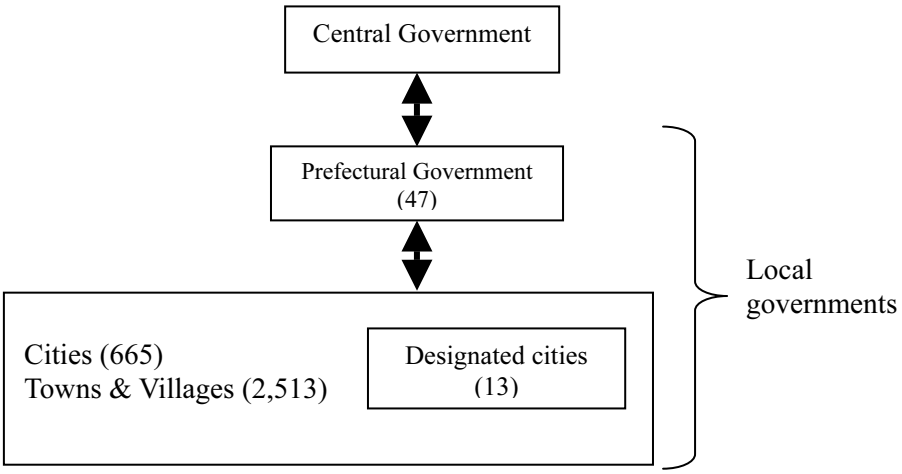
1.7 Industrial Pollution Control Measures by Local Governments

1.7.1 Japanese Local Governments

a. Outline

Under the present Constitution of Japan that was enacted soon after the end of WWII in 1946, the following tenets were adopted as the framework for local self-government: respect for local self-government (Article 92), election of chief executive officers and assembly members by direct popular vote (Article 93), the right of local public entities to manage their local legislation, administration and finances (Article 94), and consent by popular vote of special laws applicable to one local government (Article 95). The present system of local government is operated based on this law.

Government body in Japan is composed of three layers, i.e. central government, prefectures, and municipalities. Policies determined by the central government are implemented by the prefectures and municipalities. Local public entities, i.e. local governments, refer to these prefectures and municipalities. Besides these ordinary local public entities under the Local Autonomy Law, larger cities, designated as cities possessing populations of more than 500,000 (in reality 1,000,000), are recognized as special public entities with wider ranging authority under the same law. There are 13 cities designated in this way (as ordinance-designated cities) as of April 1, 2003[93]. Since large cities are different from small and medium cities and are faced with unique problems, based on the concept that such problems should be dealt with under special systems, various administrative affairs and duties closely linked to the daily lives of citizens have been transferred from prefectural to municipal control. For example, ordinance-designated cities are granted authority with respect to welfare, public health and city planning affairs. Moreover, such authority is expanding to areas that previously required approval or authorization from prefectural governments. In other words, ordinance-designated cities have been granted the same duties and roles as prefectures.



Note: numbers as of April 2003

Figure 1.7.1 Administrative Structure of Japan

In Japan local governments, in particular large cities, have played an important role in environmental pollution control. Air pollution and other types of industrial pollution came

[93] Government-designated cities before 1970 were Osaka, Kyoto, Nagoya, Yokohama, Kobe and Kitakyushu. The cities suffering from Industrial pollution by active industries were Osaka, Yokohama and Kitakyushu.

to the fore from the second half of the 1950s, and responsibility for industrial pollution control was put at the door of the central or prefectural governments under ordinances. However, industrial pollution control was not effective, and meaningful measures failed to be taken.

Municipalities possess little authority regarding pollution control at that time; nonetheless, as Japan entered the period of rapid economic growth, they started taking measures in order to protect the health and living environment of citizens from rapidly worsening industrial pollution. As a result, in large cities especially, based on full understanding of local conditions, various activities including establishment of pollution control ordinances, binding of pollution control agreements, administrative guidance based on scientific knowledge, review of industrial attraction measures and so forth came to be implemented. These measures gained the support of local residents and ordinary citizens outraged over pollution. Pollution control measures by local governments were succeeded by the Basic Law for Environmental Pollution Control enacted in the latter part of the 1960s; moreover, they had a major impact on the legislation and systematization of related laws.

Even now, prefectures and municipalities implement pollutant emission controls based on the Water Pollution Control Law, Air Pollution Control Law and Waste Management Law and the like, and they are empowered to carry out on-the-spot inspections of facilities that discharge pollutants.

During the 1960s and 1970s, when industrial pollution became obvious, many mayors of large cities and governors of prefectures elected were those who were supported by the opposition party. In 1963, an ex-lawyer became the mayor of Yokohama City, and mayors supported by the opposition party were also elected in Sendai City and Kawasaki City, during the 1960s. Also, in prefectures, the Governor of Tokyo in 1967, and the Governor of Osaka Prefecture in 1971, as well as the Governor of Kanagawa in 1975, were ex-academics who were supported by the opposition party. In 1964, the mayor of Yokohama City, Mr. Asukada, was the central figure in the formation of the 'National Reform Mayors Association', and in 1971, the number of mayors in this group was 106. These trends made the Liberal Democratic Party, the administrative party, realize that there was a need for measures to be taken for pollution control.

b. Role of Local Governments

Prior to the Basic Law for Environmental Pollution Control, the Soot & Smoke Control Law, Water Quality Protection Law and Industrial Wastewater Control Law already existed. The Water Quality Protection Law included no provisions for the role of local governments, but the Soot & Smoke Control Law stipulated the roles of prefectures to include acceptance of notifications of smoke emitting facilities, on-the-spot inspections, and environmental monitoring and emergency steps such as the issue of smog warnings.

The Basic Law for Environmental Pollution Control in 1967 made local governments responsible for formulating and implementing pollution control measures. This law stipulated that the role of the national government was to promote pollution control measures from the nationwide standpoint and support local governments, and made local governments responsible for promoting measures and implementing monitoring, control, guidance, and grievance and dispute settlement with respect to air pollution, water pollution and environmental pollution in general.

Environmental pollution control was mainly the responsibility of prefectures. However, following amendment and establishment of related legislation in 1970, ordinance-designated cities were granted the same powers as the prefectures. Municipalities were charged with handling grievances and problems relating to noise, vibration and odor.

1.7.2 Enactment of Environmental Pollution Control Ordinances

Because industrial pollution problems were extremely regional in character, they were considered to be problems that should be dealt with by local governments, as local governments were the governmental bodies closest to the local people[94].

The Tokyo Metropolitan government was a pioneer in this arena when the government formulated the 'Factory Pollution Control Ordinance' in 1949. Since then, the Osaka prefectural government developed the Pollution Control Ordinance for Business Establishment in 1950, and other heavily industrialized areas, such as Shizuoka, Niigata, and Fukuoka prefectural governments and the Kawasaki municipal government, enacted similar ordinances. When the Basic Law for Environmental Pollution Control was enacted in 1967, 23 prefectures out of 46 prefectures and 20 cities out of 560 (only 3.6% of all cities) had some type of pollution control ordinances[95].

There were even cases of pollution control ordinances which had provision for notification of the concerned facilities by companies, or permitting systems for operation.

Following enactment of the Basic Law for Environmental Pollution Control in 1967, and especially after 1970, prefectures and ordinance-designated cities all over the country established ordinances for pollution control.

1.7.3 Voluntary Agreements on Pollution Control

a. Changes in the Number of Pollution Control Agreements

The history of pollution control agreements between local governments and private enterprises can be traced back to an agreement signed in Shimane Prefecture in 1952. However, up until the middle of the 1960s, almost all agreements were concerned with compensation for pollution damage, and numbers were very sparse.

Since then, as seen in the pollution control agreements signed between Yokohama City and an electric power utility operator (the Electric Power Development, Co., Ltd.) in 1964 and between the City of Tokyo and another electric power utility operator (Tokyo Electric Power Co., Ltd.) in 1968, agreements aimed at adopting tough pollution control standards in excess of national controls in order to prevent pollution in advance started to appear. Based on these pioneering models, pollution control agreements became a popular means of preventing pollution on a nationwide scale.

Figure 1.7.2 shows the trend in the number of pollution control agreements (cumulative total number of effective agreements at each year). The number of such agreements increased constantly except for slowdowns at the beginning of the 1980s and middle 1990s, and more than 50,000 such agreements have been concluded in terms of the number of affected establishments.

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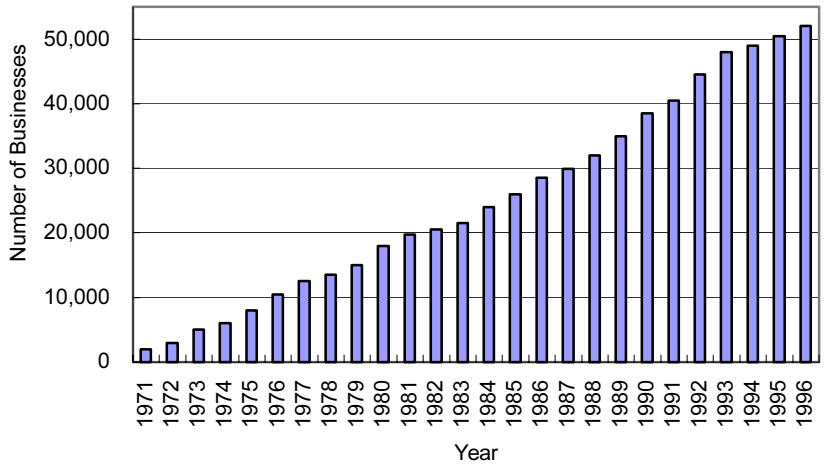
94 Prime Minister's Office and Ministry of Health and Welfare, *1969 White Paper on Environmental Pollution*

95 SATOH Atsushi / NISHIHARA Michio (eds.), *Kogai Taisaku I*, Yuhikaku, 1969, pp.129 -149
The local governments do not include towns and villages.



Note: The graph indicates the accumulated number of pollution control agreements, and does not exclude those already expired for factory relocation and/or consolidation of companies.
Source: Environment Agency, *White Paper on the Environment*

Figure 1.7.2 Cumulative Number of Concluded Pollution Control Agreements (1971-1996)

b. Background to the Spread of Pollution Control Agreements

b.1 Prior to 1971

In the first half of the 1960s, pollution-related health damage became a serious social problem throughout Japan and triggered a wave of strong local resistance. Against this background, due to fears of worsening pollution, it became more and more difficult for large-scale factories and thermal power plants to find their locations. This trend can be illustrated by the abandonment of the plan to develop the Numazu-Mishima petroleum industrial complex in the face of strong resistance by local residents.

Local governments at that time did not possess any legal authority to deal with industrial pollution problems; nevertheless, they were spurred into taking action by demands for the resolution of pollution problems by residents. Pollution control agreements were advanced as a means of responding to such conditions by developing systems to prevent pollution from the start of plant operations and obtaining the understanding of citizens.

In 1964, the same year that development of the Numazu-Mishima petroleum industrial complex was abandoned, there was a citizens' movement opposed to plans for the construction of Isogo thermal power plant (Electric Power Development, Co., Ltd.) in an industrial district specially developed by Yokohama City. In the election for the mayor of Yokohama that year, the opposition party-backed candidate who had pledged measures to deal with pollution was victorious. Yokohama City proposed tough pollution control criteria to the power company and following consultations between both sides, a pollution control agreement was concluded and the construction plan was executed. This agreement contained pollution control measures far stricter than national controls, and it was viewed as an effective means of preventing pollution before it happened. In what became known as the "Yokohama approach," and this agreement became the model for subsequent pollution control agreements.

During the discussions leading up to conclusion of this agreement, the environmental pollution section of the Ministry of International Trade and Industry played an effective

coordinating role by negotiating with the power company and approaching other government agencies[96].

Concerning the sectors targeted by pollution control agreements as of 1970, the four industries of chemicals, iron and steel and metals, electricity and gas, and pulp and paper accounted for approximately 70%, with large-scale establishments in basic materials industries, and the like acting as the main agreement parties.

b.2 1971 Onwards

The Environmental Pollution Diet of 1970 established a set of legislation for pollution control under the Basic Law for Environmental Pollution Control, but major cities and areas containing major industrial concentration frequently adopted stricter controls than national standards through establishing ordinances and compiling pollution control plans. Because monitoring emissions at the outlets was insufficient, more and more local governments placed emphasis on advance notification of pollutant generating equipment, making sure that predicted emission levels conformed to standards, and providing administrative guidance aimed at revising and improving plans.

Many pollution control agreements included pollution control management arrangements between local governments and private enterprises as administrative measures to cover those parts not suited for ordinances. For this reason, the number of pollution control agreements continued to increase even after the general framework of environmental pollution-related legislation was established.

In the first half of the 1970s, following the establishment and revision of environmental pollution-related legislation at the national level, many prefectures amended pollution control ordinances with the emphasis placed on prevention. As one aspect of this, the establishment of pollution control agreements was made compulsory in some cases.

During this period, the sectors of enterprises targeted by pollution control agreements diversified from basic materials industries (chemicals, iron and steel, and pulp and paper), electricity and gas to assembly and processing sectors such as machine manufacturing.

c. Contents and Methods of Pollution Control Agreements

Looking at the contents of these pollution control agreements, rather than focusing on specific areas of pollution (air pollution, water pollution, noise, and the like), many of them placed obligations on enterprises concerning environmental pollution in general.

In terms of the method of agreement, some agreements were concluded with individual enterprises and business establishments according to the category of business, while others were concluded with all enterprises in certain districts as in the case of large-scale coastal industrial complexes.

Pollution control agreements between local citizens and enterprises aimed at preventing pollution in advance also appeared. Examples were; a) pollution control agreement established between the pollution countermeasures committee, composed mainly of local doctors, and a chemical plant in Iwaki, Fukushima Prefecture (1970), and b) the agreement signed between the residents of Mizuho Town in Kyoto Prefecture and a metal processing plant.

During the 1970s, reflecting a tougher attitude towards environmental pollution, more pollution control agreements provided for suspension of operations, compensation for damages, strict liability and on-the-spot inspections, where pollution had occurred.

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[96] ISHII Kuniyoshi, *20 seiki no Nihon Kankyo Shi*, Japan Environmental Management Association for Industry, 2002, p.54
HASHIMOTO Michio, *Shishi Kankyo Gyosei*, Asahi Shinbunsha, 1988, p.76

Other agreements established concrete pollution prevention measures based on consideration of local pollution emission levels, thereby preempting legislative controls based on the viewpoint of total emissions.

After that, as the response to conventional industrial pollution issues, such as air pollution and water pollution, advanced, the fields requiring priority response gradually changed to global environmental issues, industrial waste problems and problems of hazardous chemical substances in minute quantities. Furthermore, environmental management systems like ISO14001 steadily began to spread. In response to these changes, more and more conventional pollution control agreements were revised to wider environmental protection agreements and underwent renewed conclusion.

Table 1.7.1 Number of Pollution Control Agreements
(Between Local governments and Enterprises)

		# of Agreements	Ratio
Pollution in general		26,027	80.5%
Restriction on fuels / raw materials		5,430	16.8%
Restrictions on soot / smoke		11,357	35.1%
Restrictions on wastewater discharge		16,139	49.9%
Restrictions on noise		14,119	43.7%
Restrictions on vibrations		11,053	34.2%
Restrictions on odor		10,655	33.0%
Industrial wastes		11,180	34.6%
Other pollutions		4,861	15.0%
Environmental improvements such as increasing greenery		12,874	39.8%
Penalties for violation		9,861	30.5%
Responses for pollution occurrence		17,471	54.1%
	Cease operation or pay compensation	14,798	45.8%
	No-fault compensation	4,274	13.2%
On-site inspection related		18,359	56.8%
Community involvement	Interested party	2,260	7.0%
	Observer	2,148	6.6%
Total agreements		32,316	100.0%

Note: Number of valid agreements as of March 31, 2001 (between local governments and corporations)
Source: Ministry of the Environment, "Environmental Protection Measures by Local Governments 2002"

d. Assessment of Pollution Control Agreements

The voluntary agreement, arranged between a company and a local government, plays an important role in demonstrating the attitude of the local government towards industrial pollution control and in supplementation and coordination of industrial pollution control measures that are not covered by laws and regulations.

The voluntary agreement is advantageous to both the company and the local government. The local government can reduce costs for information collection, legislation, and compliance monitoring, since companies maintain data about their pollutants and their measures for pollution control. Companies can be more flexible in selecting pollution control options under the agreement, which have led to implementation of rational pollution control.

Pollution control agreements gained their popularity due to the following advantages:

(i) Pollution control agreements made it possible to take appropriate and timely measures in accordance with geographical and social conditions specific to the local areas and to complement national environmental pollution control legislation.
(ii) Since many pollution control agreements set numerical targets for future pollution control, they were effective in encouraging the introduction of pollution control measures and development of pollution control technologies aimed at attaining these goals.
(iii) Since local citizens often impede building factories for location and operational concern, it was more realistic and made sense, even from enterprises' standpoint, to conclude pollution control agreements with local governments rather than striving for the consent of citizens.

At the same time, the voluntary agreement might have a low feasibility in industrial pollution control because it depends on the company's discretion and enforcement power may be weak. The local government and the company must clarify and understand the expectations and demands of each side before the conclusion of the agreement in order to realize an effective agreement.

A factor behind the prevalent establishment and effective functioning of the voluntary agreement in Japan is the trust that companies have gained from the local people and municipalities, after many years of effort.

e. Requisites of Pollution Control Agreements[97]

The experience of Yokohama City indicated that the following conditions were required in order for pollution control agreements to be effective:

- The contents of agreements should be established based on scientific and technical viewpoints, but never on an abstract or ethical basis.
- Stringent agreements are not always desirable. Agreements need to be adjusted taking into account economy, technology and the capacity limits of the local enterprise.
- In order to check whether or not the enterprise can fully implement agreements, administrative authorities need to understand the most feasible pollution control technologies. Accordingly, it is desirable for local governments to ensure that sufficient numbers of their personnel have the proper training and education. Also, if local personnel acquire know-how of advanced technology, they must concentrate on that type of work.
- It should be understood that pollution control agreements are not concluded for the sake of enterprises and administrative authorities but primarily for the welfare of citizens.

BOX: Yokohama Approach to Pollution Control Agreements

In the mid-1960s, when local governments did not have any legal authority to take pollution control measures, the first pollution control agreement was hammered out as a result of the independent efforts of Yokohama City Government. The discussion-based agreement obtained by the city constituted an oath by the target enterprise to implement necessary pollution control. The city, with the backing of citizen movements and the consent of the company about to build the target plant, was able to take the initiative in the implementation of pollution control measures.

The pollution control agreement adopted by Yokohama differed from other two types of agreement adopted in Yokkaichi and Numazu-Mishima. In the case of Yokkaichi, measures were implemented as post-facto countermeasures to pollution caused by plant

[97] EX Corporation, "Japan's Experience in Urban Environmental Management", Metropolitan Environment Improvement Program, World Bank, 1996

construction; whereas in the case of Numazu-Mishima, plans for the construction of a plant were eventual scrapped in the face of a fierce and organized opposition campaign by citizens.

Due to its unique nature, the Yokohama pollution control agreement was described as the "Yokohama style." The introduction and success of this Yokohama style pollution control agreement, aimed at preserving the health and living environment of citizens, was wholly down to the initiative of the Mayor of Yokohama. At that time, local governments were not permitted to independently enact ordinances establishing standards and methods stricter than the national legal framework, however, the Yokohama style broke from such conventional thought.

The agreement, based on scientific data, current and future projections of air pollution, and best available technology (BAT) for pollution control, established the maximum possible pollution control targets. It was far stricter than laws and prefectural ordinances established later on, however, the company involved accepted the standards as being scientifically rational since they were backed up by large-scale monitoring and wind tunnel experimentation.

This agreement also played a major part in the introduction and development of advanced technology. For example, it led to the introduction of the first LNG power generation and concentric stacks in Japan.

The first pollution control agreements targeted new plants, but later agreements came to target existing industrial facilities. Even after related laws and regulations were established, the contents of the Yokohama style agreement remained revolutionary. For example, it applied stricter control levels than the law and introduced total amount control of pollutants compared to the concentration regulation under the law.

1.7.4 Pollution Control Organizations and Budgets

a. Public Pollution Control Organizations in the Government

Pollution control department at the local level were established ahead of the Environment Agency at the national level. Prior to enactment of the Basic Law for Environmental Pollution Control in 1967, prefectures designated by the government under the Soot & Smoke Control Law of 1962 (for example, Tokyo and Osaka Prefecture, and the like) were given the duty of registering and monitoring smoke-generating facilities and taking steps in emergency situations. Accordingly, prefectures containing designated areas established administrative departments to deal with environmental pollution control.

Cities with no legal authority initially only assigned personnel to deal with complaints and grievances, but out of the growing need to respond to pollution issues, cities such as Osaka, Yokohama and Kitakyushu established their own organizations for that purpose.

Following enactment of the Basic Law for Environmental Pollution Control, similar organizations came to be established at the prefectural level. As of 1968, 34 municipalities possessed section or subsection organizations (see Table 1.7.2).

As of July 1970, one year prior to establishment of the Environment Agency, specialist pollution departments or sections (including temporary sections) had been established in 37 out of 47 prefectures[98]. In October 1971, when the Environment Agency was established, the number had increased to 46 prefectures, 255 cities and 16 towns, while another 282 cities, 606 towns and 104 villages had specialist pollution subsections (or groups). Therefore,

[98] Prime Minister's Office and the Ministry of Health and Welfare, *1971 White Paper on Environmental Pollution*

there was great expansion and strengthening of pollution-related organization within local governments at this time[99].

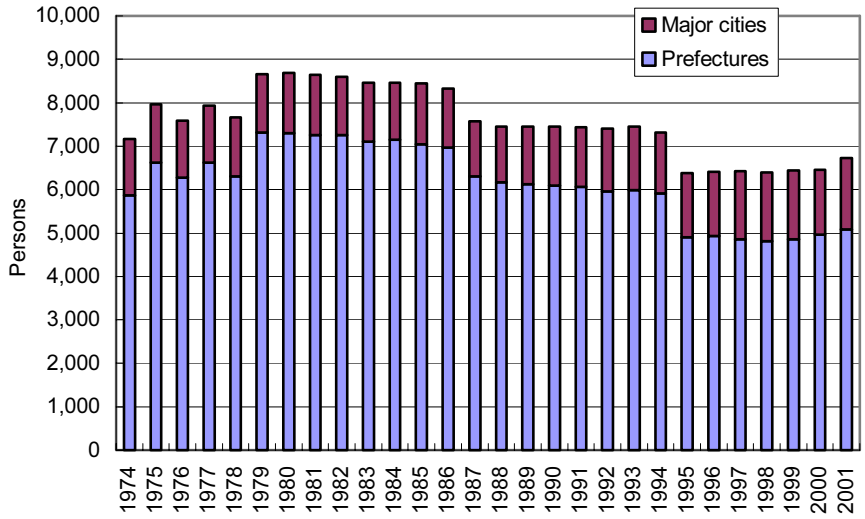
As of July 1970, the number of local government personnel engaged in pollution control affairs reached 3,046, consisting of 1,300 in prefectural governments and 1,746 in municipal governments. In 2001, the number of employees engaged in environmental administration in all local governments was approximately 16,000 in total, breaking down into 5,080 in prefectures and ordinance-designated cities and 9,527 in municipalities[100].

Table 1.7.2 Establishment of Dedicated Sections for Pollution Control in Prefectural Governments (1960-1968)

	Section	Sub-section	Total	Total number of pollution related (sub) sections (with sections set up prior to enactment of Law)
1960	1	0	1	1
1961	0	0	0	1
1962	1	0	1	2
1963	2	2	4	6
1964	2	1	3	9
1965	2	1	3	12
1966	2	3	5	17
1967	8	5	13	30
1968	4	0	4	34
Total	22	12	34	

Source: Prime Minister's Office / Ministry of Health and Welfare, *1969 White Paper on Environmental Pollution*

In particular, the number of personnel engaged in environmental administration (excluding natural conservation) in prefectures and ordinance-designated cities reached 8,681 in 1980, although it diminished slightly after that.

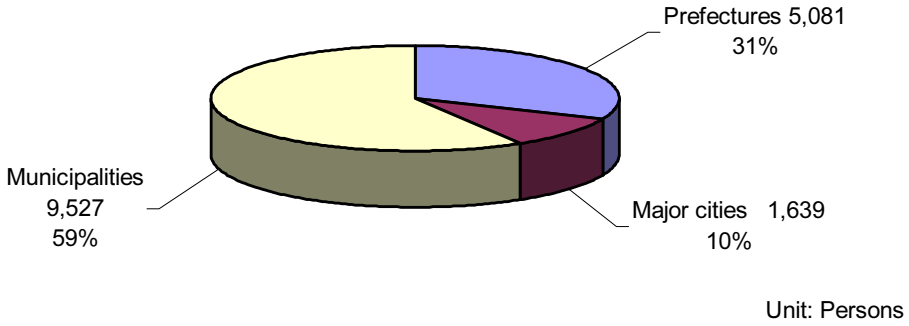


Note: Nature Conservation, Waste, and Sewage excepted
Source: Ministry of the Environment, *2003 Environmental Statistics*

Figure 1.7.3 Changes in Number of Environmental Officers in Prefectural and Designated City Governments (1974-2001)

[99] Environment Agency, *1972 White Paper on Environment*
[100] Ministry of the Environment, *2003 Environmental Statistics*

Existing research institutions found it increasingly difficult to respond to the demand for pollution monitoring, survey and analysis and to achieve the systematic implementation of pollution controls. Accordingly, there was a growing need for pollution centers or pollution research institutes linked to pollution departments, and as of July 1970 such centers and institutes had been established in 14 prefectures and one ordinance-designated city. By 2003, 47 prefectures and 12 ordinance-designated cities had established local environmental research bodies[101].



Source: Ministry of the Environment, *2003 Environmental Statistics*

Figure 1.7.4 Environmental Officers in Local Governments

b. Establishment of Councils

As of 1968, 199 local governments had established organizations for deliberating on the basic items of pollution control measures, adjudicating pollution disputes, processing grievances, and carrying out liaison and coordination for pollution control measures. Now, such councils can be found in all prefectures and ordinance-designated cities. As of 2001, 856 councils concerned with environmental matters and 432 concerned with pollution matters had been established[102].

c. Establishment of Monitoring Setups

Establishment of monitoring systems gathered pace after the Soot & Smoke Control Law of 1962 made prefectures responsible for carrying out continuous monitoring in designated areas. As of 1967, almost all prefectures had installed automatic analyzers and were conducting monitoring on sulfur oxides. Moreover, another four prefectures had established monitoring data and centralized management systems based on telemetry. The number of permanent monitoring stations in February 1971 was 140 in 21 prefectures and 85 in 13 ordinance-designated cities[103]. Within one year, this had increased to 321 stations in 42 prefectures and 176 stations in 43 ordinance-designated cities, indicating just how quickly the air pollution monitoring and measurement system spread.

As for water pollution, 30 prefectures and five designated cities[104] conducted periodic monitoring and measurement at more than 2,000 points throughout the country, as of 1969[105].

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[101] The data is shown in web-links of National Institute for Environmental Studies. Now it is hard to find institutes whose names include "Pollution", as they have changed the word to "Environment", as in "Environmental Center". Many pollution centers were previously local institutes for public health, and they expanded the operations of these institutes. In most of these facilities, they play either one or both roles as centers for health and environment or center for environment and health research.

[102] Ministry of the Environment, *2003 Environmental Statistics*

[103] Designated by the enforcement ordinance of the Air Pollution Control Law.

[104] Designated by the enforcement ordinance of the Water Pollution Control Law.

[105] *1970 White Paper on Environmental Pollution, 1971White Paper on the Environment* and *1972 White Paper on the Environment*

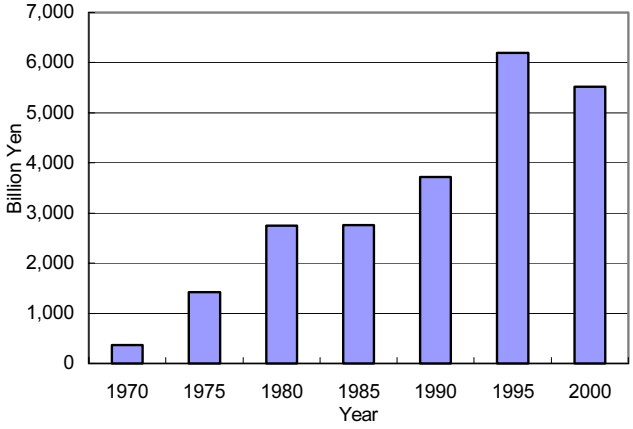
Looking at the situation in terms of monitoring and measuring equipment installation, as of July 1970, 2,330 sets were installed for air pollution, 614 for water pollution and 1,318 for noise and vibration. In terms of automatic measuring devices, the numbers were 215 with respect to air pollution and 12 for water pollution[106]. In order to analyze wastewater and exhaust gas samples from the emission sources that required monitoring activities, analysis facilities at the above-mentioned pollution centers and public health centers were utilized.

d. Pollution Control Budgets

Pollution control budgets in local governments started to increase following enactment of the Basic Law for Environmental Pollution Control in 1967. By the time the framework of environmental legislation was established in 1970, the said budgets amounted to approximately 370 billion JPY, and they increased by 3.8 times to 1,400 billion JPY 5 years later, 3,700 billion JPY by 1990, and 5,500 billion JPY by 2000.

Almost all these budgets were spent on construction of sewage systems and waste treatment/disposal facilities. Of the total budgets in 1975, prefectures bore 37% and municipalities 63%. The share of municipalities increased further to 80% by 2000, indicating that municipalities were mainly responsible for sewage development.

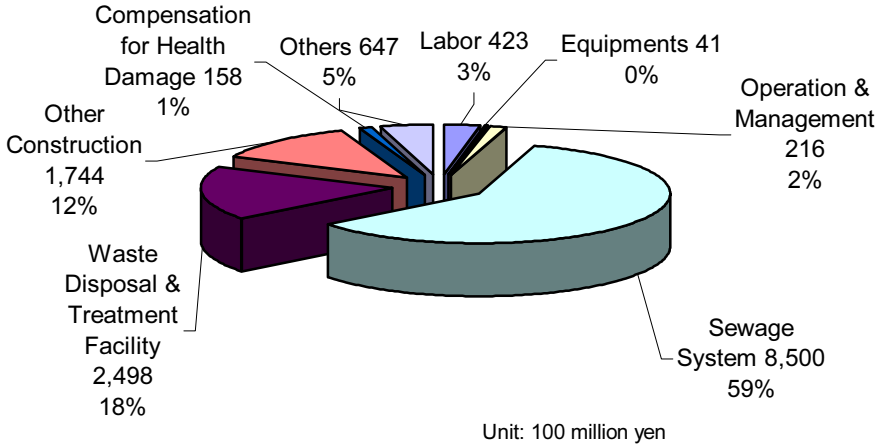
As indicated in the following breakdown of pollution control budgets, general budgets consisting of personnel expenses, equipment purchase costs and administration expenses were 68.1 billion JPY and accounted for just 4.5% of total budgets in 1975.



Source: Prime Minister's Office / Ministry of Health and Welfare, *White Paper on Environmental Pollution*
Environment Agency (Ministry of the Environment), *White Paper on the Environment*

Figure 1.7.5 Shifts in Pollution Control Budget in Local Governments (1970-2000)

[106] Ministry of Home Affaires, *Pollution Control by Local Governments,* Daiichi Hoki Shuppan, 1971



Source: Environmental Agency, *1977 White Paper on the Environment*

Figure 1.7.6 Details of Pollution Control Costs in Local Governments, 1975

1.7.5 Case Studies at Major Local Governments

The following sections introduce the experiences of the three ordinance-designated cities -- Yokohama, Osaka, and Kitakyushu -- that played pioneering roles in the establishment of industrial pollution control measures in Japan. Since legal authority to implement pollution control measures was granted to ordinance-designated cities in 1971, our focus will be directed to activities prior to that year.

a. Yokohama City[107]

a.1 Emergence of Problems

Rapid growth in population and industrial activities in the years following WWII triggered expansion of the urbanized area and unplanned land use.

By the mid-1960s, approximately 90% of sulfur oxides (the prime cause of air pollution) in Yokohama were discharged from large-scale factories located in the existing coastal industrial district. Moreover, it was predicted that a similar amount of sulfur oxides would be emitted from large factories in a new coastal industrial district. However, because Yokohama City did not have authority to impose direct pollution controls, it was only able to monitor the SOx levels and deal with complaints on a case-by-case basis.

a.2 Citizens Movements

Air pollution in coastal industrial districts became a serious problem from the start of the 1960s, and citizens harbored concern against the influx of large number of enterprises to these areas. This eventually led to the formation of the civic organization known as the Naka-Isogo Districts Environmental Sanitation Protection Committee in April 1964. This group called on the central government, prefecture and city to take pollution control measures. The citizens' actions against industrial pollution in Yokkaichi and Numazu-Mishima also had an effect on this movement.

[107] EX Corporation, "Japan's Experience in Urban Environmental Management - Case Study Yokohama", Metropolitan Environment Improvement Program, World Bank, 1996
SARUTA Katsumi, "Chiho Jichitai ni yoru Kogai Taisaku no Tenkai - Yokohama Hoshiki wo Chushin nisite", Asia ni okeru Kankyo Seisaku no Keisei Jisshi Katei Kenkyukai, Institute of Developing Economies (ed.), "Nihon no Kogai Taisaku Keiken ni kansuru Hearing no Kiroku", 2002, pp.1-16
Japan Society for Atmospheric Environment (ed.), *Nihon no Taiki Osen no Rekishi III*, 2000

a.3 Actions by the Municipal Government

It was against this background that an opposition party-backed mayor was elected on a platform pledging improvement of the living environment for citizens and greater citizen participation in the municipal assembly. This signaled a change in the city's previous policy of giving priority to attracting factories to its industrial district. Although Yokohama City at that time possessed no legal authority concerning pollution control, when a request was made to the city to grant land that had been created for Tokyo Electric Power to Power Supply Development Co., Ltd. for construction of a coal-fired power plant, the new mayor decided to treat the matter not simply as a pollution issue concerning a single power plant, but rather from the viewpoint of general environmental control in the coastal industrial district.

In order to implement measures, the city established pollution control section with 7 staffs in the public health division of the sanitation department and established the Yokohama City Pollution Control Conference composed of citizen representatives, academics and industrial representatives. The conference examined criteria concerning the concentration of gas emissions and the height of stacks at the power plant based on local air pollution surveys and scientific experimentation including wind tunnel tests and dispersion experiments. After debates with the industries based on these scientific data obtained from current and future projections of air pollution and data based on scientific experimentation, Yokohama City arrived at a pollution control agreement containing agreed numeric values by the end of 1964.

At the same time, the city established its pollution center composed of 10 municipal staffs specializing in such fields as environment, chemistry, electricity, machinery and law, and the like. All staff members were with higher education. These staff members were very interested in environmental issues and displayed a great deal of passion and dedication in their work.

a.4 Pollution Control Measures

The main pollution control measures adopted were as follows:

- Establishment of an automatic monitoring station (Japan's first telemetry system in 1965)
- Promotion of pollution control agreements with planned and existing large-scale factories in coastal districts
- On-the-spot inspections based on pollution control agreements
- Implementation of the Kanazawa reclamation project
- Information disclosure

The Kanazawa reclamation project was a plan to develop an industrial estate for relocating SMEs from mixed residential and industrial districts in the city. The reclaimed site was provided with a 50 m green buffer zone separating the industrial district from the residential area. Funding for the green buffer zone was provided by the Pollution Control Service Corporation.

The industrial estate was equipped with a common wastewater treatment plant, which was constructed using a low-interest loan with a 30-year payback period from the Pollution Control Service Corporation. Yokohama City subsidized part of the interest payments. Relocation to the new industrial estate was started in 1981, and the city provided exemptions for property tax, corporate tax and real estate acquisition tax in order to mitigate the financial burden of relocating SMEs.

Moreover, in order to secure the confidence of citizens, the city actively disclosed the results of scientific surveys conducted by the city and enterprises regarding the contents and effects of the agreement.

a.5 Response of Factories

As the pollution control demands from general citizens became more vociferous, accepting pollution control agreements before commencing plant construction became an important factor for enterprises when concluding land sale contracts ahead of location in the new coastal industrial district.

In the following years, Yokohama City concluded pollution control agreements with already existing factories too, and a number of important factors lay behind their success. Firstly, enterprises were able to understand the Yokohama style prior to concluding pollution control agreements for new factories. Secondly, as public opposition to environmental pollution grew, it was essential for enterprises to obtain the consent of the local government and citizens for their plant construction and expansion works to ensure the future success of their businesses. Thirdly, enterprises realized that pollution control measures in the long run were not so expensive and that they could handle major investment in the initial stage. Finally, seen from the viewpoint of plant construction, the signing of a pollution control agreement basically signified approval of an enterprise's pollution control by Yokohama City, thus paving the way for building good relations with citizens.

a.6 Response of Citizens

Active disclosure of information by the city and visible improvement in the environment generated understanding and trust in the city's policies among citizens. Citizens' movements continued to support the city's pollution control measures.

b. Osaka City

b.1 Prewar Situation

The coastal belt in the western part of Osaka was not only a production center of industrial goods already for domestic consumption, but also a center of air pollution before WWII. Air pollution caused by smoke from factories here, inevitably, developed into a serious problem during the wartime. In response to this, Osaka City cooperated with Osaka Prefecture in implementing improvement measures, and these activities deepened awareness of pollution among enterprises and citizens. Meanwhile, the city provided guidance on improving coal burning methods, monitored dust fall and conducted surveys on the economic impacts of pollution, and the like. These activities provided valuable data on air pollution in the postwar period.

b.2 Postwar Pollution

During the period of economic regeneration and growth following the war, soot, smoke and dust problems caused by coal combustion, and ground subsidence problems caused by excessive pumping of groundwater became apparent. In particular, ground subsidence led to massive damage at times of flooding. In response to this, Osaka City implemented a series of ground subsidence measures that succeeded in halting the problem in a short time.

b.3 Actions by the Municipal Government

Osaka City compiled a plan of control measures for air pollution, which had worsened even more. Fortunately, because the city's public health department and sanitation research center possessed an extensive store of air pollution monitoring and measurement data and technical personnel, it did not take very long to determine the required air pollution control measures. In particular, abundant know-how was available in both the public and private sectors regarding methods for air pollution surveys.

A data network including extensive monitoring (improved monitoring techniques) was built for the survey. Visual monitoring was implemented together with the introduction of automatic measuring equipment to survey air pollution conditions.

In 1958, prior to the national level legislation, the city established a smoke control organization of local enterprises and established a smoke control month in response to complaints over pollution-related damages. These measures originated from the smoke control measures adopted before the war.

Moreover, the Osaka City Pollution Control Council, which was established in 1962, had adequate members of public health and labor sanitation experts, who played a guiding role in the organization of an administrative strategy from the public health viewpoint.

In particular consideration of the unique circumstances of Osaka, the council designated the coastal industrial belt in the west of the city as a special area and further divided it into the large enterprises district and the SMEs district. The council then recommended to the city government that it simultaneously implement two sets of measures. As measures for the large enterprises district, Konohana District special measures were required. This entailed categorizing existing large enterprises into groups according to technical similarities and having each group compile a plan of pollution control measures. As a result, the city was able to deal with this district without using a lot of its own engineers. Meanwhile, measures in the SMEs district were implemented by the Nishi Yodogawa Pollution Control Special Measures Headquarters. Because the enterprises here did not have capacity to implement their own plans, the city deployed many engineer staffs in an effort to improve conditions at numerous factories in a short time.

Because the large enterprises were able to utilize national funds for the measures, Osaka City channeled its support into the SMEs. Based on a survey of SMEs, the city established two such systems -- the Osaka City Pollution Control Equipment Loan Scheme and a scheme to support purchasing of industrial land for the relocation of pollution-generating facilities (1967). The latter of these systems resulted in the mass relocation of factories out of residential areas.

Osaka City possessed abundant data as a result of its air pollution monitoring network as well as accurate data on factors causing factory smoke, for example, scale of facilities, fuel used, raw materials, height of stacks, and so on, which had been obtained in surveys conducted at numerous plants. Also, by means of simulation utilizing the diffusion factors obtained in air tracer experiments, it calculated the pollution impact and pollutant reduction rate of individual factories. As a result, the city was able to conduct persuasive and scientific debate with business owners and engineers. Environmental impact data from each factory had a major impact in resolving the city's industrial air pollution problems. In districts of high-concentration pollution, the city needed to establish its own standards because national standards were not stringent enough. The above examples clearly indicate the way in which the city enlisted the participation of business owners in its pollution control measures.

Anti-pollution campaigns by the mass media (newspapers and television) sprang up during the 1960s. These raised the awareness of citizens about the benefits of pollution control carried out prior to pollution warning levels, and also had an impact on the new mayor, who was interested in urban pollution control. These campaigns also contributed to the establishment of environmental pollution-related legislation on the national level.

Osaka City won a great deal of public backing fanned by this mass media coverage, and was thus able to promote anti-pollution control measures despite not having any legal authority with respect to factory owners.

Enterprises at first resisted pollution control, looking on them as impediments to industrial growth. However, as pollution conditions worsened every year, enterprises themselves were confronted with the adverse impacts of pollution on the working environment. Thus, enterprises belatedly acquired a sense of social responsibility. Activities on the part of industry also became more significant with the establishment of the industrial pollution

control measures research group under the Osaka Industry Association (1968) and the industrial pollution counseling center under the Osaka Chamber of Industry and Commerce.

Smoke management associations were set up in each district and proved extremely effective in conducting pollution control measures. Also, numerous pollution control technologies were developed, and improvements were made to pollution control equipment in factories. The factories provided numerous proposals and much technical information to the municipal government's engineers. The good sense and sincerity displayed by Osaka's factories in this way was worthy of the highest respect.

The "Quiet Town Campaign" demonstrated that pollution could be resolved not only by ordinances but also through the efforts of each and every citizen. Osaka planned measures that were based on scientific validation and it also obtained the support of citizens and the mass media. At the same time, this campaign stimulated awareness of social responsibility among enterprises and encouraged cooperation with its efforts. This success was underpinned by Osaka's tradition of citizen self-government dating back 400 years.

c. Kitakyushu City[108]

c.1 Pollution Generation

Kitakyushu was formed as a result of amalgamation of five neighboring cities in 1963 and subsequently developed as one of Japan's representative industrial districts. Its symbol in the past was "seven-colored smoke," which contained dust and sulfur dioxide. Kitakyushu was home to numerous large-scale enterprises in the iron and steel, pharmaceuticals, ceramics and electric power industries, and these enterprises were already major sources of air and water pollution before the start of WWII. These problems deteriorated even more during the postwar reconstruction and the period of rapid economic growth from 1955 to 1965. Citizens living in the districts containing these ceramics, pharmaceuticals and iron and steel concerns suffered health damages as a result of major ash fall, smoke and odor.

c.2 Citizens Movements

In the 1950s, citizens had kept silent about pollution from steel plants. The Fukuoka prefectural government enacted a pollution control ordinance in 1955, but Yawata Works which was the central enterprise of pollution generation was not targeted by any regulation during 1950s. Yawata citizens had a sense that their life was supported by smoke from Yawata Works, so hesitated to criticize the Works. Pollution problems had been kept unregulated with this sentiment of citizens which put a high priority on enterprises[109].

Women's associations in the areas around the industrial districts sent a petition to the city complaining about the dirtying of laundry as a result of soot and smoke air pollution in 1951. After this, residents' associations and women's associations demanded that enterprises make improvements and lobbied the city to mediate in 1960. In 1963, the Tobata District Conference of Women's Associations, with a membership of approximately 6,000, conducted a survey to record the actual state of pollution and sought improvements from enterprises based on the results.

c.3 Movements by the Municipal Government

Kitakyushu City was lobbied to take actions prior to the implementation of full-scale pollution control measures on the national level.

Even before the formation of Kitakyushu City, for example, Tobata City had started measurements of dust fall in 1958, and the Kitakyushu Five Cities Committee on Air

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[108] EX Corporation, "Japan's Experience in Urban Environmental Management", Metropolitan Environment Improvement Program, World Bank, 1996
Kitakyushu City, *Kitakyushushi Kogai Taisakushi*, and *Kitakyushushi Kogai Taisakushi - Kaiseki Hen*, 1998

[109] SHOJI Hikaru / MIYAMOTO Kenichi, *Nihon no Kogai*, Iwanami Shoten, 1975, p.40

Pollution Control Measures was established in 1959 in order to coordinate between each city and initiate full-scale investigation of pollution conditions.

At the time of establishment of Kitakyushu City in 1963, an environmental pollution subsection consisting of four members was established in the public health division of the health department. Then, following the total application of the Soot & Smoke Control Law in 1965, a pollution control division was newly established with the guidance section of four staffs and the survey section of three staffs. Moreover, in order to provide a scientific response to pollution problems, Kitakyushu City Health Research Institute (eight members under the director) was newly formed and commenced analysis, survey and research activities on pollution control measures.

The Pollution Control Measures Council was established in 1963, and various measures were implemented based on its reports.

The major air pollution control measures implemented by Kitakyushu City from before its inauguration up to 1970 were as follows:

- Survey of dust fall
- Special survey of air pollution (1966)
- Installation of air pollution automatic measuring devices (sulfur dioxide, suspended particulate matter) (1964), establishment of an air pollution constant monitoring setup based on telemetry (9 observation posts) (1970)
- National Kitakyushu Air Pollution Measurement Center (1966)
- Epidemiological survey utilizing national health insurance cards (1962-1967)
- Child epidemiological survey (4 times from 1965 to 1969), adult epidemiological survey (1966)
- Environmental pollution patrols (from 1961)
- Smog warning system (1964)
- Implementation of factory pollution diagnoses consigned to experts (213 factories, 1,452 facilities) (1963-1968)
- Pollution control agreement (1967): 11 in total up to 1970
- Pollution control fund loan system (executed in 1968)
- Pollution control ordinance (1970)
- Kitakyushu Air Pollution Control Liaison Council (1970): 30 enterprises, 32 factories

The Fukuoka Branch of Ministry of International Trade and Industry in 1969 commenced a comprehensive preliminary survey of industrial pollution with a view to achieving the environmental standards for sulfur oxides by 1975. In this survey, wind tunnel experiments were implemented and pollution was predicted based on measured data of diffusion from each smokestack at 55 factories[110]. Based on the findings, the city made 47 enterprises and 55 factories submit improvement plans and concluded pollution control agreements based on those contents with 54 plants in 1972.

As a result of amendment of the cabinet order under the Air Pollution Control Law in February 1970, the prefectural governor granted the city the right to issue smog warnings. Kitakyushu was the only city in the country to be given this right at that time. This was permitted because of the location of Kitakyushu far away from the prefectural seat of government in Fukuoka. With the delegation of this authority, the system was established for issuing sulfur oxides air pollution warnings to enterprises and also demanding reductions of emissions.

[110] The first wind channel experiment was conducted by Fukuoka Bureau of International Trade and Industry from 1969 to1971 as a part of the Industrial Pollution Comprehensive Preliminary Survey covering the Kitakyushu area. The second wind channel experiment was carried out by the municipal government of Fukuoka from 1973 to 1975.

Following the enactment of environmental pollution-related legislation by the Environmental Pollution Diet at the end of 1970, pollution control in Kitakyushu was greatly strengthened and came to be implemented in a comprehensive, general and stable manner.

In 1973 in response to revision of environmental standards for sulfur oxides, a second round of wind experiments was implemented, and the results were utilized in compiling measures for reducing sulfur oxide emissions.

These efforts resulted in a dramatic improvement in the air and water environment of Kitakyushu, and it was introduced in the OECD White Paper on the Environment as a city that had succeeded in transforming from a "city of gray" to a "city of green."

c.4 Approach Based on Public and Private Cooperation

From the city's viewpoint, it was necessary to find ways to protect the health of citizens while at the same time promoting development of industry. Accordingly, the city established the Kitakyushu Air Pollution Control Liaison Council in 1970 with the objective of building a cooperative relationship between administration and industry. With this organization in place, ample debate and exchanges of opinions took place between the local government and enterprises. This process guaranteed the efficacy of pollution control agreements that were based neither on strict controls nor ordinances.

On hearing the results of examination on sulfur oxides control based on wind tunnel experiments targeting the above enterprises (emission sources), the city proposed maximum ground concentrations to be complied with by enterprises. Moreover, each enterprise in 1972 prepared reduction plans based on their preferred methods in order to promote the necessary measures. This approach guaranteed equal treatment for different enterprises and also provided a great deal of persuasion to business leaders at headquarters.

c.5 Response of Enterprises

In order to respond to the system of sulfur oxide air pollution warnings and reduction requests based on the transfer of authority to issue smog warnings in 1970, enterprises assigned environmental personnel and made efforts to prepare in-house organizations capable of responding to pollution reduction demands by the city government. They also established internal setups for preparing the abovementioned sulfur oxide reduction plans.

It is interesting that the majority of pollution control technologies introduced by companies were CP technology, since this was not primarily intended to remove pollutants. Enterprises adopted numerous pollution prevention technologies in order to cut down the pollution.

d. Characteristics of the Three Cities

Characteristics common to the above three cities can be summarized as follows[111];

a) Citizens started movements to oppose the pollution, calling on and putting pressure on the city governments to resolve the problems. Citizens' grievances were sent to the local governments. The outcomes of mayoral elections were affected (Yokohama and Kitakyushu).
b) In response to this pressure, the city governments built mechanisms for surveying and monitoring pollution and damage, implementing scientific surveys and examining pollution control measures based on the obtained data, even though they were under no legal obligation to do so. When it came to seeking control

[111] FUJIKURA Ryo, "Nihon no Chiho Kokyo Dantai no Iosankabutsu Taisaku – Kodo Keizai Seityoki ni Jissisareta Kogai Bosi Kyotei to Gyosei Shido", TERAO Tadayoshi / OHTSUKA Kenji (eds.), *Kaihatsu to Kankyo no Seisaku Katei to Dynamism - Nihon no Keiken Higashi Asia no Kadai*, Institute of Developing Economies, 2002, pp.64-72
EX Corporation, "Japan's Experience in Urban Environmental Management", Metropolitan Environment Improvement Program, World Bank, 1996

measures from enterprises too, rather than making demands from an ethical standpoint, they made proposals based on scientific data and surveys concerning control technology. As a result, the enterprises had no choice but to accept the proposals.

c) Trust relationships were formed between administration and industry through cooperation and appropriate communication. In Osaka and Kitakyushu, workshops and liaison councils were staged so that both sides could communicate with each other. In Yokohama, although such forums did not exist, the authorities and enterprises communicated with each other on a one-to-one basis when negotiating pollution control agreements. In particular, because the administration side adopted a rational (not emotional) approach based on scientific data, it was able to secure the confidence of enterprises.

d) As a result of carrying out information disclosure, it was possible to win a certain amount of public confidence with respect to administration.

e) Section or division in charge of pollution was formed in the city government, expert staffs were assigned, and cooperative relations were built with external experts and research agencies.

f) As enterprises became aware of their social responsibility, understanding was nurtured among top management and in-company technical groups charged with examining industrial pollution countermeasures were established.

g) Mass media supported citizens' movements.

h) Tense relations were sustained between citizens, enterprises and administration.

i) With respect to SMEs, Yokohama and Osaka municipal governments implemented industrial estate relocation measures and built local economic support systems. Kitakyushu also created an economic support system. Particularly in the case of Osaka, municipal employees provided consulting to factories and supported control.

1.8 Measures to Promote Pollution Control by Industry

1.8.1 Systems to Promote Industrial Pollution Control by Industry

To stimulate industries to take actions against industrial pollution, Japan has introduced economic incentives such as public financing and preferential tax treatment, support for technology development and information provision, establishment of internal organizations within companies, human resource development, relocation of factories, and voluntary agreements on industrial pollution control.

An outline of such efforts is shown below.

Table 1.8.1 Government Promotion of Industrial Pollution Control

Economic incentives to promote investments	- Low interest loans by public financial institutions - Preferential tax treatment (special depreciation of facility, reduction of fixed asset tax)
Support for technical development	- Support system for technical development
Development of industrial complexes	- Utilization or restriction of land for industrial purposes by urban planning or three major metropolitan development laws - Factory location policy, attraction plans for industrial complex - Notification by Factory Law - Factory location suitability study
Technical guidance / provision of information	- Provision of relevant information through concerned institutions
In-house organization / human resource development	- Pollution Control Officer requirements

1.8.2 Economic Incentives

a. Legal Basis

Article 24 of the Basic Law for Environmental Pollution Control, enacted in 1967, stated the following: “the central and local governments must strive to take the necessary financial, tax and other measures concerning development of facilities for controlling pollution by business owners,” and went on to stipulate, “in implementing the aforementioned measures, special consideration must be shown with respect to SME owners.”

Environmental legislation thus stipulated the responsibilities of the national government, and measures for economic support, which have continued until the present day, were implemented in accordance with the assigned responsibilities.

b. Public Financing

In the area of public financing, numerous institutions started to provide finance for industrial pollution control. These included the Japan Development Bank which started a loan system in 1960; the Small Businesses Modernization Funding Scheme began in 1963; a loan system was started by the Japan Finance Corporation for the Small and Medium Enterprise and the Pollution Control Service Corporation in 1965; and loan systems were initiated by the Small and Medium Enterprise Promotion Corporation and People's Finance Corporation in 1968 and 1970 respectively. These funding systems were also utilized in pollution control.

The characteristics of each scheme are summarized in Table 1.8.2.

Table 1.8.2 List of Public Loans for Pollution Control

Financial Institution	Year Begun	Target Company	Type of Target Facility	Characteristics
Japan Development Bank	1960	Large company	Individual	Through mediation by the Ministry of International Trade and Industry
Small and Medium Enterprises Modernization Fund	1963	SMEs	Individual	Contact through prefectural governments
Japan Finance Corporation for Small and Medium Enterprise	1965	SMEs	Individual	
Pollution Control Service Corporation	1965	Small, medium and large enterprises, local governments	Joint, individual	Pollution prevention facility
Japan Small Business Promotion Corporation	1968	SMEs	Joint	Leasing was also available
People's Finance Corporation	1970	Micro enterprises	Individual	

Source: KONISHI Aya, "Nihon ni okeru Kogai Boshi no tameno Koteki Yushi Seido ni tsuite", *Kaihatsu Enjo Kenkyu*, Vol. 3, No. 1, 1996, pp.168-187

Each scheme is described in brief in Table 1.8.3.

The reasons behind the introduction of the public financing schemes were found in the general rules for special corporations[112], i.e. 1) development of expensive infrastructure without increasing the tax burden, 2) attraction of private sector funds, and 3) higher efficiency of works.

The public financing schemes were started by multiple public financial institutions in response to stipulation of the central government's responsibility for providing financial support as stated in the Basic Law for Environmental Pollution Control. Public funding was strongly required as the demand for funding constantly exceeded the supply during the period of rapid economic growth and as private financial institutions were unwilling to offer loans to pollution control investments that did not seem to contribute to higher production[113].

The financial resources were borrowed from the government's loan and investment programs, such as postal savings, welfare pensions, national pensions, savings from the special governmental account, and revenue from national trust funds. These were funded from the government loan and investment program.

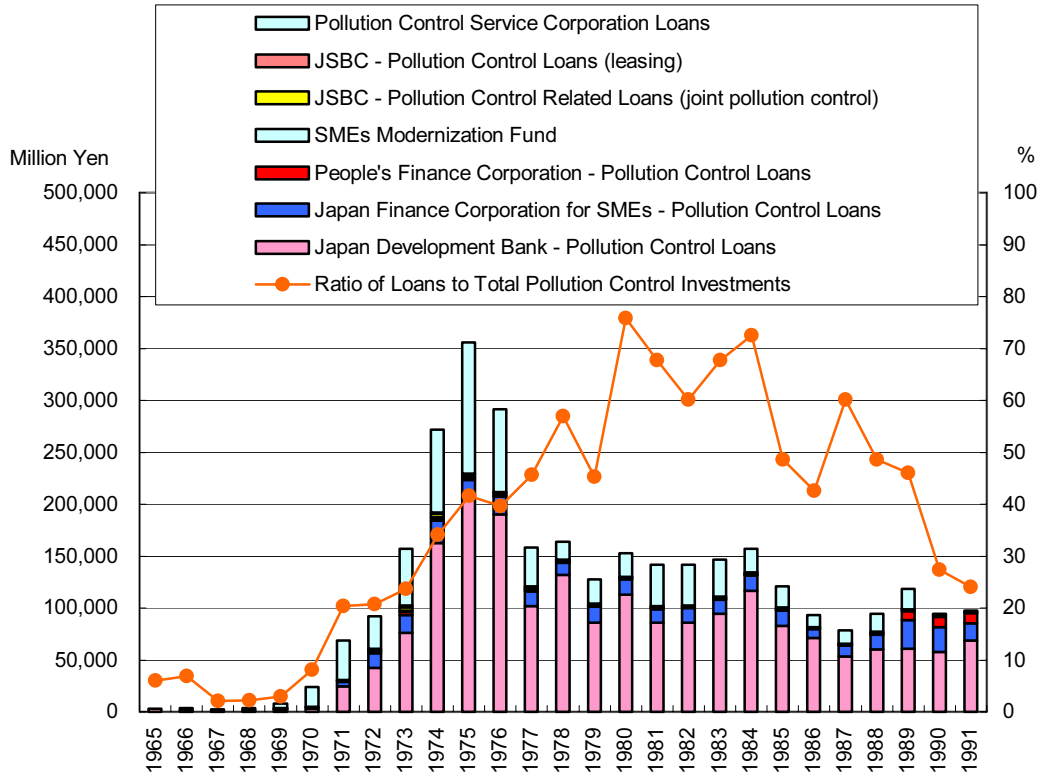
Figure 1.8.1 shows changes in the amount of loans from each financial institution and ratio of public financing to total amount pollution control investment. The ratio of the public loans to investment was very high between 1975 and the mid- 1980s and peaked in 1984 at around 74%. Over the whole period 1965 to 1991, public loans accounted for approximately 37% of the total.

[112] YOSHIDA Kazuo, *Gyokaku to Kisei Kanwa no Keizaigaku*, Kodansha, 1995, p.146
[113] Global Industrial and Social Progress Research Institute, "Asia Chiiki ni okeru Sangyo Gijyutsu Iten ni kansuru Tyosa Kenkyu Hokokusho", 1998, pp.101-106

Table 1.8.3 Summary of Public Financing of Pollution Control (1975)

Public Financial Institutions	Target facility	Target companies	Target area	Target facility	Ration of Loan (Limit)	Loan Limit	Interest rate	Loan period ( ) Indicate period of deferment	Remark
Pollution Control Service Corporation	Joint, Individual	Small, medium and large enterprises, local governments	Nation wide (some specified areas)	1,2,3,4,5,6,7,8	Joint: SMEs 80%, Large 70% Individual: SMEs 80% Large 50%	No Limit	Joint: SMEs 4.5% Large 8.0% Individual: SMEs 6.3% Large 8.2%	Joint: Less than ten years (one year) Other: Less than 20 years (Three years) Individual: Less than ten years (one year)	Limited to factories & businesses established prior to May 1965
Japan Finance Corporation for Small and Medium Enterprise	Individual	SMEs	Nation wide	1,2,3,4,6,7,8, 11,15,17,18, 20,21,22	No Limit	Direct loan: Less than 150 million JPY Indirect loan: Less than 20 million JPY	15, 21: 8.4% Other: 7.3%	Less than ten years (two years)	For 15 & 21, Limited to plans approved by the factory location low article 14
People's Finance Corporation	Individual	Micro enterprises	Nation wide	Same as Japan Finance Corporation for Small Business	No Limit	Less than 18 million JPY	15, 21: 8.4% Other: 7.3%	Less than ten years (two years)	21, Same as Japan Finance Corporation for Small Business for 15 & 21
Japan Development Bank	Individual	Large enterprises	Nation wide	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 21	10: Less than 70% 12: About 30% 17: 35% Other: About 50%	No Limit	Except 8.2% for 10 8.7% for 21	Approx 10 years (When necessary)	Limited to factories & businesses established prior to June 1965, for 1-7
Small Business Promotion Corporation	Joint	SMEs	Nation wide	1,2,3,6,8	Interest 80% Lease 65%	No Limit	No interest Loan Lease 2.7%	Less than 15 years (Two years) Less than 12 years (Two years)	
Small and Medium Enterprise Modernization Fund	Individual	SMEs	Nation wide	1,2,3,4,5,7,8, 9,11	50%	0.1-5.0 million JPY	No interest	1-3, 6-8: 12 years 4,9,11: 5 year (one year)	
Agriculture, Forestry and Fisheries Finance Corporation	Joint, Individual	Livestock breeder	Specified areas	1,2,15,21	Loan to what was not covered by subsidiary 80%(term 90%) Loan to the left of non-subsidized: individual 18 million JPY, enterprises 36 million JPY or 80%		7.0% 4.5%	15 years (Three years)	

Note: The numbers shown above refer to the following:
1-Wastewater treatment facility, 2-Flue gas treatment facility, 3-Dust control facility, 4-Specified substances treatment facility, 5-Low sulfur fuel storage facility for emergency, 6-Noise control facility, 7-Odor control facility, 8-Industrial waste treatment/disposal facility, 9-Ocean pollution prevention facility, 10-Caustic soda manufacturing process conversion facility, 11-Conversion to industrial water supply, 12-Heavy oil desulfurization equipment, 13-Lead free gasoline, 14-District heating cooling, 15-Relocation of polluting factory, 16-Liquefied natural gas power plant, 17-Converting to non-polluting equipment, 18-Measure & analysis equipment, 19-Scarped car treatment facility, 20-Charge on Public pollution control works, 21-Factory environment management, 22-Change in business type
Source: This table was based on Mr. Kazuo Hishida's table but excluded "Maritime Credit Corporation" and Environmental Sanitation Business Finance Corporation.



Source: Japan Development Bank, "Annual Business Report", each year; Japan Finance Corporation for Small Business, "Gyomu Hokokusho", each year; People's Finance Corporation, "Gyomu Tokei Nenpo", each year; Small and Medium Enterprise Agency, "Summary of Measures for Small and Medium Enterprises", 1965-1985; Small and Medium Enterprise Agency, "Pandect of Small and Medium Enterprises", 1986-1991; materials from Japan Small Business Corporation (JSBC) and Pollution Control Service Corporation

Figure 1.8.1 Amount and Ratio of Low Interest Public Loans, and Investment in Pollution Control (1965-1991)

b.1 Japan Development Bank

The first loans for environmental pollution control facilities were provided under financing for wastewater treatment facilities in 1960, following enactment of the Industrial Wastewater Control Law in 1958. Then, financing for emission gas control facilities was established, following the enactment of the Soot & Smoke Control Law in 1962. After that, the types of facilities qualifying for loans were expanded in line with the establishment of legislations.

Characteristics of the Japan Development Bank were: 1) it offered loans to large enterprises and set no ceiling on loans; 2) the facilities targeted by its loans were pollution control facilities designated by the national government (wastewater treatment facilities and emission gas control facilities, and the like); 3) it also offered loans to pollution prevention facilities such as fuel oil desulfurization facilities at oil refineries, LNG-related facilities at thermal power plants, and non-polluting process conversion (for example, conversion in caustic soda manufacturing); and 4) it required letters of recommendation from the Ministry of International Trade and Industry.

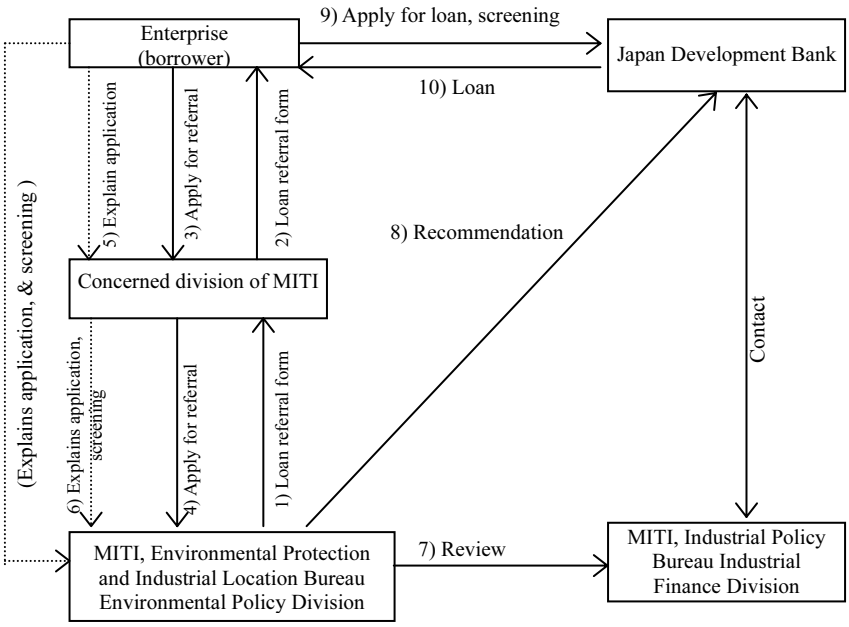
Moreover, Japan Development Bank loans were not solely restricted to pollution control facilities, but were also available for production facilities within overall investment programs.

Applying for Japan Development Bank loans was made to the Ministry of International Trade and Industry, who reviewed the application, and then made appropriate recommendations to

the Bank regarding financing. Therefore, technical reviews were said to be not required for obtaining loans[114].

The Japan Development Bank was reorganized as the Policy Investment Bank following integration with the Hokkaido-Tohoku Development Corporation in June 1996. The Policy Investment Bank merged the scheme for financing pollution control measures with that of the Japan Environment Corporation, as described later.

The Japan Development Bank commenced actual lending in 1971, and total lending peaked at approximately 200 billion JPY in 1975, after which it stabilized at around 80 billion JPY. In 2002, the amount of loans made for environmental measures was 73.7 billion JPY; nevertheless, these environmental measures were qualitatively different from the pollution control of the past since they included development of new and natural energy sources such as hydro and wind power, promotion of energy saving in industry, waste recycling schemes, and pollution prevention works, and the like.



Source: Ministry of International Trade and Industry, *Industry and Pollution*, 1989

Figure 1.8.2 Financing Procedures of the Japan Development Bank

b.2 Financing for SMEs

As indicated above, schemes of financing pollution control for SMEs were through the Japan Finance Corporation for Small and Medium Enterprise, the Small Businesses Modernization Funding Scheme, the Small Business Promotion Corporation (the present Japan Small and Medium Enterprise Corporation), and the People's Finance Corporation. One of the reasons why special financial measures for SMEs came to be provided through so many channels was that it was very difficult to secure funding for SMEs in the midst of heavy demand for funds during the period of rapid growth (1960 - 1975), and SME owners formed an important part of the support base for the ruling Liberal Democratic Party.

[114] Global Industrial and Social Progress Institute, "Asia Chiiki ni okeru Sangyo Gijyutsu Iten ni kansuru Tyosa Kenkyu Hokokusho", 1998, pp.101-106

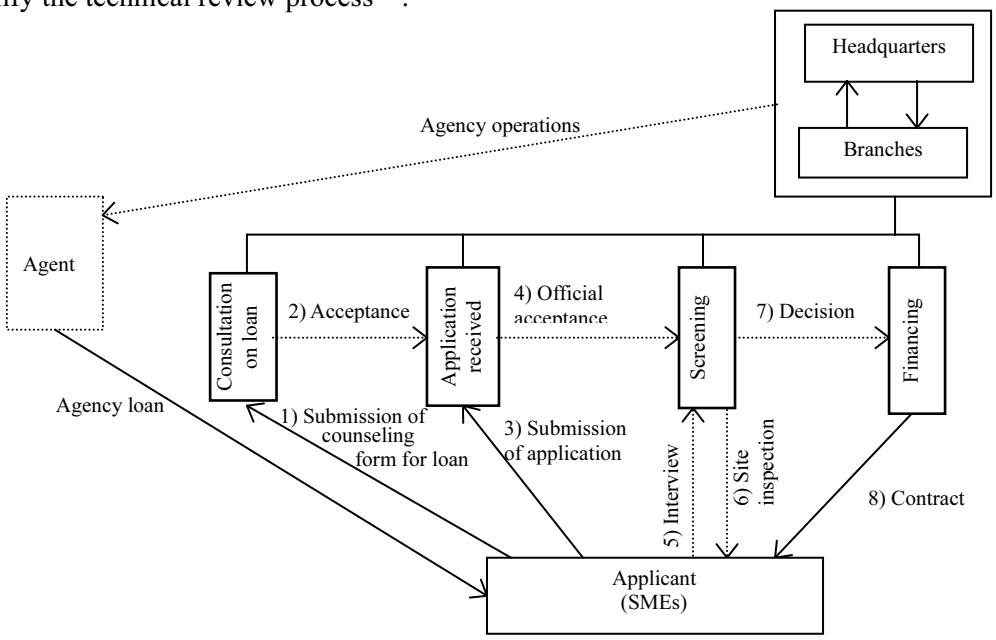
Japan Finance Corporation for Small and Medium Enterprise

The corporation started providing loans for industrial pollution control facilities in 1965, five years after the Japan Development Bank started to provide finance for pollution control.

The standard rate of interest on general loans by the corporation in 1965 was 8.7%, while that on loans for pollution control facilities was 7%, representing a discount of 1.7%. In the 1970s, with the successive enactment of industrial pollution control legislation, the types of facilities targeted by loans widened. Moreover, the Noise Control Law was enacted in 1968. Vibration, which was a particular problem in SMEs, was also targeted for control; however, in the absence of effective measures to deal with this, a loan scheme for plant relocations and conversion of business establishments was created in 1973. Furthermore, energy conservation loans were initiated in 1979 following enactment of the Energy Conservation Law[115].

Lending for pollution control measures was not greatly utilized until 1970. However, the amount of loans increased dramatically from 1972 and reached a peak of 21 billion JPY in 1974. In the same year, the amount of all pollution-related loans including those for factory relocation and business conversion other than pollution control facilities was more than 27 billion JPY[116]. Energy-related loans in 2002 amounted to 20.4 billion JPY[117].

The corporation adopted both direct lending and lending via agents. In the latter case, numerous agents (city banks, local banks, trust banks, and the like) provided loan counseling, received loan applications, implemented document reviews and site surveys, made decisions on loans, concluded contracts and paid out funds. When SMEs applied for loans, contracts were concluded following reviews that were based on two types of survey, i.e. interview survey and site survey. The corporation did not possess a technical review capacity, but since pollution control equipment was listed up based on the legislation, it was possible to simplify the technical review process[116].



Source: Ministry of International Trade and Industry, *Industry and Pollution,* 1989

Figure 1.8.3 Financing Procedures of Japan Finance Corporation for Small and Medium Enterprise

[115] Ministry of International Trade and Industry*, Overview of the Environment*, 1996

[116] KONISHI Aya, "Nihon ni okeru Kogai Boshi no tameno Koteki Yushi Seido ni tsuite", *Kaihatsu Enjyo Kenkyu*, Vol.3, No.1, 1996, pp.168-187

[117] Japan Finance Corporation for Small and Medium Enterprise, "Japan Finance Corporation for Small and Medium Enterprise 2003 Reference Materials" http://www.jasme.go.jp/jpn/summary/disclosure/2003jfs03.pdf

Small and Medium Enterprises Modernization Funding Scheme

This scheme, linked to the Industrial Wastewater Control Law, started to provide loans for pollution control investments from 1960 by establishing a loan category for wastewater control facilities in SMEs.

The features of this scheme were: 1) it targeted SMEs, 2) loan applications were made through prefectures, 3) the maximum loan limit was small (3,000,000 JPY at the start, raised to 40,000,000 JPY at present), and 4) there was no interest on the loan. Amount of loans under this scheme peaked at 1.1 billion JPY in 1971 and varied around 1 billion JPY after that. Target facilities were strictly defined although in-depth technical review of the required facilities was not carried out. Having said that, prefectures conducted corporate diagnoses when they received applications. Loans covered up to 50% of equipment costs. Prefectures established special accounts and received 50% of the necessary funds in government subsidies, while paying the remaining 50% from their own accounts[118].

This scheme has more or less finished its historical mission and is now being transformed into a scheme for strengthening the business base of small business owners.

People's Finance Corporation (Public Finance Corporation from 1999)

The People's Finance Corporation commenced providing loans for industrial pollution control facilities in 1970 and followed this in 1972 with a program of special loans intended solely for industrial pollution control facilities. These schemes targeted small, medium and micro enterprises. The total amount of loans peaked at around 3 billion JPY in 1973 but fell after this, and it was around 500 million JPY by the end of the 1980s[119].

In 1999 the People's Finance Corporation was integrated with the Environmental Sanitation Business Finance Corporation to form the National Life Finance Corporation. The new corporation established a new special loan item for environment and energy measures. This special loan was given a ceiling limit of 72 million JPY for plant funding (15 years maximum) and 48 million JPY for operating funds (5 years maximum). The fact that the application of loans was extended to operating funds was a noteworthy feature[120].

Small Business Promotion Corporation (the Japan Small Business Corporation in 1980, the Japan Small and Medium Enterprise Corporation from 1999)

Responsibility for funding upgrading and equipment modernization under the Law for Subsidization of Small and Medium Enterprises Modernization of 1963, was passed on to the Small Business Promotion Corporation. Upgrading here referred to the establishment of and relocation to industrial estates and the formation of factory apartments by groups of SMEs.

This upgrading program was intended to form SMEs into groups with the aims of relocating them to suburban industrial estates free of urban pollution problems and modernizing their operations. The scheme allowed for the lending of up to 65% of the necessary funds for industrial estate development and building and facilities construction. Of these funds, 40% was financed by the national government and 25% by the prefectures. Loans were provided to cooperative business associations and member SMEs[121].

The number of loans made up to 1975, including upgrading projects that were commenced in 1961 before the Small Business Promotion Corporation handled, was 237 cases of industrial grouping, 171 cases of factory sharing, 7,805 cases of common facilities, and 167 cases of

[118] Ministry of International Trade and Industry, *Overview of the Environment*, 1996
[119] TERAO Tadayoshi, "Nihon no Sangyo Seisaku to Sangyo Kogai", KOJIMA Reiitsu / FUJISAKI Nariaki, *Kaihatsu to Kankyo - Asia Shin Seichoken no Kadai*, Institute of Developing Economies, 1994, p.299
[120] Ministry of Economy, Trade and Industry, *Overview of the Environment 2001*, 2001
[121] SATOH Atsushi / NISHIHARA Michio (eds.), *Kogai Taisaku I*, Yuhikaku, 1969, pp.293-308

common pollution control facilities. This large number of cases demonstrated just how well the system was utilized[122].

b.3 Pollution Control Service Corporation (Japan Environment Corporation)[123]

The Pollution Control Service Corporation was established as a special corporation with 100% government funding in October 1965, with the objective of realizing the immediate mitigation of environmental pollution. Since the corporation targeted pollution that had already occurred, its activities at first were limited to existing factories in areas designated under the former Water Quality Protection Law and Soot & Smoke Control Law.

Activities of the corporation were divided into direct operations and financing operations. Direct operations were construction of common pollution control facilities, common welfare facilities (buffer green zones and parks), factory apartments and industrial estates in severely polluted areas. Financing operations on the other hand entailed the provision of loans to pollution control facilities of individual enterprises in designated areas.

The Figure 1.8.4 shows the scheme of the financing operation. First of all, when making loan applications, it was necessary to attach a certificate demonstrating the need of the pollution control facilities issued by the local government concerned. This program seems to have targeted cases to which injunctions by local governments were issued. The amount of loans was 20 billion JPY in 1970, reached a peak of approximately 130 billion JPY in 1975, and reverted to around 20 billion JPY in the 1990s. Meanwhile, the common pollution control facilities program was abandoned in 1987, and the factory relocation site development program was suspended in 1992. Large enterprises initially accounted for more than 80% of the loan projects, and SMEs the remaining 20%. Viewed in terms of the type of facilities, loans for flue gas treatment facilities and wastewater treatment facilities fell dramatically after the peak year; moreover, after the corporation changed its name to the Japan Environment Corporation, industrial waste treatment/disposal facilities came to account for the majority.

b.4 Financing by Local Governments[124]

In addition to national financing schemes, public financing of pollution control investments by local governments also played an important role. The earliest example was the loan system established by the Metropolitan Government of Tokyo in 1960. By 1988, the number of prefectures and ordinance-designated cities possessing similar systems grow to 42. There were also cases of subsidies for compensating interest payments provided in tandem with low-interest loans.

Such loans amounted to 2 billion JPY in 1970 and peaked at 40 billion JPY (4,472 cases) in 1976, after which the amount decreased. There were around 500 loans totaling 5.5 billion JPY in 1998. These figures had doubled to approximately 1,100 loans with roughly 23.7 billion JPY or four times as much loans by 2000.

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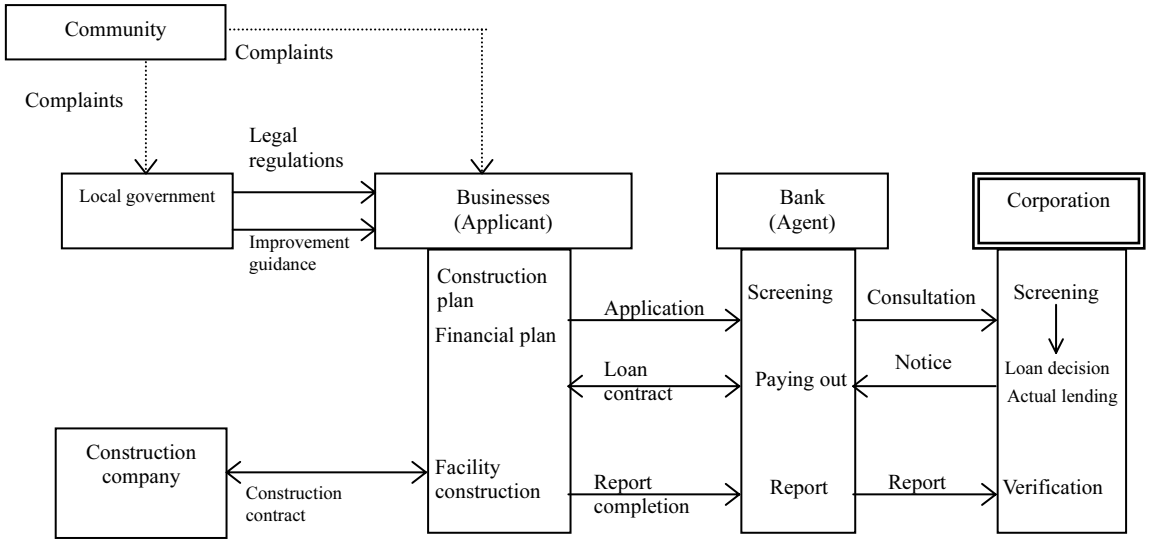
[122] MIMURA Hiroshi et al., *Toshikeikaku to Chusho Reisai Kogyo - Jyuko Kongo Chiiki no Kenkyu*, Shin Hyoron, 1978, p.220

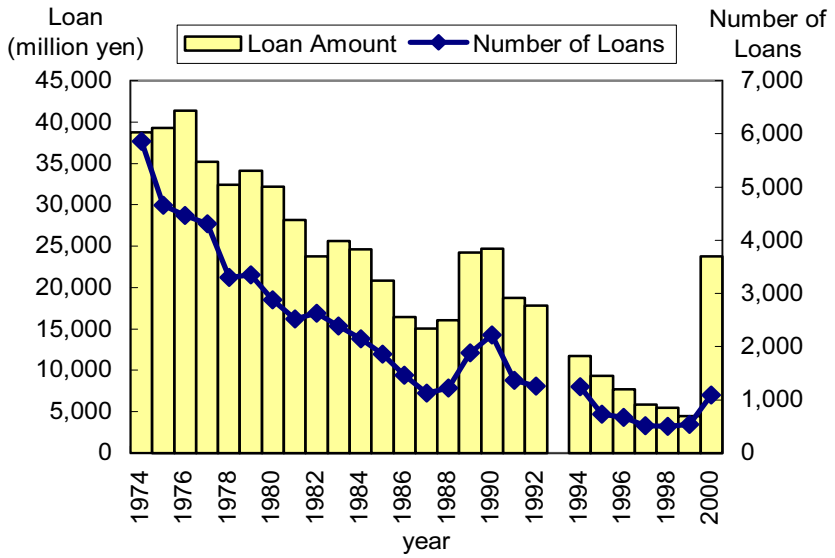
[123] Pollution Control Service Corporation, "25 Year History of Pollution Control Service Corporation", 1991. The Pollution Control Service Corporation changed the name into the Japan Environment Corporation in 1992. Its financial business was taken up by the Development Bank of Japan.

[124] Environment Agency, *White Paper on the Environment*



Source: Ministry of International Trade and Industry, *Industry and Pollution,* 1989

Figure 1.8.4 Financing Mechanism by Pollution Control Service Corporation



Note: There is no data for 1993.
Source: Ministry of the Environment, *2002 Environmental Statistics*

Figure 1.8.5 Lending by Local Governments (1974-2000)

c. Preferential Tax Measures[125]

Special tax measures targeting pollution control were implemented with respect to national and local taxes.

c.1 National Taxes

Examples of preferential tax measures at the national level were special depreciation, special repurchasing of business assets in line with pollution control measures, shortening of service

[125] Ministry of International Trade and Industry, *Industry and Pollution*, 1988
Ministry of International Trade and Industry, *Overview of the Environment,* 1996

life, and the pollution control reserve fund system. These measures were stipulated in the Special Taxation Measures Law.

Special Depreciation

In the special depreciation system, applying individuals or corporations could depreciate pollution control facilities, and the like designated by the Minister of Finance by adding special depreciation to ordinary depreciation. This system was started in 1967 when fuel oil desulfurization facilities and waste oil facilities were targeted. In 1969, flue gas treatment facilities and wastewater treatment facilities became included in this scheme.

The depreciation limit on target equipment and facilities was calculated as follows:

Allowable depreciation limit = Ordinary allowable depreciation limit +
special allowable depreciation limit (acquisition cost + special depreciation rate)

Application of special depreciation was widened in line with strengthening of legislation and the allowable special depreciation rate that was also increased to 50% in 1971, although it was reduced again from 1977. From 1987, the scope was once more narrowed to only new pollution control facilities.

Special depreciation was the so-called accelerated depreciation system, whereby the depreciation rate was higher when the facility was just installed and then became lower in later years. This system enabled excessive expenses to be processed at the start of construction and freed up funds for current use within companies, thereby easing fund management conditions for enterprises.

Shortening of Service Life

Measures to shorten the service life of equipment and facilities in the valuation of assets had the same effect as the special depreciation. This system was applied to wastewater treatment facilities from 1961 and flue gas treatment facilities from 1963.

Special Repurchasing of Business Assets

The special repurchasing of business assets in line with pollution control measures exempted a certain ratio of profit tax in cases where land and buildings, and the like were transferred in line with the relocation of enterprises from areas suffering from air and/or water pollution and areas designated under noise controls. The measure was designed to promote the relocation of polluting facilities.

Pollution Control Reserve Fund System

The pollution control reserve fund system was established in 1972 with the aim of smoothly disbursing pollution control facilities operating costs and consigned treatment costs, and the like irrespective of income fluctuations. In this system, enterprises operating designated works that entailed high pollution control costs and large income fluctuations were allowed to save from tax exemptions the equivalent to 0.3% of their income (0.6% for special sectors with extreme income fluctuation) in order to cover pollution control expenses in designated operations. The accumulated funds were used to pay pollution control expenses, while funds that were accumulated for three years were incorporated into gross revenue. However, this system received strong criticism as the method for withholding profits with the aim of controlling pollution, and it was eventually scrapped in 1978 following three years of interim measures[126].

[126] TERAO Tadayoshi, “Nihon no Sangyo Seisaku to Sangyo Kogai”, KOJIMA Reiitsu / FUJISAKI Nariaki (eds.), *Kaihatsu to Kankyo - Asia Shin Seichoken no Kadai*, Institute of Developing Economies, 1994, pp.304-305

c.2 Local Taxes

Measures taken at the local tax level included the total or partial exemption from fixed asset taxes on pollution control facilities, exemption from the special land holding tax on land used for pollution control facilities, and special handling of the business facility tax for pollution control facilities. These measures were stipulated in the Local Tax Law.

Examples of the preferential application of the fixed asset tax were exemption for wastewater treatment facilities in 1960, following enactment of the Industrial Wastewater Control Law in 1958, and exemption for flue gas treatment facilities in 1963, following the enactment of the Soot & Smoke Control Law in 1962.

In response to the enactment of the Soot & Smoke Control Law in 1962 and the Air Pollution Control Law in 1968, a plan to lower sulfur contents of fuels was discussed. With respect to heavy oil desulfurization facilities, 50% of the fixed asset tax was exempted for three years for those installed from 1967 to 1970.

Special measures for the fixed asset tax were applied to target facilities over certain periods. Facilities targeted by tax exemption measures were wastewater treatment facilities as stipulated in the Water Pollution Control Law, flue gas treatment facilities as stipulated in the Air Pollution Control Law, and industrial waste treatment/disposal facilities as stipulated in the Waste Management Law. Other examples were tax reductions on odorous substance control facilities prescribed in the Odor Control Law, and facilities targeted for special depreciation in the Special Tax Measures Law.

Tax exemption measures were also provided concerning the special land holding tax on land used for the above-mentioned facilities. Exemption from the special land holding tax was first applied to land used for installing wastewater treatment facilities according to the Industrial Wastewater Control Law of 1958.

Other examples were exemption from the business facility tax[127] on pollution control facilities stipulated in the Water Pollution Control Law, Air Pollution Control Law and Waste Management Law; exemption from taxes on facilities financially assisted or assigned by the Japan Small Business Corporation to business owners who carried out upgrading projects; and exemption from the business facility tax on facilities assigned by the Pollution Control Service Corporation.

d. Subsidy for Technical Development

Subsidies were mainly provided for technical development carried out by SMEs. Details are given in section 1.8.3.

e. Effect of Economic Measures

e.1 Effect of Public Loans

The Japan Development Bank and the Pollution Control Service Corporation provided loans of 300 billion JPY for pollution control investments in 1975, which was the peak year of their lending. Total pollution control investments by companies with capital of over 100 million JPY amounted to 930 billion JPY in that year, which means that public financing covered more than 30% of the total pollution control investments.

[127] The business facility tax can be divided into two categories: tax related to business and tax related to new establishment. The former is imposed to companies whose offices are above a certain size, and the latter to companies that newly establish and expand beyond a certain size of offices. The business facility tax is a special-purpose tax to secure financial resources to maintain and improve urban environment. Only cities designated in the Local Tax Law can impose the tax.

In 1975 public financial institutions and local governments provided 40 billion JPY of low interest loans to SMEs[128].

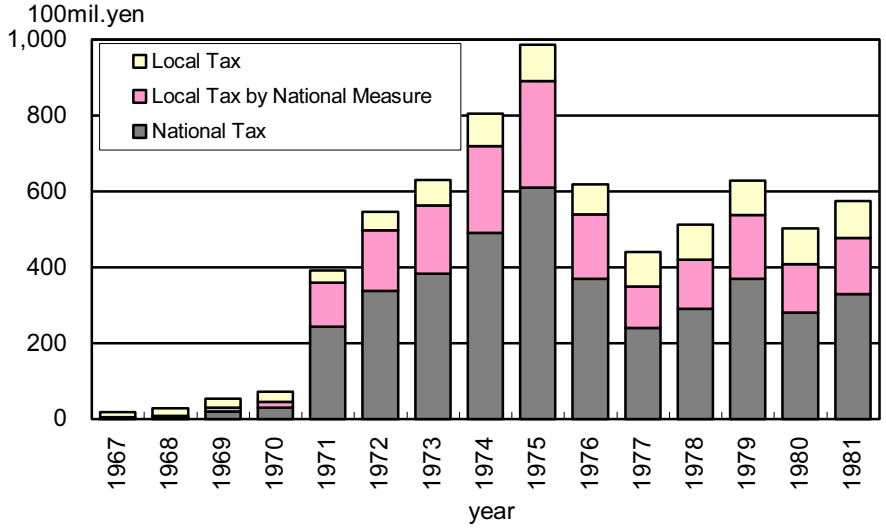
While the average annual interest rate by commercial banks to private companies in the 1970s was 9.1%, the rate by the Pollution Control Service Corporation was 7.5% to large enterprises and 6.5% to SMEs. The difference in the interest rates meant subsidy to the private companies to implement environmental improvements[129].

The system of low-interest public loans was one of the major factors behind the implementation of large-scale pollution control investments in spite of burgeoning demand for funds during the period of rapid economic growth.

e.2 Effect of Preferential Tax Measures[130]

In addition to fiscal investment and loan measures, special depreciation and other tax reduction measures played an important part in Japan's industrial policy. The preceding sections described how preferential tax measures were applied from the beginning of pollution control investments in enterprises. The Ministry of Finance monitored statistics on the amount of income reduction (tax savings from the viewpoint of enterprises) that resulted from these measures.

According to the statistics, revenue reduction peaked at approximately 100 billion JPY in 1975. Of this, 60 billion JPY was derived from reduction in national tax revenue, of which the corporation tax accounted for 20%.



Note: The estimation of an initial budget base.
Source: Tax Research Commission, "Tax Research Commission Materials", each year from 1975 to 1981

Figure 1.8.6 Decrease in Tax Revenue by Preferential Tax Treatment for Pollution Control[131] (1976-1981)

[128] TERAO Tadayoshi, "Nihon no Sangyo Seisaku to Sangyo Kogai", KOJIMA Reiitsu / FUJISAKI Nariaki (eds.), *Kaihatsu to Kankyo - Asia Shin Seichoken no Kadai*, Institute of Developing Economies, 1994

[129] OH Suk-pil, *Kankyo Seisaku no Keizai Bunseki*, Nihon Keizai Hyoronsha, 1999

[130] TERAO Tadayoshi, "Nihon no Sangyo Seisaku to Sangyo Kogai", KOJIMA Reiitsu / FUJISAKI Nariaki (eds.), *Kaihatsu to Kankyo - Shin Seichoken no Kadai*, Institute of Developing Economies, 1994, pp.295-308

[131] Re-created the figure from TERAO Tadayoshi, "Nihon no Sangyo Seisaku to Sangyo Kogai", KOJIMA Reiitsu / FUJISAKI Nariaki (eds.), *Kaihatsu to Kankyo - Asia Shin Seichoken no Kadai*, Institute of Developing Economies, 1994, p.305

Generally speaking, preferential tax measures were designed to attract plant investment and were effectively utilized by enterprises to accumulate capital. In particular, special depreciation served the function of interest-free loans and helped raise the fluidity of funds and the projected rate of returns for the enterprises concerned. Also, special depreciation speeded up capital recovery terms and thereby reduced risks of technical obsolescence resulting from technological progress.

Because pollution control investment did not directly result in higher profits, it was difficult for enterprises to recover such investment over a short term. Since special depreciation resulted in an interest-free loan, it was effective in reducing the burden of pollution control investments and mitigating the burden of borrowing funds for enterprises.

The pollution control reserve fund system prepared operating funds for enterprise pollution control facilities, and as such did not act as an inducement for pollution control investment.

Exemption from and reduction of the fixed asset tax accounted for a good share of preferential local tax measures. Changes in targeted facilities and reduction rates corresponded to changes in the handling of special depreciation measures for national taxes. Preferential fixed asset tax measures targeted both past and new pollution control investments and, rather than directly inducing new pollution control investments, they were more effective in mitigating the tradeoff relationship with new investment for production expansion by reducing the overall cost of corporate pollution prevention.

e.3 Summary

In order to deal with environmental pollution problems in Japan, it was necessary for a massive investment in pollution control during the 1970s, and there is no doubt that economic incentives played a major role in bringing this about.

Economic incentives for pollution control by industry can be characterized as follows:

- Public financing for pollution control investments was promoted as a part of industrial policy by the Japan Development Bank and organizations under the MITI.
- The organizations specially established for SMEs supported financially vulnerable SMEs to tackle industrial pollution control; they provided not only loan services but also acted in factory relocation and changes of businesses.
- Economic incentives for pollution control such as public financing and preferential tax treatment were linked to the regulations.
- Local governments granted tax relief to companies who participated in the plant relocation projects implemented by the Pollution Control Service Corporation and the Japan Small Business Corporation in order to promote the project participation.
- The Pollution Control Service Corporation developed, as its direct projects, green buffer zones and green parks between industrial and urban areas (the development costs were originally planned to be shared by the industries).
- Local governments provided loan services for pollution control investments to SMEs to supplement public financing by the national institutions.

Another factor that deserves attention in explaining the effectiveness of economic incentives is the fact that social conditions required that pollution control measures be advanced at a high pace. Although economic incentives were retained for some time following the massive implementation of pollution control measures, numerous preferential tax measures for plant investment were scrapped during review of the system from the end of the 1970s. Total review of pollution control-related measures, however, did not take place until the latter

part of the 1980s. Today, the onus of measures is placed more on energy saving and new energy facilities and waste recycling facilities rather than conventional pollution control facilities.

Loans for pollution control facilities by the Japan Environment Corporation were taken over by the Policy Investment Bank in 1999. Because the corporation's loan programs were limited to pollution control facilities, their scope of application was restricted and did not cover cleaner production facilities, and the like. Private financial institutions in the start of the 1970s encouraged enterprises to utilize loans for production facilities to the full, while introducing at no commission the loan scheme of the Pollution Control Service Corporation to investments for pollution control facilities[132].

Some economists maintain a notion in principle that public funding and preferential tax measures sustain inefficient enterprises and distort markets. However, when one considers the extent of damage that would have been caused by not taking any pollution control backed up by incentives during the period of rapid economic growth, the social instability that would have been triggered by the collapse of enterprises unable to deal with pollution control measures, and the chaos that would have ensued the resulting political instability, there was not really any other alternative to taking such measures. In particular, the preventive effect from large-scale implementation of pollution control was especially notable[133].

1.8.3 Support for Technology Development and Information Dissemination

a. Legal Basis

Article 15 of the Basic Law for Environmental Pollution Control of 1967 stated the following: "The government must take necessary measures for the promotion of science and technology that will contribute to the prevention of environmental pollution, for example, preparation of test and research setups, promotion of research and development, dissemination of achievements, nurturing of researchers, and so on."

With national government's responsibility stipulated in the above manner in environmental law, various support measures were implemented for related areas of research and development.

Since the early 1970s the government has provided financial support to SMEs in development and practical application of pollution control technologies.

- Financial support for promoting pollution control technologies and their introduction by private industry,
- National and local public research institutions developed needed technologies that would have been appropriate for individual companies, and
- Technologies were disseminated to SMEs through public research institutions and local chambers of commerce and industry.

Another factor behind the smooth dissemination of pollution control technologies in Japan was the Japanese system of corporate groups consisting of parent companies (finished product makers, and the like) and subcontractors (component makers, and the like), in which parent companies provided technical guidance to major and minor suppliers.

[132] MORISHIMA Akira, "Kankyo Jigyodan no Keii" Asia ni okeru Kankyo Seisaku no Keisei Jisshi Katei Kenkyukai, Institute of Developing Economies, "Nihon no Kogai Taisaku Keiken ni kansuru Hearing no Kiroku", 2002

[133] Japan Environment Association, OECD Report: Nihon no Keiken - Kankyo Seisaku ha Seikoshitaka, 1978

b. Subsidization of Pollution Control Technology Development by Private Enterprise

At the start of the 1970s, existing subsidy systems were expanded to cover SMEs and reallocated to provide greater support for pollution control technology development. Similar measures were continued into the 1980s.

The major systems utilized in pollution control technology development at that time included the Technology Improvement Subsidy System (Japan Small and Medium Enterprise Corporation), the Important Technology Research and Development Subsidy System (Agency of Industrial Science and Technology), and Loan System for Commercialization of New National Technologies (Japan Finance Corporation for Small Business).

Of these, the Technology Improvement Subsidy established in 1967 (revised to the Creative Technology Research and Development Subsidy in 1997) aimed to increase the added value of products and smooth the way for advances into new fields by SMEs by partially subsidizing the costs of new technology research and new product prototype development. As can be seen in establishment of the Specified Pollution Control Subsidy (1972-1987) and the Resources Conservation and Energy Saving Subsidy (1975-1996), and the like, the scope of the subsidy system was revised in accordance with changing socioeconomic trends and the needs of SMEs.

In particular, as well as the introduction of a special pollution subsidy (specified pollution control measures) in the 1970s, subsidization rates were raised (from the ordinary rate of 1/2 to 3/4) to encourage greater use of the financial assistance on pollution control.

Table 1.8.4 Technical Division relating to Pollution Control in Creative Technology Research and Development Subsidy System

Subsidy category	Area of Technology	Example of Technology
General technology	Resource related technology	1. Technology for utilization of unused resources 2. Resource alternative technology 3. Technology for efficient use of resources
Environmental technology	Waste / recycling technology	1. Waste management technology 2. Recycling technology
	Environmental protection technology	1. Air pollution control technology 2. Water pollution control technology 3. Offensive odor control technology 4. Noise and vibration control technology 5. Ground subsidence or soil contamination control technology 6. Management / measurement technology for pollution control 7. New production technology contributing for pollution control 8. Environmental improvement and protection technology

Major research and development themes targeted by the subsidy system during the 1970s included the following:

- Development of pollution control technologies for application to SMEs
- Development of closed processes that do not discharge pollutants into the

environment
- Commercialization of pollution control technologies that conduct testing and research stage
- Development of technologies for removing nitrogen oxides from fixed combustion systems such as boilers and sintering furnaces

From the late 1980s onwards, whereas problems of industrial air pollution and water pollution stabilized, waste discharges increased rapidly and waste problems such as the emergence of pollution caused by improper treatment/disposal in the past started appearing. In response, a series of legislative measures related to waste management and recycling was enacted and amended during the 1990s. In order to promote corresponding technology development and experimental study, subsidization of technology development was implemented based on the Emergency Measures Law for Promotion of Business Activities Promoting Rationalization of Energy Use and Utilization of Recycled Resources (the Energy Conservation and Recycling Support Law), and subsidization of experimental study was carried out in order to build technology development schemes for concretely realizing new recycling-related legislation.

It was in such circumstances that industrial technology research and development was added to the mandate of the New Energy and Industrial Technology Development Organization (NEDO), which was created as the central organization for finding alternative energies to oil in the 1980s immediately following the second oil crisis. As a result, NEDO came to play an important role in providing technology development-related subsidies for energy conservation, new energy development and recycling and coordinating research and development based on cooperation by the public and private sectors.

c. Research and Development and Technology Transfer by Public Institutions

National and public test and research institutions undertook the research and development of technologies that were beyond the capacity of SMEs alone. The main categories of public research and development were;

i Research and development by national research institutions/laboratories
ii Research and development by public research institutions/laboratories at the prefectural level, and the like
iii Research and development by the Japan Small and Medium Enterprise Corporation

Of these, research and development by public research institutions/laboratories at the prefectural level played an especially important role for the following reasons: familiarity with local needs (research and development corresponding to local industrial structures and sector compositions), immediate effectiveness of R&D achievements (centering mainly on applied technologies rather than basic R&D), integration with dissemination and public information structures (direct technology guidance and information provision to local enterprises), and so on.

c.1 Technology Development for SMEs by National Research Institutions

National research institutions mainly implemented long-term and planned research and development on common and fundamental technology issues in SMEs.

The national institutions that carried out industrial pollution control research and development during the 1970s and 1980s were the National Research Institute for Pollution and Resources (reorganized in July 1970 under the jurisdiction of the Ministry of

International Trade and Industry) and the National Institute for Environmental Studies (newly established in March 1974 under the jurisdiction of the Environment Agency)[134].

National Research Institute for Pollution and Resources was formed following reorganization of the Resource Research Institute (established in 1952) aimed at expanding and reinforcing the research department for industrial pollution control measures. In addition to conducting joint research with private enterprises, the National Research Institute for Pollution and Resources sought to transfer technology to enterprises through providing technical counseling, technical guidance and technical training services and concluding industrial property implementation contracts, and the like.

The National Institute for Environmental Pollution Research implemented research on methods for monitoring and measuring the effects of air pollution, water pollution and noise on human health and living environments, while the National Research Institute for Pollution and Resources specialized in research on pollution control technologies and pollutant dispersion prediction technologies at emission sources and achieved results that directly led to the upgrading of pollution control technologies and equipment in factories.

c.2 Technology Research and Development for SMEs by Public Test and Research Institutions

Public test and research institutions include those on agriculture, forestry and fisheries (agricultural experiment stations, livestock experiment stations, experimental forestry stations, and experimental fisheries stations), but the following paragraphs examine those concerned with the manufacturing sector (prefectural technology institutions, and the like) and related to pollution control and environmental protection (institute of environmental sciences, and the like).

Compared to the above-mentioned national research institutions, public test and research institutions at the prefectural level have the following characteristics:

- These institutions have research and development programs that correspond to local industrial structures and sector composition, as well as staff who possess thorough knowledge of production processes, technical levels and needs of local industries. In some prefectures even possess institutions specializing in local industry categories (fiber and textiles research institutes, ceramics research centers, paper industrial research centers, leather technology centers, food processing research centers, brewing test stations, and so on).
- Rather than research into fundamental technology issues, research and development themes are set based on joint research and applied technology issues proposed by enterprises and can thus be put into practical application more readily.
- Since the institutions also implement technology guidance and information provision, dissemination and advertisement of research and development achievements is much smoother.
- In addition to conducting research and development, local public test and research institutions support the R&D efforts of private enterprises by implementing testing on request (physical tests, chemical tests, and the like), undertaking studies, providing technical counseling and guidance, and opening facilities for use (analysis instruments, and the like).

Many of these institutions originated from industrial test stations and instruction agencies established before or immediately after WWII. In order to enhance research and

[134] The National Research Institute for Pollution and Resources was turned into the National Institute for Resources and Environment in 1991, and it became the National Institute of Advanced Industrial Science and Technology in 2001 after it was integrated into the Agency of Industrial Science and Technology. The National Institute of Environmental Pollution Research changed its name to the National Institute for Environmental Studies (NIES) in 1990. The NIES integrated the Division of Wastes Research in the National Institute of Public Health and was turned into an independent administrative institution in 2001.

development functions, many institutions were formed by combining industry specific stations and agencies. In the 1970s, national subsidies to prefectural test and research institutions were greatly expanded in an effort to disseminate technology development and reinforce public information activities in the fields of pollution control and energy conservation.

Distribution of institutions possessing the above kinds of functions in each prefecture (considerable accumulation of technology on the local level) is a characteristic feature of Japan, which is thought to have been one of the major factors that contributed to the nation's recovery from industrial pollution problems and the oil crises.

c.3 Technology Development by the Japan Small Business Corporation

By utilizing subsidies for the improvement of technology for alternative energy, the Japan Small Business Corporation implemented general research and development and promoted the dissemination and technology transfer of those achievements in the following areas:

1) Common technical issues facing industry (development of technology for alternative energy and development of industrial base)
2) Development of seeds of new technology to the stage where practical application can be achieved (new technology development at small and medium scale)
3) Issues requiring objective handling of expert technologies and skills and development of software in order to promote rationalization of energy use (research and development of systems for passing on and disseminating sophisticated production technology)

d. Technology Guidance and Information Provision for Pollution Control

To disseminate information about and promote application of pollution control technologies such as those developed by the national and local public research institutions, the following actions have been taken with national financial assistance.

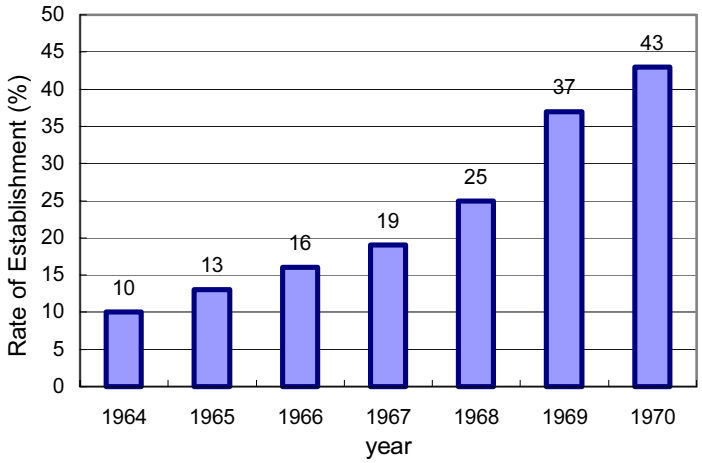
- Assigning pollution assessment specialists at advisory offices for SMEs in each prefecture to help SMEs to identify necessary actions for pollution control.
- Establishing consulting offices for industrial pollution related issues, giving advice and guidance on legal compliance and pollution control technologies at each Chamber of Commerce and Industry in major cities.
- Establishing technical advisory divisions in public test and research institutions run by local governments and organizing site-visiting teams with specialists and the staff from the institutions to visit and advise SMEs on pollution control technology issues.
- JSMEC offering training programs for technical advisors from the prefectural governments and providing them with relevant information through preparation of lists of pollution control technologies and manuals on how to guide SMEs on pollution control.
- Prefectural governments offering training programs on pollution control for engineers from SMEs.

The advisory offices for SMEs in each prefecture and the chambers of commerce and industry in major cities played important roles in disseminating information about pollution control to SMEs.

1.8.4 Organizations and Human Resource Development for Industrial Pollution Control

a. Industrial Pollution Control Organizations in the 1960s

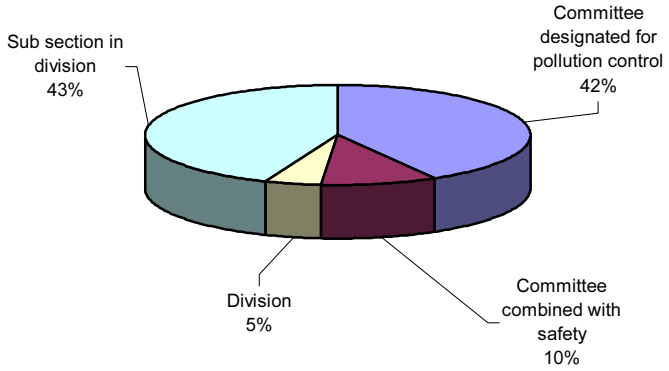
According to a survey of in-house pollution control organizations in 1970[135], out of 2,512 enterprises with 300 or more employees, 1,089 (43%) possessed such organizations. The rate of establishment of such organizations in the same industry group was just 10% before 1964, but the figure increased in line with the growing social awareness and severity of pollution problems.



Source: YAMAGUCHI Tsutomu, *Chikyu Kankyo Saisei heno Chosen*, Jiji Press, 2002

Figure 1.8.7 Changes in Establishment of In-house Pollution Control Organizations (2,512 Large Factories Surveyed, 1964-1970)

Looking at the said 1,089 establishments with pollution control organizations, committee-type organizations were the most common, in particular pollution expert committees accounted for 42%. Many of the enterprises that adopted departmental pollution control organizations relied on single supervisors rather than expert organizations and thus had very fragile systems.



Source: YAMAGUCHI Tsutomu, *Chikyu Kankyo Saisei heno Chosen*, Jiji Press, 2002

Figure 1.8.8 Types of In-house Pollution Control Organizations (1,089 factories in 1970)

[135] YAMAGUCHI Tsutomu, *Chikyu Kankyo Saisei heno Tyosen*, Jiji Press, pp.81-84

Tokyo Electric Power Co., which implemented the most advanced pollution control measures in Japan, established its pollution control headquarters in 1968. Moreover, Nippon Steel Corporation, one of Japan's leading corporations, was engaged in tackling pollution problems from the 1960s, although it was not until 1970 that it set up a specialist pollution control department in its headquarters. Oji Paper Co., Ltd., Japan's leading paper manufacturer, established an environmental control department in its headquarters and environmental control sections in each of its plants in 1972[136]. It can thus be seen that Japan's leading corporations embarked on the organization of pollution control activities in earnest from the end of the 1960s to the start of the 1970s.

Environmental pollution problems became serious social issues and, in spite of enactment of the former pollution-related legislation, enterprises did not have sufficient capacity to address the problems. The pollution control ordinance, pioneering legislation at that time, enacted by the Tokyo Metropolitan government in 1969, included provisions relating to a notification system for plant facilities, setting of environmental standards, compilation of pollution prevention plans, and so on. Another facet of this was the requirement for the appointment of pollution control managers in specified business establishments. This provided the model framework for the pollution control manager system described in the following section.

In 1971, the Law for Establishment of Organization for Pollution Control in Specified Factories was enacted. In the 1980s, development of human resources and building of control systems for pollution control measures and energy conservation in enterprises was advanced under the energy manager system, based on the Law concerning Rational Use of Energy (Energy Conservation Law). Prior to the introduction of these legislation-based control systems at the national level, a number of local governments introduced model manager systems and had achieved a certain degree of success.

b. Pollution Control Manager System based on the Law for Establishment of Organization for Pollution Control in Specified Factories

This law was applied to plants (specified plants) in the manufacturing, electricity supply, gas supply and heat supply sectors that possess facilities generating soot, effluent, noise, vibrations, and/or specified or general particulates and fulfilled other certain conditions (for example, plants discharging at least 1,000 m^3/day of effluent on average).

Under this law, specified plants are required to establish pollution control organizations consisting of a pollution control supervisor responsible for pollution control measures, pollution control managers possessing expert knowledge and skills on pollution control, and chief pollution control managers (positioned between the supervisor and the managers) charged with assisting the pollution control supervisor (see Figure 1.8.9).

Appointment of chief pollution control managers is required in large-scale facilities such as those with emission gas of 40,000 Nm^3/hr or with effluent of 10,000 m^3/day. Enterprises are required to appoint qualified persons and report their names to the governor or mayor. This law made it compulsory for enterprises to establish pollution control organizations in their plants and provided the real basis for environmental management in Japan.

The number of specified factories possessing the above pollution control organizations was approximately 11,000 at the end of March 1976, 20,000 in 1985 and 21,000 in 1992.

Qualifications for pollution control managers were divided into 11 categories (14 as of 2003) related to air, water, noise and dust, and they had to pass subject-specific national examinations or complete special courses and be recognized as possessing expert knowledge and skills. The number of annual examination applicants was highest in the water-related examination, followed by the number applying for the air-related. At its peak, the number of applicants for one category exceeded 50,000 (see Figure 1.8.10).

[136] It is based on chronology in environmental reports of each company.

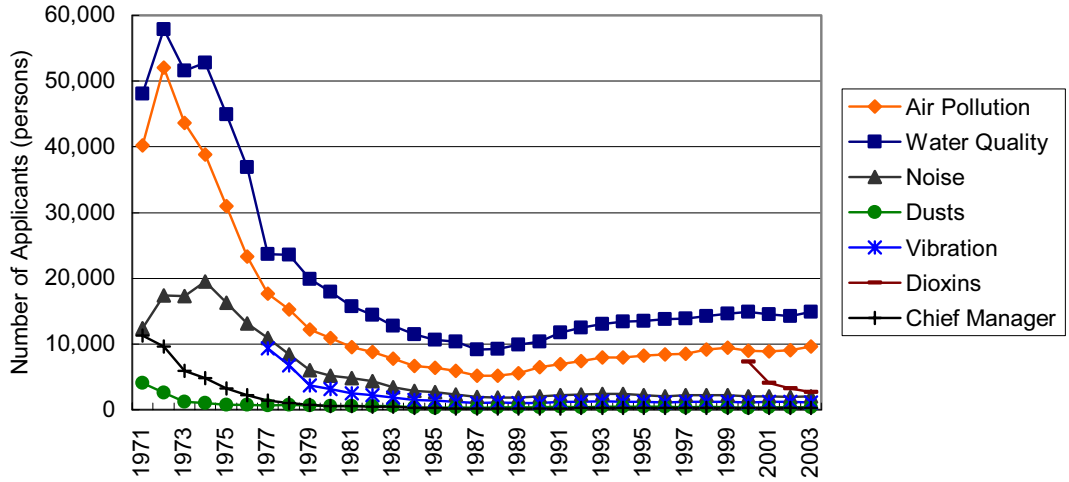
(Actual title)		(Title under the Law)	
Plant manager / Deputy plant manager	=	Pollution Control Supervisor / Deputy	Supervisor of Pollution Control
Division chief / Deputy division chief	=	Chief Pollution Control Manager (qualified) / Deputy (qualified)	Assist pollution control supervisor. Direct pollution control managers.
Section chief / Unit head	=	Pollution Control Manager (qualified) / Deputy (qualified)	Be in charge of divided technical issues on pollution control

Figure 1.8.9 System of Pollution Control Organizations based on the Law

Moreover, in 1977 and 2000, qualification categories were added for vibration and dioxins respectively, and almost 10,000 people applied for each type of qualification in the first year.

In every case, the number of applicants was highest in the first year but gradually declined and stabilized after that. The number of applicants for water and air-related qualifications showed a slight increase again in the 1990s. (It is thought that successors were needed to replace the original managers who retired during this period. Moreover, this indicates that the qualification system was incorporated into and utilized in the pollution control setup of enterprises).

The Industrial Pollution Control Association (established in 1962, currently the Japan Environmental Management Association), which was designated as the responsible agency for implementing national examinations for pollution control managers, contributed to the dissemination of pollution control technology, environmental assessment techniques and environmental management systems.



Source: Data from Japan Environment Corporation

Figure 1.8.10 Trend in Number of Applicants for Pollution Control Manager by Type (1971-2003)

c. Energy Manager System Based on the Energy Conservation Law

The Energy Conservation Law, enacted in 1979 immediately following the second oil crisis, defined factories consuming at least 3,000 kl/year of fuels (converted to crude oil) or using 12 million kWh/year of electricity in the manufacturing, mining, electricity, gas and heat supply sectors, as type-1 factories, and it required them to appoint an energy management officer (a heat management officer or electricity management officer), and report their energy consumption by submitting periodical reports and mid-long term plans. The system was subsequently expanded to include factories of half the above scale (setting of type-2 factories in the revision of 1999) and factories in additional sectors (2002 revision).

Like the pollution control manager system, this requirement promoted organizational development and human resource development regarding energy saving.

Moreover, by requiring factories to check compliance with criteria for rational energy use in the periodic reports and mid- to long-term plan preparation stages, and to implement self-analysis in cases where the non-binding target of annual improvement in the unit energy consumption of 1% per year could not be achieved, it was ensured that complying with the law would lead to review of overall energy use and examination of measures for improving unit energy consumption in plants.

Moreover, in order to support the efforts of designated factories, the Ministry of International Trade and Industry provided energy conservation diagnosis services and tools such as a guidebook and checklist to promote energy saving. Therefore, in addition to human resources development and system building, support measures affecting actual operations were provided with a view to raising the effectiveness of energy conservation utilizing these human resources and systems.

1.8.5 Industrial Location Measures[137]

a. Framework for Industrial Location Measures

Recognizing that pollution-related damage is linked to the location of factories, industrial location measures began to be taken from the latter part of the 1960s. These measures can be summarized as follows.

Table 1.8.5 Summary of Industrial Location Measures

	Purpose	Methods	Implementing body
Factories in residential areas	Preventive measures	Land use restriction by City Planning Law	Prefectural governments, municipalities
	Elimination of mixture of residential and industrial uses in urban areas	Development of industrial complexes for SMEs and group relocation, and financial assistance	Municipalities, Pollution Control Service Corporation, Small Business Promotion Corporation
Restriction and guidance for factory location	Restriction of new factory location and development of industrial estate in neighboring area	Law concerning Restriction on Factories in Existing Urbanized Area of the Metropolitan Region (1959), Law concerning Restriction of Factories in built-up district in Kinki Region (1964)	Prefectural governments

[137] White Papers on Environmental Pollution (later the Environment), which have been issued since 1969, included contents about industrial location measures and mentioned them every year. However, White Papers on the Environment issued after 2002 have not included them. It represents that the mission of industrial location measures were recognized as ended.

	Purpose	Methods	Implementing body
		Industrial complex development in neighboring area	Housing and Urban Development Corporation, local governments
		Financial assistance	National government
	Relocation of factories	Formulation of factory relocation plan	National government
		Suitability survey for factory locations	National government
		Development of industrial complex	Japan Regional Development Corporation, local governments
		Financial assitance	National government
Location of factories	Pollution prevention in large scale industrial complexes	Comprehensive / preliminary study on industrial pollution	National government
		Carry out environmental impact assessment on industrial complex development	Development entity
	Pollution prevention by factory location	Mandatory notification by the Factory Location Law	Concerned corporation
		Environmental impact assessment of development of electric power resources	Development entity

b. Land Use Controls

The first legislation concerning land use controls is the City Planning Law of 1919 (the old city planning law). This law defined residential, commercial and industrial zones, while other areas were classified as undesignated areas. This law purported to regulate land uses, but because it exerted no controls on the location of residential and commercial facilities inside industrial zones, it led to the appearance of mixed residential and industrial land use[138]. Strict land use control was only systematized following enactment of the new City Planning Law in 1968.

c. Residential and Industrial Mixing Countermeasures in Existing Urban Areas and Separation from Industrial Belts

Industrial pollution repeatedly caused problems in industrial belts that were newly developed in the period of rapid economic growth and in mixed residential and industrial areas that developed in line with urbanization. Problems in industrial belts were caused by a lack of environmental consideration when locating industries, while mixed residential and industrial areas appeared because the old city planning law did not regulate the location of non-industrial buildings and facilities within industrial zones.

In order to promote relocation of factories from mixed residential and industrial areas, the Pollution Control Service Corporation commenced construction of and transfer of industrial complex and facilities to enterprises in 1965, and its record over the 25 years from 1965 is as shown in Table 1.8.6. Works by the Pollution Control Service Corporation are characterized by the fact that it mainly targeted existing plants. Works for relocation and joint operation of small and medium plants and construction of common wastewater treatment facilities were actively advanced for those plants particularly prone to wastewater problems, for example, plants in the plating, printing, metal surface finishing, dyeing and

[138] MIMURA Hiroshi et al., *Toshikeikaku to Chusho Reisai Kogyo - Jyuko Kongo Chiiki no Kenkyu*, Shin Hyoron, 1978

tanning industries. In addition, modernization of production processes was implemented in many cases.

Green buffer zones were referred to as common welfare facilities because they were viewed as facilities for protecting the health of citizens. Since green buffer zones were developed as subsidized projects under the jurisdiction of the Ministry of Construction, they were easy to be implemented; enterprises still needed to bear 25% of the costs. Excellent green belts were constructed under this scheme and it was regarded as a great success[139].

Table 1.8.6 Record of Facility Construction & Assignment Scheme by Pollution Control Service Corporation (1965 – 1989)

		Number of project in 25 yrs	Project cost (million JPY)
Common pollution control facilities	Common treatment facility for waste and/or wastewater discharge	27	4,819
Joint use of buildings	Apartment plant	154	220,791
Factory relocation estate	Development of industrial complex	158	196,737
Common welfare facility (green buffer zone)	Development of green buffer zone between industrial complex and residential areas	49	199,454

Note: 80% of common pollution control facilities were additional project to joint use of buildings and/or factory relocation estate scheme.
Source: Pollution Control Service Corporation, "25 Year History of Pollution Control Service Corporation", 1991

The Japan Small Business Corporation (the current Japan Small and Medium Enterprise Corporation) also financed construction projects for the grouping and common use of factories. These projects aimed to upgrade the functions of SMEs, however, their significance in terms of pollution control was on a par with projects implemented by the Pollution Control Service Corporation.

d. Location Controls and Industrial Relocation in Major Urban Areas

Regarding industrial location, it was necessary to disperse facilities and to control the excessive location of industry in large urban areas from the viewpoint of achieving balanced national land use. With the establishment of areas restricting industrial location, industrial location in urbanized areas was restricted under the Law for Restriction of Industry in the Metropolitan Region of 1959 and the Law for Restriction of Industry in the Kinki Region of 1964. Meanwhile, under the Metropolitan Region Suburban Development Belt and Urban Development District Development Law of 1958 and the Kinki Region Suburban Development Belt and Urban District Development Law of 1964, industrial estate projects were implemented as city planning projects and preferential measures such as the creation and transfer of building sites were provided to factories that relocated out of areas restricting industrial location. Projects to construct industrial estates for relocating factories to the outskirts of the Metropolitan and Kinki regions were mainly given priority by the Housing and Urban Development Corporation and local governments. By 1998, 41 such estates covering an area of 6,552 ha had been developed in the metropolitan region, and 7 estates covering an area of 1,757 ha in the Kinki region[140].

The Industrial Relocation Promotion Law was enacted in 1972 in order to promote the relocation of industry nationwide. Major cities and surrounding districts were designated as relocation promotion districts under this law. Industrial relocation plans were prepared based on the law, and measures for promoting relocation of factories to non-urban areas were

[139] According to "25 Year History of Pollution Control Service Corporation", in coastal industrial areas in Chiba Prefecture, buffering green forests were maintained. They were planted to be natural broadleaf forests like Meiji Forest in Meiji Jingu, 100 years later. Now, it is growing to be beautiful forests.
[140] National Land Agency, *Development of Metropolitan Areas 1998*, p.I-133

taken[141]. Construction of core industrial estates was promoted under this law, and the Japan Regional Development Corporation was established in the same year to promote these measures. This corporation actually established 21 core industrial estates[142]. In addition, it developed 126 estates throughout the country. The number of estates developed by local governments has so far reached 985[143]. Before developing estates, the central government requested prefectures to implement plant location improvement studies to determine whether or not plant location was appropriate. Moreover, enterprises implemented environmental assessments and examined ways to prevent pollution, although the developers were not legally mandated to implement assessments. Industrial estates were developed in accordance with environmental considerations and played an important part in preventing the spread of industrial pollution in Japan.

As mentioned earlier, enterprises that took part in such projects were entitled to economic incentives regarding land acquisition and pollution control investment when relocating. Moreover, subsidy systems for promoting factory relocation and interest payment concerning industrial estate creation were established in order to support development of industrial estates by local governments and public bodies.

e. Factory Location Measures

e.1 General Preliminary Surveys on Industrial Pollution

The Numazu-Mishima petroleum industrial complex was designated as a special area for industrial development and was subject to preparation of a basic development plan in 1964. However, this project was eventually discarded in the same year due to opposition from citizens and a resolution of opposition passed by the city assembly. In response to this upsurge in popular opposition, the Ministry of International Trade and Industry implemented Japan's first environmental assessment to analyze impacts based on scientific data. It tried to reach agreement with citizens based on the analysis findings. Unfortunately, however, agreement could not be reached.

The cancellation of a development project that had already been decided was a shocking incident to the parties concerned. This shock made developers realize the need to give full consideration to the environment when developing petroleum industrial complexes. Between 1965 and 1969, the Ministry of International Trade and Industry implemented a general preliminary survey of industrial pollution (air-related and water-related) in cooperation with local governments in 25 large-scale industrial belts (new industrial cities and special areas of industrial development) and ocean areas scheduled for reclamation where it was expected that rapid industrialization would take place. The survey largely focused on basins of important rivers situated in these industrial belts. The aim of the survey was to prevent industrial pollution by projecting future occurrence of pollution and carrying out wide-ranging guidance (improvement of plant layouts and equipment, installation of treatment facilities, conversion of raw material & energy, revision of location plans, and the like) based on the findings.

Since this survey entailed providing guidance in advance on corporate expansion plans mainly 5-10 years into the future, it was necessary to supervise the implementation of plans. Accordingly, in some areas pollution control agreements consisting mainly of improvement

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141 Ministry of International Trade and Industry, *History of International Trade and Industry Policy*, Volume11, 1993, Chapter 7

142 Ministry of International Trade and Industry, *Industry and Pollution*, 1988, p.393

143 Japan Regional Development Corporation web-site: Information regarding industrial parks developed by local governments and Japan Regional Development Corporation is available.
http://www.region.go.jp/LP-center/T_danchi_itiran.html

plans reflecting the results of company guidance were concluded in order to follow up the surveys[144].

This survey was a full-scale environmental impact survey implemented by the Ministry of International Trade and Industry, and it was implemented using the applicable scientific techniques of the time. The techniques used in this survey provided the basis for Japanese environmental impact assessment methods (survey of current conditions and prediction & simulation, and the like). The above survey was not regarded as a legislative measure, but its implementation was based on the Factory Location Law since 1973.

e.2 Implementation of Environmental Impact Assessment

The government passed a cabinet resolution on the implementation of environmental impact assessment in 1984; environmental impact assessments came to be implemented according to Environment Agency guidelines for large-scale public works developed under the central government. Ordinances and guidelines concerning environmental impact assessment were also adopted in 15 prefectures and two ordinance-designated cities prior to 1985. Systems concerning the implementation of environmental impact assessments on industrial estate development and other large-scale development projects were also established.

Furthermore, environmental impact assessment concerning thermal power plants was implemented under the administrative guidance of the Ministry of International Trade and Industry in 1979, and the findings were discussed in the Electric Power Development Coordination Council.

These environmental impact assessments were criticized in some quarters for having limitations because they presumed that projects would be implemented. Still, they helped establish the approach of conducting assessment based on environmental impact projections and encouraged developers to adopt preventive pollution control measures.

Legislation on environmental impact assessment system was delayed until the Environmental Impact Assessment Law was enacted in 1997.

e.3 Factory Location Law

The Factory Location Law of 1959 was amended in 1973 in order to promote the appropriate location of factories while protecting the environment. This law required enterprises to establish green belts and environmental facilities and notifify prefectural governors when establishing plants[145]. Governors were empowered to recommend necessary measures to the concerned factory owners if the location would affect the living environment or impede the prevention of environmental pollution.

Prior to amendment of this law, the verdict in the Yokkaichi Smog case was delivered in 1972. The decision pointed out the duty of business owners to display care with respect to the natural environment and local citizens during factory construction and operation. It also pointed out that factories were obliged to conduct scientific analysis and assess foreseeable pollution for the future, and imposed joint responsibility for managing land inside the industrial complexes. This verdict made the adoption of factory location policy in consideration of local living environment indispensable[146]. The law was enacted in response to these needs.

In addition to helping with the cost of developing land for environmental facilities (green belts, and the like) inside industrial estates and installing environmental management

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144 Prime Minister's Office / Ministry of Ministry and Welfare, *1970 White Paper on the Environmental Pollution 1970*

145 Japan Industrial Location Center*, Kojo Ricchiho Kaisetsu,* 1974
Ministry of International Trade and Industry, *Industry and Pollution*, 1989

146 Ministry of International Trade and Industry, *Industry and Pollution*, 1989, p.395

facilities and equipment, this law established a system for providing loan from the Japan Development Bank (current Policy Investment Bank) for factory environmental development. Moreover, local governments obtained information concerning industrial water supply, effluent discharging and gas emitting facilities because notification of new factories had to be given to prefectures and were able to obtain valuable data useful for planning source control measures.

1.9 Judicial Resolution of Industrial Pollution and Environmental Cases

The preceding sections have discussed the contents of legislation directly affecting industrial pollution in Japan. It is common knowledge that industrial and environmental control measures in enterprises were advanced according to this framework. Social factors were crucial in making industries comply with laws and regulations regarding industrial pollution control. One of the social factors has been judicial resolution of industrial pollution cases.

Major factors that gave judicial resolution weight in triggering such a serious response from enterprises were the four major industrial pollution litigations, arrests of pollution criminals by the police, definition of criminal responsibility for pollution cases, and provisions concerning strict liability in environmental laws. These factors are summarized in this section.

1.9.1 Four Major Industrial Pollution Litigations

The four major industrial pollution litigations were as follows:

- The Itai-Itai disease case (finalized in August 1972)
- The Niigata Minamata disease case (finalized in September 1971)
- The Yokkaichi smog case (finalized in September 1972)
- The (Kumamoto) Minamata disease case (finalized in March 1973)

These cases gained a lot of attention throughout the world. They occurred prior to the enactments of the Air Pollution Control Law (amended) and the Water Pollution Control Law of 1971, and were initiated when victims filed civil actions for compensation against the perpetrators.

Table 1.9.1 Four Major Pollution Lawsuits

	Toyama Itai-Itai disease	Niigata Minamata disease	Yokkaichi asthma	(Kumamoto) Minamata disease
Defendant	Mitsui Mining and Smelting Co., Ltd.	Showa Denko K.K.	Six corporations in Yokkaichi No.1 industrial complex	Chisso Corporation
Plaintiffs (persons)	33	76	12	138
Filing the suit	March 9, 1968	June 12, 1967	September 1, 1967	June 14, 1969
Decision	June 30, 1971 (first trial) August 9, 1972 (appeal court)	September 29, 1971	July 24, 1972	March 20, 1973
Compensation claim	62 million JPY (first trial) 151.2 million JPY (appeal court)	522.67 million JPY	200.58 million JPY	1,588.25 million JPY
Compensation ruled	57 million JPY (fist trial) 148.2 million JPY (appeal court)	277.79 million JPY	88.21 million JPY	937.30 million JPY
Legal basis and point of contention	Article 109, Mining Law (absolute liability) Connection with discharged cadmium	Article 709, Civil Law (unlawful acts) Possibility of formation/discharge of methyl mercury. Connection between contaminated fish and human intake of fish.	Articles 709 & 719, Civil Law (joint tort) Connection between obstructive pulmonary disease and air pollution (SOx), and whether intentional negligence	Article 709, Civil Law (unlawful acts) Connection with organic mercury, whether liability existed, and validity of consolation payment contract

Note 1) Six corporations in the Yokkaichi No. 1 industrial complex include Showa Yokkaichi Sekiyu Co., Ltd., Mitsubishi Petrochemical Co., Ltd., Mitsubishi Monsanto Chemical Co., Mitsubishi Kasei Corp., CHUBU Electric Power Co., Inc. and Ishihara Sangyo Co., Ltd. 2) Number of plaintiffs is at the time of verdict.

Source: Economic Planning Agency, *1973 White Paper on Economics*

These court rulings are said to have had a profound impact on Japanese corporate attitudes during the 1970s (although it is now difficult to collect testimony on the effects from business owners of that age). The following paragraphs examine some of the reasons behind the size of this impact.

It is not our intention to comment on the contents of these rulings, but the verdicts in the four big cases were said to be different from the rulings of prior civil actions[147].

One major difference concerned the question of criminal intent or negligence, which was an important factor in determining compensation for damages. These rulings reversed the conventional view of negligence. Prior to the decisions, polluters were cleared of negligence liability if they had previously installed some form of pollution control equipment. In the four major cases, however, the courts ruled that the perpetrator should be responsible for compensating victims when the former infringes on the social lifestyle of the latter to an intolerable extent, regardless of the level of the perpetrator's installation of pollution control devices[148]. These rulings also clearly highlighted the obligation of enterprises to pay attention to the human damage caused by environmental pollution. These rulings traced the fault for pollution-related human health damage back to the operation of industry. Particularly in the Yokkaichi Smog case, fault was even questioned with respect to the original location of the industry. This tightening of corporate liability for faulty judgments paved the way for seeking liability equivalent to strict liability in enterprises.

These rulings also involved important views about cause and effect relationships. Proof of the relationship between cause and effect was generally regarded as important in pollution civil liability cases. With respect to cause and effect in cases of illegal behavior, it was considered sufficient to say that results would not have occurred if the original behavior had not taken place. In pollution-related cases concerning air pollution and water pollution, however, it was extremely difficult for plaintiffs to prove that cause and effect relationships existed. In the four major cases, the courts ruled that an epidemiological causal link was enough to prove the probability of the connection between an industry's business and a victim's damage even though the defendant demanded strict determination of a scientific causal relationship. Three of the cases raised specific cause-related ailments, while the Yokkaichi Smog case dealt with the non-specific ailment of asthma. Even so, epidemiological investigation recognized that an epidemiological causal link did exist.

The third major result was the recognition of joint liability for illegal behavior in the Yokkaichi Smog case. In this case, it was necessary to prove joint liability because the damage was caused by smoke stacks owned by a number of enterprises. As a result of this ruling, it became possible to file civil actions lawsuits for compensation in cases where asthmatic damage caused by air pollution was recognized, irrespective of whether or not enterprises discharging the causal pollutants had taken ample countermeasures.

1.9.2 Environmental Pollution Crime Law and Police Response

A less well-known law among environmental legislation is the Law concerning Punishment of Environmental Pollution Crimes Affecting Human Health (the Environmental Pollution Crime Law, enacted in 1970, enforced in July 1971). This law aimed to punish "parties that discharged substances causing harm to human health and caused risk to public life or health in line with business activities at plants and business establishments."

This law set out a dual system of penalties whereby both the polluting parties and the corporate employers of polluting parties were penalized[149].

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147 NOMURA Yoshihiro, *Kogai Ho no Kiso Chishiki*, Gyosei, 1973, pp.167-199

148 YABE Ken, "Denki Mekki Gyokai ni okeru Kankyo Taisaku no Ayumi to Kongo no Kadai", *Sangyo Kogai,* Vol.28 No.9, 1992, pp.129-136 and comments of Mr. YABE on Oct. 21, 2003.

149 OHTSUKA Tadashi, *Kankyo Ho*, Yuhikaku, 2002, pp.342-345

This law was not applied very frequently. Nevertheless, it seemed to have had a major impact in the plating industry especially. Before the law was enacted, cases of human health damage caused by hydrogen cyanide in sewers and cyanide spills in rivers occurred in 1969. Following enactment of the Environmental Pollution Crime Law, cyanide discharge became a potential target for immediate criminal prosecution. Around that time, the Tokyo Metropolitan police set up a special environmental squad and commenced patrols, and it is said that these developments instilled great fear among business owners in the plating industry. As a result, the plating industry was stimulated into taking voluntary measures for pollution control[150].

1.9.3 Criminal Liability in the Kumamoto Minamata Disease Case

The Minamata incident, which caused many fatalities, was Japan's worst ever case of pollution crime, although initially criminal liability was not sought, and it took a long time for the injured parties to file criminal charges. In the damage lawsuit filed by the victims in 1969, 16 years after the disease first broke out, negligent liability of the plaintiffs became the main point of contention. When this liability was recognized in the court ruling in March 1973, the victims felt that this marked the end to the issue.

However, a party who had been protesting about self-negotiation with Chisso Corporation was arrested and indicted on charges brought by the company[151]. This incident became a turning point for filing criminal charges to Chisso. In spite of causing death to many residents, Chisso was not held responsible for criminal liability. Indeed, the company won a favorable not-guilty verdict. These events attracted intense opposition which eventually led to criminal charges for murder and injury charges being brought against the owners and directors of Chisso in March 1975, 20 years after the first cases of Minamata disease were reported.

The defendants challenged these charges citing the statute of limitations for actions requiring that victims must file within three years from the time of the indictment; nevertheless, victims dating back to before the statute of limitations were recognized and two former executives of Chisso were indicted for professional negligence and involuntary manslaughter (rather than murder and injury) in May 1976. Both defendants were found guilty in the first trial that ended in 1979. The defendants appealed the original decision and the initial verdict was finally settled in the Supreme Court in 1988.

The criminal indictment and guilty verdict in the first trial of these former executives of Chisso had a major impact on industry because it clearly demonstrated that corporate managers could be held criminally liable in cases where pollution led to fatalities. Furthermore, it is said this verdict had a big impact on parties concerned with air pollution causing ongoing damages, in particular the electric power industry.

1.9.4 Provision of Strict Liability

With revisions of the Air Pollution Law and Water Pollution Law implemented in 1972, provision concerning the strict liability of enterprises for civil compensation for damages was added.

Civil compensation for damages revolved around the question of deliberate intent or accidental negligence, and pollution cases witnessed various debates on the subject of negligence. Particularly in cases of pollution accompanying corporate activities, it was very difficult for victims to prove the whereabouts of negligence within the perpetrating

[150] YABE Ken, "Denki Mekki Gyokai ni okeru Kankyo Taisaku no Ayumi to Kongo no Kadai", *Sangyo Kogai,* Vol.28 No.9, 1992, pp.129-136 and comments of Mr. YABE on Oct. 21, 2003.
[151] TOGASHI Sadao, *Minamatabyo Jiken to Ho*, Sekifusha, 1995

enterprise; nonetheless, as a result of the above legislation, strict liability irrespective of negligence was clarified in specific pollution-related cases under administrative law.

In cases where enterprises discharged pollutants into the atmosphere or water bodies and caused harm to human life or health, the discharging parties were held responsible for compensating for the said damage. Accordingly, victims were empowered to file damage compensation claims without considering the question of negligence at all, assuming the probability of the cause and effect relationship. Industrial concerns that this would lead to an increase in lawsuits led to the establishment of the Pollution-related Health Damage Compensation Law[152], which placed a major burden on enterprises.

As a result, enterprises are put at risk of being charged with strict liability that handle hazardous substances and might discharge excessive amounts of pollutants into the atmosphere and water bodies. This made such enterprises realize the need for preventive measures.

[152] Ministry of International Trade and Industry, *History of International Trade and Industry Policy,* Volume15, 1991, pp.342-343

1.10 Victim and Citizens Movements, Mass Media and Public Awareness

This section describes victim movements and examines how press coverage affected public awareness with respect to environmental pollution. In particular, it focuses on the effects of the anti-pollution campaigns conducted by the mass media in the 1960s and 1970s. It is the time when pollution problems resulting from the long-term policy of high-level economic growth became a nationwide issue, the four major industrial pollution lawsuits were filed, basic environmental legislation such as the Air Pollution Control Law, the Water Pollution Control Law and the Basic Law for Environmental Pollution Control was enacted, and the Environment Agency was established.

1.10.1 Victim and Citizens Movements

It has already been pointed out in section 1.1.1, 1.7 and 1.9 that victim movements against pollution were an important factor in the promotion of industrial pollution control in Japan. These movements, however, took a long time to attract social attention. For example, it is well known that the movement against Minamata disease by victims was hardly recognized by the local government at first and did not even attract much interest from the mass media, which viewed the problem as nothing more than a peculiar local disease[153]. Interest in Minamata disease only increased after numerous other pollution problems occurred and developed into major social issues. As shown in Table 1.9.1, Minamata disease, which caused the earliest and most extreme health damage, was the last of the four major industrial pollution litigations to be filed for civil action. It was 15 years after the disease first occurred that the Civic Conference for Minamata Disease Countermeasures, a support group composed of citizens (non-victims), academics, and city assembly members was formed in 1968[154].

In particular, people thought that pollution-related problems should have been resolved through private relief as a special relationship between polluters and victims. As a result, movements by victims displayed little popular support. Nevertheless, mass media coverage of the real extent of the damage became a major factor in spreading general citizens movements in the latter part of the 1960s. The damage itself as well as increasing local awareness of such damages added extra momentum to citizens movements, seeking to define responsibility, restore the environment and provide relief.

The movement against the Numazu-Mishima petrochemical industrial complex in 1964 was not a movement by victims, but primarily of residents opposing industrial development. It was propelled by numerous interest groups, fishermen, farmers, schoolteachers, laborers and academics who were aware of the pollution-related damage caused by earlier petrochemical complexes at Yokkaichi and other incidents. This developed into a major campaign arousing public awareness about the pollution-related damage caused by industrial development, and it eventually led to adoption of a resolution opposing the development by the municipal assembly and the eventual abandonment of the whole project.

Following the Numazu-Mishima campaign, movements by victims attracted support and understanding from many citizens. Moreover, these movements were backed by students, lawyers, doctors and scientists, and thus developed a broad base of social support.

With this support, victim campaigns acquired the capability to file civil litigations beyond simple opposition. Since plaintiffs were required to prove the cause and effect relationship of the damage in some litigations, the cooperation of doctors and scientists in such movements was indispensable. With the cooperation of such supporters, the contents of

[153] HASHIMOTO Michio (ed.), *Minamatabyo no Higeki wo Kurikaesanai tameni*, Chuohoki Shuppan, 2000
[154] IIJIMA Nobuko, *Kankyo Mondai to Higaisha Undo*, Gakumon Sha, 1984

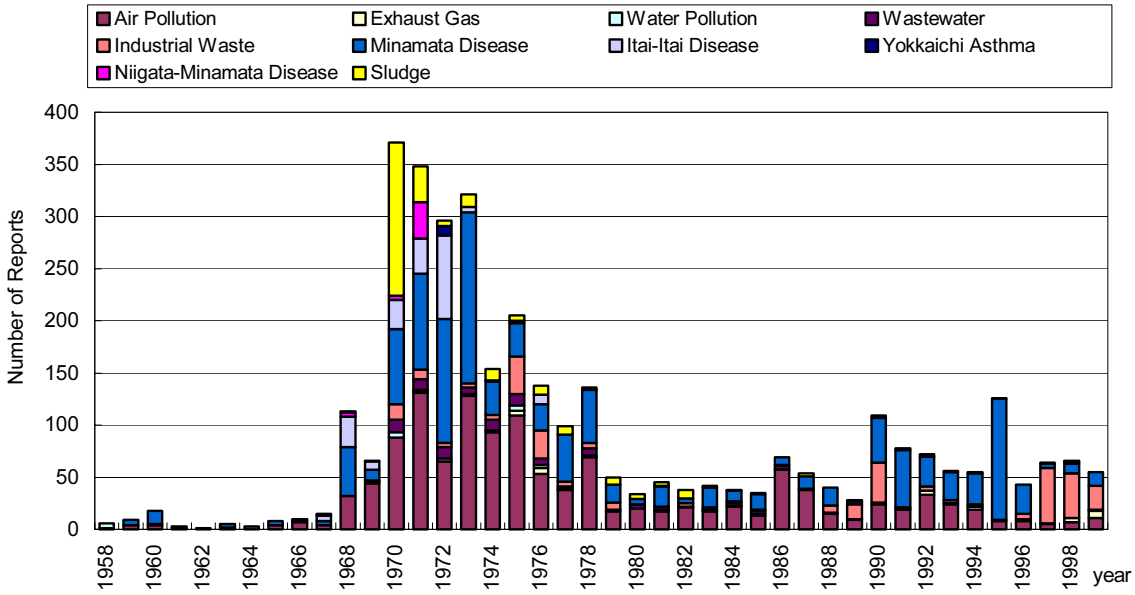
deliberation in such cases were extremely high-level and plaintiffs were often victorious. Numerous civil lawsuits were brought before the courts following the first of such cases in the latter part of the 1960s, and these raised awareness towards the importance for the victim movements to be able to demonstrate the scientific cause and effect relationship.

1.10.2 Trend in Media Coverage

The number of newspaper headlines regarding industrial air and water pollution rapidly increased from 1970 to 1974 but declined thereafter according to the headline database for 1945-1999 of Asahi Newspaper, one of the major newspapers in Japan. In contrast, the newspaper headlines regarding industrial waste problems were first found in 1975, and their number has been increasing, especially in recent years (see Figure 1.10.1).

Among the 3,522 headlines regarding industrial pollution, about 54% (1,907 headlines) were found in the eight years from 1969 to 1976, which were characterized by peaks both in anti-pollution campaigns by the mass media as well as in actual industrial pollution control measures.

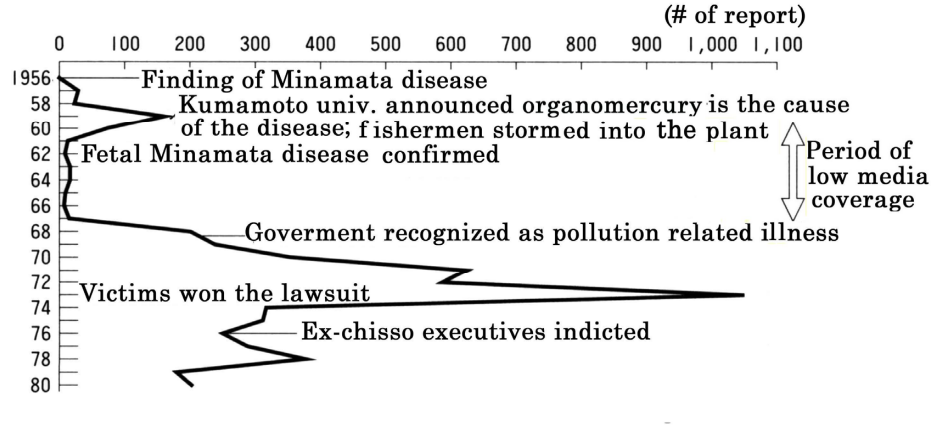
Among the four major pollution litigations, the Minamata case was most often seen (about 1,200 times, about one third of the total number) in the newspaper headlines. The peak of reporting on the Minamata case was in 1973, the year in which the Kumamoto district court delivered the judgment. The case continued to attract media coverage through the second and third prosecutions, and the government-proposed settlement in 1996.



Source: Data from 'Asahi-shinbun Sengo Midashi Database (Database on Asahi- Newspaper headings after WWII) "

Figure 1.10.1 Number of Reports on Industrial Pollution in Asahi Newspaper (1958-1999)

Figure 1.10.2 shows the number of articles related to the Minamata disease by the Western Headquarters of Asahi Newspaper. As we saw in Figure 1.10.1, it shows a major peak over the period from 1968 to 1976. The number peaked at more than 1,000 in 1973, when the Kumamoto district court delivered the first judgment. This means that the western region edition of Asahi Newspaper carried almost three articles per day on the Minamata disease issue, and it is considered to have had a major impact at the time.



Source: NISHIMURA Mikio, "Minamata", Institute for Global Environmental Strategies (ed.), *Kankyo Media Ron*, Chuo Hoki Shuppan, 2001, p.113

Figure 1.10.2 Number of Reports on Minamata Disease related News by Asahi-Shinbun Western Headquarters (1956-1980)

1.10.3 Public Awareness

a. Media Coverage and Formation of Public Opinion

Two basic water quality laws (the Water Quality Protection Law and the Industrial Wastewater Control Law) were enacted in 1958. Preparation of these laws actually started in the Upper House just after the mass media reported on the bloody conflict between a paper mill and fishermen working at downstream of the Edo River, which was heavily polluted by effluent from the paper mill. It was before the peak of the anti-pollution campaign by mass media, and introduction of water pollution regulations was considered too early, even though the Minamata disease case and several water contamination cases were already recognized. This is a symbolic case in which media coverage triggered legislative measures against industrial pollution.

Environmental pollution became more widespread in the 1960s. However, the impacts of industrial pollution were largely confined to local communities, and media coverage on them was regarded as local news and attracted little interest in national newspapers[155]. It was in the late 1960s when the mass media started anti-pollution campaigns about the seriousness of environmental degradation, like the Yokkaichi petroleum complex case, where local people suffered from asthma, fetidity of the fish, offensive and irritating odors, and air pollution. This anti-pollution campaign helped the general public to understand issues scientifically and increase their awareness over the problems.

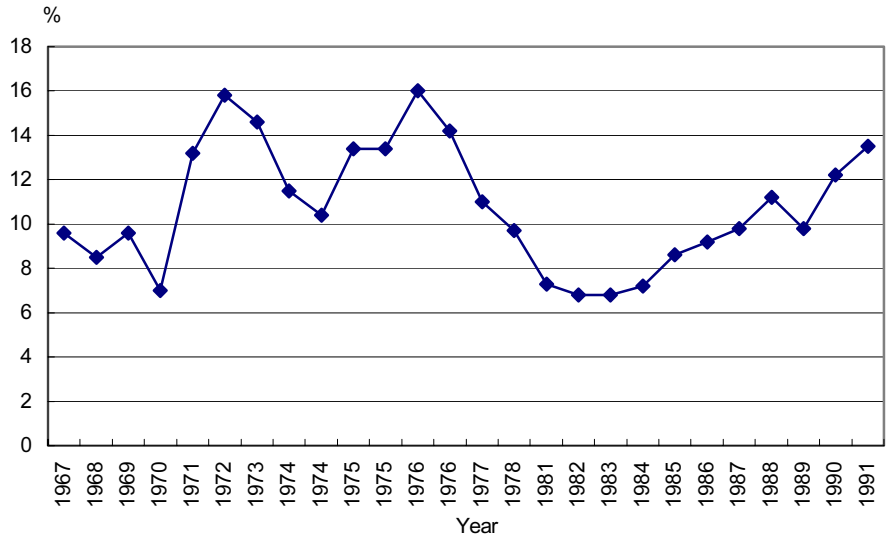
In 1970 the inter-ministry liaison committee for pollution control was organized to integrate and systematize pollution control measures, and 14 laws regarding industrial pollution control were established or amended in November of that year. In 1971 the government established the Environment Agency to integrate administrative control on industrial pollution. The anti-pollution campaign by mass media gradually formed public opinion against industrial pollution by reporting local people's complaints and protests against pollution, which showed that the mass media had power to move the government.

The impact of Japanese media coverage on public awareness was raised in the report entitled "Japan's Experience in Urban Environmental Management" in the Metropolitan

[155] HARA Tsuyoshi, "Kogai Hodo Shiron", Institute for Global Environmental Strategies (ed.), *Kankyo Media Ron*, Chuohoki Shuppan, 2001, pp.116-133

Environmental Improvement Program by the World Bank. According to this report, "Japan's mass media had a major impact in informing citizens of the importance and potential dangers of environmental pollution, and people who acquired much information from the mass media made a major contribution to environmental improvement in Japan."

Looking at the findings of a government public opinion survey as shown in Figure 1.10.3, there were strong demands for protection of the living environment from 1968 to 1978, coinciding with the period of most intense mass media coverage that was shown in Figure 1.10.1. In other words, one can infer the extent of influence that the mass media exerted.



Source: Cabinet Office "Public Opinion Survey of People's Lives"

Figure 1.10.3 Trend in Demand on Protection of the Living Environment by Public Opinion Survey (1967-1981)

b. Disclosure of Monitoring Findings and Public Opinion

The Air Pollution Control Law and Water Pollution Control Law made it obligatory for prefectural governors to constantly monitor conditions of pollution in the atmosphere, public water bodies and groundwater and to disclose the findings, in order to clarify the degree of achievement of environmental standards in each area. Monitoring results were published in prefectural and municipal white papers on the environment and in newsletters, and the like[156]. Local newsletters delivered to each household were particularly effective in disseminating information to citizens and played an important role in raising awareness about environmental conditions of their community.

[156] For example, on page 4 of the public relation paper "Fuji" issued by the Fuji municipal government in Shizuoka Prefecture on January 25, 1976, results of CO_2 concentration at 9 spots in the city and the number of days over environmental standard of CO_2 were reported.

1.11 Organizations for Industrial Pollution Control

This section examines service providers and industrial groups concerned with industrial pollution control measures. Also, refer to section 1.7.4 for organizations in local governments and section 1.8.4 for organizations within enterprises.

1.11.1 Service Providers

The services provided to enterprises for industrial pollution control include the sale of pollution control devices and wastewater and emission gas analyzers by manufactures, wastewater and emission gas analysis services, environmental consulting, and training services to develop human resources.

a. Birth and Development of the Pollution Control Equipment Industry

The pollution control equipment industry had emerged around 1965, which was before enactment of the pollution control laws in 1970. Some companies recognized a possible demand for pollution control equipment by foreseeing the enhancement of pollution control regulations, according to the establishment of the Soot & Smoke Control Law in 1962 and the Inter-ministry liaison committee for pollution control in 1964. In 1965, when industrial pollution was recognized as 'a serious social problem', the market for pollution control equipment was created[157].

Most companies that entered the pollution control equipment market were originally from the machinery industry. There were only 60 companies manufacturing pollution control equipment during 1965 to 1967. In 2001 the number of pollution control equipment manufacturers had increased to 117.

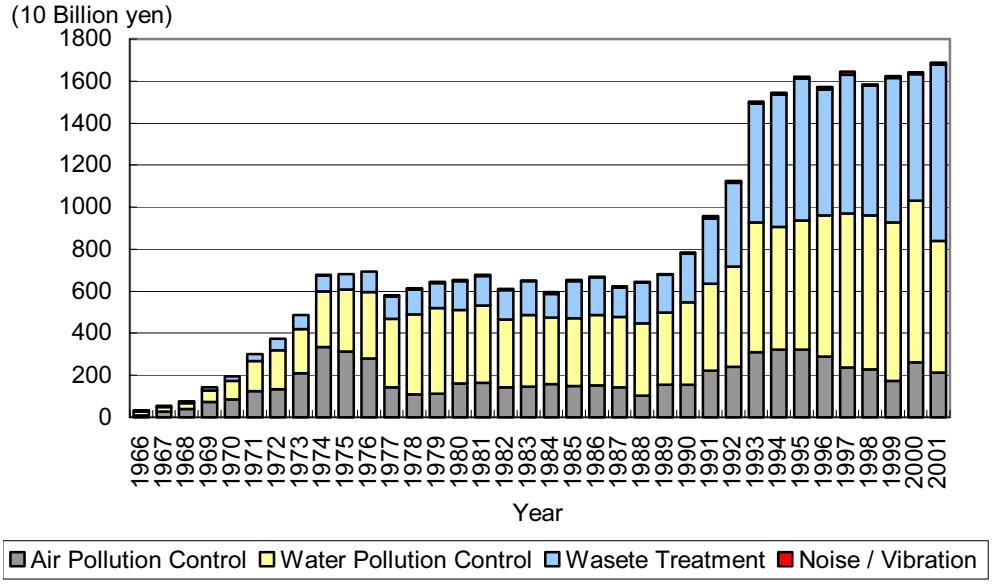
Engineering companies and wastewater treatment device manufactures started accepting orders for industrial wastewater treatment, but the spread of technology was slow following the enforcement of the Water Quality Protection Law and Industrial Wastewater Control Law in 1958 because of the technical limitations of manufacturers and the fact that legal controls were not always strict. In the latter half of the 1960s, as water pollution problems became more serious throughout the country, facilities for managing wastewater were rapidly introduced by the paper, chemical, and food industries. Nonetheless, it was impossible to treat the various kinds of wastewater generated by these sectors using the technologies of wastewater treatment devices that existed at that time. Consequently, companies were forced to rely on trial and error processes in order to develop industrial wastewater treatment technologies. In many cases, wastewater discharging factories and water treatment device manufacturers jointly developed treatment processes. It is said that many water treatment device manufactures at that time responded to the sudden upsurge in demand by introducing technologies from overseas engineering companies. Each manufacture and engineering company seemed to acquire technical capability by introducing overseas technologies while at the same time practicing trial and error in applying equipment to factories and gaining experience.

Air pollution control measures in the 1960s mainly consisted of soot countermeasures, and dust collectors were used for this purpose. Flue-gas desulfurization was one of the most expensive control technologies. Tumbler type dust collectors and electrostatic precipitators at that time were manufactured with technology from Europe and United States.

Full-scale flue-gas desulfurization technology had not been developed in the 1960s. Unfortunately, Japanese unique technology and individual devices were hardly capable of satisfying the required standards. Even Japan's leading major engineering companies did

[157] Kogai Boshi Setubi Kizai Jiten Henshu Iinkai, "Soron", "Kogai Boshi Sangyo no Genjo to Doko ni tsuite", *Kogai Boshi Setsubi Kizai Jiten,* 1977

not have sufficient technology or experience. Research and development into flue-gas desulfurization was started in 1966, when the Agency of Industrial Science and Technology assigned the development to certain engineering companies and electric power companies; however, it did not result in practically applicable technology. The first plant in Japan to incorporate flue-gas desulfurization technology was constructed in 1969 and utilized technology that was imported from Wellman Road Co., Ltd. in the United States. After that, Japanese enterprises have acquired the capacity and become internationally competitive in the field of flue-gas desulfurization technology[158]



Note: Value includes not only private sector demand but also public sector demand.
Source: Japan Society of Industrial Machinery Manufactures, "Kogai Boshi Sochi no Seisan Jisseki ni tsuite", 1969-1991 and "Kankyo Souchi no Seisan Jisseki", 1992-2001

Figure 1.11.1 Production Turnover of Pollution Control Equipment (1966-2001)

Production turnover of pollution control devices, including demand from the public sector, grew from 34 billion JPY in 1966 to 1,689.7 billion JPY in 2001, representing a fifty-fold increase over the period[159]. In recent years, the share of waste treatment devices displayed particular growth, with demand mainly coming from the public sector. Public sector demand also mainly accounted for the increase in production of wastewater treatment (sewage) facilities. Currently, public demand accounts for 70-80% of the production.

Air pollution control devices must undergo renewal. Accordingly, Figure 1.11.1 show two peaks of demand occurring in the mid-1970s and the mid-1990s.

As of 2002, the number of environmental equipment manufacturers belonging to the Japan Society of Industrial Machinery Manufacturers was 117. Table 1.11.1 shows the number of manufacturers and production turnover by capital size. The 31 major manufacturers with capital of more than 10 billion JPY accounted for 80% of production with each of these major companies generating production turnover of 40 billion JPY.

[158] Mitsubishi Kakoki Corp., *Mitsubishi Kakoki 60 nenshi*, 1995
[159] Japan Society of Industrial Machinery Manufactures, "Kogai Boshi Sochi no Seisan Jisseki ni tsuite", and "Kankyo Souchi no Seisan Jisseki"

Table 1.11.1 Status of Environmental Equipment Manufacturers

Capital Size	Number of Enterprises	Annual turnover (billion JPY)	Ratio (%)	Annual turnover per enterprise (million JPY/company)
Less than 100 million JPY	37	22	1.3	594
More than 100 million JPY, less than 1 billion JPY	28	114	6.8	4,071
More than 1 billion JPY, less than 10 billion JPY	21	188	11.1	8,952
10 billion JPY and more	31	1,366	80.8	44,065
Total	117	1,690	100.0	14,444

Source: Japan Society of Industrial Machinery Manufactures, "Kankyo Sochi no Seisan Jisseki", 2001

b. Analytical Instrument Industry

The first step to advance pollution control was the measurement of pollutants in effluent and emission gas at the source. The targets for analysis in emission gas were particulates, sulfur oxides, nitrogen oxides and carbon monoxide, while the targets for effluent were organic and hazardous substances.

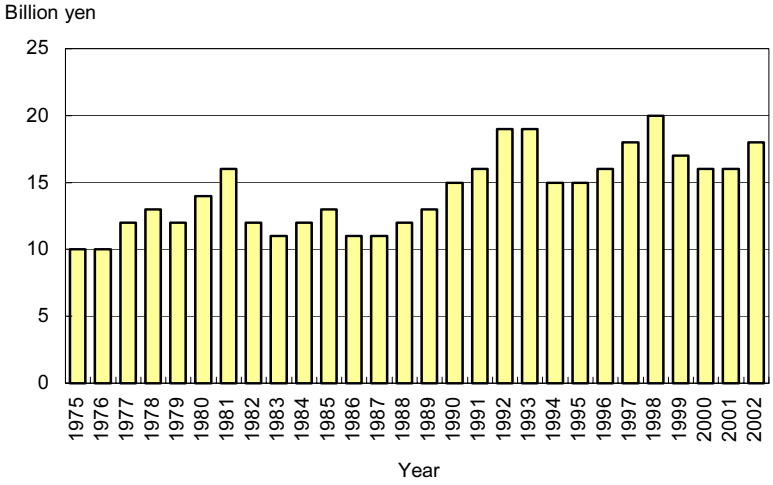
Concerning air pollution, analysis of particulates and sulfur oxides in the air during the mid-1960s was started. In 1966, continuous air monitoring by analog telemeters at four points in Yokkaichi City was started, and similar telemetry monitoring systems were set up in other local governments. Moreover, local governments experiencing pollution also started continuous monitoring of pollution sources by telemeter system around 1972-1973.

Meanwhile, enterprises possessing specific facilities discharging regulated effluent and emission gases were obliged, under the Water Pollution Control Law and Air Pollution Control Law of 1970, to implement self-analysis twice per year although it became necessary to adopt continuous monitoring in order to confirm the functioning of treatment facilities. Moreover, local governments tended to request that enterprises conduct continuous monitoring when concluding pollution control agreements with emission sources.

With this background, the demand for effluent and emission gas automatic analyzers increased, and such devices were developed from the late 1960s to the early 1970s. Almost all the analytical instrument manufacturers that developed and retailed the analyzers belonged to the Japan Analytical Instruments Manufacturers Association[160]. According to the association, there are currently 101 analytical instrument manufacturers with a combined production turnover of approximately 300 billion JPY, and environmental analytical instruments account for between 15-18 billion JPY[161].

[160] The web site of Japan Analytical Instruments Manufacturers Association: http://www.jaima.or.jp/

[161] Editorial Committee for Japan Analytical Instruments Manufacturers Association 40 Shunen Kinenshi (ed.), "Japan Analytical Instruments Manufacturers Association 40 Shunen Kinenshi" and its web site



Note: Environmental (pollution) analytical instruments include air pollution analyzers (except automobile exhaust gas analyzer), automobile exhaust gas analyzers, water quality analyzers, and other instruments.
Source: Editorial Committee for Japan Analytical Instruments Manufacturers Association 40 Shunen Kinenshi (ed.), "Japan Analytical Instruments Manufacturers Association 40 Shunen Kinenshi" and its web site

Figure 1.11.2 Changes in the Annual Turnover of Environmental Analytical Instruments (1975-2002)

c. Effluent and Emission Gas Analysis Services and Environmental Consulting

c.1 Effluent and Emission Gas Analysis Services

The Water Pollution Control Law and Air Pollution Control Law require pollution sources to conduct effluent and emission gas analysis on a regular basis. Although some factories possessing continuous analysis equipment and laboratories that can implement this type of task themselves, most companies consign the task to analysis contractors. The number of analysis contractors possessing analysis laboratories increased during the 1970s. Almost all of them belong to the Japan Environmental Measurement and Chemical Analysis Association, which was established in 1974 under the authorization of the Ministry of International Trade and Industry and the Environment Agency[162] (Japan Environmental Measurement & Chemical Analysis Association). This association currently has around 560 member enterprises.

The number of facilities targeted by the Air Pollution Control Law was approximately 200,000, while the number of establishments targeted by the Water Pollution Control Law was approximately 300,000. Since analysis needs to be carried out by the businesses themselves in order to secure compliance for effluent and emission gas, the market size of this industry has grown to about 100 billion JPY.

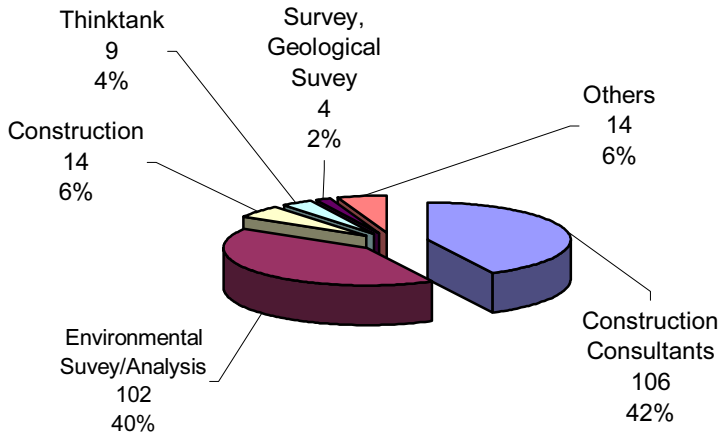
c.2 Environmental Consultants

Environmental consultants for industrial pollution control mainly arose in line with the implementation of environmental impact surveys for development projects by the national government, local governments, public entities and power suppliers. In particular, the general preliminary survey of industrial pollution by the Ministry of International Trade and Industry was implemented with cooperation of consultants. Moreover, following adoption of the 1972 Cabinet resolution on environmental protection measures in public works, the market for environmental assessment was formed in line with systematization based on

[162] Japan Environmental Measurement and Chemical Analysis Association: http://www.jemca.or.jp/info/

central government works projects and environmental assessment ordinances by local governments. The number of environmental assessments implemented based on separate laws was 800 by 1983[163].

The Japan Environmental Assessment Association was formed with 65 corporate members in 1978. Membership increased to 158 corporations in 1985, 239 in 1995 and almost 280 in 2003.



Source: Japan Association of Environment Assessment, "JEAS News"

Figure 1.11.3 Composition of Members of Japan Association of Environment Assessment (1996)

Member corporations possessed some 9,000 engineers in 1996. Sales turnover in the environmental sector was approximately 210 billion JPY among all member enterprises, and 50% was occupied by enterprises concerned with environmental assessment and other environmental services.

d. Human Resources and Training Services for Industrial Pollution Control

The service industry to train human resources for industrial pollution control measures in enterprises originated out of the obligation to assign pollution control managers holding national qualifications in specific plants targeted by the Law for Establishment of Organization for Pollution Control in Specified Factories in 1971.

Training services are mainly provided by the Japan Environmental Management Association, which provides training courses and other services every year.

1.11.2 Industry Associations

Industry associations represented major stakeholders influencing industrial pollution control measures when they were formulated and when they were implemented in practice. Industry associations also played an important part in disseminating information on national pollution control measures and on the measures taken by competitors to member enterprises.

a. National Industry Associations

The Japan Federation of Economic Organizations and the Japan Chamber of Commerce and Industry played a particularly important role among national industry associations.

The Japan Federation of Economic Organizations was established in 1946 with the aim of contributing to Japan's postwar economic reconstruction. As of 2003, it counted 126

[163] Japan Society for Atmospheric Environment (ed.), *Nihon no Taiki Osen no Rekishi III*, 2000, pp.1008-1020

national associations by industry type, 47 regional economic organizations and 1,268 enterprises among its membership. The Japan Chamber of Commerce and Industry succeeded the Federation of Chambers of Commerce and Industry that had been established in 1892 and was established in 1922 with the aims of promoting development of local commerce and industry and social welfare. That organization is composed of 27 chambers of commerce and industry with a total of 1,600,000 members throughout the country.

Important industry associations targeting SMEs are the Central Federation of Societies of Commerce and Industry and the National Federation of Small Business Associations.

Numerous industry associations exist throughout the country in each sector, and most of them belong to the Japan Federation of Economic Organizations. At the local level, SMEs are organized under local chambers of commerce and industry, and almost all manufacturing enterprises in Japan belong to either industry associations or chambers of commerce.

a.1 Japan Federation of Economic Organizations

The Japan Federation of Economic Organizations is positioned at the pinnacle of industry in Japan, and the president of the association has such high social status that he is referred to as the premiere of the business community. The president of the Japan Federation of Economic Organizations is normally appointed from top enterprises in the manufacturing and electric power sectors.

The Japan Federation of Economic Organizations in 2002 had revenue of approximately 5 billion JPY, of which 4.2 billion JPY was raised from memberships. Moreover, the organization had approximately 200 administrative staffs.

Up to 1993, the Japan Federation of Economic Organizations organized political funding support for the Liberal Democratic Party and had a major influence over formation of government economic policy. As Japan is a consensus-based society, it was said that the government could not submit policy bills to the Diet without first obtaining the Federation's consent. The Japan Federation of Economic Organizations ceased to organize political funding in 1994, but is said to have increased its influence over national policy development and has the reputation of being the think tank of the Japanese business world[164].

Since the Japan Federation of Economic Organizations has occupied such an important position in society, everyone would agree that it also played an important role in forming policy on pollution control measures.

The Japan Federation of Economic Organizations, representing the collective opinion of industry, was aware of the need for pollution controls in the 1960s, but took a negative approach towards the adoption of strict controls.

Because of defeat in three major pollution litigations in July 1972, awareness of the necessity of pollution control measures even at the expense of economic growth was enhanced.

In 1967, the Ministry of Health and Welfare drafted a proposal for the Basic Law for Environmental Pollution Control but did not contain the provision of harmonizing environmental protection with sound economic growth. The provision, 'environmental protection measures must be in harmony with proper economic development' was eventually incorporated in Article 1 in consideration of the strong resistance of the business community. In fact, the Japan Federation of Economic Organizations presented its written views to the government in January 1967, stating, "the basic principle of pollution control administration lies in raising the welfare of local citizens by realizing harmony between protection of the living environment and development of industry." It should be noted that this opinion did not seek to harmonize issues related to human health with industrial development. The opinion also sought limited application of the polluter-pays-principle and suggested that the

[164] KOGA Junichiro, *Keidanren - Nihon wo Ugokasu Zaikai Think Tank*, Shincho Sensho, 2000

competent ministry should be the Economic Planning Agency rather than the Ministry of Health and Welfare[165].

Although it is said that many of the industry associations at that time were opposed to the draft of the basic law, it was eventually passed in 1967 after two adjustments, which concerned the harmonization provision and the setting of environmental standards as non-binding targets.

Not all the opinions of the Japan Federation of Economic Organizations were reflected in industrial pollution control policy. The Federation naturally represents the opinions of industrial interests, but the feature of policy making in Japan is such that the opinions of other interested parties were heard in forming a broad consensus[166].

It took a long time to reach agreement in formulating the Environmental Impact Assessment Law. This bill was discussed for three years from 1981 to 1983, and no conclusion could be reached. Eventually, the legislation was given up. Forceful opposition to the bill by the Federation of Electric Power Companies under the Japan Federation of Economic Organizations was well known at that time[167].

It would be erroneous to think that the Japan Federation of Economic Organizations always opposed industrial pollution control policies. The Federation was mainly concerned with excessive regulation by the authorities. Moreover, since the Federation possessed such large political influence, once environmentally friendly policies were agreed upon, its member organizations would support it.

The Japan Federation of Economic Organizations has 38 policy committees including the environment and safety committee and resources and energy countermeasures committee, which have been particularly active.

Ever since its Global Environmental Charter of 1996 and its Environmental Appeal of 1997, the Japan Federation of Economic Organizations adopted a positive approach to environmental issues. In 1996, the Federation compiled the industry specific Environmental Voluntary Action Plans and started following up and assessing activities concerning global warming countermeasures and targets for reduction of industrial waste disposal quantities. In addition, in 2004, it announced the "Three Approaches to Building an Environment-Oriented State"[168].

a.2 Japan Chamber of Commerce and Industry

The Japan Chamber of Commerce and Industry is a nationwide organization comprising 527 local level chambers of commerce and industry with a total membership of 1,600,000 enterprises[169]. This is Japan's largest organization concerned with commerce and industry and functions as the general coordinator of local chambers of commerce throughout Japan.

Chairman of the Japan Chamber of Commerce and Industry is considered one of the honorable positions in the Japanese business community. Since the Japan Chamber of Commerce and Industry includes many non-manufacturing enterprises, this organization does not necessarily represent the interests of manufacturing sector alone. Moreover, the organization emphasizes the interests of SMEs in local economies as its members are close to local markets.

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165 HASHIMOTO Michio, *Shishi Kankyo Gyosei*, Asahi Shinbunsha, 1988, pp.97-119
KAWANA Hideyuki, *Document Nihon no Kogai Volume 2 - Kankyotyo*, Ryokufu Shuppan, 1988, pp.68-108

166 On the process of creating Japanese policies, it is normal that bureaucrats coordinate interests with involved parties outside an assembly.

167 Nippon Keidanren, *Keizai Dantai Rengoukai 50 nenshi*, 1991

168 http://www.keidanren.or.jp/japanese/policy/2004/002.html

169 http://www.jcci.or.jp/

The Japan Chamber of Commerce and Industry includes the permanent environment and energy committee. Income of the organization in 2002 was 3.6 billion JPY, obtained almost from membership fees and project activities. The secretariat has a permanent staff of 101.

a.3 The Central Federation of Societies of Commerce and Industry

The Central Federation of Societies of Commerce and Industry[170], a general economic entity (established as a voluntary organization in 1959), was established in 1962 based on the Commerce and Industry Association Law of 1960.

Composed of prefectural federations of commerce and industry, the Central Federation of Societies of Commerce and Industry conducts guidance and communications on organizations and operations of and compiles the collective opinions of members, which it publishes or presents to the government as reports and proposals, thereby contributing to the sound development of commerce and industry societies and the promotion of commerce and industry in Japan.

Commerce and industry societies, which make up the 47 prefectural federations, are established mainly in municipal areas and number 2,776 throughout the country. These societies carry out similar activities to chambers of commerce and industry. However, they differ in terms of organization and operation since they mainly deal with SMEs. Members of commerce and industry societies belong to all kinds of industries and number approximately 1,050,000 throughout the country. The ratio of member business owners to all businesses (rate of organization) is an unprecedented 63.0% on average and the membership of course represents a wide range of sectors.

The Central Federation of Societies of Commerce and Industry contributes to the formation of national policies and disseminates information on environmental administration and tax systems, and the like to SMEs.

The Central Federation of Societies of Commerce and Industry had an income of 1.35 billion JPY in 2002 of which 50% was provided from national subsidies. The secretariat of the Federation had 43 permanent staff members.

a.4 National Federation of Small Business Associations

The National Federation of Small Business Associations[171], a special authorized corporation, was established as the National Federation of Small Business Cooperative Associations following revision of the Small Business Cooperative Association Law in 1955. In 1958, in line with enforcement of the Law concerning Organization of Small Business Associations, the name of the organization was changed to the National Federation of Small Business Associations. It is composed of the central association in each prefecture and a national federation made up of them. The membership of the central association in each prefecture is composed of cooperative business associations, small cooperative business associations, mutual aid associations, credit cooperative associations, cooperative association federations, corporate cooperatives, industrial cooperatives, commercial cooperatives and commercial cooperative federations, shopping district promotion cooperatives and those federations, and other small and medium enterprise-related cooperatives and agencies. The National Federation of Small Business Associations acts as the general guiding agency overseeing all these cooperatives and groups. It also includes cooperatives composed of small and medium manufacturing industries, as well as credit cooperative associations, which are the financial institutions most closely connected to local communities.

For promoting and developing SMEs, the National Federation of Small Business Associations organizes small business owners and implements various measures through their organizations aimed at modernizing their plants and equipment, enhancing and developing

[170] http://www.shokokai.or.jp/
[171] http://www.chuokai.or.jp/index.html

technology, rationalizing and consolidating business operations, offering guidance on upgrading the general structure, and stabilizing and enhancing the markets and environment surrounding their businesses. In particular, this organization plays an important role in disseminating information on national environmental trends, public financing and preferential tax measures down to the grassroots level via member associations.

The National Federation of Small Business Associations had income of 3.0 billion JPY in 2002, of which 70% was provided from national subsidies. The association has 51 permanent administrative staff.

b. Industry Associations

Industry associations have also played an important part in industrial pollution control measures. Steel, oil refining, petrochemicals, cement, and pulp/paper, are the some of those industries that discharge large quantities of pollutants and have long been organizing industrial associations in each sector, as indicated in Table 1.11.2.

Table 1.11.2 Establishment of Industry Associations

Name	Month and year established	Number of member firms (as of 2003)
Japan Iron and Steel Federation	November 1948	64 manufactures 66 trading companies
Petroleum Association of Japan	November 1955	18 firms
Japan Petrochemical Industry Association	June 1958	10 firms
Japan Chemical Industry Association	April 1948	191 firms
Japan Cement Association	February 1948	20 firms
Japan Paper Association	February 1972	41 firms
Federation of Electro Plating Industry Association, Japan	August 1948	28 industrial unions (1,962 firms)
The Federation of Electric Power Companies of Japan	November 1952	10 firms

Other examples include the Japan Electronics and Information Technology Industries Association, the Japan Automobile Manufacturers Association, the Japan Textile Finishers' Industry Association, the Japan Fluoropolymers Industry Association, the Japan Chemical Fibers Association, the Japan Paint Manufacturers Association, and the Japan Adhesive Industry Association. These associations have maintained strong links with competent departments such as the basic industries department and the mechanical and information industries department within the Ministry of International Trade and Industry (currently, the Ministry of Economy, Trade and Industry).

Many industry associations opposed the enactment of the Basic Law for Environmental Pollution Control in 1967; (likewise, when it came to amending the law in 1970,) and the Ministry of International Trade and Industry, having strong relations with industrial associations, strongly opposed the amendment of the law (removal of the provision about harmony with industrial development) as well[172]. Having said that, these associations and

[172] YAMAGUCHI Tsutomu, "Nihon no Ricchi Kogai Gyosei no Tenkai Katei", Asia ni okeru Kankyo Seisaku no Keisei Jisshi Katei Kenkyukai, Institute of Developing Economies (ed.), "Nihon no Kogai Taisaku Keiken ni kansuru Hearing no Kiroku", 2002, pp.49-55

departments actively exchanged information in order to comply with the pollution control legislation enacted in the 1970 Environmental Pollution Diet. Companies belonging to the iron and steel federation, for example, were willing to share information about pollution control with competitors as a common agenda. These sector-wise industry associations have full-time staffs, sections or committees specializing in environmental issues, and their activities continue until today.

Industrial associations with large numbers of SMEs, i.e. pulp/paper, dyeing, and electroplating, tackled the pollution issues as described below.

In the pulp/paper sector, the Japan Technical Association of the Pulp and Paper Industry was created in 1947, prior to the establishment of the Japan Paper Association. Within the technical association, engineers presented research achievements, exchanged information and prepared technical manuals. The association opened its doors to a wide range of professionals, and it has now become an academic society. The technical association is not technically an industry association, but it is supported by the pulp/paper industry as well as engineers in the industry. This association extensively exchanged technical information from the late 1960s and 1970s, and the achievements were compiled and published as a pulp/paper manufacturing technical treatise (environmental control and water supply edition) in 1978.

The electric plating industry also has its own approach. With the enactment of three legislations – the Industrial Wastewater Control Law in 1958, the Basic Law for Environmental Pollution Control in 1967, and the Water Pollution Control Law in 1970, the electroplating industry recognized that thorough treatment of wastewater was an essential requirement for the industry. Since the electroplating industry is composed of mainly SMEs, the industry association took an initiative in developing new technologies and treating wastewater rather than leaving such tasks to individual members. It was also less expensive and posed less investment risk for the member enterprises to introduce joint pollution control equipment, so that industry-wide pollution control was promoted. In 1970, out of about 3,900 plating enterprises in Japan, 3,490 or 89% of companies belonged to the industry association, which boasted the highest rate of membership among all the industry associations[173].

Administrative authorities were also able to provide necessary guidance and advice to industry through these industrial associations. In the electroplating industry, joint implementation of pollution control under the guidance of the industry association was promoted at an early stage. Some of the examples included electroplating industrial complexes established by the Takasaki Metal Industrial Complex Cooperative Association and the Katsushika Plating Plant Cooperative Association in 1968. Moreover, regulation of cyanide was strengthened by the Water Pollution Control Law, as a result of which the treatment of concentrated cyanide wastewater containing complex cyanide became a major issue for the industry. In response to it, the Tokyo Plating Pollution Control Cooperative Association was established and developed a concentrated cyanide treatment plant utilizing a high-temperature combustion process[174].

Industry associations in some cases acted as pressure groups to put brakes on tightening regulation for pollution control. However, more importantly, they enabled member companies to exchange information and opinions, and implemented joint projects to deal with pollution control issues crossing over the interests of individual enterprises. These activities played an important role in the dissemination of technology within industries.

[173] YABE Ken, “Denki Mekki Gyokai ni okeru Kankyo Taisaku no Ayumi to Kongo no Kadai”, *Sangyo Kogai*, Vol.28 No9, 1992, pp.129-136

[174] Now the process is changed into heat hydrolytic.

c. Industry Associations concerned with Industrial Pollution Control

Industrial enterprises producing plant and machinery for pollution generating sources, also acted in response to major pollution-related issues. Plant- and environmental analysis-related associations include the following:

- Japan Analytical Instruments Manufacturers Association (manufactures of environmental analytical instruments, established in August 1960)
- Japan Society of Industrial Machinery Manufacturers (manufactures of pollution control devices, established in 1967, whose predecessor is the Industrial Machinery Association established in 1948)

The Japan Analytical Instruments Manufacturers Association had 101 members as of 2003. Production turnover for the analytical instruments produced by its members was 17,707 million JPY, of which exports accounted for 5,060 million JPY. Experts belonging to this association play an important role in preparing Japanese Industrial Standards relating to environmental analysis.

Members of this association have greatly contributed to the development of pollution administration in the country by developing automatic analyzers for air and water quality as well as the telemetry systems which utilize the automatic analyzers.

As mentioned earlier, plant manufactures, who belong to the Japan Society of Industrial Machinery Manufacturers, have been actively involved in the development of pollution control equipment. Member enterprises concerned with pollution control played an important role by providing vital information concerning the technical feasibility of pollution control measures when the government was establishing emissions standards, and they also actively cooperated in the preparation of technical standards and guidelines for pollution control measures.

Other industrial machinery-related industry associations include the Japan Construction Equipment Manufacturers Association, the Japan Industrial Conference on Cleaning, and the Semiconductor Equipment Association of Japan. Each of these groups has strived to produce environmentally friendly industrial machinery.

Table 1.11.3 shows the major associations specifically relevant for industrial pollution control.

Table 1.11.3 Public-Service Corporations Specifically Related to Pollution Control

Name	Year and month established	Member firms (as of 2003)
Japan Environmental Management Association for Industry	September 1962	Approx. 1,200
Japan Association of Industries and Environment	June 1973	89
Water Re-Use Promotion Center	May 1973	105 bodies/members
Energy Conservation Center, Japan	1978	2,856 supporting members
Clean Japan Center	November 1975	146 supporting members
Industrial Waste Management Foundation	December 1992	None
Japan Industrial Waste Technology Center	November 1988	9 corporate members
National Federation of Industrial Waste Management Associations	July 1978	47 bodies 21 supporting firms

The Japan Environmental Management Association for Industry (JEMAI)[175], whose predecessor is the Air Pollution Control Industries Association, was established in 1962 with the aim of promoting air pollution control in parallel with growing industrial activity. This association changed its name to the Industrial Pollution Control Association in 1966, and changed again to the present name in 1993. The purpose of this association is to contribute to sound industrial development and the welfare of citizens by conducting studies and technical guidance in response to pollution problems arising from industrial activities. Association members include major enterprises from a wide range of industrial sectors including electric power generation, iron and steel, chemicals, oil refining, electrics and electronics, automobiles, machineries, and construction. This association has a permanent staff of 70 and conducts operations on a scale of approximately 1.3 billion JPY per year. Their operation is mainly supported by their own revenue from profit-making activities, which contain services such as study and research assigned by national agencies, training, information provision (including publishing), and international exchange. Among these services, the association has been carrying out training of pollution control managers and publishing of specialized literature on pollution control, and it has thus played a central role in the development of human resources engaged in industrial environmental measures in Japan.

The Japan Association of Industries and Environment[176]was established with the objectives of forming social consensus on the joint existence of industry and the environment and thereby contributing to sound industrial development and creation of a rich environment by conducting planning, study and research concerning harmonization between industrial activities and environmental protection. Japan's top enterprises are counted among its membership and it serves as a forum for discussing environmental management in industry. It also implements policy research and puts forward opinions in the formulation of legislation. It currently has 10 staff and conducts operations worth approximately 200 million JPY per year.

The Clean Japan Center[177] was established in response to the liabilities defined by the Waste Management Law of 1970 for management industrial wastes, which required enterprises to deal with the recycling of wastes. The Japan Chamber of Commerce and Industry has promoted the Clean Japan campaign since September 1973, encouraging industry to take part in this endeavor. The Ministry of International Trade and Industry, in its interim report for the discussion group on recycling in 1974, proposed the establishment of the Japan Clean Center as a national center for nationwide recycling activities aimed at achieving the goals of recycling policy. With this background, the Japan Clean Center was established with support from Ministry of International Trade and Industry, the Japan Chamber of Commerce and Industry, and the Japan Federation of Economic Organizations. The center has since played a central role in the implementation of study and research and provision of information for the promotion of industrial waste recycling.

The Industrial Waste Management Foundation was established under public and private sector cooperation with the objective of promoting development of industrial waste treatment/disposal facilities. In addition to providing loans to private treatment/disposal operators for facility development, it operates a fund to finance activities for restoring the status quo in areas where waste has been illegally dumped. The Industrial Waste Technology Center provides manifests for proper treatment/disposal and conducts awareness and training activities for treatment/disposal operators and waste dischargers. The National Federation of Industrial Waste Management Associations is a federation of waste treatment/disposal operators in each prefecture and conducts activities aimed at raising the quality of the waste treatment/disposal industry.

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175 http://www.jemai.or.jp/JEMAI_DYNAMIC/index.cfm
176 http://www.pc-room.co.jp/sankan/
177 Clean Japan center, "Clean Japan Center 20 nenno Ayumi", 1995, http://www.cjc.or.jp/index.php

1.11.3 Academic Societies and Universities

Table 1.11.4 shows the academic societies that are concerned with industrial pollution. Among the oldest are the Japan Society of Public Health and the Chemical Society of Japan. Members of the former society started looking into public health problems and health damage issues caused by air and water pollution in the 1950s. The Chemical Society of Japan includes almost all the chemists in Japan among its membership, who have contributed greatly to the development of the chemical industry. The members have deep knowledge about the safety of chemical substances, and thus the Society provided a base for addressing issues of labor safety in enterprises.

Concerning waterworks and sewage, the sanitary engineering department of the Japan Society of Civil Engineers is concerned with water treatment technology. This society also played a central role in dealing with waste-related issues at the start of the 1970s. Since then, societies in each respective field have been established.

These societies conducted research into industrial pollution control measures from a technical viewpoint. Moreover, environment-related specializations in universities were established and graduates became employed in the environment and safety departments of enterprises and by central and local governments, environmental consultants and environmental equipment makers, where they made a major contribution to industrial pollution control measures in Japan.

Table 1.11.4 Academic Societies Related to Industrial Pollution

Name of Academic Society	Year Established	Number of Members (2003)
Japan Society of Public Health	Established in 1947.	7,930
Chemical Society of Japan	Established in 1878. Merged with the Industrial Chemical Society in 1947.	Approx. 20,000 in 1960 More than 30,000 since 1970
Japan Society of Civil Engineers	Established in 1914. The environmental engineering committee and the environmental system committee deal with environmental pollution.	42,363
Japan Society for Occupational Health	Established in 1972.	Approx. 7,000
Japan Society on Water Environment	Established as a voluntary group, Japan water pollution research in Oct. 1971. Changed to current name in June 1991.	Regular members; individual: 2,647, corporate: 189 Student members: 403 Total: 3,239
Japan Society of Atmospheric Environment	Established as 'Air Pollution Research Conference' in 1960. 'Air Pollution Research Association' during 1978-1994. Changed to current name in 1995.	Regular members: 1,646 Student members: 94 Supporting members: 93 organizations Total 1,833
Japan Society of Waste Management Experts	Technical working group of Japan Waste Management Association has been active since the 1970s, and it officially established as academic society in March 1990.	Regular members: 3,653 Students: 319 Foreigners: 24 Public: 114 Supporting: 193 Community groups: 2 Total: 4,305
Society of Environmental Science, Japan	Established as a voluntary association in Nov. 1987. Approved as aggregate corporation in June 1993.	Regular members: 1,495 Associated members: 163 Supporting members: 33 Honorary members: 19 Total: 1,710

Name of Academic Society	Year Established	Number of Members (2003)
Society for Environmental Economics and Policy Studies	Established in 1995.	Approx. 1,000
Japan Association for Environmental Law and Policy	Established in 1997.	Regular members: 411 Supporting members: 4 organizations
Japanese Society for Environmental Sociology	Established in 1992 by reorganizing the Study Group on Environmental Sociology started in 1990.	Approx. 400

1.12 Investment in Pollution Control

1.12.1 Surveys of Pollution Control Investment

The amount of investment in industrial pollution control has been the subject of a number of sampling surveys. The Ministry of International Trade and Industry commenced a survey of facility investments in 1956, and investigated the amount of investment in industrial pollution control since 1971. The Pollution Control Service Corporation (1976-1990) also conducted surveys on trends in facility investment by SMEs. Meanwhile, the Japan Society of Industrial Machinery Manufacturers has implemented a survey of the production of environmental devices on the producer side since 1966.

Table 1.12.1 gives an outline of each of these surveys.

Table 1.12.1 Surveys of Pollution Control Investment

Name of the Survey	"Surveys of Capital Investment in Industrial Pollution Control"	"Surveys of Trends in Pollution Control Investment by SMEs"	"Surveys of Environmental Equipment Production"
Implementing body	Ministry of International Trade and Industry	Environment Agency & Pollution Control Service Corporation	The Japan Society of Industrial Machinery Manufacturers
Target of the survey	Companies in the mining and manufacturing industries with capital size of 100 million JPY that MITI has jurisdictions (exclude food processing)	Companies in the manufacturing industry with employees of 30 people or more and capital size of less than 100 million JPY.	Member companies of the Society and members of the Council of Good Environmental Equipment
Year	FY 1972 -	FY 1977 - 1991	FY 1970 -
Scope of the survey	Past record, forecast, and future plans for pollution control investments	Trend in investments for pollution control and their reasons and installment periods.	Record of pollution control equipment production

Note: In 'Study on Capital Investment' by Ministry of International Trade and Industry (currently Ministry of Economy, Trade and Industry), pollution control became survey items during the mid 1960s.
Source: FUJIKURA Ryo, "Kigyo no Kogai Boshi Hiyo ni kansuru Shisan", *Shigen Kankyo Taisaku*, Vol.35, No. 14, 1999, pp.53-60

1.12.2 Pollution Control Investment in the Manufacturing Sector

Although no comprehensive statistical survey of the amount of pollution control investment in the overall manufacturing sector has been carried out, surveys of the overall amount of capital investment including that in non-manufacturing sectors have been conducted in addition to the surveys shown in Table 1.12.1. Table 1.12.2 shows the estimates of the amount of pollution control investment in the manufacturing sector based on these data.

Pollution control investment increased dramatically at the start of the 1970s when the general framework of pollution-related legislation was enacted and strengthened, and it reached a peak in 1975, after which it decreased to 30% of the peak level by 1982. During the 1980s, both the ratio of pollution control investment to total capital investment as well as the actual amount of pollution control investment remained low. The ratio of the pollution control investment recovered to more than 2% in the 1990s, while the amount of the pollution control investment persisted around 300 billion JPY. As for the reasons behind this recovery in the 1990s, it is supposed that cycle factors, i.e. renewal and replacement investments played a bigger part than regulations.

Table 1.12.2 Estimated Pollution Control Investments in Manufacturing Industry

	Surveys of Financial Statements of Corporation Industry			Surveys of Capital Investment in Industrial Pollution Control		
	Capital investment in manufacturing industry (A) (million JPY)	Rate of pollution control investment to capital investment in manufacturing industry (B) %	Pollution control investment (C) (million JPY)	Pollution control investment (D) (million JPY)	Rate of pollution control investment to capital investment in manufacturing industry (E) %	Total pollution control investment in all the industry sectors surveyed (F) (million JPY)
1965	1,809,196	4.76	86,078			29,700
1966	1,921,975	2.37	45,640			26,800
1967	2,930,496	6.66	195,185			46,200
1968	4,357,164	4.10	178,644			62,400
1969	5,237,102	7.46	390,551			106,700
1970	5,591,097	6.58	367,654			163,700
1971	5,171,027	8.29	428,738			270,600
1972	5,344,399	11.29	603,399			323,200
1973	6,770,142	13.74	930,113			440,300
1974	8,034,574	18.93	1,521,152	388,500	11.84	584,500
1975	5,921,765	23.98	1,420,241	497,100	17.25	747,800
1976	5,950,241	22.52	1,340,083	437,400	14.77	719,500
1977	6,193,933	13.46	833,935	166,400	6.68	359,400
1978	6,095,954	9.19	559,965	167,000	5.63	339,500
1979	7,481,082	7.36	550,893	150,700	4.51	290,200
1980	9,285,540	4.24	393,595	97,100	2.60	295,000
1981	10,185,864	2.05	209,104	103,500	2.45	384,600
1982	10,172,126	2.31	235,417	117,500	2.76	432,400
1983	10,167,501	2.13	216,239	75,300	2.54	439,500
1984	12,006,949	1.80	216,125	72,000	2.04	321,400
1985	13,081,761	1.90	248,553	105,500	2.44	357,000
1986	12,151,155	1.80	218,721	73,400	2.12	267,400
1987	11,899,621	1.10	130,896	53,800	1.81	242,800
1988	14,956,140	1.30	194,430	71,500	1.70	281,300
1989	18,414,813	1.40	257,807	91,600	1.96	272,500
1990	21,483,369	1.60	343,734	97,200	1.54	294,800
1991	22,529,742	1.80	405,535	116,400	1.40	369,300
1992	18,932,154	2.50	473,304	117,600	1.43	370,000
1993	14,791,101	2.90	428,942	117,553	3.42	477,558
1994	12,873,807	2.50	321,845	100,200	4.62	359,900
1995	13,848,842	2.90	401,616	101,800	2.91	409,300
1996	14,341,596	2.80	401,565	135,300	3.31	444,800
1997	15,494,645	2.40	371,871	74,662	2.32	332,662
1998	12,979,047	2.20	285,539	91,235	3.67	245,966
1999	11,165,378	2.60	290,300	73,754	5.09	231,280
2000	13,238,284	2.40	317,719	76,771	4.49	224,865
2001	11,291,523	2.70	304,871	61,267	5.35	192,993

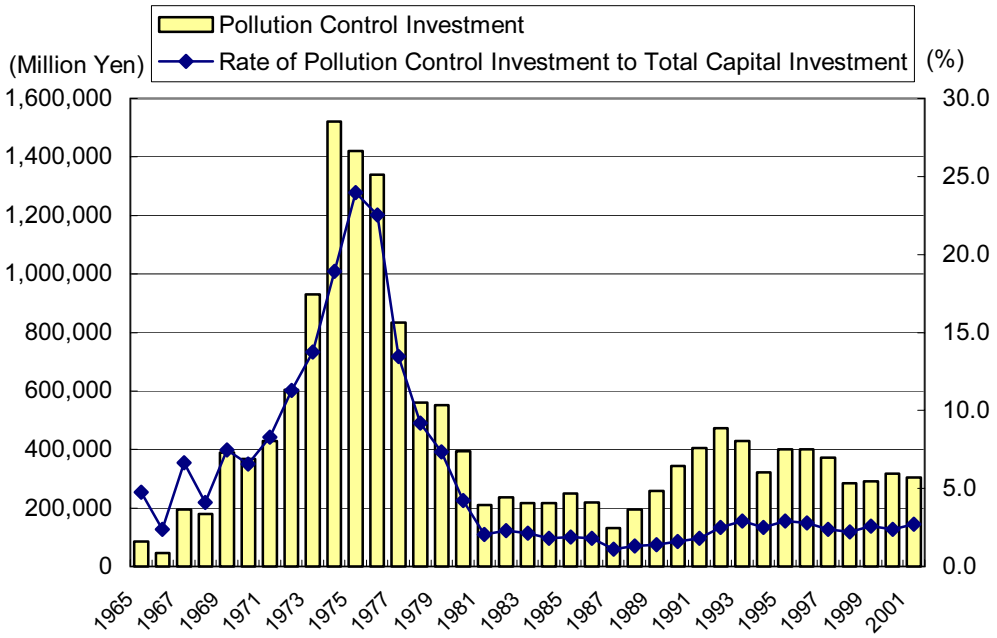
Note 1: Data in column (A) Capital investment in manufacturing industry from the Policy Research Institute, Ministry of Finance's "Survey of Financial Statements of Corporation Industry" (nominal value without land purchasing cost).

2. For column (B) Rate of pollution control investment to total capital investment in manufacturing industry, values for 1965-1977 are calculated for the whole industry from "Survey of Capital Investment" by the Ministry of International Trade and Industry; values for 1978-1983 are estimates; values for 1984-2001 are ratio of capital investment by purpose in manufacturing industry from "Survey of Capital Investment". Values for 1978-1980 are estimated by multiplying the average (B)/(E) during 1974-1977 by (E) during 1978-1980. Values for 1981-1983 are estimated by multiplying the average (B)/(E) during 1984-2001 by (E) during 1981-1983.
3. Column (C) is calculated value of (A) x (B).
4. Column (D) indicates total pollution control investment in manufacturing industry in "Survey of Capital Investment in Industrial Pollution Control" conducted by the Ministry of International Trade and Industry.

5. Column (E) indicates calculated ratio of pollution control investment in manufacturing industry in "Survey of Capital Investment in Industrial Pollution Control" conducted by the Ministry of International Trade and Industry.
6. Column (F) indicates total of pollution control investment for all industries (including non-manufacturing sectors such as mining and electricity) in "Survey of Capital Investment in Industrial Pollution Control" conducted by the Ministry of International Trade and Industry. Data prior to 1971 are from the Ministry of International Trade and Industry's "Survey of Capital Investment" and the Environment Agency's *1977 White Paper on the Environment*.
7. Ratio of pollution control investment in "Survey of Capital Investment in Industrial Pollution Control" is higher than investment ratio by purpose in "Survey of Capital Investment" since the former survey was targeted for companies with capital size of 100 million JPY or more. The latter include the companies that did not invest in pollution control. The latter is used for estimation of pollution control investment in manufacturing industry. The capital investment indicated here does not include land-purchasing cost. The Ministry of International Trade and Industry's "Survey of Capital Investment in Industrial Pollution Control" does not include food processing industry, but that point is disregarded here.

Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

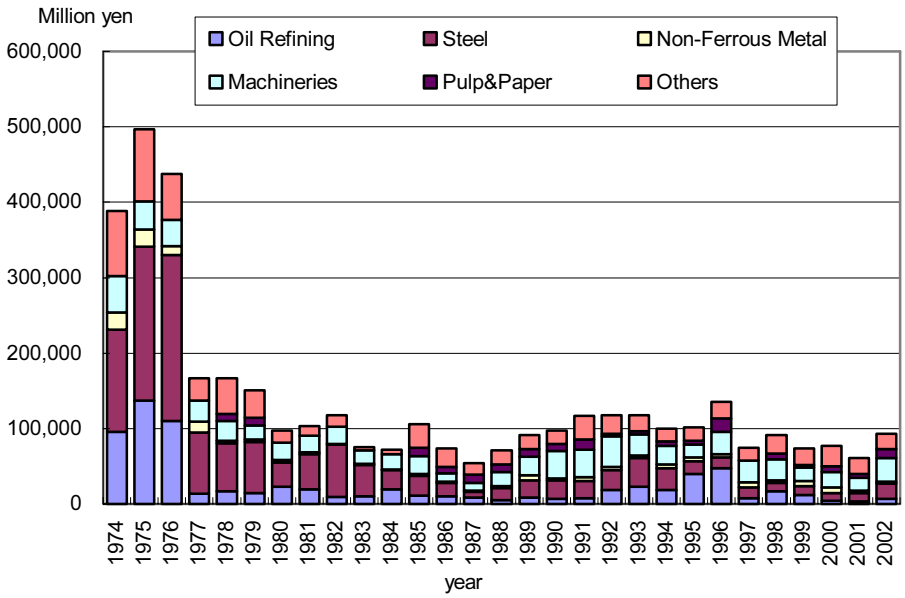
The estimated values are approximately three times larger than the value reported in the survey of capital investment into industrial pollution control equipment (results of sample survey). This is inevitable difference because whereas the first survey targeted only enterprises with a capital base of 100 million JPY or more, the estimated values were obtained from all business establishments including those with less than 100 million JPY capital.



Source: Developed from data in Table 1.12.2.

Figure 1.12.1 Estimated Changes in Pollution Control Investment and Proportion due to Investment in Manufacturing Industry (1965-2001)

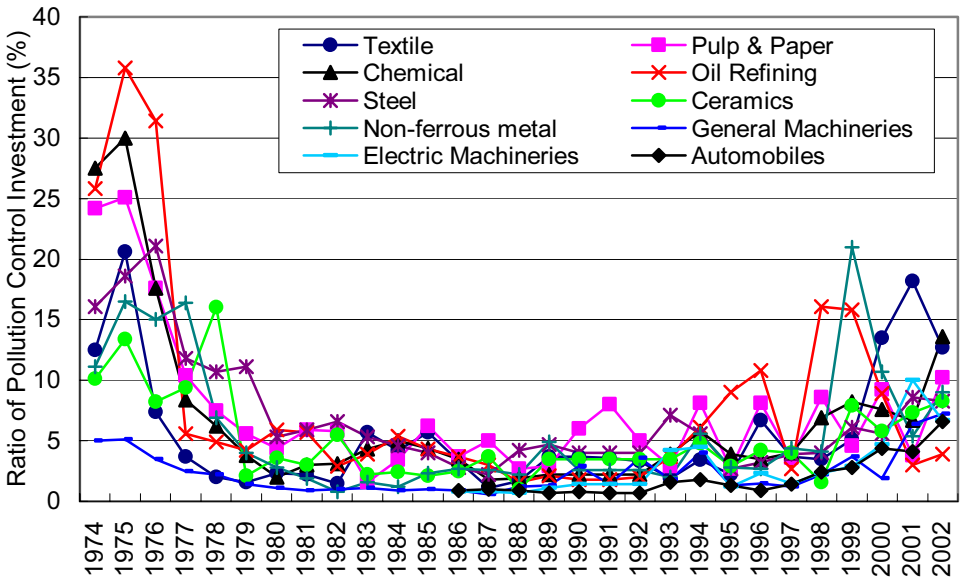
Figure 1.12.1 does not show sector trends, which can be obtained from the 'pollution control investment by manufacturing industry' in the "Survey of Industrial Pollution Control Investment" (see Figure 1.12.2). This figure shows that investment in two sectors, namely oil refining and iron & steel, accounted for roughly 70% of the total investment during the peak period in the mid 1970s.



Note: The amount of pollution control investments represent those by the firms responded to the survey, not all firms in Japan. Based on the "Survey of Capital Investment in Industrial Pollution Control."
Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

Figure 1.12.2 Changes in Pollution Control Investment by Major Industry Types (1974-2002)

Looking at the ratio of pollution control investment to capital investment by sector according to these surveys, it can be seen that the ratio differs by sector. The ratio in basic industries was particularly high in the mid 1970s.

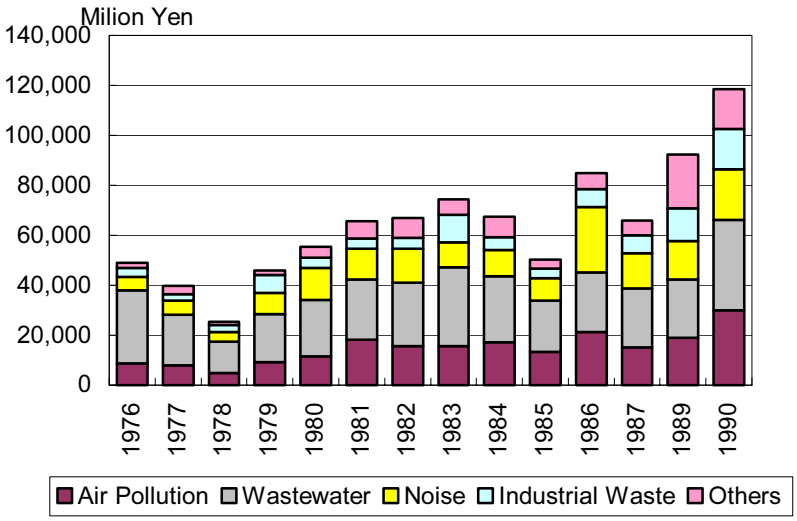


Note: Based on the "Survey of Capital Investment in Industrial Pollution Control."
Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

Figure 1.12.3 Changes in Rate of Pollution Control Investment by Type of Industry (1974-2002)

1.12.3 Investment by SMEs

This section examines average pollution control investments made by SMEs. Figure 1.12.4 shows estimates of pollution control investment by SMEs according to "Survey of Trends in Pollution Control Investment by Small and Medium Enterprises" that was carried out by the Pollution Control Service Corporation. It shows that investment varied in the range of 50-100 billion JPY during the 1980s. This amount is equivalent to roughly 40% of the overall pollution control investment indicated in Figure 1.12.1.



Source: Pollution Control Service Corporation, "Survey of Trends in Pollution Control Investment by Small and Medium Enterprises", 1990. From 1976 to 1978: 8 industries, from 1979 to 1981: 18 industries, from 1982 to 1990: 22 industries. 1988: No data

Figure 1.12.4 Investment in Pollution Control by SMEs (1976-1990)

The following Table 1.12.3, compiled from the above data, shows the average amount of investment in those enterprises that was invested in pollution control. The average amount was around 10 million JPY for each purpose.

Table 1.12.3 Average Pollution Control Investments by SMEs

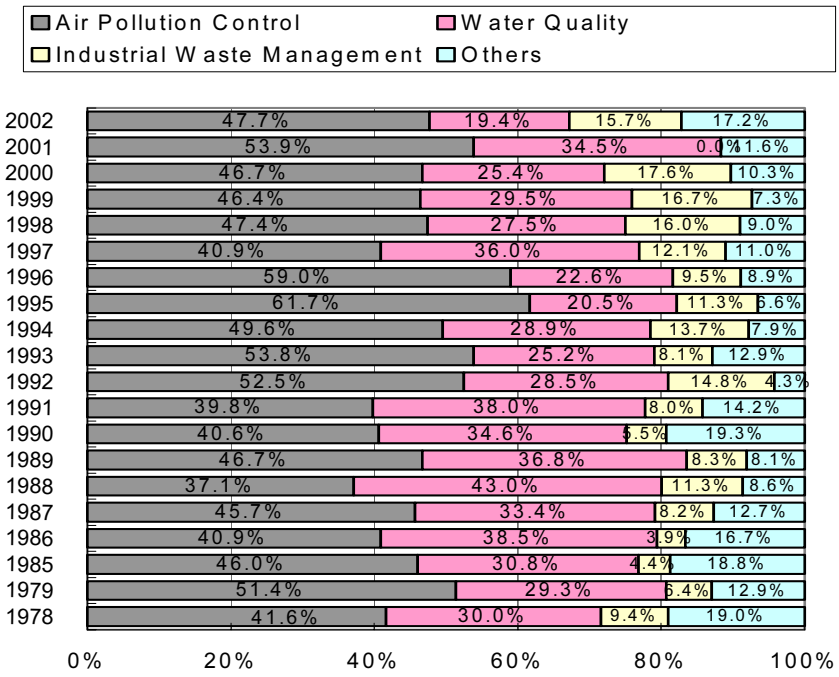
	Air Pollution (10 thu JPY)	Water Quality (10 thu JPY)	Noise/Vibration (10 thu JPY)	Overall (10 thu JPY)
1981	808	704	815	855
1982	696	891	1,556	1,226
1983	521	818	500	819
1984	631	726	795	852
1986	833	710	1,157	1,035
1987	650	769	927	881
1989	783	781	938	1,134
1990	953	1,008	953	1,229
Average	734	801	955	1,004

Source: Pollution Control Service Corporation, "Survey of Trends in Pollution Control Investment by Small and Medium Enterprises", 1990

1.12.4 Breakdown of Pollution Control Investment

The following Figure 1.12.5 shows the breakdown of pollution control investment in the manufacturing sector, based on the survey of pollution control capital investment for the late 1970s and from 1985 onwards. This shows that investment in air pollution control facilities accounts for a large share (40-50%). The share of investment in water treatment equipment

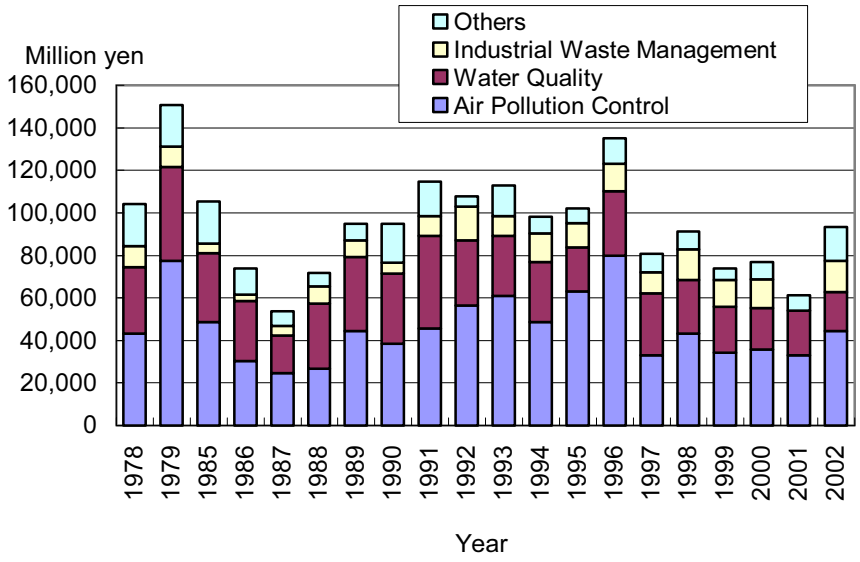
also increased from the late 1980s, while the share of investment in waste treatment facilities started increasing in the 1990s.



Note: Details of the measures are unknown for year 1980 to 1984. Also, the food industry is not included. Based on the "Survey of Capital Investment in Industrial Pollution Control."
Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

Figure 1.12.5 Composition of Pollution Control Investments by SMEs by Purpose (Firms with capital of 100 million JPY or more, 1978-2002)

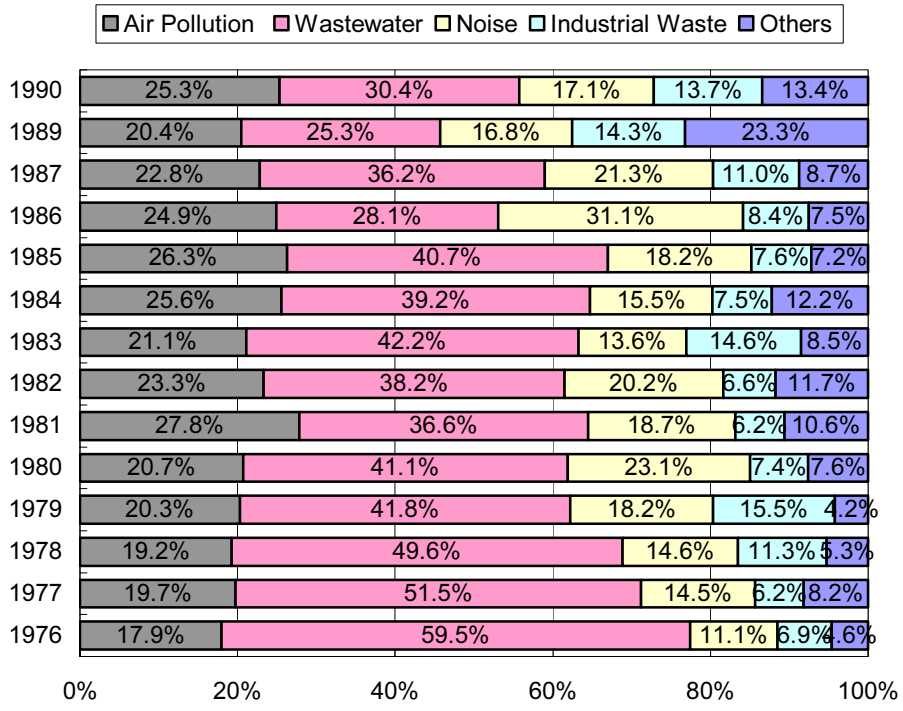
Figure 1.12.6 shows actual amount of investment by purpose according to the "Survey of Capital Investment in Industrial Pollution Control". One can see that investment in air pollution control measures occupies a major weight. In particular, the amount of investment in air pollution control measures increased during the mid 1990s, indicating the size of the contribution made by this area at that time.



Note: Based on the "Survey of Capital Investment in Industrial Pollution Control."
Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

Figure 1.12.6 Changes in Amount of Pollution Control Investments by Purpose (1978-2002)

Meanwhile, Figure 1.12.7 shows the breakdown of pollution control investment in SMEs. The high ratio of investment in wastewater treatment and noise and vibration control differs from the breakdown of investment that was surveyed for large-scale enterprises.

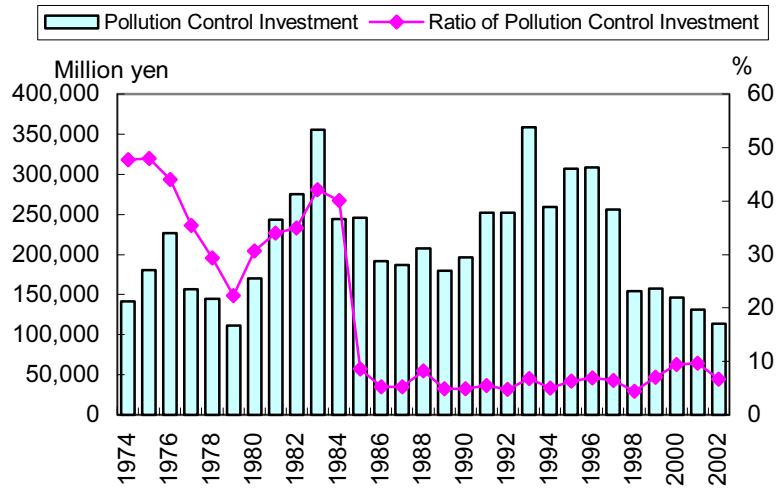


Source: Pollution Control Service Corporation, "Survey of Trends in Pollution Control Investment by Small and Medium Enterprises", 1990

Figure 1.12.7 Composition of Pollution Control Investments by SMEs (1976-1990)

1.12.5 Breakdown of Pollution Control Investment in the Electric Power Industry

The previous sections examined pollution control investment in the manufacturing industry. However, the amount of pollution control investment is also considerable in non-manufacturing industries such as the electric power, gas utility and mining industries. Investment in non-manufacturing industries is largely dominated by the electric power industry. As shown in Figure 1.12.8, the amount of pollution control investment in the electric power industry has been enormous, amounting to an annual average of between 200-300 billion JPY. Out of this investment, around 70% has been for air pollution control.



Note: Based on the "Survey of Capital Investment in Industrial Pollution Control."
Source: Ministry of International Trade and Industry, *Survey of Capital Investment Plan of Major Industries*

Figure 1.12.8 Pollution Control Investment and Its Ratio to Capital Investment by Electricity Industry (1974-2002)

1.12.6 Pollution Control Equipment Production Turnover

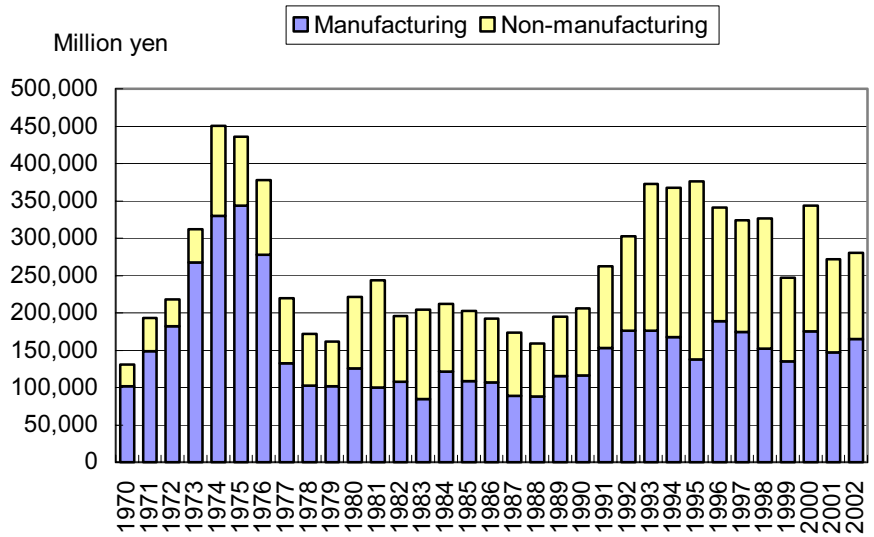
According to statistics of the Japan Society of Industrial Machinery Manufacturers, the amount of pollution control equipment production for the private sector is as follows. The production is divided into that for manufacturing, electric power and other industries.

Private sector demand has varied in the range of 200-350 billion JPY, of which the manufacturing industry has accounted for between 100 billion and just under 200 billion JPY, except for the period of sharp increase between 1973-1977. Clearly, there was heavy investment in pollution control in response to the environmental legislation in the 1970s.

The production turnover for pollution control equipment for the manufacturing industry roughly accounts for half of the estimated amount of pollution control investment shown in Figure 1.12.1 (see Figure 1.12.9). In particular, two peaks can be seen: one around 1975 and the other in 1995. It can be seen that that air pollution control facilities account for a large share of the investment (see Figure 1.12.10) and that the two peaks in investment were the result of increased production in air pollution control devices. The peak around 1995 reflects the fact that air pollution control equipment generally consists of mechanical devices, and it needs to be replaced after 15 to 20 years[178] in operation. In recent years since the start of the 1990s, the weight of investment in industrial waste treatment has been increasing, and this is considered indicative of the fact that it is becoming more and more difficult to dispose of industrial wastes by simple landfilling alone.

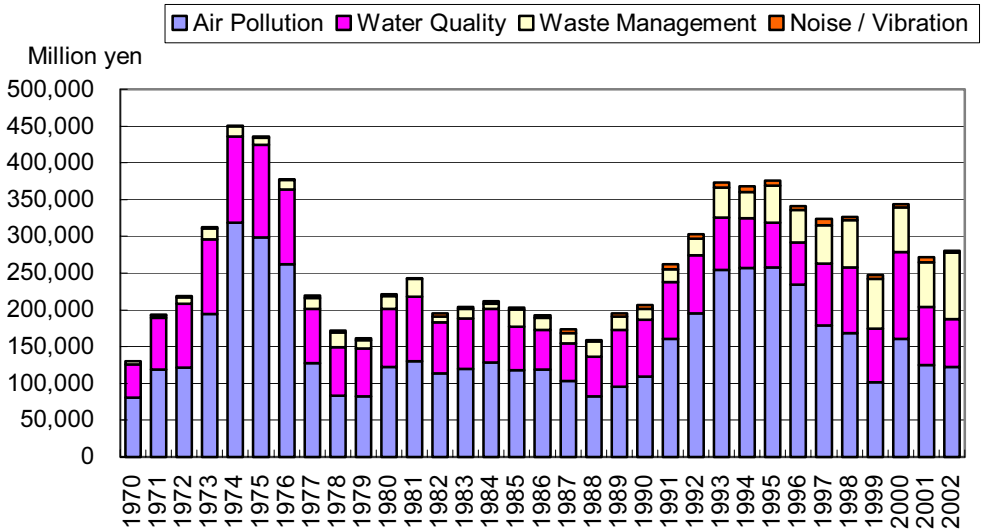
[178] From 1974 to -1976, we can see the cost to produce pollution control equipments for industry has increased. However, investment of oil desulfurization equipment has contributed to 10 billion JPY of the cost. It is supposed that clear replacement investment does not reflect it, because it is set in the production process.

The ratio of investment by type shown here differs from the breakdown of investment by SMEs. The ratio of investment in air pollution control falls in SMEs, and this is considered to reflect the fact that not many small businesses use large smoke generating facilities.



Note: The values represent actual prices.
Source: Japan Society of Industrial Machinery Manufacturers, "Kogai Boshi Sochi no Seisan Jisseki ni tsuite", 1969-1991 and "Kankyo Sochi no Seisan Jisseki", 1992-2002

Figure 1.12.9 Value of Production of Pollution Control Equipment for the Private Sector (1970-2002)



Source: Japan Society of Industrial Machinery Manufacturers, "Kogai Boshi Sochi no Seisan Jisseki ni tsuite", 1969-1991 and"Kankyo Sochi no Seisan Jisseki", 1992-2002

Figure 1.12.10 Value of Production of Pollution Control Equipment for the Private Sector by Type (1970-2002)

1.13 Macroeconomic Impact of Pollution Control Costs

1.13.1 Analyses of Macroeconomic Impact

The economic impact of pollution control investment can be considered from two viewpoints; the impact on prices through higher costs due to the investment, and that on incomes through higher demands accompanying the investment. In the first point, pollution control investment is non-productive so that the cost of investment has a negative effect because it limits productive investment, and because investment and maintenance costs increase production costs.

In the second point, on the other hand, capital investment in pollution control equipment contributes to increasing national income and leads to job creation. Judging from following analysis on Japan's experience of industrial pollution control, the negative effects of investment were almost cancelled out by the national income boosting impact and were only negligible.

Analyses in the following documents are considered in this section:

- *White Paper on Economics* (1973)
- *Industry and Pollution* (1997)
- *Review of Japan's Environmental Policy* by the OECD Environment Committee (1977)
- *White Paper on the Environment* (1992)

a. Analysis of the 1973 White Paper on Economics

The 1973 White Paper on Economics (by Economic Planning Agency) dealt with the macroeconomic impact of pollution control investment. According to this paper, the effects of pollution control investment can be summarized as follows:

1. Pollution control costs are directly translated into cost increases.
2. From the business management viewpoint, pollution control investment reduces investment efficiency and raises the capital coefficient.
3. This cost appreciation and investment alter the demand structure via the market supply and demand relationship.
4. This alters the structure of investment in each business category.

The macroeconomic model was used to analyze the above effects of pollution control investment. The result concluded, "the increase in the actual amount in the fiscal year of 1970 resulted in lower GNP and exports and higher imports and prices in all cases; however, the impact is not so large considering current environmental pollution problems."

The report went on to say, "granting that macroeconomic estimation contains various assumptions that make it difficult to generalize, the strengthening of environmental pollution controls and increase in pollution control investment after 1960 did not have a very large impact on the overall economy or individual industries, whereas the pollution prevention effect of this investment was big."

b. 1977 Analysis of Industry and Pollution

The Ministry of International Trade and Industry commissioned analysis of the economic effects of pollution control activities based on the macroeconomic model and went on to publish a summary of the findings.

Based on a comparison of the impact on GNP between the case of pollution control investment and that of no pollution control investment -- assuming that the environmental conditions as of 1960 were realized in 1985, it worked out that GNP was 2 trillion JPY less in

1985 in the case of pollution control investment than in the case of no-pollution control investment. However, this represented no more than 1% of GNP at that time and was considered a small impact. The following conclusions were drawn from this analysis:

"First of all, it cannot be said that pollution control activities, when viewed from the macro and long-term viewpoints, have a major impact on economic growth, price levels or the national standard of living, and the like. Accordingly, even if bold pollution control policies are advanced, the overall economy will not be greatly imbalanced. Secondly, however, for enterprises that belong to industries subject to frequent occurrence of environmental issues, as well as areas that have high concentrations of such enterprises, a very serious impact will be caused and it is necessary to promote individual policies from a microeconomic viewpoint in the immediate future[179]."

c. 1977 Review of Japan's Environmental Policy by the OECD Environment Committee

The OECD Environment Committee implemented a review of Japan's environmental policy between 1976 and 1977. The review reported the following conclusions:

"This concerns the economic cost and impact of pollution control policies in Japan. It is obvious that pollution controls imparted tangible and intangible benefits, however, these entailed costs. Although it is not very well known in Japan, the cost of pollution control was very high. In particular, it was thought to be higher than in other countries.

In 1975, it is estimated that pollution control costs (initial and operating costs) accounted for approximately 3% of GNP and that the economic cost (consisting of the depreciation of pollution control facilities, capital opportunity costs and operating costs) was just under 2%. In industries such as pulp/paper, iron and steel, electric power generation, and chemicals, pollution control led to fairly large increases in production costs. However -- and this is an important point -- the impact of these additional costs on the Japanese economy was not that great. Actually, there was no major impact on the competitiveness of Japanese industry. Cost for a certain company becomes revenue for another, and even for the companies that paid out pollution control costs, additional work is created in the long run. The effects of pollution control policies spread outwards through the economic mechanisms, and it is not easy to accurately gauge all these effects.

It was not sufficient to merely observe what happened in the beginning of the 1970s. Pollution control was no more than one of numerous factors that impacted on the economy during this period. It can be pointed out that the economic growth rate did not drop until the worldwide recession of 1974-1975, and that pollution control costs did not impede the realization of higher rate of economic growth, a lower unemployment rate compared to numerous other countries, as well as an appropriate surplus in the international balance of payments.

The best method for estimating the economic impact of pollution control costs is to utilize the macroeconomic model to measure movements in various economic indicators accompanying pollution control, assuming that other conditions remain uniform. Japan may be the only country in the world where research groups are not merely limited to policy decision makers who have utilized a number of such models. These model findings must be handled with the utmost care; however, it is noteworthy that the findings of all models indicate that relatively expensive pollution control costs have a practically negligible impact on macroeconomic indicators such as GNP, employment, prices and foreign trade. These findings are very interesting because theoretically they should only occur in cases where the economy is in a state of underemployment, and are not applicable to Japan in the past.

[179] Ministry of International Trade and Industry, *Industry and Pollution*, 1977, p.37

Pollution control policies trigger changes in the economy. In other words, a number of industries and areas hosting such industries are prone to be impacted. Although the problems that occur as a result should be taken extremely seriously, Japan's experience shows that the overall impact does not create any major hardship[180]."

The economic cost of pollution control investment in 1975 was estimated as 1.7% of GNP.

d. Analysis in the 1992 White Paper on the Environment

The 1992 White Paper on the Environment analyzed the effects of investment into pollution control measures by studying past events. The results of this analysis were summarized and published by Chikyu Kankyo Keizai Kenkyukai (Global Environment and Economy Research Group) in June 1994. The 1992 White Paper on the Environment analyzed the effects of pollution control investment on the national economy in the following way.

"The aggregate cost of private sector pollution control investment carried out in the most active period of 1965-1975 was approximately 5.3 trillion JPY (at 1970 prices), and this report considers the impact that this pollution control investment had on the Japanese economy.

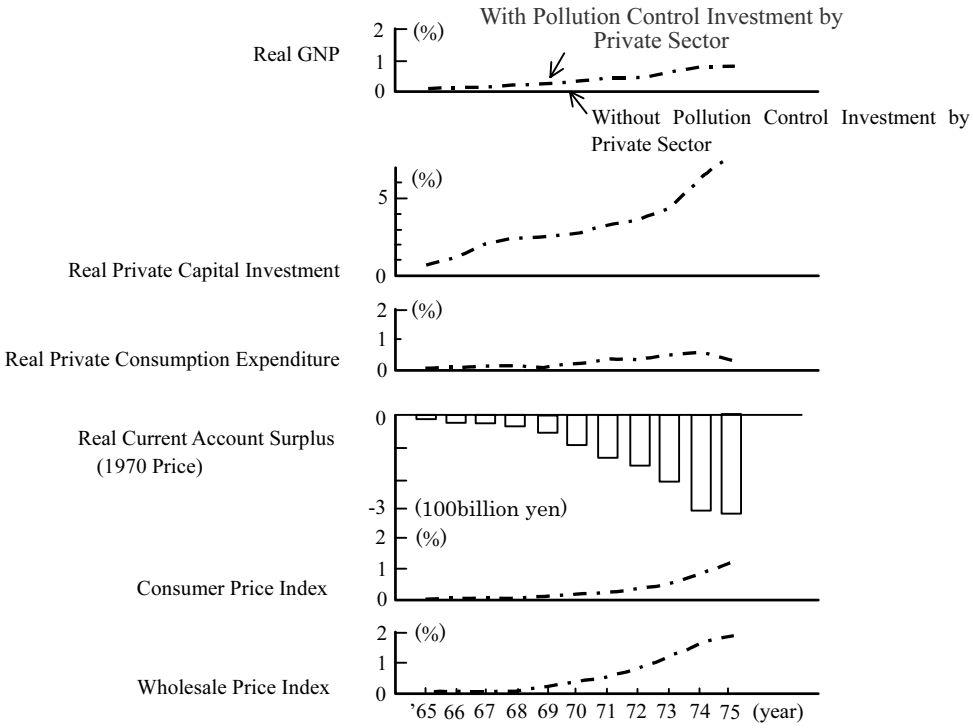
The impact of pollution control investment on the economy must be considered from two major aspects: that is the impact of higher costs arising in line with investment on prices, and that of higher demand occurring in line with investment on income.

Concerning the first major impact on prices, although this differs according to the supply and demand relationship for products, cost increases caused by pollution control investment affect the prices of the products concerned. This has an effect on product prices in industries that purchase the products as components or raw materials, and also has a ripple effect on the prices of final consumer goods. These price increases cause demand to contract in accordance with the price elasticity of demand for each product (ratio of change in demand corresponding to change in price). As a result of this, capital investment in each industry is reduced, which causes supply capacity to fall.

Concerning the second impact affecting income, pollution control investment represents a cost in the industry concerned, but at the same time it also represents increase in demand in industries that receive the investment. Moreover, increased demand in the pollution control industry represents increased demand for pollution control materials and parts, thereby boosting investment in related industries and increasing supply capacity.

To sum up, whereas the first impact reduces the real GNP (price effect), the second impact increases it (income effect). In order to discuss the economic impact of pollution control investment in real terms, it is necessary to consider numerous other factors too; however, according to the results of collating these effects using the quantitative model developed by the Environment Agency, as is indicated in Figure 1.13.1, compared to the case where no pollution control measures are implemented, it worked out that real private sector capital investment increased by approximately 7.4%, real private consumption increase by approximately 0.4%, real current account surplus (1970 prices) decreased by approximately 300 billion JPY, and real GNP increased by approximately 0.9%. In terms of the consumer price index, assuming a level of 170.4 (1970 = 100) in 1975, pollution control investment increased it by approximately 1.2%. This represents an increase in the annual average rate of price increase between 1965-1975 from approximately 8.3% to 8.4%. Moreover, concerning the wholesale price index, this was increased from the 1975 level of 154.2 (1970 = 100) by approximately 1.7%. This is equivalent to an increase in the annual average rate of inflation from 5.5% to 5.7%.

[180] OECD Environment Committee, *Japanese Environmental Policy Review Report in Japanese 1976-1977*, 1977, pp.112-113



Source: Environment Agency, *1992 White Paper on the Environment*

Figure 1.13.1 Economic Influences of Pollution Control Investment in Private Sector (1965-1975)

Judging from the above estimate results, although the economic impact of pollution control investment differs according to each industry, the effect on the overall national economy was not significant during the period of rapid economic growth. The experiences of other countries demonstrate almost the same trend. The OECD states that the impact of pollution control investment on GNP is neutral or negligible. Leaving aside the period of economic growth when Japan was vigorously pushing investment into boosting production capacity, looking at the period of recession following the oil crises that coincided with the peak in pollution control investment, it is thought that this investment stimulated sluggish demand and contributed to propping up capital investment and employment."

The 1992 White Paper on the Environment stated that the macroeconomic impact (income reduction effect) of increased costs accompanying pollution control investment in the 1970s could be disregarded. On the other hand, pollution control investment contributed to GNP as private sector capital investment, although the resulting increase was estimated at just 0.9%.

1.13.2 Supplementary Analysis

The following Table 1.13.1 indicates the stock of pollution control capital in 1979 based on the amount of pollution control investment in the manufacturing sector in the decade from 1970 to 1979 (cumulative amount using deflated prices each year (1979 prices)).

Table 1.13.1 Estimated Costs of Pollution Control in the 1970s

	Pollution Control Investment in Manufacturing Industry (actual value) (million JPY)	Deflator	Pollution Control Investment in Manufacturing Industry (1979 value)	Residual Capital Ratio	Residual Capital (million JPY)
1970	296,328	57.4%	515,819	0.1	51,582
1971	336,117	57.0%	589,848	0.2	117,970
1972	443,585	57.9%	766,292	0.3	229,888
1973	663,474	67.0%	990,527	0.4	396,211
1974	796,878	85.4%	933,027	0.5	466,513
1975	855,780	87.8%	974,343	0.6	584,606
1976	736,431	92.6%	795,187	0.7	556,631
1977	346,579	95.7%	362,017	0.8	289,614
1978	287,369	95.3%	301,686	0.9	271,518
1979	282,714	100.0%	282,714	0.5	141,357
Capital Stocks					3,105,888

Economic cost is the sum of depreciation cost, capital stock opportunity cost (interest rate) and operation and maintenance (OM) cost. Assuming a service life of 10 years, interest rate of 10%, and OM cost of 20% of the investment cost[181], the economic cost in 1979 was 640 billion JPY, equivalent to 0.28% of sales turnover in 1980[182], and 1.24% of added value. The impact of a few percent on added value was a major burden. However, since the rate of increase in added value during the 1970s was large anyway, this was viewed as an absorbable amount.

This can be gathered from the fact that the ordinary profit rate was maintained at a high level as shown in Figure 1.13.2. Meanwhile, the increase in productivity was also large, and as indicated in Figure 1.13.3, the rate of growth in added value per employee (labor productivity) over the previous year was maintained at an extremely high level throughout the 1970s, in spite of a minus figure after the oil crisis in 1975.

The same figure also shows the annual rate of growth in manufacturing added value. Again, this shows consistent positive growth throughout the 1970s apart from a temporary drop in 1975. The ordinary profit rate also remained high in the 1970s as shown in the following figure.

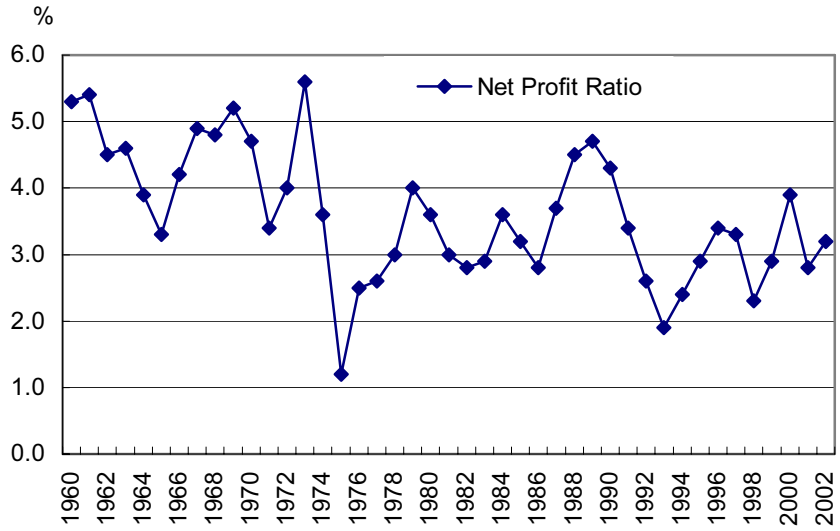
The 1992 White Paper on the Environment estimated the national income effect of pollution control investment in the 1970s to be approximately 0.9%. Assuming national income to be roughly 200 trillion JPY, it is equivalent to a rise in income of approximately 2 trillion JPY. Since the amount of capital investment was roughly 500 billion JPY, the multiplier effect of the investment was 4.0.

Meanwhile, considering that the per capita added value in the manufacturing sector at that time was 3 million JPY, it works out that the investment had a job creation effect of 660,000 people.

[181] Presumption that every year's OM cost is 20% of capital investments is based on the data in *Japanese Environmental Policy Review Report 1976-1977* by OECD. It has been used in the analyses by the Environment Agency. We suppose it is valid value when we judge data of maintenance cost included pollution control investment sheet of Japan Environment Corporation. Data from Building and Maintenance Cost of Pollution Control Facilities by Kawaski City (cited in *1967 White Paper on Economics*) proved validity of the presumption.

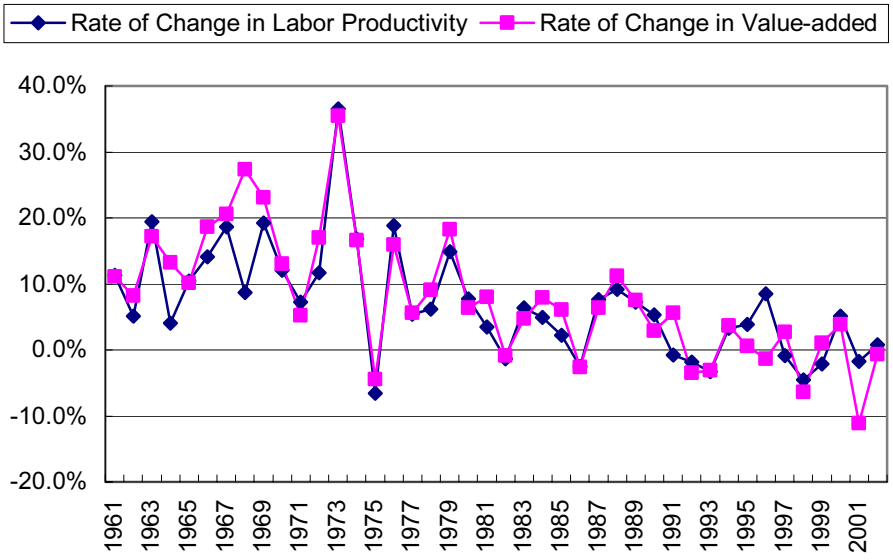
[182] Economic costs are 639,777 million JPY. Sales of the manufacturing industry in 1979 are 230,810,479 million JPY, and the amount of added value is 51,593,600 million JPY according to the result of Corporative Statistics Research.

Present pollution control investment is approximately 500 billion JPY in the private sector. Assuming that the added value is 40% of this, i.e. 200 billion JPY, and the per capita added value is 8 million JPY, it works out that this investment supports the employment of 25,000 workers.



Source: Policy Research Institute, Ministry of Finance, "Study on Financial Statements of Corporation Industry"

Figure 1.13.2 Changes in Rate of Ordinary Profit in Manufacturing (1960-2002)



Source: Policy Research Institute, Ministry of Finance, "Study on Financial Statements of Corporation Industry"

Figure 1.13.3 Changes in Rate of Value-Added and Labor Productivity over Previous Year (1961-2001)

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1 OVERVIEW OF INDUSTRIAL POLLUTION CONTROL MEASURES IN JAPAN 1-1

Chapter 2

Impacts of Utility Prices and Environmental Regulations on Industrial Pollution Control in Japan

2 Impacts of Utility Prices and Environmental Regulations on Industrial Pollution Control in Japan

2.1 Introduction

Industrial pollution control in Japan has been implemented by a combination of various policy measures such as direct regulation of pollution sources and relevant administrative guidance/advice, financial measures including financing industrial pollution control investments and preferential tax treatment, as well as technical assistance and market development regarding pollution control.

In this chapter, we will examine how these policies functioned in practice by focusing on actual examples and analyzing policy measures. Furthermore, we will review existing documents that attempted to analyze such policy measures, especially in the area of cost effectiveness, appropriate guidance for cooperative behavior, and promotion of ways to internalize environmental costs. From these viewpoints, the following section evaluates policy on industrial pollution control in Japan.

The topic/policy issues evaluated in this chapter are:

1. Sulfur oxide (SOx) pollution control
2. Industrial water supply and wastewater
3. Markets and costs of industrial waste disposal
4. Energy conservation

2.2 Sulfur Oxides (SOx) Pollution Control

Air pollution caused by industrial activities includes dust fall, sulfur dioxides, and nitrogen oxides. Dust fall had long been a major pollutant especially in industrial cities, and was originally regarded as an irritant, but not so much as a health risk. The conditions of dust fall have improved in the course of converting energy sources from coal to oil, but the use of oil as an energy source resulted in increasing sulfur dioxide in the atmosphere during 1960s and 1970s. At the same time, increasing adverse effects on human health led to the development of anti-pollution measures. By the 1980s, sulfur oxide emissions from industrial activities have greatly reduced. As for nitrogen oxide, ambient air quality has remained steady, with pollution from fixed sources declining but increasing from mobile sources.

Among the three major pollutants, cost effectiveness has been analyzed for sulfur oxides, which is the subject of this chapter.

The following section trends in policy measures for air pollution control in Japan during the 1970s and 1980s, as well as actual responses to those policies. Then, it discusses cost-effectiveness analysis of measures based on key research papers and documents.

The Japanese experience in air quality management should be considered in light of the fact that severe health problems caused in the early years, this being followed by a series of measures which resulted in successful air pollution control policy and practice[1].

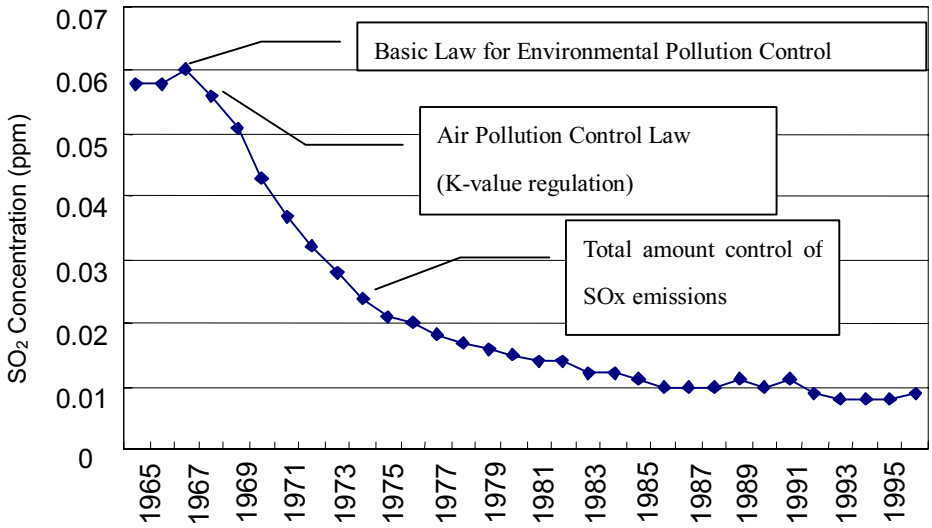
[1] Committee for Japan's Experience in the Battle against Air Pollution (ed), *Japan's Experience in the Battle against Air Pollution*, Japan Times, 1997, p.42

2.2.1 Outline of and Trend in Japanese Sulfur Oxide Control Measures

An outline and trend in sulfur oxide control measures in Japan are shown below.

a. Changes in Ambient SO_2 Concentration

The following Figure 2.2.1 shows the changes in ambient SO_2 concentration during 1965-1996.



Note: 14 continual monitoring stations were 5 in Tokyo, 4 in Yokohama, 3 in Kawasaki, Isozu in Yokkaichi and Nishiki in Sakai.
Source: Modified Figure 4-1-25 in *1996 White Paper on the Environment* by the Environment Agency.

Figure 2.2.1 Changes in Ambient SO_2 Concentration: Annual Mean Value at 14 Continuous Monitoring Stations (1965-1995)

Concentration of sulfur oxides at air pollution monitoring stations reached its peak in 1967, then decreased to almost one third of this, i.e. from 0.06 ppm to 0.02 ppm by 1977. The rate of decrease has slowed since then. Considering that the environmental standard for one hour average value per day for SO_2 is 0.04 ppm and no more than 0.1 ppm in each hour, it is obvious that the environmental standard was satisfied in 1970s in national average.

The following section will review policy actions and backgrounds of the short-term countermeasures implemented for sulfur oxide control.

b. Trend in Regulatory Measures for Emission Reduction of Sulfur Oxides

In Japan, the first national level sulfur oxide emission control was systemized by the Soot and Smoke Control Law enacted in 1962. By this regulation, put into force on August 1962, five heavily polluted areas were targeted and emission concentration was regulated for sulfur oxides from smoke generating facilities to 2,200 ppm, while in the second regulation, target areas were expanded to 20 areas and the value became 800 - 2,800 ppm.

In 1968, the Air Pollution Control Law replaced the Soot and Smoke Control Law, and the latter introduced “K-value control” which set one-hour allowable emission amount according to effective stack heights, instead of regulating SOx concentration of emission gas. Moreover, regulations for using low sulfur content fuel were introduced in 1970, while area-wide total amount control began in 1974. Main developments after these laws are shown in following Table 2.2.1.

Table 2.2.1 Trend in Regulation of Sulfur Oxide Emissions during 1960s - 1980s (National Level)

Year	Regulation
1962	**Introduction of the regulation on SOx emissions in targeted areas based on Soot & Smoke Control Law**
1968	**Introduction of "K-Value Control" based on Air Pollution Control Law** Strengthened eight times up to 1976.
1970	**Introduction of seasonal fuel use regulation system** During winter, many areas could not satisfy the environmental standard because of increased fuel usage and diffusion conditions of SO_x. To tackle this, the regulation limited the concentration of sulfur content of fuel in certain urban areas for the specific period.
1974	**Introduction of area-wide total amount control** Because of the fact that the environmental standard was not satisfied with past measures in many areas, regulations to control the amount of SO_x emissions from individual sources were introduced based on the calculated permissible limit of total amount of emissions. In 1974, 11 areas were designated as target areas for area-wide total amount control schemes, and with this, SO_x control was shifted to quantitative regulation from concentration regulation.
1975	**8 additional areas designated for area-wide total amount control**
1976	**5 additional areas designated for area-wide total amount control**

c. Sulfur Oxide Levy System

The Pollution-Related Health Damage Compensation Law provided a system to compensate victims of air pollution for their medical expenses and foregone earnings. It designated areas which were exposed to heavy air pollution, and if a person who had lived or commuted to that designated area over a certain time of period developed chronic bronchitis, bronchial asthma, asthmatic bronchitis, pulmonary emphysema or its secondary disease, a institutional arrangement was made to recognize the existence of cause and effect relationship between air pollution and those diseases.

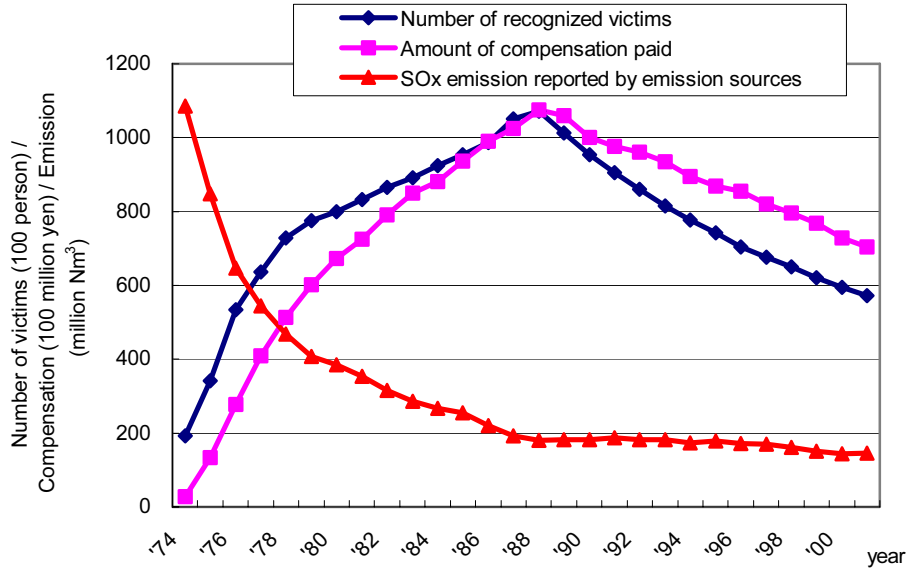
The Pollution-Related Health Damage Compensation Law was established in 1973 in order to supplement the system for damage compensation in accordance with Civil Code and prepare a solid system to compensate the victims.

The important feature of this system was that factories over a certain size were held responsible for the compensation system, according to their contribution to overall SOx emissions. This system is similar to an economic levy system for polluters. For individual factories/business establishments, a pollution levy was imposed according to emitted amount. The system is similar to charging the polluters[2]. The amount of the levy payment per unit of SOx emission is called rate of levy (JPY/Nm^3) and notional formula is shown below:

Rate of levy = anticipated amount of compensation payment in the fiscal year (t) /
nation-wide total SOx emission in the calendar year (t-1)

Figure 2.2.2 indicates changes in the number of recognized victims compensated, total amounts of the compensation and SOx emission. SOx emissions had been decreasing consistently but the number of designated victims and compensation payments had been increasing until 1986 and then started to decrease. At its peak, compensation payments amounted to more than 100 billion JPY.

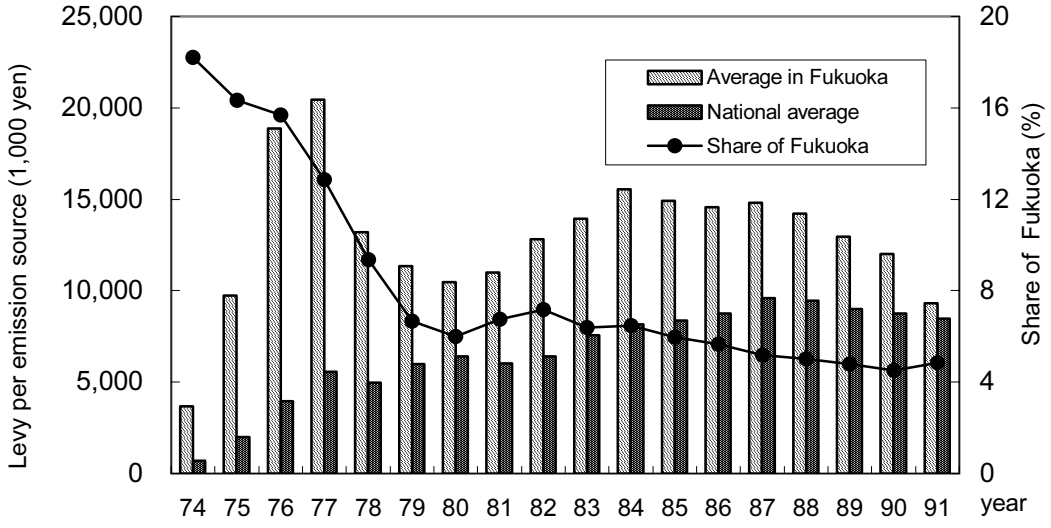
[2] MATSUNO Yu / UEDA Kazuhiro, "Kokenho Fukakin", UEDA Kazuhiro / OKA Toshihiro / NIIZAWA Hidenori (eds.), *Kankyo Seisaku no Keizaigaku - Riron to Genjitsu*, Nihon Hyoron Sya, 1997, pp.79-95



Note: 1) The volume of SOx emissions is a total of declared values from all regions of the country, reported by businesses with pollution load refund payment obligation.
2) New victims have not been recognized after cancellation of area designation in 1988.
Source: Pollution-Related Health Damage Compensation and Prevention Association, "Gyomu Nenpo" 1974-2001, each year and Ministry of the Environment, 2003 Environmental Statistics.

Figure 2.2.2 Trend in SOx Pollution and Compensation Paid based on the Law (1974-2001)

On the other hand, the average amount of the levy payment per emission source ranged from 5 million JPY to 10 million JPY, as shown in Figure 2.2.3.



Source: FUJIKURA Ryo, "Kogai Taisaku no Shakai Keizaiteki Yoin Bunseki", *Kitakyushu Kogai Taisakushi - Kaisekihen*, Kita Kyushu City, 1998, Figure 3-2-9 of p.213

Figure 2.2.3 Trend in Levy on SOx Emission (1974-1991)

d. Financial Incentives and Tax Breaks for SOx Control

While strengthening emission regulations and requiring factories and business establishments to pay compensation to victims of air pollution, the government also proceeded to introduce financial incentives and tax breaks for factories and businesses that implemented SOx emission reduction measures. These measures included low interest loans from various institutions for pollution control investment and preferential tax treatment for pollution control investment by special depreciation. See Chapter 1 for details.

New taxation was introduced in 1970 to promote desulfurization of heavy oil by a 300 JPY tariff reduction for each 1 kl of desulfurized oil[3]. This was raised to 500 JPY for 1 kl of oil and a further tariff reduction on low sulfur heavy oil in 1971[4]. Moreover, the government exempted fuel oils for Rolling heater for steel or electric power plant boiler from gasoline tax and local road tax for limited period of three years[5]. A further measure was introduced in 1974, namely a tariff reduction for imported naphtha, in which import tariffs were reduced from 2,150 JPY /kl to 1,075 JPY/kl as naphtha was an emergency pollution control fuel until desulfurization equipment by the power and iron and steel industries[6].

e. Trend in Investment in Air Pollution Control by Private Companies

e.1 Investment for Pollution Control Equipments

The following measures: 1) sulfur content reduction of imported fuel, 2) heavy oil desulfurization, 3) flue gas desulfurization, and 4) increase in effective stack heights, were implemented by private companies as emission reduction measures for SOx from stationary sources like factories. Figure 2.2.4 shows the trend in overall pollution control investment, air pollution investment and SO_2 concentration during 1965-1989.

In Figure 2.2.4, the left vertical-axis indicates the investment amount for pollution control and air pollution control (in real term), and the right vertical-axis shows the SO_2 concentration. In 1965, pollution control investment was 68.1 billion JPY (nominal 29.7 billion JPY) and air pollution control investment in real terms was 48.2 billion JPY (nominal 21 billion JPY), which accounts for 1.9% of the total capital investment. SO_2 concentration was 0.057 ppm in 1965, which is six times as much as that in 1992 (0.009 ppm). However, pollution control investment kept increasing every year and in 1975, the amount reached 1,281 billion JPY (nominal 964.5 billion JPY) and air pollution control investment was 758.3 billion JPY in real terms (nominal 570.6 billion JPY) occupied 16.1% of total capital investment. It is seen that SO_2 concentration improved dramatically as a result.

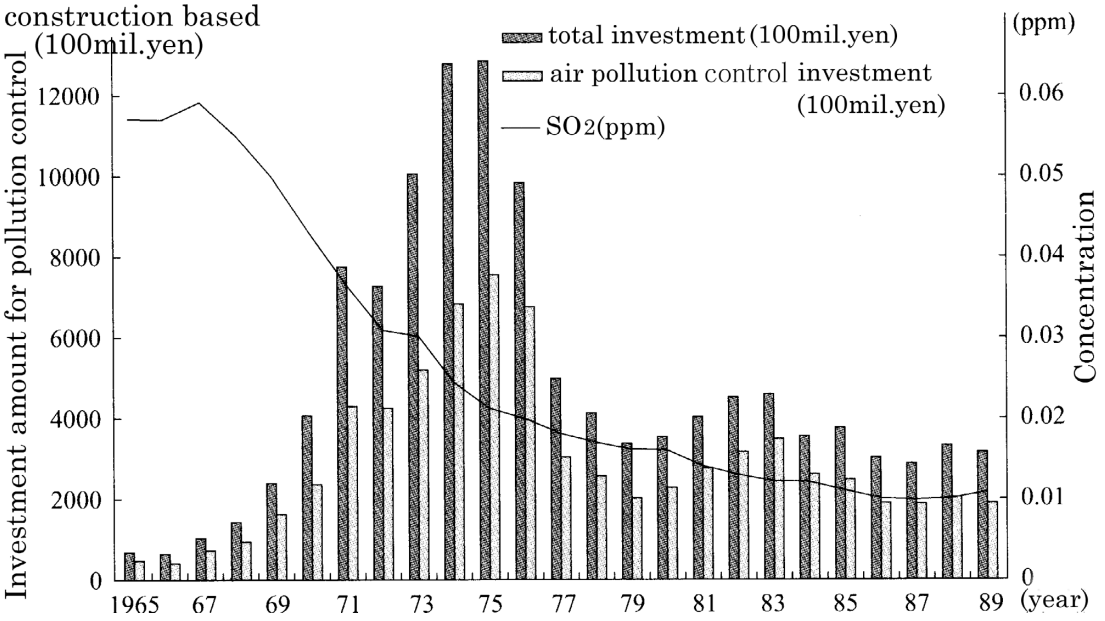
Oh Suk-pil pointed out the indexes that clearly illustrate the extent of SOx emission reduction as follows[3].

i Sulfur content of heavy oil was reduced by installation of heavy oil desulfurization equipment, and the average sulfur content of heavy oil for domestic consumption was reduced from 2.60% in 1965 to 1.02% in 1991.
ii Flue gas desulfurization equipment was installed widely, and the number increased from only 102 in 1970 to 2014 in 1991.

[3] OH Shuk-pil, *Kankyo Seisaku no Keizai Bunseki*, Nihon Keizai Hyoronsya, 1999
[4] Chikyu Kankyo Keizai Kenkyukai (ed.), *Nihon no Kogai Keiken*, Godo Shuppan, 1991
[5] Benefit gained by avoiding the damages is regarded as the difference between the actual damage occurred even after the control measures were undertaken and estimated damage if there had not been any measures taken as of 1976 (estimated to be 8 trillion annually). The benefit of implementing the control measures was significantly large if it is compared with the compensation paid for health damages as shown in Figure 2.2.2.
[6] KAWAUCHI Ikuho et al., "Taiki Osen Taisaku no Hiyo Beneki Bunseki: Nihon no SOx Kisei wo Jirei toshite", *Higashi Asia heno Shiten*, Special Edition Fall 2000. If the benefit calculated in Figure 2.2.6 is compared to the benefit indicated in Table 2.2.2, the latter is greater by the order of one digit. The latter numbers should be closer to reality as the calculations were based upon real data.

Followings are the reasons why Figure 2.2.4 shows a decrease in pollution control investment since 1975.

i Stagnation of new investments in basic material industries, such as the steel industry and chemical industry that contribute a huge percentage of the total amount of pollution control investment (especially air pollution control investment, centering on SOx control)
ii As pollution control improved, SOx controls made considerable achievements.
iii With the improvement of environmental pollution control, and runaway growth in oil prices, private companies directed their investment from pollution control to energy saving or development of alternative energy.



Note: 1) Investments in 1971, 1973, 1980, 1982 and 1984 are estimates while others are actual results. Each amount was obtained by study conducted by Ministry of International Trade and Industry since 1964 and they targeted companies in the country. Companies whose capital was more than 50 million JPY or more were targeted before 1968. After 1968, companies with more than 100 million capitals were targeted.

2) Amount of values was calculated based on actual values of constructions. (Real prices which were adjusted by 1980 price index.)

Source: OH Shuk-pil, *Kankyo Seisaku no Keizai Bunseki*, Nihon Keizai Hyoronsya, 1999

Figure 2.2.4 Trend in Pollution Control Investment and SO_2 Concentration (1965-1989)

e.2 Production Value of Air Pollution Control Equipment

Figure 2.2.5 shows changes in production value of air pollution control equipment. From this figure, one can see that measures centered on heavy oil desulfurization and higher stacks were implemented after the late 1960s, while investments in flue gas desulfurization equipment began in the early 1970s and peaked in 1974. The production of heavy and light oil desulfurization equipment peaked in 1975, but orders dropped by 1977. On the other hand, orders for flue gas desulfurization equipment were high until around 1977 and have remained stable since then. It is estimated that because gas desulfurization equipment introduced by private companies completed the first stage in 1977, order of replacement of facilities took the leading role after that.