

Contents

<i>List of Tables</i>	<i>vii</i>
<i>List of Figures</i>	<i>ix</i>
<i>Notes on the Contributors</i>	<i>xi</i>
<i>Preface</i>	<i>xii</i>
Introduction	1
Part I Rethinking of Japanese Experiences in Environmental Pollution Control	
1 Industrial Policy, Industrial Development and Pollution Control in Post-war Japan: Implications for Developing Countries <i>Tadayoshi Terao</i>	9
2 Historical Dynamic Interactions between Regulatory Policy and Pipe-end Technology Development in Japan: Case Studies of Developing Air Pollution Control Technology <i>Yoshifumi Fujii</i>	48
3 Role of Local Governmental Research Institutes in Development and Diffusion of Pollution Control Technologies in Japan <i>Yasushi Ito</i>	69
4 Administrative Guidance of Japanese Local Government for Air Pollution Control <i>Ryo Fujikura</i>	90
Part II Dynamism of the Environmental Policy Process in Asia	
5 Environmental Policy Planning under Imperfect Market and Government Capacity: A Case of Air Pollution Abatement in China <i>Nobuhiro Horii</i>	119

6	Rating Programme Revisited: In the Case of Indonesia <i>Michikazu Kojima</i>	154
7	Industrial Pollution Control in India: Public Interest Litigation Re-examined <i>Yuko Tsujita</i>	176
8	Environmental Policy under Multi-stakeholder Governance in China: Focusing on Implementation of Industrial Pollution Control <i>Kenji Otsuka</i>	199
9	Democratization, Decentralization and Environmental Policy in Taiwan: Political Economy of Environmental Policy Formation and Implementation <i>Tadayoshi Terao</i>	227
10	Environmental Cooperation in East Asia: Comparison with the European Region and the Effectiveness of Environmental Aid <i>Hideaki Shiroyama</i>	252
	<i>Index</i>	277

Part I

Rethinking of Japanese Experiences in Environmental Pollution Control

1

Industrial Policy, Industrial Development and Pollution Control in Post-war Japan: Implications for Developing Countries

Tadayoshi Terao

Introduction

There is a self-serving belief that the 'Japanese experience' with industrial pollution was a paragon of success in conquering environmental problems encountered in the process of rapid economic development and that this experience can be transplanted to late-comer developing countries. On the other hand, there is also the idea that the 'Japanese experience' should be presented to the developing countries as a negative lesson on serious pollution damage and failure of environmental policy. It is possible to view both of the arguments as standing on the common premise that Japan's experience can provide some kind of model for environmental pollution and policy.

However, we first have to consider why the Japanese experience can be generalized as a 'model'. Before we attempt to consider the Japanese experience as a model, the generation of industrial pollution and the process of implementing countermeasures must be analysed and appropriately positioned in the chronological process of economic development from the rapid-growth era or even earlier. Otherwise, the Japanese experience is merely a story of anecdotal experiences.

Below, we will examine whether a certain 'model' can be constructed by positioning the Japanese experience as a process through which a late-comer country aims at industrialization, and by characterizing industrial pollution as a problem generated in the process.

Generally, it is possible for a late-comer country, through industrial policy, to utilize the experience of advanced countries and to transfer technology that has already been developed to achieve industrialization more quickly.

Since the late-comer country can predict which industries can enjoy the benefits, such as decreasing costs over a long term, of introduction of technological knowledge from an advanced nation, the late-comer country can pursue economic growth systematically by promoting such industries using industrial policy measures. As industries that can be expected to enjoy decreasing costs

continuously over a long term, the heavy and chemical industries are preponderantly chosen as the industries to be promoted. The heavy and chemical industries are potential pollution sources, and if neither environmental impact assessments nor measures against pollution are introduced appropriately, they may cause pollution damage to the surrounding environment and residents. If an industrial policy to promote the heavy and chemical industries is carried out without fully taking the industrial pollution accompanying it into consideration, as seen in Japan in its high-growth era, the success of the industrial policy may cause aggravation of industrial pollution.

On the other hand in Japan, in order to compensate for the delayed response to industrial pollution, private enterprises were obliged to make large-scale investments in the mid-1970s. On that occasion, the government supported the pollution prevention efforts of private companies through measures such as administrative guidance, low-interest loans and preferential tax treatment, etc. In Japan, it can be said that industrial pollution regulation was incorporated into industrial policy and was promoted as a part of it.

In this chapter we will examine the relationship between industrial policy and industrial pollution in Japan, from the viewpoint of 'development and environment'. In Section 1, we will show how industrial policy played an essential role in the Japanese experience of industrial development by introducing the concept of 'developmentalism'. In Section 2, the relationship between industrial policy and industrial pollution will be analysed. It is assumed that industrial policy should affect the pattern of industrial development and industrial structure. The effect of the Japanese government's emphasis on heavy and chemical industrialization in its industrial policy during the rapid growth period will be discussed. Next, we will shift our focus to the unique characteristics of 'industrial pollution regulation as a part of industrial policy' in Japan in 1970s. In Section 3, energy policy, as an important element of both industrial development policy and pollution control policy, will be discussed. We will show how the complex interests of the energy industry affect the direction of air pollution control policy, especially in case of SO_x emission regulation. In Section 4, we will show how industrial pollution could be incorporated into the concept of 'developmentalism' and discuss the relationship between industrial policy and industrial pollution control.

1. 'Developmentalism' as a system and industrial policy

The experience of economic development in post-war Japan can be considered to have been a process of catching up with the advanced countries through a series of policies based on the system of 'developmentalism', a system that intensively pursues industrialization. If the pattern of development pursued by 'developmentalism' affects the process of industrial pollution generation and the possible measures taken against it, then we could stress

the importance of a 'Japanese experience' of industrial pollution control, in contrast to other developed countries.

First, the possibility of economic development pursued by the policy system based on 'developmentalism' will be discussed below.

In many types of manufacturing industries, a continuous decrease in costs over the long run can be anticipated by successively introducing advanced technologies, which were developed and put to practical use over many generations in developed countries. Therefore, it is relatively easy for policy-makers in late-comer countries to predict for which industries the long-term marginal (and average) costs will diminish by observing the experience of advanced countries. In such cases, it is possible to provide the fundamental conditions for introducing 'developmentalism' as a system; namely, a series of policies ultimately aimed at forming a national economy by strategically fostering promising industries through industrial policy, intensively providing domestic physical infrastructure, and improving the educational system to cultivate human capital. The policy system based on 'developmentalism' consists of government intervention in the market economy, under the condition that private property and market competition should be maintained as part of the fundamental framework, and this policy system is set up with the aim of achieving industrialization that can be measured objectively as sustainable growth of per capita income. It is impossible to implement such policies without minimum political integration of a state.¹

The components of the model of 'developmentalism' are as follows.

Narrowly Defined Industrial Policy Components

1. The principle of market competition based on the system of private property rights;
2. Enforcement of an industrial policy by selecting industries where costs will decrease over the long term;
3. Exports to achieve the goal of industry promotion;
4. Promotion of small and medium-scale enterprises.

Distribution Policy Components

5. Raising of domestic demand through consumption by equalizing income distribution;
6. Equalization of the agricultural land distribution.

Social Infrastructure Components

7. Enhancement of the educational system;
8. Establishment of a fair and modern bureaucracy system that abolishes nepotism.

Industrial policy should be an essential element of 'developmentalism'. However, we should not forget that 'developmentalism' emphasizes the resource allocation function of the market mechanism, and an industrial policy should always be an intervention conditioned on the existence of the

market mechanism. 'Developmentalism' is reinforced and kept sustainable as a development policy through interaction among the various elements mentioned above. When selective industrial policy intervention succeeds, it will cause unequal income distribution, which could bring on social destabilization. An income distribution policy is necessary to maintain the series of policy systems of 'developmentalism', by alleviating the negative impact of rapid economic growth.

On the other hand, when general demand for consumption is created and the equalization of the income distribution could create a consumption demand among the general public, then that may become the base of the industry development. The industrial policy and the distribution policy are reinforced mutually by the interaction between them. Provision of a social infrastructure, such as enhancement of the education system and development of a trustworthy and capable bureaucracy, is a precondition for the success of industrialization through industrial policy. Social infrastructure is also important for implementing a distribution policy and, reciprocally, equalization of income distribution expands opportunities for education, which helps provide a supply of human capital to enterprises and the bureaucracy.

Yonosuke Hara modelled the economic development of East Asia (Japan, South Korea and Taiwan) as follows, in support of an argument for 'developmentalism':

It can be said that the market economy system that is peculiar to the countries in East Asia is an economic system which realizes efficient use of mass-production-type transferred technologies from advanced nations and consequently is designed to accelerate economic growth. In a situation where only advanced nations possess technological knowledge in the international economy, the promotion of domestic industries in East Asian countries became very difficult due to the free market mechanism. In such cases, positive policy intervention by the governments of East Asian countries has been carried out. Industrial organizations have been formed with the participation of corporate organizations with strong internal cooperative relations and sub-groups of those organizations that complement each other in terms of the government's policy intervention. Such industrial organizations are also compatible with the economic and social motivation of many individuals.²

'Developmentalism' is a system of policies for mobilizing resources towards the aim of economic growth, and for maintaining rapid growth. Usage of the experience of economic development in Japan was not necessarily the only strategy used by latecomer countries for industrialization. It will be exceptional to know exactly the path to industrialization by 'the standard tactics which latecomer countries should step on', i.e., industrial policy, and to have done it in the form as extremely put into practice.

2. Industrial policy and industrial pollution

In this section, the influence of industrial policy on industrial pollution is considered.

Since industrial policy is only a means for promoting achievement of 'desirable' industrial structure, even if it were not for industrial policy, there might be no major change in industrial structure in the long run.

Industrial policy may influence industrial pollution indirectly by changing industrial structure and industrial organization and then, finally, affecting the state of industrial pollution through those changes.

Moreover, in Japan, after the government recognized the seriousness of industrial pollution, the industrial pollution regulation policy was promoted as a part of industrial policy. We will examine the validity of the industrial pollution regulation by looking at industrial policies, such as administrative guidance, low-interest loan programmes and preferential tax treatments.

Industrial policy and heavy and chemical industrialization

Heavy and chemical industrialization as a policy aim

Implementation of industrial policy is the most important constituent factor of 'developmentalism' as a system. According to microeconomic theory, the industries which should be preponderantly promoted by industrial policy are those in which decreasing long-term costs can be expected. In the early stage of industrialization, which is where industrializing late-comer countries are, decreasing long-term costs can be expected in many manufacturing industries, especially in labour-intensive light industries. However, it is most likely that the heavy and chemical industries may be counted upon to enjoy decreasing long-term costs continuously, after the late-comer countries have enjoyed a comparative advantage in labour-intensive light industries.

In the experience of industrial policy in Japan, in the 1960s when heavy and chemical industrialization was promoted, the 'income elasticity standard' and the 'rate-of-productivity-growth standard' were well known as standards of industrial selection. Moreover, in the report entitled 'The Industrial and International Trade Policy of the 1970s', which set a vision for the 1970s, the Industrial Structure Council announced, in the last stage of the high-growth era, measures for 'excessive concentration and environmental standards' (i.e., reduction of congestion in urban areas, reduction of pollution problems and increased efficiency in use of energy resources) and the 'labor contents standard' (i.e., the provision of good workplace environments).

However, if the income elasticity of a product and the rate of productivity growth of an industry are high enough, such an industry should grow by itself, and there is no theoretical reason for having to treat such an industry favourably in political terms.³

It was thought that the heavy and chemical industries were industries that met both standards.⁴

Many companies in the heavy and chemical industries are types of companies that easily generate industrial pollution, and if heavy and chemical industrialization is promoted too quickly and too extensively without taking the proper measures against industrial pollution, it is clear from the experience of advanced countries that serious industrial pollution will be generated. However, until the middle of the 1960s, Japan was promoting heavy and chemical industrialization. People who grasped the situation correctly were not in the majority, and the necessity for industrial pollution measures was not widely recognized. Huge growth in production facilities and technology was pursued in the heavy and chemical industries, which are industries that typically display decreasing long-term costs.

Plant and equipment investment adjustment and over-investment

In raw material industries that are processing industries with economies of scale, such as oil refining, petrochemicals, iron and steel, and synthetic fibre, the industrial policy authorities emphasized the necessity for 'plant and equipment investment adjustment'.

Plant and equipment investment adjustment was called 'adjustment within industry' in accordance with production control and price adjustment, and was considered to be a typical form of industrial policy.⁵ Below, we will examine the effect of the plant and equipment investment adjustment on the industrial development of heavy and chemical industries.

When the Japanese industrial policy authorities attempt to justify market intervention, 'excessive competition' has always been asserted. Excessive competition is also considered to be a major factor in excess capacity, dumping, destructive price competition and low profits of companies.⁶ However, the policy authorities did not necessarily define 'excessive competition' clearly. While the cause of excessive competition was an overly small scale, it was presupposed, conversely, that excessive competition was the cause of the small scale.

Excessive competition was explained using the decreasing cost hypothesis by Yasusuke Murakami. Market share maximization behaviour and profits maximization behaviour are not distinguished in long-run average (and marginal) cost decreasing industries in microeconomic theory. The method of increasing profits is to expand market share. When the decreasing cost is known over the long term, a market price cannot maintain static equilibrium but becomes unstable, and competition should be intensified.

The measures that the policy authorities, the Ministry of International Trade and Industry (MITI), actually took in order to prevent excessive competition consisted of creation of an anti-recession cartel and 'plant and equipment investment adjustment'. Theoretically, excessive competition will occur in the market with an oligopoly, such as raw material industries that produce homogeneous products using a large fixed capital. In that case, the policy authorities may control 'excessive competition' by market intervention, which is a kind of complementary industrial policy, and may raise

social welfare as a result. However, in order to determine the socially optimal level of fixed capital investment as a whole and the number of entry companies, the policy authorities have to possess detailed knowledge of the technologies and detailed information on the management of individual firms. This is impossible in reality.

The method wherein the policy authorities prepare opportunities for each industry to implement 'voluntary adjustment' of plant and equipment investment tends to reduce the cost of information-gathering compared to the policy wherein authorities allocate each enterprise's share of plant and equipment investment directly. However, during the process, each enterprise could gather the information on other's investment programmes and could share the arguments on adjustment of plant and equipment investment among the industrial community, so that the process would be a precise process for removing the information uncertainty regarding investment that individual enterprises face. The uncertainty regarding plant and equipment investment leads to wide variation in the market conditions that are anticipated by each enterprise and may cause a natural 'time lag' in investment. If an adjustment opportunity finishes with mere information exchange and without voluntary adjustment being successful, it only decreases uncertainty, erases the natural 'time lag' of investment of each enterprise, and has the effect of urging them to invest all at once.⁷

In both the case of adjustment by the policy authorities and the case of voluntary adjustment by enterprises, the 'share principle', which allocates the amount of investment permissions based on present market share of an established company, was often used upon actual approval and a quota rule. The consequence of this is paradoxical. Each enterprise desires to have a production capacity exceeding optimum levels to expand market share, in order to receive a more advantageous investment permission allocation. Therefore, excessive competition of a much more serious nature occurs as a result.

It is thought that such a mechanism was generated in iron and steel, petrochemicals, oil refinery and other industries, which were the raw material industries where plant and equipment investment adjustment was attempted by a policy to control excessive competition. Plant and equipment investment adjustment and over-investment in the petrochemicals industry in the high-growth era are described below, as an example.⁸ The characteristic feature of the petrochemicals industry in the high-growth era was rapid growth with active new entries launched by domestic business groups.

The 'Foreign Investment Law' was the basis of the authority for the intervention by the government in the petrochemicals industry, which depended heavily on imported foreign technologies. The Foreign Investment Council had opted for foreign technology importation before capital liberalization began in Japan. When a company attempted to join the industry as new entrant, it had to obtain governmental permission to establish a joint corporation with foreign capital and to invest in plant and equipment.

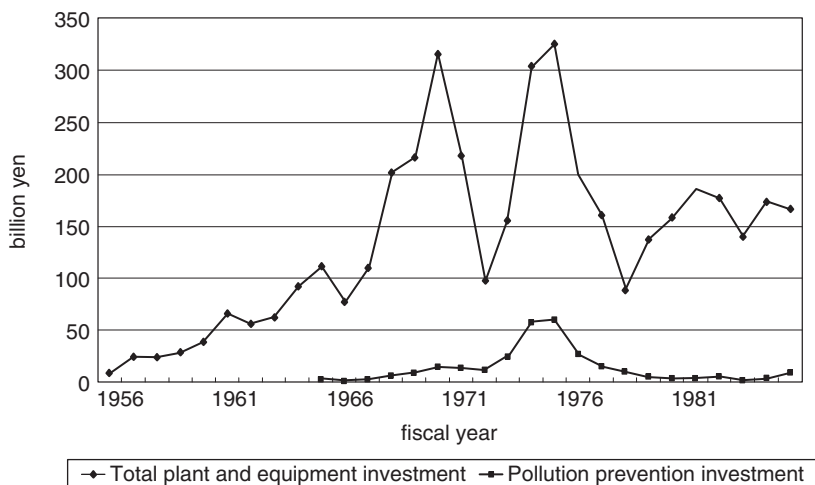


Figure 1.1 Total capital investment and pollution prevention investment of petrochemical industry

Source: Ministry of International Trade and Industry, *Shuyo Sangyo no Setsubi Toshi Keikaku*, various issues.

In the case of the petrochemicals industry of the high-growth era, the government-business complex informal roundtable group made its fixed capital invest all at once, thereby destroying the natural 'time log' in plant and equipment investment that normally results from the different predictions of each enterprise due to information uncertainty. Moreover, the minimum capacity standard for new entry set by the government eliminated the difference in decisions on investment scale among the enterprises and concentrated investments at a similar scale (around the minimum standard). The companies adopted the strategy of expanding their market share to secure future plant and equipment investment permission allocation. All of those factors brought about over-investment. Moreover, the minimum capacity standard, which was expected to act as a barrier to excessive entry, was overcome contrary to MITI's expectations by almost all the enterprises that hoped to enter. To achieve this, companies pursued the corporate strategy of 'the full set principle', where each business group provides the necessary financing and simultaneously aims at market share expansion (Figures 1.1 and 1.2).

It is thought that the above-mentioned excess investments and destruction of natural investment rhythm were generated through an almost similar process in plant and equipment investment adjustment in the iron and steel industry too.⁹

It is possible that industrial development through capital investment competition under severe financial restrictions made it difficult to sufficiently

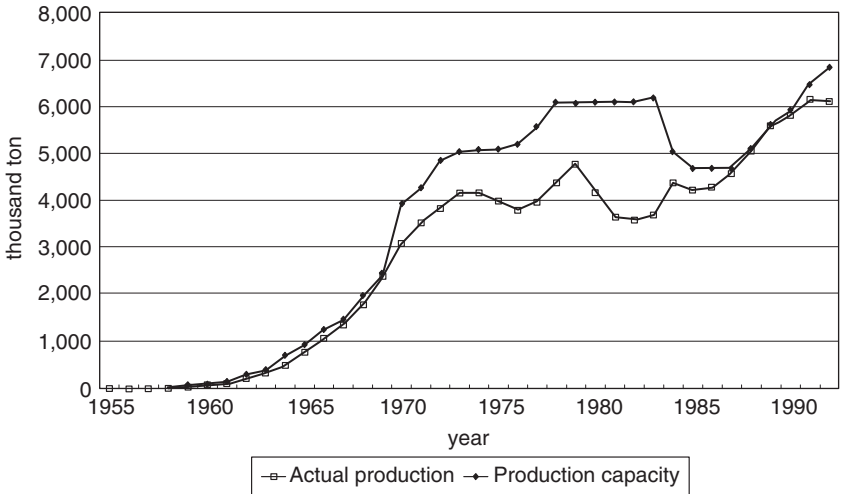


Figure 1.2 Production capacity and actual production of ethylene

Sources: Japan Petrochemicals Industry Association, *Sekiyu Kagaku Kogyo*, 30nen no Ayumi, 1989; Ministry of International Trade and Industry, *Sekiyu Kagaku Tokei Nenpo*, various issues.

invest in pollution control facilities in the cases of the petrochemicals and iron and steel industries and ultimately enlarged the load on the environment. Heavy and chemical industries in particular are accompanied by the large-scale regional development projects that include seashore reclamation in many cases. Most likely, the capital investment competition was accompanied by a rapid expansion in scale that brought about superfluous regional development, without the preliminary environmental impact assessments being put into practice.

Industrial pollution regulation as a part of industrial policy

Private enterprise was forced to make large-scale investments for industrial pollution prevention measures in the period when rapid growth of the Japanese economy began to slow. Private enterprise made use of the various industrial policy measures and the experience accumulated in industrial development policy prior to that. In Japan, it can be said that industrial pollution regulation was incorporated in the system of industrial policies and was promoted as a part of that policy system. Given that industrial pollution regulation policy was delayed at that time, 'industrial pollution regulation promoted as a part of industrial policy' was an effective method, at least over the short term.

If the industrial pollution regulation policy is incorporated as a part of industrial policy, then how is it positioned in the framework of the theory of industrial policy? First, although industrial policy is divided into 'strategic

industry policy' and 'complementary industrial policy', industrial pollution regulation is a policy that prevents negative 'externality' and is clearly classified as 'complementary industrial policy'.¹⁰

For example, when industrial pollution regulation is implemented among industries that are a significant pollution source, there may be expected to be some industries whose comparative advantage domestically might decline and be lost. For such an industry, a structural adjustment programme will also need to be implemented as a 'complementary industrial policy'. In an area with a high population density, as in Japan, the cost of pollution prevention is higher than in an area of low population density, and the comparative advantage of the pollution-intensive industries will be lost easily by introduction of pollution regulation. Most likely, the long-term strategy of the enterprises belonging to such a pollution-intensive industry will be relocation to overseas locations with more advantageous production conditions, including regulation of pollution emissions, or withdrawal from the industry. Of course, the cost of pollution prevention is only one factor that determines the comparative advantage of an industry.

As most industrial pollution regulation has a clear legal basis, pollution regulation may be considered a 'mandatory-type policy', although industrial policy is divided into 'discretionary type' and 'mandatory type' by the policy authorities. However, discretionary-type policies, which the legal system copes with by issuing administrative guidance, were implemented when the government did not have sufficient authority to implement a mandatory-type policy. Moreover, even after the legal system was improved, the mandatory-type policy with administrative guidance was often implemented.

Furthermore, industrial policy is divided into that implemented by 'regulatory means' and that implemented by 'inductive means'. Industrial pollution regulation policy carried out through various kinds of economic preferential treatment is said to be implemented by inductive means, and that which utilizes direct command and control regulation is said to be implemented by regulatory means. However, preferential treatment was used as an inductive means, and policy implementation through collection of a pollution tax, i.e., indirect regulation, was not even attempted in Japan until the late 1990s. It is one of the features of industrial pollution regulation in Japan that the authorities have pursued a combination of direct regulation and preferential treatment to the present day. Conversion to indirect regulations, such as taxation of pollutant emissions and the set-up of a transferable emissions-rights market, has not been tried in Japan.

The various means of implementing 'industrial pollution regulation as a part of industrial policy' in Japan were direct 'command and control', including '*gyousei shidou* (administrative guidance)' to the industry and/or to each enterprise, and preferential treatment such as low-interest loans and special taxation measures. Preferential treatment complements direct regulation and is premised on the promotion of direct regulation, as far as that is

possible. The preferential treatment and the direct regulation of the industrial pollution regulation policy were combined together in many cases, as a 'carrot-and-stick approach'.

Moreover, in conjunction with the promotion of pollution prevention investment by private enterprise, the development of the pollution prevention (industrial machine) industry and the pollution prevention engineering industry was indispensable. Various industrial policies for development of those industries were implemented, based on the Machine Industry Promotion Temporary Measures Law. The standardization of anti-pollution devices and measuring devices was carried out as well and contributed to the formation of those markets. Moreover, needless to say, the policy of promoting pollution prevention investment by enterprises stimulated the demand for the products of the pollution prevention industry and also contributed to the growth of those industries.

In the following section, we will show how the various means for implementing industrial policy could be utilized to implement industry pollution regulation policy in Japan.

Direct command and control with administrative guidance

According to the OECD's review of environmental policy in Japan published in 1977, on the basis of the direct regulation, 'the emission standards are enforced by persuasion rather than coercion'.¹¹ This is because the application of penalty is considered to be the last resort, to be used only when a polluter doesn't obey an order issued by the proper government agency for improvement or suspension of discharge. The enforcement of the law is conducted primarily through administrative guidance, rather than by punishing the polluter. The OECD report on environmental policy in Japan characterized direct intervention in private enterprise as a form of industry pollution regulation, as follows:

Compliance and cooperation by industry cannot be entirely accounted for by good sentiments. It is also obtained by a delicate handling of sticks and carrots by the administration, which can be more or less responsive to industry's needs in terms of accelerated depreciations, of funding, of procurements, of permits, and the like. Pollution abatement efforts are part of a package negotiated between industry and administration. It has even been suggested that some segments of the Japanese administration welcomed pollution controls because it increased their bargaining power at a time when other types of controls, such as controls over imports, foreign exchange, licensing, had been relaxed.¹²

Standards are utilised as a weapon in the hands of the administration in the negotiations it engages in with polluters rather than as prescriptions that automatically apply. There is no reason to believe that it is a less efficient way of utilising standards.¹³

Direct regulation using emission standards was implemented, combined with preferential treatment such as low-interest loans from government-affiliated financial institutions and special taxation measures. MITI received applications and played a gate-keeping role for access to low-interest loans from the Japan Development Bank (JDB), which provides the major portion of low-interest loans for large enterprises, and, indeed, MITI had a substantial role in deciding the allocation of the loans. Although most of the prefectural and municipal governments prepared individual low-interest loans too, they were for small and medium-sized enterprises and self-employed individuals with limited budgets. Furthermore, at that time, MITI was issuing guidance on pollution prevention to each industry and providing assistance for development of pollution prevention technology.

Starting in the early 1960s, MITI was in charge of air pollution prevention together with the Ministry of Health and Welfare, and MITI was in charge of water pollution prevention, in cooperation with the Economic Planning Agency. MITI lost most of its authority for direct regulation of industrial pollution due to legal revisions, pollution-related enactments in the 'Pollution Diet' in 1970, and the establishment of the Environment Agency in 1971. MITI's authority was shifted to the Environment Agency and local government. From that time on, pollution control measures by MITI tended to take the form of administrative guidance to the industries and private enterprises, through provision and allocation of low-interest loans and preferential tax treatment. It can be interpreted from the expansion of the low-interest loans and the preferential tax treatment in the first half of the 1970s that MITI was retrenching its operations as it had lost direct legal authority in industrial pollution control regulation. Although the need for these measures weakened in the latter half of the 1970s, MITI's earlier expansion of the preferential treatment made it difficult to reduce them.

The industrial pollution control measures for each enterprise can be carried out effectively only if the regulation is done comprehensively, so that it applies either on an industry-wide or area-wide basis. Individual private enterprises have a disincentive to spend large amounts on pollution prevention investment, given the severe competition with other enterprises, as it would handicap them in the competition. Individual enterprises will decide to invest in large-scale pollution prevention facilities only when all enterprises in the same industry are pressured to invest simultaneously.¹⁴ Therefore, as far as the command and control approach by direct regulation is concerned, the industrial policy of MITI, which issued administrative guidance to each industry by establishing or utilizing industry organizations for every industry, can be thought to be an effective method for industry pollution regulation as well.

Environmental standards and emission standards in Japan are not uniform throughout the country. There are many variations; in some cases regulations are stricter and, in other cases, exceptions are made and regulations are partially relaxed (as was the case in the K-value regulation and the fuel

low-sulphurization plan). These exceptions offer room for discretion to be more careful and effective during the process of implementing industrial pollution regulations through administrative guidance. The 'pollution control agreements' that local governments concluded with private enterprises may be considered as a kind of discretionary regulatory measure.

Preferential treatments

According to the 24th article of Basic Law for Environmental Pollution Control on the installation and maintenance of the pollution prevention facilities, 'administrative authorities need to make the necessary effort to take financial and taxation measures'. It is prescribed that the administration should 'provide the necessary funds and provide technical assistance, etc.', in the Air Pollution Control Law, which is a substantive law of the Basic Law for Environmental Pollution Control. There is a similar statement in the Water Pollution Control Law as well.¹⁵

As preferential treatment for pollution prevention investment by private enterprises, there are the low-interest loan programmes and the tax relief available through various types of preferential taxation measures. Low-interest loan programmes offered by a government-affiliated financial institution have an effect similar to a subsidy to private enterprises by reducing the interest payments. The interest rates of those loans are significantly lower than the market rate at the given time. Furthermore, in some cases these loans are interest free, such as loans to small and medium enterprises from local governments.

Although various measures, such as direct tax deductions, special (accelerated) depreciation and fund reserves, are combined, preferential tax measures basically reduce the tax payment burden of the private enterprises. The preferential tax measure system also has the same effect as provision of subsidies by substantially reducing part of the tax payment burden. Preferential tax measures are known as 'the tax expenditure'.

As for preferential treatment for environmental pollution prevention, direct subsidy to private enterprises from the central government has never been spent to promote investment for pollution prevention. However, for research and development on pollution prevention technology, substantial assistance was given by the central government to private enterprises. Local governments supplied subsidies mainly for the small and medium enterprises to prevent industrial pollution. In some cases, subsidies by local governments, combined with the provision of loans from them to small and medium enterprises for pollution prevention investment, were intended to reduce the amount of loan interest payments. In the latter half of the 1970s, the amount of subsidy payments by local governments for pollution prevention was about 10 billion Japanese yen annually.

We will present an outline of the low-interest loans and the preferential tax treatment for pollution prevention, as well as the effect of such treatment, in the following section.

Low-interest loan programmes. It was in the fiscal year (FY)1960 that the low-interest loans offered by the Fiscal Investment and Loan Programme (FILP) started to be applied to pollution prevention investment of private enterprises. In the same year, Japan Development Bank (JDB) set up a loan scheme for investment in wastewater treatment facilities. Most of the loans offered by JDB are for large enterprises. The low-interest loans offered by the Pollution Control Service Corporation (later known as the Japan Environmental Corporation [JEC] and at present known as the Environmental Restoration and Conservation Agency [ERCA]) covered not only small and medium enterprises, but also large enterprises as well.

The loan schemes for pollution prevention provided exclusively to small and medium enterprises were set up in FY1960, through the Small and Medium Enterprise Modernization Promotion Fund. After that, the Japan Finance Corporation for Small Business (JFCS), Japan Small Business Corporation (JSBC) and Pollution Control Facility Lease Programme, etc., together with the Pollution Control Service Corporation, inaugurated funding to small and medium enterprises for pollution prevention.

The undertakings of the Pollution Control Service Corporation, which was set up in 1965, included not only the low-interest loan business, but also the 'construction and transfer of pollution prevention facility' scheme as well.¹⁶ Under the 'construction and transfer' scheme, complete facilities are transferred at construction cost on the condition of long-term low-interest loans, to relocate factories discharging pollutants away from multiuse areas of residence and industries. This was considered especially cordially by the small and medium enterprises. The targets of the low-interest loans of Environmental Pollution Control Corporation were not only small and medium enterprises but also large enterprises. Most of the loans were financed for large enterprises during the mid-1970s; the new loans to large enterprises in FY1975 reached approximately 100 billion yen. However, in later years, most of the loan customers were small and medium-sized enterprises (Figure 1.3).

The JDB financing for pollution prevention accounted for the biggest share among such loans offered by several government-affiliated financial institutions, and the JDB loans had a heavy impact on the trend in pollution prevention investment by large industries, such as power generation, iron and steel, oil refining and petrochemical, etc.¹⁷ From FY1970, the amount of JDB loans for pollution prevention expanded rapidly. The actual amount of new loans exceeded 200 billion yen in FY1975, setting a record, and it exceeded by 25 per cent the new loans by JDB during FY1974 and FY1976. During this period, pollution prevention loans were one of the main businesses in the JDB lending scheme (Figure 1.4).

The JDB programme provided loans for large-scale plant investment related to pollution prevention, such as the heavy oil desulphurization facility of a petroleum refinery and the LNG (liquefied natural gas) unloading, storage and vaporization facility at a thermal power plant. The heavy oil

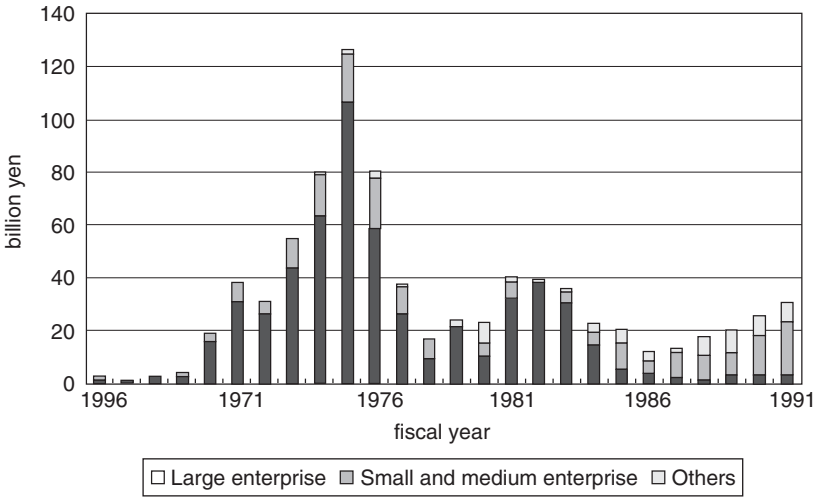


Figure 1.3 Annual loan lending by Pollution Control Service Corporation
Source: Pollution Control service Corporation, *Jigyō Nenpo*, various issues.

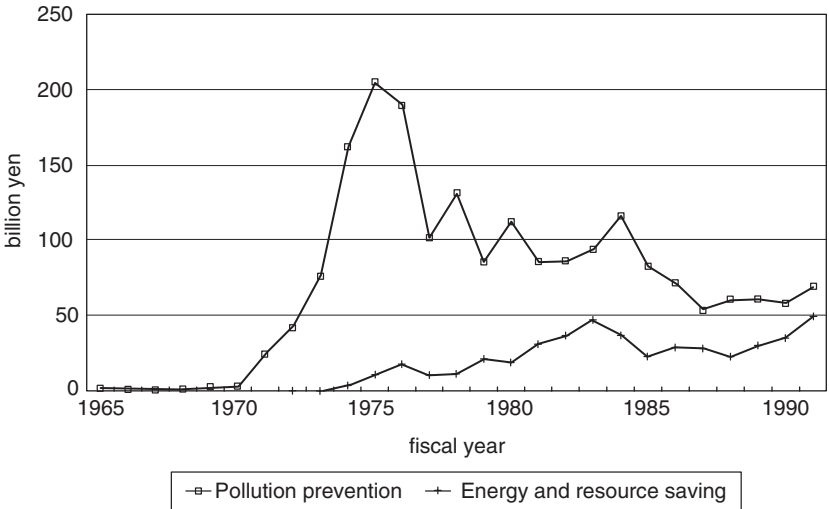


Figure 1.4 Annual loan lending by JDB on pollution prevention and energy saving
Source: Japan Development Bank, *Jigyō Nenpo*, various issues.

desulphurization facility itself is a large-scale plant in an oil refinery. The JDB loans covered investment for the flue gas desulphurization equipment too. Therefore, the loan supported the major part of the 'low sulphurization' plan on financial fund supply side.

Most of the government-affiliated financial institutions and the local governments were involved in policy finance for the small and medium enterprises, and the entire structure of policy finance was quite complicated. Although the financial institutions and their lending facilities partially overlap each other, they each had their own characteristics and were segregated within their demarcations. Most of these financial institutions each had their own loan programme for pollution prevention investment, and each institution's programme reflected the characteristics of that institution.

Japan Finance Corporation for Small Business (JFS) started a lending scheme for the pollution prevention facilities of the small and medium enterprises in FY1965 and took the central role in policy implementation.¹⁸ JFS loans accounted for a large share of the pollution prevention loans for the small and medium enterprises, until the mid-1980s when Pollution Control Service Corporation reduced its loans to large enterprises and began to concentrate on small and medium enterprises (Figure 1.5).

Pollution prevention investment by private enterprise increased rapidly during the latter half of 1960s and the first half of 1970s. At that time, the importance of 'pollution control' as an emergent policy issue led to an expansion of the credit ceiling of the government-affiliated financial institutions.

It is quite difficult to compare the total amount of loans from the government-affiliated financial institutions for pollution prevention investment by private enterprise because the terms and conditions, such as loan-applicable equipment, interest rates, repayment periods and limit amounts, differ markedly among the many loan programmes. When pollution prevention investment by large private enterprises reached its peak in FY1975, the annual total of new loans for pollution prevention loaned by JDB and the Pollution Control Service Corporation amounted to approximately 300 billion yen, which constituted the majority of the loans for large enterprises. According to a survey by MITI, pollution prevention investment by private enterprise (i.e., manufacturing, electric power, gas and mining industries, which were capitalized in excess of 10 billion yen) amounted to a minimum of approximately 1,000 billion yen in FY1975. It can be seen that pollution prevention loans provided by JDB and the Pollution Control Service Corporation covered a significant part of the pollution prevention investment of large private enterprises at that time.

For small and medium enterprises, government-affiliated financial institutions supplied low-interest loans for pollution prevention investment of approximately 40 billion yen in FY1975, when such investment reached its peak. When one includes the loans provided by local governments to small and medium enterprises, which amounted to approximately 40 billion yen, the total amount loaned to small and medium enterprises in FY1975 was approximately 80 billion yen. According to the investment survey by the Japan Small Business Corporation, the total amount of pollution prevention investment by small and medium enterprises in this year was approximately 80 billion yen.

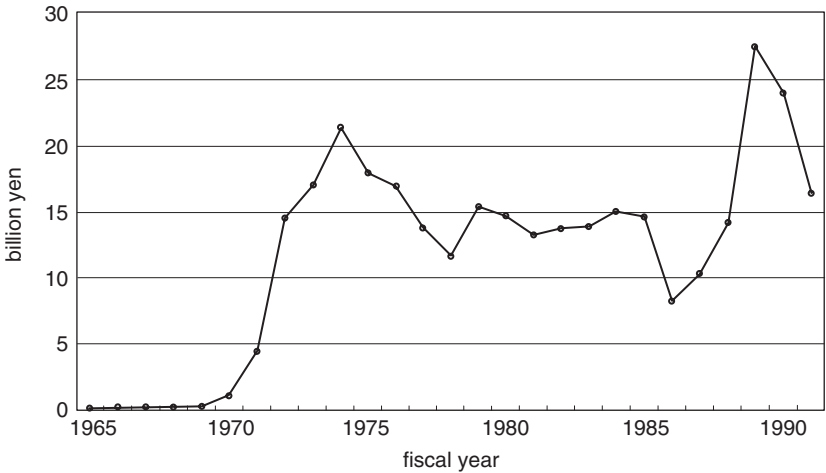


Figure 1.5 Annual loan lending on pollution prevention of small and medium enterprises by JFS

Source: Japan Finance Corporation for Small Business, *Gyomu Hokokusho*, various issues.

This survey indicates that the loans provided by government-affiliated financial institutions for pollution prevention investment by small and medium enterprises covered a very high percentage of private pollution prevention investment, although it may be assumed that pollution prevention investment and the definition of the small and medium enterprises differ at each institution.

Preferential tax measures. Preferential tax treatment has often been utilized as an indispensable means of implementing industrial policy, together with low-interest loans by government-affiliated financial institutions. The effect of the preferential tax measures is the same as the effect of subsidy payments, so that preferential tax measures are called 'tax expenditures'. However, because budget restrictions are loose compared to the provision of direct subsidies and no report to the Diet is required, budget restrictions are an easy-going policy instrument that policy-makers can use at their own discretion. On the other hand, monitoring of abuse is difficult. Preferential tax measures, once introduced, have often been abused rather than serving their original policy purpose and have sometimes been preserved due to the vested interests of beneficiary groups even after their significance for policy objectives ceased to exist. Unlike with direct subsidy payments, it is difficult to predict in advance how much one preferential measure will cause tax revenue to decrease. The biggest difference between preferential measures and subsidy payments is that subsidy payments are not available to the corporations in deficit.

Most of the preferential treatment measures related to the national tax are based on the Special Taxation Measures Law. Various preferential treatments,

such as an 'allowance reserve' that is designated by corporation tax law, also exist in the corporation tax system, in addition to the measures prescribed by Special Taxation Measures Law.

A portion of local taxes on corporations, including the corporate enterprise tax, prefecture residents' tax and local municipal tax, are collected based on the amount of national tax payment (which in case of a corporation is the corporation tax). Therefore, preferential tax measures instituted by the central government for the national tax (the corporation tax) influence the local taxes, too. The decrease in local tax revenue is divided into two parts: the reduction caused by the effects of the central government's measures and the reduction caused by measures directly based on the local tax law.

There are two types of preferential tax measures. One is the 'deduction-type' measure, such as income deductions and tax exemptions, and the other is the 'deferral-type' measure, such as special (initial) depreciation, pollution control reserve funds and allowance revenues.

'Deduction-type' measures decrease the amount of a tax or taxable income directly. One example would be reduced rates for and exemptions from the fixed local property tax. Regarding the 'deferral-type' measures, such as special depreciation, reserve funds and allowance reserves, we briefly explain in the following section.

Special depreciation measures accelerate depreciation of property in corporate accounting under some methods and enable the depreciation to be entered under losses. This is done to reduce the corporation's book profit, which is the basis for the computation of the amount of the corporation tax to be paid, thereby reducing the corporation tax. Special depreciation measures can postpone corporate tax payment to the future by taking the future amount of depreciation in advance. Therefore, a special depreciation measure is not a direct tax deduction measure such as a tax credit or tax deduction from income, but only has the effect of postponing taxation to future years. So long as the corporation tax payment is usually delayed in comparison with the repayment, a special depreciation has an effect similar to getting an interest-free loan.

Reserve fund and allowance reserve measures permit an enterprise to keep a tax-free reserve fund within a fixed period and up to the ceiling, when there are some profits, to prepare for future payments and hedge against the risk of income fluctuation in future. It becomes taxable as part of the corporation tax when it is withdrawn from the reserve fund. The reserve fund measure has the same effect as an interest-free loan for capital accumulation by enterprises, because these measures postpone the corporation tax payment, similar to the effect of special depreciation measures.

Together with the fiscal investment and loan programme, the preferential tax treatments, such as special depreciation, reserve funds and allowance reserves, occupied a very important position in the industrial policy of post-war Japan. Private enterprises emphasized preferential tax measures as an effective means of capital accumulation, and preferential tax treatment was

an important means of stimulating plant investment in the direction favoured by government policies.¹⁹ Because the actual effective interest rate was high enough throughout the 'high growth period' in Japan, it seems likely that the effect of the interest-free loans provided by preferential tax measures for plant investment was strong in that period.²⁰

As for the preferential tax treatment related to the pollution prevention investment, there are provisions in the Basic Law for Environmental Pollution Control, Air Pollution Control Law and Clean Water Law. As a measure for pollution prevention in the national tax, the corporation tax was decreased through special depreciation measures and a pollution control reserve fund based on the Special Taxation Measures Law.²¹

Looking at the decreases in tax revenue amount, the exemption from or reduction of the fixed property tax was the most important preferential measure at the local tax level, except for the decrease in local taxes along with the decrease of corporation tax implemented through the preferential tax measure of the central government.²²

The decrease in tax revenue (or for the enterprises, the amount of tax payment reduction) through the special taxation measures related to prevention of pollution is shown in Figure 1.6. The overall decrease in tax revenue was estimated at approximately 100 billion yen at its peak in FY1975. National tax (in this case, corporate tax) revenue reduction related to pollution prevention alone reached approximately 60 billion yen, or approximately 20 per cent of the whole corporate tax decrease of FY1975. These data were estimated with a budget base by the National Tax Bureau of the Ministry of Finance, and reported to the Government Tax Commission (the Prime Minister's consultative council).

A special depreciation measure by the central government can give an economic incentive to private enterprises to investment in pollution prevention equipment. Pollution prevention investment in most cases does not directly cause profit expansion for the enterprise concerned. Therefore, when the rapid execution of pollution prevention is required, it is not easy for the private enterprises to recover their investment costs incurred for pollution prevention equipment in the short run.

Special depreciation measures applied to the pollution prevention facilities can trigger pollution prevention investment because the burden on the enterprise to carry out pollution prevention investment is clearly reduced so long as the measure is equivalent to an interest-free loan.²³ When special depreciation measures for pollution prevention investment were introduced in FY1967, the ratio of special depreciation deduction for the first year after pollution prevention investment was set at 33 per cent and was raised to 50 per cent in FY1971. It was reduced to 33 per cent in FY 1977 and then decreased continuously to reach 27 per cent in FY1980, 25 per cent in FY1982 and 22 per cent in FY1985. From FY1987, it came to be accepted only when pollution prevention equipment was set up along with new construction of a plant.

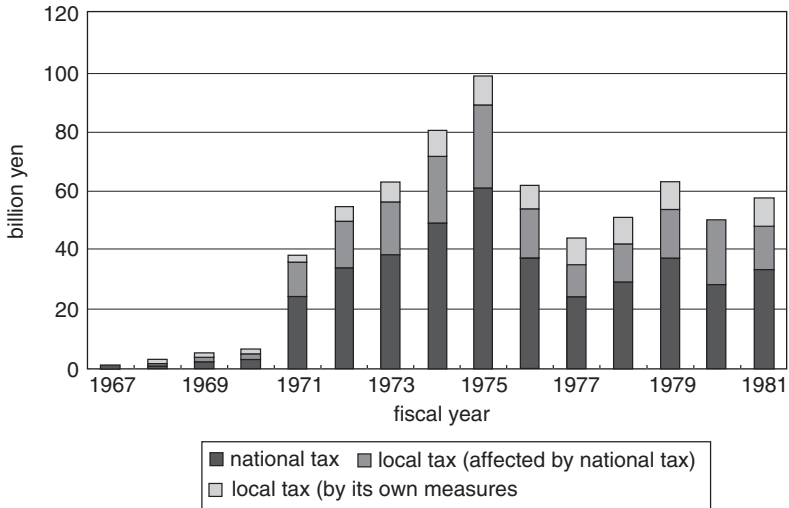


Figure 1.6 Decrease in tax revenue by special tax treatments on pollution prevention
 Source: Government Tax Commission, *Zeisei Chosakai Kankei Shiryoshu*, various issues.

The pollution prevention reserve fund was introduced in FY1972, to avoid placing too large a burden on private enterprises by having them pay for pollution prevention cost when their business performance was declining. The limit on the additional annual reserve amount was established as 0.3 per cent or 0.6 per cent of the sales revenue, depending on the type of industry. Even if more pollution prevention investment was made, there was no benefit earned by the enterprise under this system. The pollution control reserve did not provide any incentive to private enterprises for pollution prevention investment because the purpose of the reserve was to provide for the operation cost of pollution prevention facilities.

According to Tadashi Murai, the pollution prevention reserve fund was a unique system in Japan. The pollution prevention reserve fund system did not provide an incentive for enterprises to exert more effort to prevent environmental pollution. Furthermore, when payments were made from the pollution prevention reserve, there was no investigation by the government to confirm that the payments were actually utilized to cover the pollution prevention costs of the enterprise. The pollution prevention reserve was criticized, in the National Assembly right after its introduction, for taking on the characteristics of a means of profit retention in the name of pollution prevention.²⁴ The National Tax Agency was forced to admit the necessity of a re-examination of the reserve in FY1974, only two years after its introduction. At that time, the sales percentage that could be added to the reserve fund was lowered, from 0.6 per cent to 0.3 per cent and from 0.3 per cent to

0.15 per cent, depending on the type of industry. Finally, in FY1978, it was decided to phase out the reserve after a transitional period of three years.

At the local tax level, the majority of the tax revenue reduction related to pollution prevention is due to the exemption from and reduction of the fixed property taxes, together with the preferential measures. The history of change in the rate of reduction and the coverage of specific equipment almost corresponds to the historical transitions in the special depreciation measure of the national tax related to pollution prevention. The exemption from and reduction of the fixed property tax causes a tax decrease, not only on the new pollution prevention investment but also on the fixed assets acquired by past pollution prevention investment. Therefore, its effect is to induce new pollution prevention investment, but only indirectly by reducing the long-term cost of pollution prevention of the enterprise, rather than as a direct incentive for new pollution prevention investment.

Apart from preferential tax measures relating to pollution prevention, which we have already discussed, there is another type of tax treatment to promote pollution prevention efforts by private enterprises indirectly. A pollution tax or surcharge on pollution emission can induce pollution prevention investment by private enterprises, similar to preferential treatments, by increasing the cost to the enterprises of emitting pollution into the environment. According to microeconomic theory, surcharges on pollution emission and subsidies for pollution prevention should, at least in the short run, have the same effect as incentives to private enterprises for pollution prevention. However, subsidies are not a desirable method from the viewpoint of 'the polluter pays principle' (PPP). A surcharge is more desirable than a subsidy because a subsidy encourages the polluting industry in the long run. Nevertheless, it was only after global environmental problems become a policy issue in the latter half of the 1980s that the introduction of taxes came to be examined realistically in Japan. Until then, only various preferential tax treatments had been instituted in Japan as tax system measures for the prevention of pollution.

Preferential tax treatment for pollution prevention is an effective means of providing incentive for pollution prevention activities to private enterprises, and preferential tax treatment can be considered one of the factors that led to an enormous amount of pollution prevention investment in Japan within short period during the mid-1970s. However, many of those preferential tax measures remained in effect even after intensive pollution prevention investment was accomplished and the annual amount of investment had decreased. A review of the preferential tax treatment system related to the plant investment as a whole started from the end of the 1970s, and many parts of the system related to pollution prevention were abolished during the process. The amount of the corporation tax revenue exemption due to preferential tax treatment in the budget base decreased rapidly in the 1970s. However, the abolition of preferential treatment related to pollution prevention was delayed compared

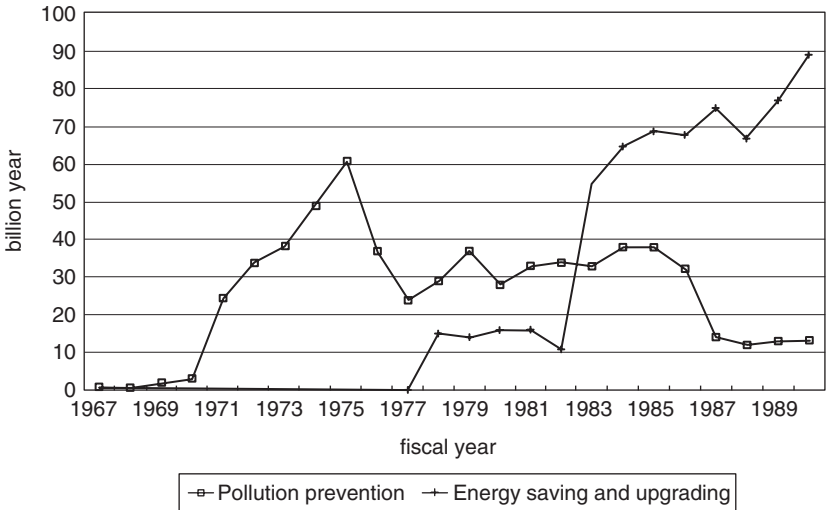


Figure 1.7 Decrease in national tax by special tax treatments on pollution prevention and energy saving

Source: Government Tax Commission, *Zeisei Chosakai Kankei Shiryoshu*, various issues.

to the abolition of other preferential treatments. This was often pointed out as evidence of an unfair taxation system. Following that, an overall check of the preferential treatments finally was undertaken in the latter half of the 1980s.

While preferential tax treatments related to pollution prevention were abolished gradually, the preferential tax measures related to energy saving and the promotion of alternative energy use were expanded rapidly after FY1981. From among the corporate tax revenue decreases caused by preferential tax measures, we compared annual trends in the amounts related to pollution prevention and the amounts related to energy saving (including upgrading of energy use) in Figure 1.7. A sudden expansion in the amount of corporate tax revenue decrease affected by energy use reflects the fact that special taxation measures related to the energy use included very powerful measures for tax credit from FY1984. Tax credit, which is a 'deduction-type' measure similar to a deduction from taxable income, is a much more powerful preferential treatment than the 'deferral-type' measures, such as special depreciation, reserve funds and allowance reserves. All of the significant 'deduction-type' measures for corporate tax had already been abolished in the 1960s.

As far as pollution prevention through special taxation treatments is concerned, the 'deduction-type' measure at the national tax level, such as tax credit and deduction from taxable income, has never been accepted by the National Tax Administration Agency. Since the mid-1980s, special taxation treatment related to energy use has been notable for the intensity and strength of its measures. It is said that historical trends in new establishment

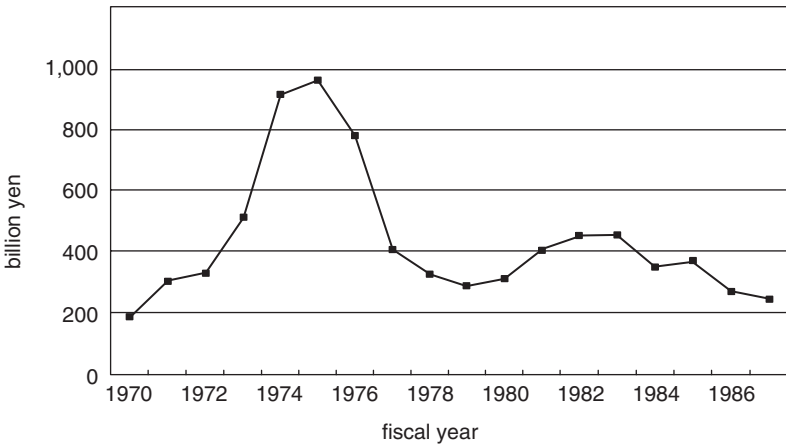


Figure 1.8 Pollution prevention investment by major private manufacturing enterprises

Source: Ministry of International Trade and Industry, *Shuyo Sangyo no Setsubi Toshi Keikaku*, various issues.

and abolishment of various preferential tax measures reflect the shifting emphasis in industrial policy, which is shifting from pollution prevention to energy conservation and new energy development. Moreover, manufacturing industry's energy-saving investment displays a close relationship with pollution prevention activities (especially air pollution). Some types of investment, such as that for improving the efficiency of boilers, could be defined as either type of investment, and so it may be possible to change the classification of investments from pollution prevention to energy saving. Although most of the special taxation measures related to pollution prevention have been abolished, some were incorporated into more powerful measures related to energy saving, thereby prolonging their lives substantially.

Pollution prevention investment by major private manufacturing enterprises, including electric power companies, is shown on Figure 1.8. At its peak in FY1975, total amount of private pollution control investment in Japan was about a trillion Japanese yen. It was about 17.7 per cent of total capital investment of those enterprises in FY1975.

3. Energy policy and industrial pollution control: political economy of 'low sulphurization'

An examination of energy policy is important when considering the relationship between industrial policy and industrial pollution regulation, since energy policy is related to both industrial policy and industrial pollution control.

Energy policy in particular has a deep relation with industrial air pollution. For example, skyrocketing energy prices in the 1970s worked as a powerful incentive for private enterprises to reduce energy use, which also reduced emission of air pollution from industries. It can be said that these energy conservation efforts brought about a reduction in the discharge of air pollutants, such as SO_x which occurs in direct proportional relation to the sulphur content in the energy consumed. Below, in order to show the importance of the relationship between energy policy and measures to reduce industrial pollution, we will focus on the example of 'measures for low sulphurization' and energy conservation.

Among the 'industrial pollution regulations for achieving industrial policy', it can be said that SO_x regulations achieved some degree of successful outcome by means of a 'combination of direct regulation and preferential treatment'. We will consider the implications of the measures in air pollution prevention policy to reduce SO_x by focusing on the relationship with energy policy.

The central part of the SO_x regulation policy from the middle of the 1960s was the reduction of discharge from the fixed sources, such as factories and power generation plants. The concrete contents of a series of regulations called the 'low sulphurization measures' were (1) low sulphurization of imported crude oil; (2) installation of heavy oil desulphurization facilities in oil refinery plants; (3) installation of stack gas desulphurization facilities; and (4) heightening of smokestacks, etc.²⁵ The source of the SO_x discharged into the atmosphere was the sulphur content in fuel, and since low sulphurization of fuel was the easiest countermeasure technologically and financially, it was first pursued as much as possible as a measure against SO_x pollution. However, fuel gas desulphurization was not yet established technologically or commercially in the mid-1960s, so it was not to be relied upon at that time.

The legal basis of the measures against SO_x was the Clean Air Act, which was enacted in 1962 and amended and expanded in 1968. However, administrative guidance without legal basis was serially issued to the industrial community (on the supply side and demand side of energy) behind the scenes. The Advisory Committee for Energy, a consultative body of the Minister of International Trade and Industry, prepared the committee report 'An Optimal Comprehensive Energy Policy' in February 1967 and took up the 'low sulphurization plan' as a subject. Furthermore, the Committee established a 'Subcommittee on Measures for Low Sulphurization' in May 1969, and it summarized the 'low sulphurization plan' in December of the same year. To carry out 'low sulphurization' effectively and extensively, the plan set forth long-term guidelines to show industries that used fuel how to set up targets for fuel use and sulphur content for each region, as well as guidelines for oil refineries that supply heavy fuel oil, which indicated targets for average sulphur content and production amount for fuel in each oil classification. Based on this plan, administrative guidance to both the supply side and the demand side was conducted intensively.

Although importation of crude oil with lower sulphur content was an effective measure, the tightness of the market after the first oil shock made it difficult to continue such importation. Thereafter, installation of the heavy oil desulphurization facilities by oil refinery companies was conducted, followed by the installation of the stack gas desulphurization facilities by industries on the fuel demand side.

On the other hand, in order to carry out this plan, the government promoted the technical development of heavy oil desulphurization facilities and stack gas desulphurization facilities, as well as installation of the equipment for these facilities. The financial burden placed on enterprises that carried out those measures was alleviated by low-interest loans from government financial agencies, including JDB, and by accelerated depreciation through special taxation measures, exemption from and mitigation of fixed property tax, and mitigation of import duties on low-sulphur crude, etc.

In the process of executing the 'low sulphurization measures', MITI issued administrative guidance, in connection with the adjustment of interests among related industry circles, and asked for cooperation among them. The related industries were the electric power and the iron and steel industries, etc., which are large users of heavy oil, and the oil refinery industry, which is the supplier. In addition to fuel, the oil refining process produces naphtha in a fixed proportion, which serves as a raw material mainly in the petrochemical industry. Therefore, the trend in heavy oil demand was a matter of serious concern for the petrochemical industry as well because it requires naphtha as a raw material. These industries were under the powerful influence of MITI at that time. Through the 'Petroleum Act' enacted in 1962, oil refineries in particular were the targets of powerful intervention by MITI regarding their quantity of production, prices, and plant and equipment investment, etc.²⁶

Prior to the 'low sulphurization plan', the electric power industry had started combustion of crude oil, which had already been substituted for heavy oil as fuel for thermal power plants starting in 1962. The sulphur content of heavy oil is higher than that of crude oil because most sulphur remains in the heavy oil in the process of refining. However, the electric power industry started crude-oil combustion in thermal power plants not because the sulphur content of crude oil is lower than that of heavy oil, but because the price of the heavy oil refined in Japan was relatively high. The prices of petroleum products are actually controlled, with the price of naphtha fixed low for the promotion of the relatively new petrochemical industry and the price of heavy oil set comparatively high.

Moreover, it was more advantageous for the electric power industry to limit measures against SO_x to fuel measures and to put off introduction of the stack gas desulphurization facilities in thermal power plants as long as possible. Fuel gas desulphurization was not yet technologically viable in the late 1960s. For the electric power industry, the deadlock in measures to reduce SO_x

through fuel low sulphurization meant that the cost of the emission gas desulphurization, which had not been fully established technically, had to be paid.

Since the petroleum policy of MITI was premised on adherence to the 'principle of refining near the consumption region', and the pattern and organization of the oil refinery industry at that time, heavy oil was produced from crude oil at a fixed rate technically. Therefore, in order to maintain the production quantity of lightweight oil, including naphtha, which was in tight supply in those days, the oil refinery companies had to secure the domestic market for heavy oil. Moreover, if crude oil was not refined and combusted in electric power plants as a fuel, it would bring no profit to the oil refinery industry. Therefore, the oil refinery industry was opposed to expansion of crude-oil combustion by the electric power industry. Combustion of low-sulphur crude oil would suppress the supply of low-sulphur crude for refinery industry, and the oil refinery industry insisted that this was not an efficient way to pursue low-sulphurization measures in Japan as a whole. A report in February 1967 issued by the Advisory Committee for Energy insisted that crude-oil combustion by the electric power industry should be 'within the limits of the type C heavy oil import schedules amount', in response to the objections of the oil refinery industry.²⁷ However, later this limit was clipped away gradually in increments.

Although continued implementation of pollution regulations would generally cause cost increases for the electric power industry, the social imperative of 'low sulphurization' provided the electrical power industry opportunities to escape the restrictions on fuel use that the government and the domestic fuel industries imposed, to realize diversification of fuels for thermal power generation, to reduce use of the high-priced domestic heavy oil, which was required by the government, and to reduce costs simultaneously.

Moreover, the electric power industry was assigned to receive the 'Kafji crude oil', which the Arabian Oil Company, a national policy concern, developed in those days. When crude-oil combustion began at electric power plants, Kafji crude oil was burned. However, the high sulphur content of Kafji crude oil became a problem, and the electric power industry requested a reduction in the amount of Kafji crude oil that it received.

The interest of the petrochemical industry in the 'low sulphurization measures' was almost the same as the interest of the oil refinery industry. Crude-oil combustion by power plants without separating the parts of lightweight crude oil, such as naphtha, could undermine the stable supply of naphtha for industrial use, and this was a serious obstacle to the development of petrochemical industry.

With such interests among related industries in the background, the 'low sulphurization measures' were promoted by the government. An important turning point was brought about by the 'pollution control agreements', which are a means of pollution regulation used by local governments. The

Tokyo metropolitan government and the Tokyo Electric Power Co. (TEPCO) concluded a 'pollution prevention agreement' in September 1968, on the occasion of the construction of a thermal power plant on the Oi wharf reclaimed land. In the agreement, TEPCO promised to use only 'Minas crude oil' with super-low sulphur content as fuel from FY1973 in the Oi Thermal Power Plant. Exclusive usage of Minas crude oil was proposed by TEPCO in the process of negotiation. The sulphur content of Minas crude oil was only 0.1 per cent, which was lower than the 1.7 per cent technical limit on sulphur content at the heavy oil desulphurization facilities (which used an indirect desulphurization method) in those days. Furthermore, TEPCO made a firm promise to continue using super-low-sulphur crude oil in the future at the Oi Thermal Power Plant.²⁸ The conclusion of this pollution prevention agreement was a big shock for the oil import, refinery and petrochemical industries. Both the oil refinery and petrochemical industries were opposed to combustion of super-low-sulphur crude oil, for which the absolute quantity was restricted, at electric power plants without refining. In the process of negotiation between TEPCO and the Tokyo metropolitan government, there was no trace of involvement by MITI.²⁹

Although, in those days, the local governments did not have the legal authority to implement pollution regulations that were severer than those of the central government, to cope with the conditions at that time, the local governments needed a regulatory means to deal with the actual conditions of their areas, since the standards of the central government's pollution regulations were too loose. 'Pollution prevention agreements' were invented under such conditions, and they were extensively utilized as a means of pollution control by most of the local governments in Japan.³⁰ The Yokohama Municipal Government concluded one of the very early examples of such an agreement with the Electric Power Development Co. Ltd, in 1964. It is known that the strong pressure from the residents in each area served as an impetus for local governments, such as the Yokohama municipal government, to press the enterprises in the area to conclude pollution prevention agreements. For the enterprises, the pollution prevention agreements were also a promise to the local community through the local government regarding prevention of pollution. Moreover, it was more desirable for the enterprises to prevent disputes with residents by concluding agreements with local government, thereby clearly showing their attitude towards pollution prevention to local residents, rather than risking a dispute later by leaving the possibility of pollution generation ambiguous. Without a definite promise on pollution prevention, neither local governments nor residents in mixed-use residential and industrial areas could accept new factories in their areas.³¹ At most of TEPCO's thermal power plants, effective SO_x emission control was realized through strict pollution prevention agreements.

The electric power industry was able to advantageously advance negotiations on combustion of crude oil with the oil refinery industry and the

petrochemical industry, and with MITI, using as leverage the pressure from local governments that were responding to their local residents' demands for pollution prevention. After 1968 when TEPCO concluded its first pollution control agreement with the Tokyo metropolitan government, the nine major electric power companies in Japan successively signed pollution prevention agreements with local governments where their plants were located. Most agreements included specific regulations on low sulphurization of fuel.³²

Furthermore, the electric power industry, together with the iron and steel industry, began using more naphtha as a low-sulphur fuel in 1971. At that time, a cloud hung over demand expansion of petrochemicals. Tightness in the supply of naphtha was easing, and a surplus of naphtha was seen overseas. Therefore, these industries could expect to procure a certain amount of naphtha at relatively low prices. Needless to say, naphtha combustion by electric power plants and the iron and steel industry stimulated the petrochemical industry more than the oil refinery industry.³³ Although the oil refinery and petrochemical industries tried to oppose such usage, naphtha combustion by electric power plants and the iron and steel industry was accepted after all.

In order not to give the electric power industry any more excuses to expand crude oil combustion under such circumstances, the oil refinery industry was forced to expedite desulphurization of heavy oil. Introduction of heavy oil desulphurization facilities at oil refineries, as well as technological developments and improvements, were advanced very quickly.

Heavy oil desulphurization facilities were already afflicted by a low operation ratio caused by over-capacity in the first half of the 1970s. As operation ratio falls, cost per unit of production increases markedly. The causes of over-investment were that (1) heavy oil desulphurization alone was inadequate because SO_x emission regulations were tightened; (2) the electric power industry, which is a large user, coped with the tighter regulations by combusting crude oil and naphtha at power plants; and (3) heavy oil desulphurization was emphasized more than necessary in the 'low sulphurization plan'.³⁴ If the oil refinery industry was going to prevent expansion of crude oil and naphtha combustion, it had to expedite desulphurization of heavy oil. This is considered to have been a cause of the over-investment in heavy oil desulphurization facilities. The capacity of a heavy oil desulphurization facility is shown in Figure 1.9. It turns out that there was hardly any increase in capacity from the second half of the 1970s.

Anti-pollution investment at that time by oil refineries is shown in Figure 1.10. It turns out that the majority of investment was spent on heavy oil desulphurization facilities (i.e., equipment to prevent pollution by consumption of the product). Therefore, the investment in the equipment to prevent pollution by the oil refinery plant itself was not as large as it appears on the whole. Although the operation ratios of the heavy oil desulphurization facilities were already very low in 1975, large-scale investment was continued until around FY1976.

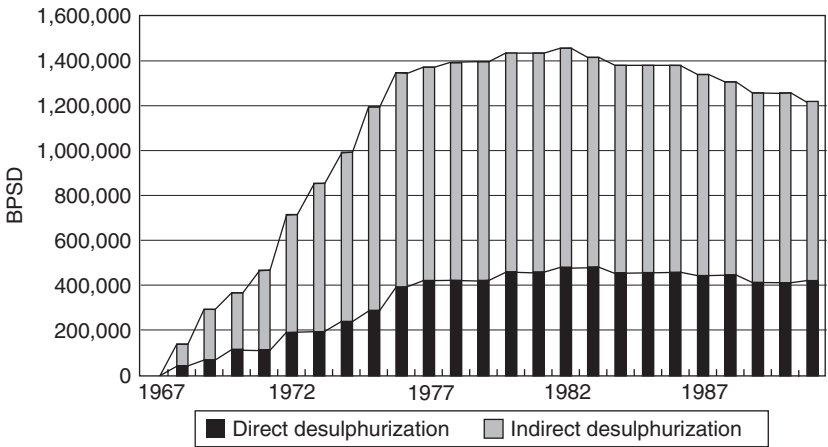


Figure 1.9 Capacity of heavy oil desulphurization facilities

Note: Capacity at the end of each year.

Source: Petroleum Association of Japan, *Naigai Sekiyu Shiryo*: FY 1991 edition, 1992.

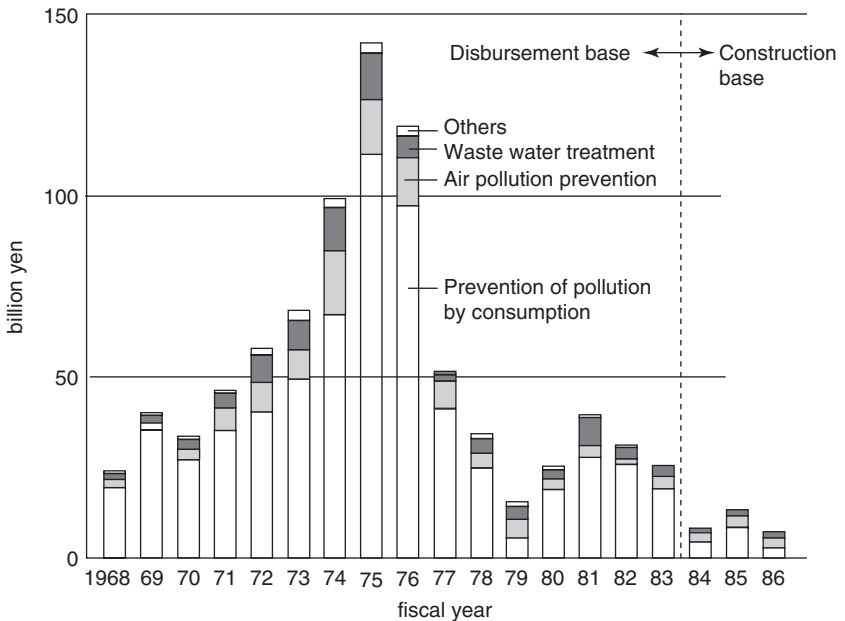


Figure 1.10 Pollution prevention investment by oil refineries

Source: Petroleum Association of Japan, *Sekiyu Renmei Shiryo*.

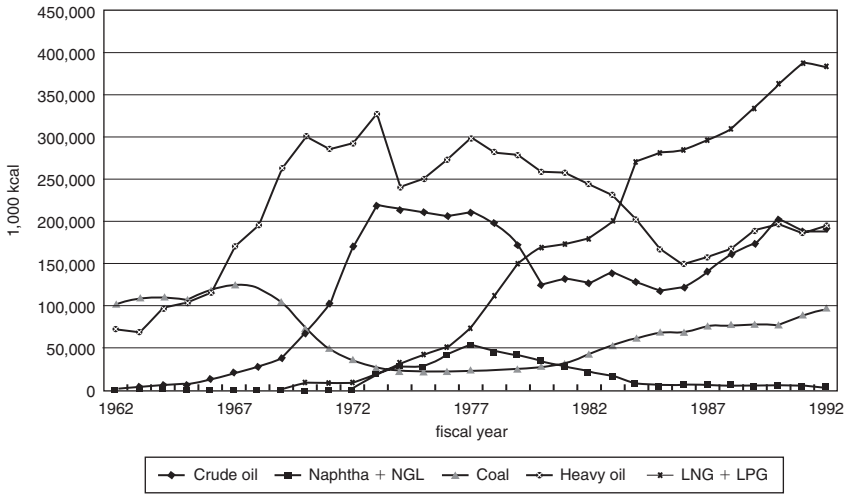


Figure 1.11 Fuel use of thermal power plants of nine major electric companies (calorific power base)

Sources: Federation of Electric Power Companies of Japan, Denkiijogyo Binran; Agency of Natural Resources and Energy, *Sogo Enerugi Tokei*, various issues.

Shown in Figure 1.11 is the amount of each fuel used at thermal power plants of the nine major electric power companies from 1962, when crude-oil combustion started at power plants. Crude-oil combustion rapidly expanded with the 'low sulphurization plan', and the amount consumed did not fall off as with heavy oil, even after the first oil crisis. Although coal use decreased rapidly in the late 1960s, it recovered considerably after the second oil crisis in 1979. LNG continued rapid growth, starting in the 1970s, and became the mainstream fuel of thermal power plants from the middle of the 1980s. LNG requires transportation and storage facilities for its own exclusive use and, although it is high cost, it has no sulphur content at all. With thermal power plants being newly located around urban areas, the only way to meet the strict requirements of SOx emission control is to construct power plants that use LNG exclusively.

When the interests of the oil refinery, petrochemical and electric power industries were opposed to each other in the 'low sulphurization measures', all that MITI did was to coordinate the opinions of the *Genkyoku* (the sections of the bureaucracy within the government that had the primary responsibility for development and supervision policies for specific industries), which were located within MITI. It seems that MITI was unable to set forth an energy policy that went beyond the adjustment of interests among the industries to make the pollution control measures more compatible. Moreover, as a matter of petroleum policy, administrative guidance seldom took into consideration the effects of substitutions for fuel and materials.

This caused serious conflicts of interest, as seen in the relation between crude oil and naphtha combustion and low-sulphur heavy oil.³⁵ However, air pollution prevention measures taken by these industries progressed eventually as requests were met concerning crude oil and naphtha combustion by the electric power and the iron and steel industries. In fact, it can be said that the social need for prevention of air pollution brought about the de facto fall of the authority of MITI over fuel use by the electric power industry.

It can be said that the 'low sulphurization measures' scored a success as an industrial pollution regulation due to administrative guidance on fuel (except in the cases of large fuel users, such as the electric power, iron and steel, and petrochemical industries mentioned above). The concentration of SO_x fell rapidly. This contrasts with the nitrogen dioxide concentration, which did not improve enough. The combination of 'direct regulation' and 'preferential treatment' using administrative guidance and experience with policies for promoting industrial growth was the easiest method for the policy authorities, because the same means they used for promoting policies for industrial growth prior to industrial pollution regulation could be applied in this case as well.

4. 'Developmentalism' and political economy of industrial pollution

'Developmentalism' is based on the principle of a market economy that maintains market competition, a private property right system and trust in the mechanism of efficient resource allocation through fair market exchanges. As we have already seen in the previous section, 'developmentalism' will hopefully be able to effect rapid industrialization by enjoying the 'advantage of backwardness'. The faster industrialization is realized, the higher the level of industrial pollution corresponding to the high growth, and that could cause the serious damage to the environment and human health if proper countermeasures are not carried out simultaneously. However, 'developmentalism' could create countermeasures very rapidly if industrial pollution problems are recognized and pollution control regulation is incorporated in the system of development policy.

Chalmers Johnson referred to the pollution control policy of Japan (a 'plan-oriented system' in his terminology), comparing it with the policy of the US (a 'market-rational system'), in his well-known book on Japanese industrial policy, as follows:

[The] most important evaluative standard in market rationality is 'efficiency.' But in plan rationality this takes lower precedence than 'effectiveness.' Both Americans and Japanese tend to get the meanings of efficiency and effectiveness mixed up. Americans often and understandably criticize their official bureaucracy for its inefficiency, failing to note that efficiency

is not a good evaluative standard for bureaucracy. Effectiveness is the proper standard of evaluation of goal-oriented strategic activities.³⁶

Both types of systems are concerned with 'externalities', or what Milton Friedman has called 'neighborhood effects' – an example would be the unpriced social costs of production such as pollution. In this instance, however, the plan-oriented system has much greater difficulty than the market-rational system in identifying and shifting its sights to respond to effects external to the national goal. The position of the plan-rational system is like that of a military organization: a general is judged by whether he wins or loses. It would be good if he would also employ an economy of violence (be efficient), but that is not as important as results. Accordingly, Japan persisted with high-speed industrial growth long after the evidence of very serious environmental damage had become common knowledge. On the other hand, when the plan-rational system finally shifts its goals to give priority to a problem such as industrial pollution, it will commonly be more effective than the market-rational system, as can be seen in the comparison between the Japanese and American handling of pollution in the 1970s.³⁷

As rapid industrialization boosted the national economy and income distribution equalization expanded the level of consumption, the standard of living was finally improved significantly. Then, most people eventually turned their attention to preservation and improvement of their ordinary lives and living environment and later on raised concerns over the preservation of the natural environment. However, a time lag can be expected between emergence of the pollution problem and social recognition of the seriousness of its damage and discomfort, so that substantial time is required to prepare the establishment of an institutional framework to prevent pollution and to promote efforts to conserve the natural environment. The delay of countermeasures caused by such a time lag placed an excessive load on environmental resources, which originally were renewable, and may have caused irreversible destruction to them.

Even after industrial pollution has been recognized as a social problem, no movement is made towards a solution if the matter is entrusted only to the market mechanism. Industrial pollution problems are an example of the inefficiency of 'market failure', created by negative 'externality'. The negative externality could be removed by 'voluntary negotiation' between the parties concerned (polluters and victims in the case of pollution) in the market economy based on the private property rights system. The problem of negative externality must be left unsolved when the 'transaction cost' to organize 'voluntary negotiation' is larger than the possible profit from an agreement achieved through such negotiation. As for the industrial pollution problem, we could imagine many cases where the transaction cost to

achieve a voluntary solution through negotiation is prohibitively high so as to preclude possible negotiation between parties concerned. For example, even if damage due to the pollution is already recognized by society, the cause-and-effect relation must also be recognized to realize compensation. The cost of organizing victims could be enormously high if pollution spreads across a wide area and the number of victims is large.³⁸ In the case that solution through voluntary negotiation is difficult, there is a possibility that government intervention could improve the allocation of resources and enhance social welfare. In the case of environmental resources, the optimum allocation of resources will not necessarily be achieved if left to the market mechanism. Policy intervention is necessary to improve allocation of resources and to enhance social welfare by making up for the deficiencies of the market mechanism.

Japan could achieve rapid economic growth by using social and administrative structure to pursue economic growth and by using the policy system based on 'developmentalism' that existed in Japan. As an inevitable corollary of such economic success, environmental problems at first appeared and then were recognized by the people and the government as an industrial pollution problem. The government and private enterprises were pressed to adopt countermeasures by the discontent and protests of the people over the industrial pollution problem. In adopting countermeasures, a style of regulation that includes direct negotiations on the details of individual pollution prevention measures was selected in view of the relationships between the government and the enterprises. These relationships had been formed through experience in implementing industrial policy that already existed at that time.

The decision-making process for the industrial policy was organized industry by industry, where the bureaucrats of the *Genkyoku* and the representative of each industry played dominant roles. Interests of each industry and producers' interests were preferentially taken into consideration, disregarding the interests of other parties, such as consumers and local residents, who were affected by the development of industry and industrial policy itself to some extent.

Industrial pollution regulation was incorporated as a part of series of negotiations between government authorities and the industries or individual firms. Although most of the industrial pollution regulations had a legal basis, in many cases the authorities relied on 'administrative guidance', which does not necessarily have a legal basis, issued to the industries or individual firms concerning specific measures. Preferential treatment such as low-interest loans and preferential taxation measures, etc., were combined with those regulations through administrative guidance. The combination of 'direct regulation and preferential treatment' was a typical measure in industrial policy. In the situation of Japan of that time where industrial pollution had already intensified, in order to promote measures against industrial pollution and reduce it

as fast as possible, it may be said that the policy was effective and necessary, at least in the short run. However, when planning ways to exploit the environmental resources, including land resources, of an economy as a whole over the long run, the limitations of responses through industrial policy or administrative guidance are clear.

The industrial policy that used administrative guidance was an effective policy instrument in the policy system based on 'developmentalism' for giving priority to industrial development above all else. However, the most serious problem of administrative guidance is that the process of negotiation between government and industry or enterprise is done behind closed doors and no record or document is left behind; in addition, the locus of responsibility for the results is ambiguous. Information disclosure is also an important issue in administrative guidance that deals with industrial pollution regulation.

According to an OECD review of environmental policy in Japan published in 1994:

[the] public should be given access to environmental information and data, including information on voluntary agreements between any levels of government and industry, and information on emission registers; exceptions to this general principle should be limited to defined circumstances. Various forms of environmental reporting should be developed by private enterprises. Public awareness of and participation in decision making concerning the environment should be enhanced.³⁹

Based on the Japanese experience, the influence that 'developmentalism' exerts on the appearance of industrial pollution and the response of society to the problem could be summarized as follows.

1. Rapid industrialization guided by industrial policy increased the burden placed on the environment, advanced environmental destruction and pollution quickly, and caused a delay of the countermeasures.
2. With delayed recognition of social problems such as environmental pollution, the industrialization promoted by un-decentralized decision-making was claptrap and brought about only ad hoc and after-the-fact measures.
3. The direct command and control regulations utilizing instruments of the industrial policy were effective at least in the short run, as measures against pollution, although the regulations were limited to after-the-fact measures.
4. There was a side effect in which the certain degree of success of the 'industrial pollution measures' prevented formation of a decentralized decision-making system required for the fundamental solution of environmental problems and amenity improvement, which should include the institutionalization of environmental impact assessments and citizen

participation in the long-term use plan for environmental resources, including national land.

Although the concept of 'developmentalism' is based on the experience of industrial policy and rapid economic development in Japan, even in developing countries to which the formulization of 'developmentalism' does not necessarily apply, it is difficult to find an example where industrialization by the government through a certain type of industrial policy was not tried once. Even if an industrial policy does not succeed in industrialization, environmental destruction will certainly be left behind, in the form of development attempted in vain.

The position of the Japanese experience as an example of industrialization provides an important viewpoint for late-comer countries that allows them to consider generation of and countermeasures for industrial pollution. In industrialization based on 'developmentalism', industrial policy was the most important means. In the Japanese experience, although industrial policy was accompanied by strong governmental intervention, the government never attempted to run a controlled economy under powerful regulation. Instead, the government did fundamentally limit its role to corrective coordination of the market economy. The problem is that, in measures against industrial pollution, it became difficult to form policy or institutions that fully reflected citizens' preferences and interests because the conventional measures used for industrial policy, such as adjustment and negotiation between the government and individual firms or industry, were to be preserved.

We have to be careful if we attempt to apply the 'Japanese experience' of industrial pollution control and environmental policies to developing countries in the present world. The social, institutional and political background, as well as the international environment, policy instruments and technological knowledge are quite different in developing countries at present compared to Japan in its high-growth era. However, we believe the 'Japanese experience' of industrial pollution control could be, at least, a reference or starting point for mutual discussion on how a policy system for environmental resource conservation should be developed during the process of economic growth when strong government intervention is inevitably required.

Notes

1. See Murakami (1996) on 'developmentalism' and economic theory of decreasing marginal cost of industry. Suehiro (1998) also explained concept of 'developmentalism' pursued by developing countries.
2. Hara (1992), p. 159.
3. Komiya *et al.* (1988), Introduction.
4. Baba (1988).
5. Miwa (1988).

6. As for excessive competition, see Okimoto (1989), pp. 38–48, and also Murakami (1996).
7. Chapter 4, 'Tekko: Kakaku to karuteru', in Imai (1976), pp. 127–81.
8. Tsuruta (1988).
9. See Chapter 4, Imai (1976). However, Miwa (1988) doubts the existence of such influence of policy intervention on enterprise behaviour.
10. On typology of industrial policy based on microeconomic theory, see Suzumura and Okuno (1993).
11. OECD (1977), p. 33.
12. OECD (1977), p. 35.
13. OECD (1977), p. 36.
14. Nakaoka (1974), p. 212.
15. Murai (1975), pp. 1–5.
16. Pollution Control Service Corporation (1991) explains details of its operation.
17. On its loan programme for pollution prevention investment and its actual lending performance, see Japan Development Bank (1976), pp. 327–43.
18. Japan Finance Corporation for Small and Medium Business (1984), pp. 200–1, 302–4.
19. Ogura and Yoshino (1988) and Ikemoto *et al.* (1984); on preferential tax treatment concerning pollution prevention, see Niizawa (1997) and Lee (2004).
20. Tsuruta (1982), pp. 76–8.
21. Murai (1975), pp. 1–3.
22. Wada (1992), pp. 84–6.
23. Murai (1975), pp. 87–90.
24. Murai (1975), pp. 7–9, 11, 100–103.
25. For the report on 'low sulphurization measures' summarized by MITI, see Furuichi (1979) and Yamaguchi (2002). See also Teranishi (1993) and Weidner (1995) on the SOx pollution control policy in Japan.
26. On MITI's influence on the petroleum industry, see Tanaka (1980).
27. See Ministry of International Trade and Industry (1969) for a detailed explanation of specific regulation measures in the low sulphurization plan.
28. Petroleum Association of Japan (1968).
29. *Shukan Enerugi to Kogai* (Energy and pollution weekly), 33, 17 October 1968.
30. Pollution prevention agreements are often treated in the same way as laws and rules, and are regarded as the 'third means of regulation' by the administration. Concerning the legal characteristics of pollution prevention agreements, see, for example, Harada (1972), pp. 153–74.
31. Many pollution prevention agreements had already appeared as means of regulation in the second half of the 1970s. However, pollution prevention agreements are regarded as arbitrary agreement formation processes between the parties concerned, and it is thought possible to regard this as a part of the dispute mediation system. On this discussion, see Terao (1993), p. 178, and also Harashina (1983). Matsuno and Ueta (1997) show the effectiveness of pollution prevention agreements as a means to implement air pollution prevention activities of major thermal power plants, by analysing the marginal cost of pollution prevention.
32. In some pollution prevention agreements between local governments and electric power companies, regulation of stack gas desulphurization facility installation was already seen as a part of the agreements. See, Denki Sangyo Shinbunsha (1972).
33. Petroleum Association of Japan (1971), pp. 175–8.

34. See Tanaka (1980). The operation ratio of heavy oil desulphurization facilities was 65.5 per cent in 1973, and fell to 54.0 per cent in 1974, according to Petroleum Association of Japan (1974), p. 8.
35. See Tanaka (1980).
36. Johnson (1982), p. 21.
37. Johnson (1982), p. 22.
38. See Coase (1960).
39. OECD (1994), p. 190.

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Index

- acid rain
 - China 121, 122, 139, 268, 270, 273
 - regimes 254–5, 261–2, 274
- ad hoc regimes 5, 253, 261–2, 265
 - East Asia 257–9, 274
 - Europe 253–5, 274
- administrative guidance 3
 - administrative cost 110
 - and capabilities of officials 107, 111–12, 113
 - with command and control 19–21
 - for developing countries 111–13
 - effectiveness 109
 - efficiency 109
 - evaluation of 109–13
 - factors contributing to success of 106–9
 - incentives for compliance 108–9
 - Japan 10, 18, 19–21, 38, 39, 41, 42, 90–113
 - low sulphurization 32, 33
 - Osaka City 93–8
 - relations with local industries 107
 - and scientific data 107–8, 111
 - transparency and participation 111
- Afsah, Shakeb 154, 167
- Agarwal, Anil 176
- aid *see* environmental aid
- air pollution
 - China 3–4, 119–49; aid to 268
 - and energy price rises 32
 - India 184
 - Osaka City 93–8
 - Taiwan 231, 232, 234, 237–8, 247
 - transmission of 255
 - see also* China
- air pollution control
 - cost effectiveness 129, 130–1
 - and energy industry 10
 - India 179
 - Indonesia 167, 168
 - Japan 3, 20, 21, 48–67; administrative guidance 90–113
 - Taiwan 227, 237–8
 - Air Pollution Control Law (Japan) 21, 27, 50, 94
 - Air Pollution Index reports (China) 210
 - Air Pollution Law (Taiwan) 229, 231
 - Alam, Ghayur 191, 192
 - allowance reserve measures 26
 - alternative energy use 30
 - anti-nuclear power plant movement 239, 242
 - APEC 253, 260–2, 265, 274
 - and ad hoc regimes 5, 261
 - environmental activities 260–1, 262
 - Osaka Summit 261
 - Vision Statement 260–1
 - Ardiputra, Isa Karmisa 168, 169, 170
 - ASEAN 257–8, 262
 - environmental policies 259
 - and marine pollution 258
 - Asian Development Bank 252, 266
 - automobile emissions 55, 56–7, 60
 - automotive industry 56–7
 - US 65, 66
 - awareness, public 222
 - Bartok Report (1969) 58
 - Basic Environmental Act (Indonesia) 156
 - Basic Law for Environmental Pollution Control (Japan) 21, 27, 49, 50
 - Baumol-Oates Tax 141
 - Beijing pollution 210
 - Benxi City 204
 - Berg, D.R. 62
 - best available technology (BAT) 110, 254, 257
 - Beyer Company 240–1
 - protest movement against 240
 - Bhopal gas incident 178, 182
 - Binnan Industrial Complex 242, 243, 244
 - Blackman, A. 133
 - Blue Sky Programmes 94

- BOD (biological oxygen demand)
 India 177, 178, 190
 Indonesia 161, 171
 Taiwan 232
- boilers
 China 121, 124, 127, 128, 129, 130
 Industrial Boiler Project 267, 272
 Japanese emission standards 59
- boycott of companies 158, 161, 162
 fear of 167
- Braadbaart, Okke 158
- bureaucracy system 11, 12
- Bush, George W. 66
- cadmium 245, 254
- California 55–6
- Canada 159, 261
- capital investment competition 16–17
- Central Pollution Control Board (India)
 179, 183
- Century Walk (China) 207–8
- Chang Rongwei 244, 246, 247
- Chen, Qingru 135
- Chen Shui-bian/administration 242,
 244, 246, 247
- Chen Tangshan 242, 243
- Chen Wenqian 241
- Cheng Hanguang 202, 204, 208
- Chernobyl disaster 254, 256
- chimney height regulations 32, 50, 51,
 103
- China 154, 257, 263, 264, 265, 274
 1970s/1980s government initiative
 system 200–5
 air pollution 3–4, 119–49;
 Abatement Projects 126–31; cost
 effectiveness of options
 129, 130–1; investment in projects
 127, 128; policy planning
 135–45
 alternative policy options 121,
 137–45
 CENRP 207, 208
 CLAPV 212–13, 219, 222
 classified information 219–20
 coal distribution structure 138,
 143–4, 148
 Coal Ordering Conference 145
 emission credit trade system option
 141–3
 emission fee system 131–5, 270;
 reform of 132
 energy paradox 270
 enforcement 205–6, 215–16; issues
 120, 132–4, 135, 136, 146;
 problems 213–16; supervision
 and inspection system 207–9
 environmental administrative system
 201–4
 environmental policy launch 200–1
 FGD requirements 142–3
 financial issues 270
 information disclosure 210–11
 investment in pollution control
 213–14, 215; SOx reduction 126,
 127
 lack of political liberty 219, 222
 media 210
 monitoring costs 120
 multi-stakeholder governance 4,
 199–222; transformation to
 205–10
 NEPA 201–2, 203, 205
 NGO participation 211–13
 People's Congress 4, 199, 208
 policy bias 119–20, 135–7; causes of
 120
 propaganda and claim management
 204–5
 public coal trading companies option
 121, 137, 143–5, 148; ESCO
 services 145
 public participation 208–9, 212
 ratings programmes 221
 regulation and administrative
 organization 201–4
 SEPA 220–1, 222, 267, 269
 sulphur tax option 137–41, 146
 sustainable development strategy
 206–7
 technology installation 216–19
 Two Control Zones policy 121–3,
 131, 137, 140, 146, 147
 water pollution 209–10
China's Agenda 21 206
 Chinese Communist Party 20
 Chupu Electric Power Company 54
 citizen lawsuit 231
 CLAPV (Centre for Legal Assistance to
 Pollution Victims) 212–13, 219, 222

- Clean Air Act (Japan) 32
- Clean Air Act (US) 56
- Clean Water Law (Japan) 27
- climate change 1, 271
- CNG (compressed natural gas) 176
- CO₂ reductions 66–7
- coal
 - and aid to China 266
 - clean coal technologies 135–6, 143, 144–5
 - and clean energies price gap 135, 136
 - distribution structure in China 120
 - Japan 38
 - and market mechanism 143, 144
 - mines in China 138–9
 - public trading companies 121, 137, 143–5, 148
 - quality in China 127
 - standards for sulphur content 122, 123, 124, 136
 - washing 123, 126, 127, 128, 129, 130, 135
- COD (chemical oxygen demand) 171
 - China 210, 215
- Colombia 154
- command and control approach 3, 5
 - China 4, 119, 120, 122, 136, 146–7, 199; background of bias 135
 - cost effectiveness 121, 122, 126–31
 - India 180
 - inflexibility of 62
 - Japan 18, 19–20, 48, 61; with administrative guidance 19–21
- common effluent treatment plants 189, 190, 192, 194
- community
 - need for consensus 242, 247
 - regulatory role 176, 177, 192, 194–5; India 187, 188
 - relations in Indonesia 168
- compensation 61
 - India 179, 190
 - Japan 179
 - and judicial activism 194
 - rights in China 201
 - United States 179
- competition, excessive 14, 15
- competitiveness
 - and compliance costs 48
 - and regulation 63–4, 66–7
- complaints by citizens
 - China 220–1
 - Kitakyushu City 105–6
 - Osaka City 106, 108
 - Taiwan 229, 248
 - see also* protest
- complementary industrial policy 18
- compliance
 - avoidance in India 176
 - costs and competitiveness 48
 - incentives for 108–9, 221
- comprehensive regimes 253
 - APEC 260–2
 - EC/EU 255–7
- Continuous Emission Monitors 122
- Corcelle, G. 255
- corporation tax revenue 27, 29, 30
- crude oil combustion 34
 - and low sulphurization plan 38
 - super-low sulphur 35
- CSCCE (Conference on Security and Cooperation in Europe) 255
- Cui, Zhiyuan 270
- dam construction project, Taiwan 245
- Dasgupta, Sumita 221
- decreasing cost hypothesis 14
- deduction-type measures 30
- deferment-type measures 30
- demand, domestic 11
- Dembowski, Hans 195
- Denmark: bottle recycling law 257
- desulphurization of heavy oil 22, 32, 36
 - see also* FGD (flue gas desulphurization)
- developing countries
 - and administrative guidance 111–13
 - education system 85
 - environment tax 137
 - establishment of LGRIs 85–6
 - market mechanism 149
 - need for participation by 1
 - policy considerations 148–9
- development *see* economic development
- developmentalism 10–12, 13
 - components of 11
 - and industrial policy 11–12
 - and industrial pollution 10–11; countermeasures 39

- developmentalism (*Contd.*)
 influence of 42–3
 Japan 39–43
 and political economy of pollution 39–43
- dioxins 97, 242, 254, 268
- discretionary measures 18, 21
- disease, pollution-related 95
- Divan, Shyam 182, 186
- Drysdall, P. 260
- dust and sandstorm issue 264
- dynamic regulation 49
- EANET 263, 264, 265, 273, 274
- East Asian Seas regime 258
- ECO-ASIA 259, 260
- ecological modernization 61
- Ecology Authority (India) 189–90
- economic development
 causing environmental problems 1
 versus environment 201, 228, 240, 244–6, 247
- economic measures 131–5, 146, 148
- economic performance and
 environmental policy 48
- education system 11, 12
 in developing countries 85
- effluent treatment 189, 190
see also waste; water
- electric power industry 33–6
 Japan 38, 39, 52
 SOx reduction 33–4
- emission credit trade system 121, 137, 141–3
 combined with sulphur tax 143–4
 market credibility 142
 monitoring 142
- emission fee system 131–5, 146, 147, 148, 270
 enforcement issues 132–4, 135
 limitations of 131–2
- emission licences 142
- emission standards, Japan 20
- end-of-pipe technologies 3, 80, 119
- Endo, T. 179
- energy conservation 30
 after price shocks 32, 79
 preferential measures 30–1
- energy industry and air pollution
 control 10
- energy policy and pollution control 31–9
- enforcement 1–2
 China 120, 132–4, 135, 136, 147, 205–6, 207–9
 India 180, 182–5
 Taiwan 229
- Environment Agency (Japan) 20
 NOx technology 55, 56–7, 58–9
- environment and development 228, 240, 244–6, 247, 248–9
- Environment Protection Bureaus (China) 132, 133–4, 135, 136, 147
- Environmental Action Programmes (EU) 256, 257
- environmental aid to China 252, 265–73
 coal projects 266, 271–2
 as environmental cooperation 265–6
 factors determining effectiveness 270–2, 274
- FGD 267, 268–9, 272, 273
 implementation of 268–70
- inherent limits 272–3
- institution-building projects 267
- justification of 272–3
- NGO criticisms 271–2
- organization and agency issues 270–1
 and technology licences 272
 technology transfer 266–7, 268, 269
 and tied aid rules 271, 272
 and trade factors 271
 types of 266–8
- environmental cooperation regimes 4–5, 252–74
 East Asia; comparative characteristics 261–2; new initiatives 262–5
 Europe 253–7
see also regional environmental regimes
- Environmental Impact Assessment Bill 62–3
- environmental impact assessments 42, 268
 India 178
 Indonesia 167, 168
 Kitakyushu City 102

- Environmental Impact Management Agency (Indonesia) 154–5, 156, 159, 162, 167
- environmental NGOs *see* NGOs
- environmental problems, development as cause 1
- environmental protection
 economic dimension 61–2
 non-flexible structure 61–3
 social dimension 62–3
- Environmental Protection Act (India) 178–9
- Environmental Protection Administration (Taiwan) 230, 233–8, 247
- Environmental Protection Agency (US) 56, 141
- Environmental Protection Bureau (China) 201–2, 203
- Environmental Protection Bureau (Taiwan) 230
- Environmental Protection Law (China) 201–2
- Environmental Protection Offices (China) 202, 203, 205–6
- environmental standards 20
 sulphur oxides 93
- ESCAP 258, 259–60, 262
- ethylene production and capacity 17
- European Court of Justice 257, 262
- European Union 253, 255–7
 environmental cooperation regimes 253–7, 262
 environmental directives 256, 257;
 and trade regulation 257
 and hidden protectionism 257
- excessive competition 14, 15
- excessive concentration and environmental standard 13
- Ferrier, G. 62
- FGD (flue gas desulphurization) 23, 50, 51, 60
 and aid to China 267
 development of technology 53–5
 installation 1965–2000 Japan 54
 Kitakyushu City 104–5
 policies in China 122, 123–6, 127, 128, 129–30, 136; cost of 125;
 negative impact on R&D 126
- R&D 53, 54, 55, 57–8
 wet process 53, 54
 worldwide dissemination of 125
- FGT (flue gas treatment) technology 49
 case study 57–9
 dry process 58–9
 dynamic process of development 65
 lead time and commencement time 58–9
 wet process 58
- Field, Barry C. 142
- finances 235, 236–7
- Fiscal Investment and Loan Programme (Japan) 22
- Fisher, D.R. 61
- Foreign Investment Law (Japan) 15
- forest death (West Germany) 254, 256
- forestry
 China 207
 India 179, 180, 181, 185
- fossil fuel projects 271
see also coal
- Freudenberg, W.R. 61
- Friedman, Milton 40
- Friends of the Earth 63
- Friends of Nature 212
- fuel switching projects 127, 128, 129, 130
- Fujii, Yoshifumi 48–68
- Fujikura, Ryo 49–50, 90–116, 120
- game theory 64, 66
- Gandhi, Indira 182
- Ganga Action Plan 190
- Germany 49, 63
 aid to China 266
 forest death 254, 256
- Global Village of Beijing 212
- global warming 66
- globalization of problems 1
 government intervention 43
see also pollution policy
- grassroots NGOs 211, 212
- Green Aid Plan projects 267, 268–9, 271, 272, 273
- green bench (India) 186
- Green Friday (India) 4, 176
- greenhouse gas reduction and US 66
- Greenpeace 63
- guidance *see* administrative guidance

- Haas, P.M. 253
 Hara, Yonosuke 12
 Harrington, W. 133
 Hayashi, Eidai 99
 hazardous waste management
 India 179, 180, 183
 Indonesia 167, 168
 heavy and chemical industrialization 10
 capital investment competition
 16–17
 as policy aim 13–14
 heavy oil desulphurization 22–3, 32,
 33
 capacity of facilities 36, 37
 low operation ratio 36
 Helsinki Commission (HELCOM) 254
 Helsinki Package 271
 hog raising 235, 237
 Horii, Nobuhiro 119–53
 Hsu Hsinliang 241
 Huai River pollution 209, 210, 222
 Huang Zhongsheng 241
 Hunter, J. 261
 Huwei Township 245
- IMO (International Maritime
 Organization) 258
 incentives
 for compliance 108–9, 221
 economic measures 120
 and emission fees 270
 for technologies 216–19
 incinerator construction projects,
 Taiwan 242, 245, 246
 income distribution and
 developmentalism 11, 12
 income elasticity standard 13
 India 154, 176–95
 air pollution 184
 enforcement weaknesses 180, 182–5
 environmental plan outlays and
 expenditures 181
 external aid to 180–1
 few industrial pollution NGOs 185
 industrial pollution control 177–88
 industrial units pollution and control
 status 184
 infrastructure priority 180, 182
 lack of resources 182–3
 laws and regulations 178–80
 low priority of pollution control
 180, 182
 monitoring and inspection deficits
 187–8
 small-scale industries 183
 SPCBs 182–3, 192–4; limitations of
 182–3
 water pollution 177–8, 179, 184,
 190–1
 see also lawsuits
 Indonesia 4, 263
 1970s and 1980s regulations 155–8
 central government organizations
 155–6
 effluent standards 160–1, 163, 179
 enforcement 158
 environmental legislation 156–8
 Governmental Decrees 157, 159
 industrial licences 157–8
 rating programmes 154–73
 State Minister for Environment 156,
 158, 159
 see also PROKASIH; PROPER
 Industrial Act (Indonesia) 156–7
 industrial policy
 inductive and regulatory means 18
 and industrial pollution 9–10, 13–31
 selection of industries 10, 13
 see also late-comer
 industrial pollution control
 and energy policy 31–9
 India 177–88
 and multi-stakeholder governance
 213–21, 222
 Taiwan 227
 Industrial Structure Council (Japan) 13
 information disclosure 4, 5, 42, 154
 China 206, 207, 208–9, 222, 223;
 limits on 219–20
 Europe and US 166
 India 176–7
 Indonesia 161
 see also media
 innovation 48
 and emission fee system 134
 incentives for 69
 and TMITRI 80
 Institute of Developing Economies 50,
 51
 intellectual property rights 269

- International Centre for Environmental Technology Transfer 272
- investment *see* plant and equipment; pollution prevention
- iron and steel industry 15, 16, 36
- Ito, Motoshige 66
- Ito, Yasushi 69–89
- Jaffe, Adam 64
- Janakarajan, S. 189
- Jänicke, M. 61
- Japan 201, 257, 263, 264, 274
 compensation 179
 developmentalism 39–43
 and ECO-ASIA 260
 economic growth 2, 41, 60–1
 electric power company 52
 environmental aid to China 5, 252–3, 266
 environmental cooperation 252
 Fund for Global Environment 265
 Japanese experience 2, 3, 11, 274; as model 5, 9, 43, 63
 performance post-second oil crisis 61
 pollution policy 2, 3, 41–2; characteristics of regulation 18; plan-oriented 39–40
 reduction-first policy 52, 60, 61, 63–6
 and regional environmental cooperation 5
 and World Bank 252
- Japan Bank for International Cooperation 266, 267
- Japan Development Bank 20, 22
 loan programmes 22, 23
- Japan Environmental Corporation 22
- Jenkins, R. 64
- Jiang Zemin, General 206, 207
- Jiangsu Province wastewater treatment 216–19, 221
- Johnson, Chalmers 39–40
- Johnson, S.P. 255
- joint ventures and aid 272
- judicial activism 176, 177, 185–8
 advantages 191
 by NGOs 194–5
 case studies 188–91
 disadvantages 191–2, 195
- lack of community participation 194, 195
see also public interest litigation
- K Ltd 72
- Kafji crude oil 34
- Kanpur leather industry 190–1, 192, 194
- Kansai Electric Corporation 92
- Kataoka, Naoki 201, 202
- Kementerian Lingkungan Hidup 168, 169, 170
- Kennedy, L. 189, 192, 194
- Kikuchi, Junichi 54
- Kikuchi, Tsutome 260
- Kitakyushu City 90–1, 98–106
 administrative cost 110
 administrative guidance 109
 anti-pollution measures 104–5
 availability of technologies and funds 108
 local industries' incentives 103–4
 Mayor 100–1, 107
 pollution control agreements 101–4
 post-1970s 105–6
 scientific data 101–3, 107–8
 silent citizens 99
 social background 111–12
 women's activities 99–100
 and Yahata Works 99, 102–3, 104, 105, 108
- KMT (Kuomintang) 228, 238, 239
 and local politics 240, 241, 244, 246, 247
- Kobayashi, Masayuki 201
- Koizumi, Mutsuo 53, 56, 59
- Kojima, Michikazu 154–75
- Kojima, Professor 260
- Kolkata leather industry 191, 192, 194
- Korea 257, 262–3, 264, 274
- Kuik, O.J. 178
- Kyoto Protocol 66
- labour contents standard 13
- Lardy, N.R. 270
- large enterprises
 effects of pollution control 70–1
 JDB financing 22, 23, 24
 use of technical guidance 71–2

- late-comer industrialization 3, 13
 - and industry promotion 11, 12
 - and technology transfer 9
- lawsuits 4
 - China 222
 - citizen (Taiwan) 231
 - Yokkaichi City 51, 53
 - see also* public interest litigation
- leather industry 188–91
- Levy, M.A. 254
- Li Peng 205
- Li Tenghui administration 246
- Li, Zhidong 133
- Liao Yonglai 240–1, 242
- LNG (liquefied natural gas) 22, 38, 51
- loans, low-interest 3, 10, 20, 21, 22–5, 69
 - Indonesia 167
 - Japan 41
- local development associations (LDAs) 91
- local government
 - China 215
 - development projects in Taiwan 240–7, 248–9
 - Japan 62
 - pollution control agreements 34–5, 49–50
 - relations with local industries 107
- local governmental research institutes 69–86
 - advantages and problems 82–3
 - collaboration and integration 84
 - numbers of 73, 74
 - R&D 73, 74–7; expenditure per researcher 77
 - recent problems 84–5
 - role of 72–3, 82, 83–4
 - social credibility 85–6
 - technical guidance from 69, 70, 71–3, 82–3, 84–5
 - TMITRI 77–9
- local protectionism 215
- López, J.G. 154
- Los Angeles 55–6
 - APCD reports 58
- low sulphurization 32, 33–5, 38, 39
 - loans for 23
 - and oil shocks 33
 - political economy of 31–9
- low-sulphur oil
 - Japan 50–1, 53
 - Kitakyushu City 103, 104
- LPG projects, China 121, 126, 127, 128, 129, 130
- LRTAP Convention 255
- Lu Genfa 221
- Lydon, P. 120
- McElroy, M.B. 120, 146
- Malaysia 263
- marine dumping standards 254, 258
- marine pollution 253–4, 258
 - oil spills 258
- market mechanism 5, 149
 - and coal 143, 144
 - and developmentalism 11–12, 39
 - negative externalities 40–1
 - policy intervention 41
- market-rational system 39–40
- mass media *see* media
- Matsukawa, Isao 61
- Matsuno, Yu 61, 62
- Matsuoka, Shunji 120, 137
- media
 - campaign in Japan 50, 52
 - China 4, 199, 205, 210; role of 207, 208–9, 216, 219
 - India 186
 - and rating programmes 161, 166, 170, 172, 173
 - role of 200, 207, 208–9
- Mehta, M.C. 187, 190, 191
- mercury 254
- Mexico 154
- Minamata disease 52
- Minas crude oil 35
- Ministry of International Trade and Industry (Japan) 14, 16, 50
 - and low-interest loans 20
- Model City Projects 268, 269–70
- Mongolia 263, 264
- Morotomi, Toru 141
- motivation for pollution control 192
 - see also* incentives
- multi-stakeholder governance 5
 - China 4, 199–222
 - effectiveness of pollution control 213–21, 222
 - see also* China

- Murai, Tadashi 28
Murakami, Yasusuke 14
Murthy, M.N. 177
Muskie, Sen. Edmund/Act 56, 57, 66
- naphtha 36, 38, 39
 production 33, 34
 Taiwan plants 239, 242, 243, 246
NEACEDT 263
NEASPEC 262, 263
negotiation 41
 and transaction costs 40–1
NGOs
 in China 211–13, 222
 India 183, 185, 194–5
 international 63, 211
Nielsen, C.P. 120
Nippon Steel Corporation 99, 102, 104, 110
Nishi Yodogawa Ward air pollution 94–5
Nishimura, Hajime 57
nitrogen oxides (NOx): Japan 52
 control policy; case study 55–9;
 dynamic spillover effect 60;
 fixed-point source 57–9; non-
 point source 56–7; policy
 background 55–6; reasons for
 success 59–60; technological
 development 56–9
 dynamic regulation 49
 emission standards 48, 59
 NO₂ concentration 39
 Osaka City 97
 R&D policy 66
Nitrogen Oxides Protocol 255
noise pollution 233, 234
Nomura, Y. 179
North Korea 263
North Sea Ministerial Conference 254, 257
Norway 254–5
NOWPAP 263, 264, 265, 274
nuclear power plant protest 239, 242
- Oates, W.E. 64, 65
OECD
 air pollution study 255
 FGD installations 125
 on PCAs 109
 review of Japanese policy 19, 42, 48, 49
 and tied aid 271
 voluntary approaches 109–10
oil desulphurization (OD) 50, 51, 55
oil refinery industry 15, 22, 38
 anti-pollution investment 36, 37
 and crude oil combustion 34, 35, 36
 heavy oil desulphurization 32, 36
 naphtha production 33, 34
oil shocks 38, 57, 60
 innovation offset 66
 and Japanese economic development 64
 and low sulphurization measures 33
 subsequent energy saving 79, 105
Osaka City 61–2, 90, 91–8, 102
 administrative cost 110
 administrative guidance 93–8, 109;
 after 1970s 97–8; reasons for
 success 95–6, 106–9
 air quality standards 93
 avoidance of PCAs 95–6
 Blue Sky Programmes 94
 complaints from citizens 106, 108
 cooperative relations 96, 98
 financial support 96–7
 leadership of mayor 96, 107
 local development associations 91
 municipal government guidance 92–4
 Nishi Yodogawa Ward 94–5
 relationships with industry 92
 scientific data 107–8
 social background 91–3, 111–12
 Soot and Smoke Prevention 92, 108
 targets 93–4
 technologies and funds 108
Osaka Gas Corporation 92
Osaka Summit, APEC 261
Oslo Commission (OSCOM) 253, 254, 256
Otsuka, Kenji 1–6, 199–226, 267
Our Common Future 259
Oyama, Kosuke 90
- PAFTAD 260
Palmer, K. 64
Pargal, Sheoli 158, 177

- Paris Commission (PARCOM) 253, 254, 256
- particulate matter (PM) 55
- Patrick, H. 260
- PBEC 260
- PECC 260
- People's Congress (China) 4, 199, 208
- petrochemical industry 15, 16, 22, 33, 38
 - capital investment competition 16–17
 - capital and pollution prevention investment 16
 - ethylene production capacity and actual production 17
 - low sulphurization measures 34, 35
- Petroleum Act (Japan) 33
- petroleum policy, Japan 38–9
- Philippines 4, 154, 263
- Piao Guangzhu 204, 208
- plan-oriented system 39–40
- plant and equipment investment
 - adjustment 14–17
 - full set principle 16
 - share principle 15
 - time lag 15, 16
 - voluntary adjustment 15
- plating industry 79–80
- politico-economic approach 2
- polluter pays principle (PPP) 29
 - India 180, 189
- pollution
 - as negative externality 40
 - social recognition of 40
 - technologies, lead time 53–4
- pollution control
 - LGRI's technical guidance 69, 70
 - market-rational US system 39
 - plan-oriented system 39
 - reserve 28–9
 - role of external organizations 70–3
 - SMEs and large enterprises differences 70–1
 - see also* regulation
- pollution control agreements 34–5, 109
 - applicability in developing countries 112–13
 - avoidance in Osaka 95–6
 - as discretionary measures 21
 - Kitakyushu City 90–1, 101–6
 - and local governments 49–50
 - OECD on 109
 - in Yokohama 95
- Pollution Control Bureau (Tokyo) 81
- pollution control equipment
 - manufacturers
 - inappropriate equipment 72
 - Japan 62
 - role of 98, 108, 112
- Pollution Control Service Corporation 22, 24
- Pollution Diet (Japan) 20, 25
- pollution prevention investment
 - 1970–1986 Japan 31
 - by private manufacturing 31
 - oil refinery industry 36, 37
 - and special depreciation measures 25, 27
- polychlorinated biphenyls (PCBs) 256
 - Kitakyushu City 105
- Porter, Michael/Hypothesis 48, 63–6
- Portney, P.R. 64
- poverty alleviation 182
- Prasad, P.M. 186
- Prasad, U.R. 177
- precautionary principle 254, 257
- preferential tax measures 3, 10, 20, 25–31, 41
 - abuse of 25
 - decrease in tax revenue 27–30
 - deduction-type measures 26
 - deferral-type measures 26
 - pollution prevention to energy use 30–1
 - private enterprises 26–7, 29
- preferential treatment 21–5, 41, 69
 - China 218, 219
 - energy use 30–1
 - as inductive means 18–19
- private enterprise
 - pollution prevention investment 10, 17, 19, 24
 - preferential tax measures 26–7, 29
 - R&D 65
 - special depreciation measures 27
- private property rights 11, 39
- PROKASIH 154, 155, 159–62
 - guidelines 160
 - performance criteria 161
 - target factories 159

- promotion of industries 10, 11
 PROPER 4, 155, 167–70, 210
 China 210–11
 performance criteria 167–8
 pulp and paper companies 164–5
 target companies 169–70, 171
 PROPER PROKASIH 154, 155, 162–7
 black rated companies 166
 characteristics of companies 163
 and low-interest loans 167
 performance criteria 162
 results 163, 170, 172
 target companies 171
 property tax exemptions 26, 27, 29
 protest movements 63
 Indonesia 158
 Japan 50, 52
 Kitakyushu City 100
 Taiwan 229, 230, 240–5
 PT Trebor 161, 167
 public awareness 42
 public interest litigation 4, 176, 186–7
 enforcement limitations 190, 191,
 192
 Kanpur leather industry 190–1, 192,
 194
 Kolkata leather industry 191, 192,
 194
 petitions and number of cases 187
 Tamil Nadu leather industry 189–94
 time issue 191
 violation of court orders 190, 191
 public opinion, role of 200, 205
 public participation 5, 111, 199
 China 206–7, 208–9, 212, 219, 220;
 pressure 220–1
 in decision making 42–3
 Indonesia 160
 Taiwan 248
 public transportation 176
 pulp and paper companies, Indonesia
 164–5
 Punish Polluters Principle (PPP) 49

 Qu Geping 200, 205, 207, 208

 rate-of-productivity-growth standard 13
 rating programmes 4
 China 210–11, 221
 enforcement limitations 171–2, 173
 impact of 170
 Indonesia 154–73
 meaning and limitations 170–2,
 173
 value of 173
 reduction-first policy 52, 60, 61, 63
 and technological development
 63–6
 regional environmental regimes 252,
 274
 comparison of 253–61
 requirements for creating 265
 regional sea regimes 253–4, 261, 274
 East Asia 258–9
 Europe 253–4
 regulation on pollution 18
 and competitiveness 63–4, 66–7
 as complementary industrial policy
 18
 and loss of comparative advantage
 18
 as part of industrial policy 17–31
 technical guidance from authorities
 80–2, 83–4
 technical responses 69
 relocation of industries
 from residential areas 22
 Osaka City 96–7
 to avoid regulation 18
 research and development
 by LDRI 73, 74–7
 expenditure by research institutes 75
 subsidies 21
 research institutes
 numbers of 73, 74
 R&D expenditure by sector 75;
 per researcher 77
 researchers by sector 76
 reserve fund measures 26
 residents
 China 199
 India 177, 189
 pressure from 167
 resource conservation 168
 Rhine toxin spill 256
 Rio Summit (1992) 180, 199, 206, 210
 Rissho High School 56
 Rock, Michael T. 154
 Rosencranz, Armin 182, 186
 Russia 263

- Sahasranaman, A. 189, 190
 Sakai Power Station 61–2
 sand dust 264
 sand storms, China 268
 Sato, Hajime 186
 Sawhney, Aparna 177
 sea *see* marine
 sectoral regimes 258, 259–60
 SEEN 271–2
 self-assessment by polluters 237
 self-relief organizations 230, 248
 Semarang 158, 161
 service unit-type NGOs 211
 setting technical requirements 122
 Shikata, Hiroshi 103
 Shindo, Muneyuki 90
 Shiroyama, Hideaki 252–76
 shocks, environmental 254
 Single European Act 256, 257
 SJC (Sino-Japan Friendship Centre)
 267–8
 small and medium enterprises
 and developmentalism 11
 effects of pollution control 70–1
 installation of abatement equipment
 71
 loans 22, 24, 25; annual lending 23
 pollution prevention investment
 242–5
 support for 69
 technical guidance for 71–2, 80–1
 smog 55–6
 smog alarm 103–4
 smoke
 smoke dust in China 119
 as symbol of prosperity 99
 Smoke and Soot Regulation Law (Japan)
 50
 smokestack heights 32, 103
 social association-type NGOs 211, 212
 social costs 40
 social infrastructure 11, 12
 socio-economic factors 5
 soil pollution 245, 264
 Soot and Smoke Control Law (Japan)
 92, 93, 99
 South Pacific Commission 258–9
 South Pacific region 262
 South West Pacific sea regime 258
 special depreciation measures 26, 27
 Special Taxation Measures Law 25–6,
 27
 stack gas desulphurization 32, 33
 stakeholder participation 111, 199
see also multi-stakeholder governance
 State Council Committee on
 Environmental Protection (China)
 203, 204, 205, 207
 State Environmental Protection
 Administration (SEPA) 141, 267,
 269
 state pollution control boards (India)
 182–3, 192–4
 performance of 193
 stock market role 177
 Stockholm Conference (UN) 155, 178,
 200, 255
 strategic industrial policy 17–18
 Su Huanzhi 243–4
 Su Wenxiong 244
 subregional environmental regimes
 262–3, 274
 subsidies for pollution prevention 21,
 29
 sulphur oxides (SOx) emissions 10
 cause and effect 53
 China 119, 121, 122
 and Health Damage Compensation
 Law 61–2
 Japanese control policy 32, 39;
 characteristics of 51–3; history
 of 49–51; reasons for success
 59–60; and technological
 development 49–55
 Osaka City 94–5
 pollution control agreements 35
 R&D policy 66
 reduction 48–9; by option 129
 standards 50, 93
 sulphur dioxide; changes 1964–2004
 in Japan 52; China 215, 270
 Two Control Zones targets 131
 Sulphur Protocol 255
 sulphur tax 121, 137–41, 143, 147
 collection of 139–40
 and desulphurization 140
 impact of 138, 139
 setting rate 141
 surcharge on pollution emission 29
 Sweden 254–5

- Taichung County 239–42, 247
- Tainan County 239, 242–4
- Taiwan
- airport construction 243–4
 - anti-development faction 239–42
 - citizen lawsuit 231
 - democratization 4, 227–49;
 - underground influence 246–7
 - development versus environment 239–6, 247
 - DPP administration 230–1, 238–40
 - emergence of environmental administration 228–31
 - environmental quality 231–3
 - growth as priority 228–9
 - inspections and fines 233–4, 235–7
 - laws and regulations 229;
 - effectiveness of 233–8; lack of enforcement 229
 - local government environmental policy 238–47
 - number of disputes 249
 - self-relief movements 230, 248
 - suppression of political liberty 227, 228, 229
- Taiwan Environmental Protection Union 240
- Tamil Nadu
- leather industry 188–90
 - public interest litigation 189–94
 - SPCB performance 193, 194
- Tani, Gohei 100–1
- tanneries
- China 209
 - India 188–94
 - Southeast Asia 192
- tax credits 30
- see also* preferential tax measures
- tax expenditures 21, 25
- technical guidance 69
- deficit in India 183
 - from LGRIs 69, 70, 71–3, 82–3, 84–5;
 - differences between authorities 83–4
 - from TMITRI 77–80
 - role of regulatory authorities 80–2
- technological development
- dynamic process 64–6
 - Japan 60–1
 - private sector 60
 - and reduction-first policy 63–6
 - and SOx control policy 49–55
 - technologies
 - availability of 108
 - best available 110, 254, 257
 - cleaner production 80
 - incentives 216–19
 - needs-pull 53–4
 - technology transfer 261
 - and aid to China 266–7, 272
 - late-comer industrialization 9, 12
 - role of LGRIs 73
- Terao, Tadayoshi 1–6, 9–47, 63, 227–51
- Thailand 263
- Three Rivers and Three Lakes 209–10
- tied aid 271, 272
- TMITRI (Tokyo Metropolitan Industrial Technology Research Institute) 77–9
- number of researchers and R&D expenditure 77, 78
 - technical guidance for plating industry 79–80
- Tokyo Electric Power Co. 35–6, 51
- Tokyo pollution control agreement 35–6, 51
- Top Runner Regulation 66–7
- Toxics Link 191
- trade secrets 82, 83, 103
- transaction cost of pollution control 40–1
- Tripartite Environmental Ministers Meeting 264–5, 274
- Tsujita, Yuko 176–98
- Two Control Zones policy 121–3, 137, 147
- distribution of 122
 - targets 131
 - transfer of pollution outside 137, 140, 146
- Ueta, Kazuhiro 61, 62, 141, 142
- United Nations 159
- 1972 Human Environment Conference 155, 178, 200, 255
 - China's Agenda 21* 206
 - ECE 255
 - Rio Declaration 199, 210
 - UNCED 261, 262
 - UNDP 206

- United Nations – *continued*
 - UNEP 258, 259, 261
 - UNIDO 192
- United States
 - automotive industry 65
 - FGD 125
 - FGT research 58
 - Kyoto Protocol 66
 - market-rational pollution control 39–40
 - NOx policy 55–6, 57
- vander Linde, C. 48
- victims of pollution
 - China 201, 209, 212–13, 222
 - India 179, 190
- Vietnam 263
- violations of regulations
 - China 207, 208–9, 215–16
 - India 176, 190, 191
 - Taiwan 233, 234, 235–7
- voluntary approaches, types of 109
 - see also* administrative guidance
- Wang Canfa 212
- Wang Hua 201, 210, 211, 212
- Wang, Jinnan 125, 142
- waste gas emissions, China 213, 214, 215
- Waste Management Law (Taiwan) 229, 231
- waste pollution, Taiwan 233, 234, 236, 237
- wastewater discharge
 - China 213, 214, 215
 - Indonesia 167, 168
- wastewater treatment
 - China 216–19, 221
 - Tokyo plating industry 80
- water pollution
 - China 209–10
 - India 177–8, 179, 184, 190–1
 - prevention; Indonesia 154, 159, 160; Japan 20, 21
 - Taiwan 227, 231, 232, 233, 234, 236, 238, 247
- Water Pollution Control Law (Japan) 21
- Water Pollution Prevention Law (Taiwan) 229, 231, 236
- Weidner, H. 49, 59, 61
- Wheeler, David 158
- World Bank 120, 146, 176–7, 267
 - and China 210, 222, 266, 267
 - and climate change 271
 - and fossil fuels 272
 - and Indonesia 159
 - and Japan 252
 - PROPER 4, 210
 - PROPER PROKASIH 154, 166
- World Health Organization 93
- WWF India 185
- Xie Jingtao 201
- Xie Zhenhua 207
- Xu Kezhu 212
- Yahata Works 99, 102–3, 104, 105, 108
- Yangzhou City 221
- Yokkaichi City 50, 53
 - Yokkaichi asthma 51
- Yokohama Municipal Government 35
 - PCAs 95
 - SOx control policy 49–50
- Yunlin County 239, 244–6, 247
- Zarsky, L. 261
- Zhou, Dadi 125
- Zhou Enlei 200