

11

Environmental Problems and the Role of Local Governments:

Coping with Pollution in Yokohama City

Fukashi Utsunomiya

I. INTRODUCTION

A review of environmental policies in Japan made by the Environment Commission of the OECD in 1976 and 1977, evaluates the initiative of local governments in the prevention of environmental pollution as follows: "In the days when the central government did not pay much attention to environmental pollution control, it was local governments that took the initiative in environmental pollution prevention. Furthermore, the regulations adopted by local governments were more progressive and stricter than those of the central government. It was also local governments that introduced the concept of compensation systems and total pollution control."¹

If we review the history of environmental policy in Japan, it is possible to divide it into the following three periods. The first period was that of environmental pollution control, from about 1955 to around 1975. During this period, due to strict regulations, environmental pollution problems began to be improved around 1973.

The second period, from 1975 to 1987, marked by the creation of amenities, and characterized by the creation of a comfortable environment.

From about 1988, global environmental problems surfaced internationally as serious issues threatening the survival of humankind. Our country has had to actively wrestle with these global environmental problems as it enters this third stage, centered around these global issues. Local governments will also play a new role in this global environmental age.

In this paper, the author will focus on the role of local governments in the first of the three periods, that is, the period in which emphasis was placed on environmental pollution control, particularly on the policy and the progressive role of the Yokohama municipal government in environmental pollution control. He examines those control measures taken by the Yokohama municipal government for pollution prevention (particularly for air pollution prevention) to achieve successful results and the lessons to be learned about pollution prevention from the experience of Yokohama City.

II. ENVIRONMENTAL PROBLEMS AND ENVIRONMENT ADMINISTRATION IN YOKOHAMA CITY

At present, Yokohama City has an area of 433 square kilometers and a population of 3.28 million (as of Sept. 1, 1993), following Tokyo as the second largest city in Japan. Yokohama City suffered from serious problems of air and water pollution during the period of high economic growth beginning in 1955. Its natural environment was also destroyed by housing and land development. Today, as a result of strict regulations, the environmental problems in Yokohama City have been substantially improved. Air pollution problems from SO_x and water pollution problem from cyanides and chromium have been eliminated to the extent that the city may be said to have succeeded in extricating itself from a critical state of environmental pollution.

1. Present State of and Countermeasures to Air Pollution

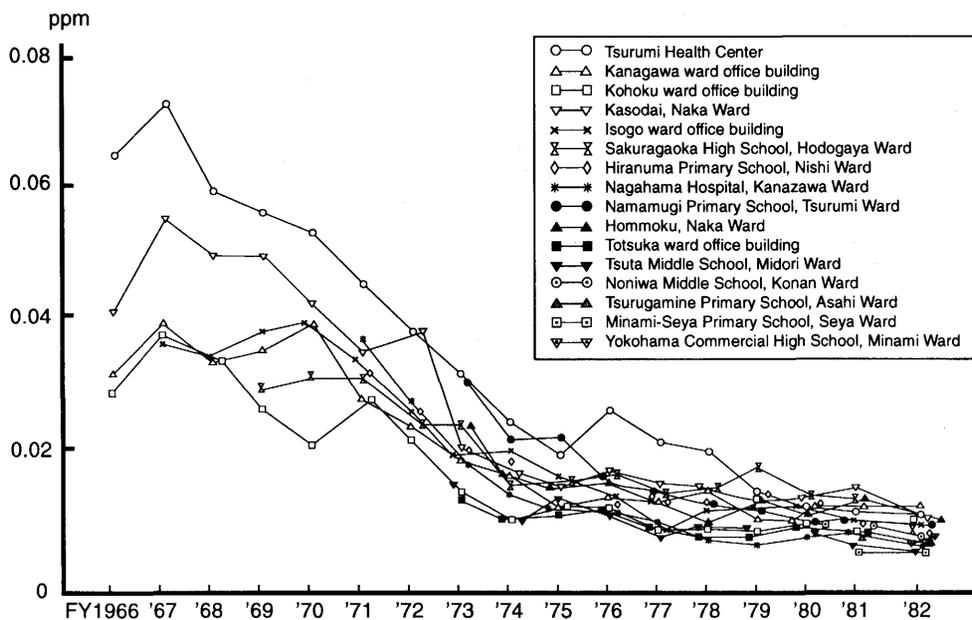
(1) Sulfur oxides (SO_x)

The Yokohama municipal government took measures against SO_x earlier than against any other air pollutants, introducing the K-value control method (for regulating permissible amounts of SO_x emissions according to the height of smoke stacks) under the Air Pollution Control Law, and the method of determining the R-value under the Kanagawa prefectural ordinance for environmental pollution prevention. Prior to the strengthening of regulations under these laws, Yokohama actively carried out SO_x emissions controls by various methods, including pollution prevention agreements with enterprises. Due to these regulations, air pollution by SO_x, which peaked around 1967 as shown in Figure 1, began to improve around 1970, and concentrations of SO_x tended to decline sharply after 1973.

However, even in 1975 measurements at some observation stations did not meet the environmental standard of 0.04ppm (one day average value of one-hour values). In view of this, the municipal government endeavored to strictly control SO_x emissions by formulating its own total-emission control measure (an additional control) in April 1975 called the "Yokohama municipal government guideline for measures against SO_x and smoke and soot." This guideline urged fixed sources of SO_x to use fuel oil with a lower sulfur content or to use gas, resulting in a remarkable reduction of SO_x emissions. Consequently, concentrations of SO_x were reduced so that by 1980, measurements at all observation points reached the environmental standard. This tendency has continued to today. Figure 2 shows trends in SO_x emissions, indicating the effectiveness of this guideline. As a result of strengthened regulations, emissions began to decline remarkably around fiscal 1973, and dropped from 104,500 tons/year in fiscal 1968 to about 17,000 tons/year in fiscal 1975 and further to 4,845 tons in fiscal 1991.²

(2) Nitrogen oxides (NO_x)

Air pollution from NO_x began to pose a serious problem in the first half of the 1970s. Damage due to photochemical smog began to be reported in fiscal 1971 (number of reported persons affected was 2,337). In fiscal 1973, warnings against photochemical smog were issued on 20 occasions and the reported number of those affected was 1,545. In fiscal 1975, 1980, 1985, and 1991, warnings were issued 12 times, three times, six times, and five times, and the number of those affected was 6,175, zero, 113, and 340 persons respectively.³

Figure 1 Year-to-year Changes in the Concentration of Sulfur Dioxide

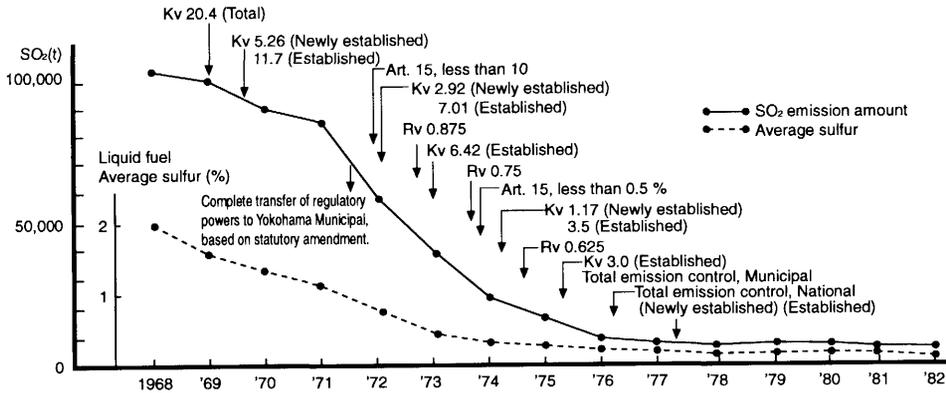
Source: *White Paper on the Environment of Yokohama* (1983 edition), by the Environmental Pollution Measures Bureau, Yokohama Municipal Government, p. 14.

In fiscal 1991, the environmental standard for photochemical oxidants was not met at any of the observation stations.

As for NO_x, the concentrations of nitrogen monoxide and nitrogen dioxide are measured at 16 observation stations. A remarkable change in the measurements of these concentrations is noted at only a few observation stations, with the concentrations generally remaining unchanged from the first half of the 1980s. Measurements satisfied the environment standard (one day average of one-hour values ranging from 0.04 to 0.06ppm or less) at two observation stations in fiscal 1979, at five in fiscal 1982 and at three in fiscal 1991.

What measures did the Yokohama municipal government take to address the NO_x problem? It has taken measures for the reduction of NO_x emissions from factories and other establishments under the Air Pollution Control Law, the Kanagawa prefectural ordinance for environmental pollution prevention, environmental pollution prevention agreements with enterprises and the above-mentioned guideline. It formulated the Yokohama municipal guideline for measures against NO_x in August 1977 in order to attain an intermediate target (daily average) value of 0.04ppm, and started the area-wide total pollutant volume control aimed at fixed sources of NO_x. The total annual emissions for the city of Yokohama was estimated at about 49,500 tons in fiscal 1977, which, broken down according to emissions sources, is 29,600 tons (60%) for factories and other establishments as fixed sources, 16,500 tons (33%) for automobiles, and 3,400 tons (7%) for ordinary households and others.⁴ The guideline was aimed at reducing the emissions amount of 29,600 tons/year from fixed sources to 13,000 tons/year or less,⁵ and covered 1,200 factories and others designated as sources of smoke and soot under the Air Pollution Control Law. At present, almost all factories and establishments attain the emissions standard specified by the guideline.

Figure 2 Trends in SO_x Emissions in Yokohama City and Changes in the Emissions Standard



K value: A constant value specified by the emissions standard under the Air Pollution Control Law. According to this system, an allowable limit of SO_x is determined according to the height of a smoke stack.

R value: A constant value specified by the regulation standard under the Kanagawa prefectural ordinance for environmental pollution prevention. By this system, an allowable amount of SO_x is determined according to the consumption of fuel by factories or others. However, later, the municipal government introduced the system of regulating the total emissions amount according to the Air Pollution Control Law, so that this municipal standard was abolished on March 31, 1977.

Source: *White Paper on the Environment of Yokohama* (1983 edition), by the Pollution Measures Bureau, Yokohama Municipal Government, p. 23.

Furthermore, the Air Pollution Control Law was partially amended in September 1981 to introduce a method of total pollutant volume control for Tokyo, Kanagawa and Osaka. Together with the cities of Kawasaki and Yokosuka in Kanagawa Prefecture, the Yokohama municipal government enforced the total emission control method from April 1982. This method is applied to factories and other establishments which consume energy equal to 4 kiloliters of crude oil per hour. At present, 33 factories are regulated by this method.

As a result of these regulations concerning the fixed sources of NO_x, the annual emission amount of NO_x was reduced to 11,500 tons in fiscal 1991, which was significantly below the reduction target (13,000 tons/year) set by the 1977 guideline. Furthermore, establishments using natural gas or gasoline engines came to be regulated by the Air Pollution Control Law from February 1991.

However, as mentioned above, the situation is such that the NO_x environmental standard has yet to be attained within Yokohama City. The main reason for this is believed to be increased emissions from automobiles, which are mobile sources of NO_x emissions. The number of automobiles in the city exceeded 1,275,000 in fiscal 1991, about 2.5 times the number in fiscal 1975.⁶ In view of this, the Yokohama municipal government formulated the "Yokohama municipal plan for prevention of environmental pollution by automobiles," the main contents of which were to reduce air pollution by automobiles, to develop and to popularize low pollution automobiles and to take measures to protect residents along expressways and other roads from damages. Furthermore, it is taking integrated measures against automobile emissions with a "special measure law for the reduction of total NO_x emissions from automobiles in designated areas," enforced from June 1992.

2. The History of Environmental Policy of the Yokohama Municipal Government

Here we will discuss on a history of the development of the Yokohama municipal government's environmental policy and its future prospects, in the following three periods: the period from 1955 to 1974, when its environmental policy was developed in the form of pollution regulations; the period from 1975 to 1987, where emphasis was laid on environment control and the creation of a comfortable environment; and the period from 1988 to the present, when it develops its environmental policy with consideration to the global environment.

(1) Period of pollution regulations (from 1955 to 1974)

a. Period when factories were encouraged to build and there were few pollution regulations (from 1955 to 1962)

The incidence of the so-called "Yokohama asthma,"⁷ which mainly affected members of the occupation forces and their families around 1951, is a known case of air pollution affecting the health of human bodies in Yokohama City. Air pollution problems were being caused from about that time to the beginning of the latter half of the 1950s. However, it was in the first half of the 1960s that air pollution began to be a social problem. In those days, the municipal authorities gave priority to encourage manufacturers to build factories in the city rather than to regulate environmental pollution. The municipal government began to carry out inland development projects in Totsuka and Kohoku wards around 1955, and framing a municipal ordinance encouraging industry to build factories in the city (which provided for exemption of the fixed asset tax for new enterprises); it also invited Nippon Petroleum Refining, Showa Denko, Tokyo Gas, Tokyo Electric Power, Niigata Engineering, Nissei Oil Refining, Ishikawajima-Harima Heavy Industries, Tokyo Shibaura Electric (presently, Toshiba Corp.) to establish their factories and plants on frontage reclaimed land in Daikokucho and 3,820,478 square meters of reclaimed land slated for industrial use in the Bay of Negishi.

While promoting this policy of prioritizing industrial development, the municipal government took a negative attitude toward environmental pollution control. When a land reclamation project in the Bay of Negishi started in April 1960, for example, the Medical Association of Isogo Ward, Yokohama City, submitted a 10-point petition to the Mayor asking for measures to prevent pollution caused by the land-reclamation project. The petition's first item requested the municipal authorities to formulate a municipal ordinance so that the project might be carried out responsibly under their supervision. In reply to this petition, the municipal government did not go beyond saying, "In view of the fact that the Kanagawa prefectural ordinance for prevention of industrial pollution is enforced throughout the prefecture and that it is proper that problems such as the present case be covered by an administrative setup covering a broader area, the Yokohama municipal government expects that the prefectural ordinance will be enforced effectively and will request the prefectural government to exercise sufficient guidance and supervision and strengthen the necessary control organizations concerned. In consideration of this, the Yokohama municipal government does not intend to formulate a special municipal ordinance for the purpose."

This negative attitude of the Yokohama municipal government is clearly evident in the fact that there is no provision for pollution prevention in its sales purchase contracts for reclaimed land in Daikokucho (from September 1955 to March 1961) and the No. 1 reclaimed land in the Bay of Negishi (from February 1959 to December 1964).

This attitude taken by the Yokohama municipal government may be understood as an abandonment of its autonomous position as a basic self-governing entity supposedly responsible for citizens' health, welfare and security. It includes important implications, leaving us a lesson which we have to ponder in discussing what administrative responsibility is.⁸ Furthermore, we can also gather some important suggestions as to the importance of giving consideration to the environment when carrying out a project from its planning stage, or the consequences of a development project carried out without consideration for the environment, and also suggestions as to what role a self-governing entity should play in development projects.

At the same time, the Yokohama municipal government made attempts at pollution prevention administration during this period. First, in August 1956 it installed smoke and soot fallout meters in 15 places in the city and started measurements, and began measurements by the lead dioxide method in 10 places in January 1959. Furthermore, from May 19 1961, the municipal government was commissioned by the Kanagawa prefectural government to settle grievances concerning environmental pollution. In December 1960, the 30-member Yokohama Municipal Committee on Pollution (renamed the Yokohama Municipal Council on Pollution on June 6, 1964), was established as an advisory organ to the Mayor of Yokohama. The municipal government assigned three full-time officials in charge of pollution to the Public Sanitation Department of its Sanitation Bureau in June 1955.

b. Birth of a progressive government, and the period of inception and development of pollution prevention administration (from 1963 to 1969)

Mr. Ichio Asukata, a candidate of the Japan Socialist Party (now Socialist Democratic Party of Japan) was elected mayor of Yokohama on April 17, 1963 to create a progressive government in Yokohama City. Mayor Asukata led the municipal government for 15 years until he resigned from the post to become chairman of the Socialist Party.

It may be said that the environmental administration of the Yokohama municipal government entered its embryonic stage, developed and matured under this progressive government. As soon as Asukata became mayor, the environmental policy of the Yokohama municipal government was changed, and the municipal government started taking active measures for pollution prevention. After 1963, it developed a string of environmental policy initiatives, carrying out the city's own innovative measures. It is worthy of note that in its approach to pollution control the progressive government presented a striking contrast to the conservative municipal government which had continued until 1963.

The progressive local governments, which arose one after another throughout the country in those days, resisted the central government's policy of giving priority to industrial development, and advocated welfare, improved living conditions and the participation of citizens in government. In Yokohama City too, strong public opinion was formed for new policies, as public concern about environmental pollution spread among citizens and movements arose to oppose pollution. The office of the Association of Citizens' Movements was established in October 1963, and the Federation of Citizens' Movements was organized in January 1964, with labor unions at its center. On June 1, 1964, a citizens' organization (The Naka and Isogo Ward Environmental Sanitation Preservation Council) was formed with as many as 200 executive committee members, and included the support of neighborhood associations, representatives of medical associations, public health center officials, people's welfare committee members, officers of social welfare councils, representatives of women's organizations, leaders of local shopkeepers associations and others in Naka and Isogo wards in Yokohama City.⁹ Furthermore, on July 15 the same year, a group of scholars presented

the mayor with a nine-point petition on pollution prevention. The petition called for formulation of the city's own regulations and standards for pollution control, and for strengthened public organizations for pollution prevention administration.

With the support of public opinion and citizens' organizations, and under pressure from the group of scholars, on December 1, 1964 the Yokohama municipal government concluded an environmental pollution prevention agreement (the first of its kind in Japan) with Electric Power Development Co., addressing the siting of Unit 1 of its Isogo thermal power plant. This was the Yokohama municipal government's first pollution prevention agreement concluded with an enterprise and it became a powerful means of pollution prevention, and pollution prevention agreements between the administrative authorities and enterprises came to be called the "Yokohama system."¹⁰ Though the electric power plant was under the direct jurisdiction of the Ministry of International Trade and Industry, this agreement established the right of the Yokohama municipal government to enter and inspect plant premises, and give instructions on environmental pollution prevention measures, and obligated the power plant to observe stricter standards than those of the central government. It also clearly stated that being located in Yokohama City, the power plant was responsible for pollution prevention.¹¹ This agreement was a creative response on the part of the municipal government, which was not allowed to exercise its legal right on a power plant, to solve the problem of pollution which would affect the city's people. This was precisely a case of local problems being solved locally and flexibly by a local government.

It was also in this period that specialized public organizations in charge of environmental pollution and environmental policy were strengthened and expanded.

In April 1964, an environmental pollution section (staffed by seven persons) was established within the Public Sanitation Department of the Sanitation Bureau. However, the above-mentioned group of scholars stressed in its petition that "because the present pollution-related unit is too weak, it is necessary to strengthen it and to upgrade it to a Pollution Section." In response to this, the Yokohama municipal government raised the pollution unit to the Pollution Center staffed by 10 persons, and decided that it should be headed by a director corresponding to a bureau director, and that its special staff include a senior manager and a senior chief to handle official works on pollution affairs. In October of the same year, the Mayor issued a directive to all the bureaus and departments to prepare documents related to pollution in consultation with the Sanitation Bureau because of the need to prevent pollution. Furthermore, in May 1965, the Liaison and Coordination Conference on Pollution Measures was set up within the city hall.

It is also worthy of note that environmental pollution monitoring systems were established. In 1964, an automatic measuring instrument of sulfurous acid gas was installed, in January 1965, automatic SO₂ recorder/meters were installed in eight places in the city, and in the following year, wired telemeters were installed. However, the Yokohama municipal government's budget for pollution control was only ¥14,070,000, of which ¥5 million was earmarked for equipment improvement subsidies at medium and small enterprises.¹² It is clear how small this budget is when compared with the city's environment-related budgets for fiscal 1983 and fiscal 1992, which were about ¥2,332 million and ¥5,638 million respectively. For reference, the pollution related budget of the Tokyo Metropolitan government in 1963 was only ¥100 million.

The OECD's Environment Policies in Japan stated that "there was practically no environmental policy, either direct or indirect, in Japan for 20 years after the war's end."¹³ However, on a local level, in Yokohama City, environmental policy solving local problems locally was formed and implemented before any action by the central government. As men-

tioned above, air pollution from SO_x, which peaked around 1967, only started to be improved from around 1970.

c. The period of maturation of pollution prevention policy (from 1970 to 1974)

This is the period during which the pollution policy of the Yokohama municipal government matured. On December 25, 1970, a pollution prevention agreement was concluded between Nippon Kokan Kaisha (now NKK) and three self-governing entities, namely, the Kanagawa prefectural government, the Yokohama municipal government and the Kawasaki municipal government. Many people from other self-governing entities, making what was called a "pilgrimage to Yokohama," visited the Yokohama municipal government to study the gentlemen's agreements concluded with enterprises, and the Yokohama system spread throughout the country. By September 30, 1992, about 39,800 agreements had been concluded throughout the country.¹⁴

In June 1971, the Pollution Center was upgraded to a Pollution Measures Bureau (staffed by 38 persons) to strengthen the organization and control of environmental administration. In August of the same year, according to the Enforcement Rules of the Prefectural Pollution Prevention ordinance, the Kanagawa prefectural government authorized the mayor of Yokohama City to permit the establishment of designated factories, receive reports on the start of business enterprises and settle affairs related to business relocations. Furthermore, in the "1985 Integrated Plan for Yokohama City" formulated in 1973, "environmental problems in urban areas and environmental pollution" was listed as the first item of the "Important Tasks for the Protection of Residential Life." The plan also spelled out the city's own environmental targets for the atmosphere, sea and rivers, noise pollution, and others. These environmental targets were partially revised and incorporated in the new integrated plan called the "Yokohama Plan for the 21st Century" (1981).

(2) The period of environmental management and creation of a comfortable environment (from 1975 to 1987)

During this period, the Yokohama municipal government's environmental administration, not only became centered on its guideline and fine-tuned to respond to environmental problems, but also came to develop measures to evaluate and control the environment of the city as a whole and to preserve and create a more humane and comfortable living environment. First, in April 1975, the municipal government formulated the "guideline for measures against sulfur oxides and smoke and soot" as the city's own total pollutant volume regulation, and started environmental prevention administration on the basis of this guideline. In the second half of the 1970s and the first half of the 1980s, a total of nine guidelines and regulations were formulated, including the "Guideline for Environmental Impacts Assessment in Yokohama City" enforced from July 1981.

In April 1975, the Environmental Pollution Research Institute was established to do integrated research on environmental problems, and the Yokohama municipal government presented four long-term targets in its "Yokohama Plan for the 21st Century," formulated in December 1981, and set forth six measures to attain these targets.¹⁵

The four long-term targets are:

- i. To grasp and integrate natural and social conditions in the city, to regulate and conduct the proper utilization of the air, water, and natural environments, and to control the environment as a whole in an integrated way.

- ii. In order to clean the air and create a green-rich environment, efforts will be made to reduce the total emissions of pollutants in the atmosphere, and to attain the targets of this plan.
- iii. To recover the rivers and the sea so that fish can live and people can swim without worry, efforts will be made to reduce pollutants discharged into them, and to attain the targets of this plan.
- iv. To prevent the deterioration of the environment due to urban activities, to ensure a good environment where people can live without worry.

Among the measures listed, special importance was attached to (a) the establishment of an environment management system; (b) the expansion of an environmental impacts assessment system; (c) the control and countermeasures of sources of environmental pollution; (d) the establishment of monitoring and measuring systems; (e) the scientific elucidation of environmental problems; and (f) relief measures for victims of environmental pollution.

In March 1986, the Yokohama City Environmental Management Plan—Environmental Plan 21 was formulated in order to embody the long-term environmental targets of the Yokohama Plan for the 21st Century and the Yokohama City Environmental Charter. This environmental control plan took an integrated approach to the environment establishing environmental targets to implement and preserve the following three viewpoints: (a) a living environment including nature and environmental pollution which is related to the lives of people; (b) the foundations of urban life, economic conditions, and other natural and production environments which are related to people's lives; (c) a comfortable environment with many green spaces, beautiful river embankments and sea shores which will give comfort and peace to the people who live there.

Furthermore, the Yokohama Plan for the 21st Century clarified measures to achieve its targets and guidelines for caring for the special characteristics of different areas. Efforts are being made to promote these measures.¹⁶

(3) The period of the global environment (from 1988 toward the 21st century)

In June 1991, the Pollution Measures Bureau was reorganized into the Environment Conservation Bureau (staffed by 207 persons), which consisted of the Administration Department, the Environmental Pollution Control Department and the Environmental Science Research Institute. The City's *White Paper on the Environment* for fiscal 1992, which was subtitled "For an Earth-Friendly City, Yokohama" emphasized the need for local governments to cope with global environmental problems. Environmental policy for the global age is beginning to take shape in Yokohama, too. At present, the municipal government is formulating a new "Integrated Plan for Yokohama," targeting the year 2010, by revising the Yokohama Plan for the 21st Century, and will review its previous environment management plans and develop its environmental policy for the global era on the basis of the new plan.

3. Air Pollution Control and the Evaluation of the Yokohama System

(1) The Yokohama system and environmental pollution prevention agreements

As mentioned above, the Yokohama municipal government concluded a pollution prevention agreement with Electric Power Development Co. in 1964, which obligated the latter to take integrated pollution prevention measures. The main contents of the agreement included the following: (i) The emissions of smoke and soot should be less than $0.6\text{g}/\text{Nm}^3$,

and those of sulfurous acid gas less than 500ppm (less than 1/2 and 1/4 of the statutory emission standard respectively); (ii) burning fuel should be high quality coal (Hokkaido coal); (iii) Yokohama municipal government officials should be permitted to enter power plant premises for inspection; and (iv) the company should observe the directions of the city government if there is a danger of environmental pollution. In other words, it is noteworthy that this agreement not only made it obligatory for the enterprise to permit the entry of public officials onto the plant premises and to obey the orders of the city government with respect to pollution control, but also included control standard values far higher than those specified by the central government's smoke and soot control law. It is of great significance that by adopting this system, the Yokohama municipal government, a local self-governing entity, was able to secure the means of control and guidance for preventing environmental pollution.¹⁷

Later, the Yokohama municipal government, utilizing this system as a powerful means of environmental pollution prevention, concluded environmental pollution control agreements with a Tokyo Electric Power's thermal power plant, oil refineries and iron and steel mills. At present, it has concluded such agreements with 24 factories of 18 companies.¹⁸ The environmental pollution prevention agreement concluded on December 2, 1970 between Nippon Kokan Kaisha (now NKK) and the three municipal and prefectural governments—the Yokohama and Kawasaki municipal governments and the Kanagawa prefectural government—concerning the Keihin Iron and Steel Works on Ogishima Island is particularly well known as an agreement covering a large area.

a. Environmental pollution prevention agreements and the innovational policy of Yokohama City

Why was this innovational policy known as the Yokohama system developed in those days when neither the central government nor prefectural authorities had an effective policy for preventing environmental pollution? It is very important to examine this question when discussing the role and responsibility of local governments in environmental administration.

Both external and internal factors were involved in the birth of the Yokohama system. The external factors may be classified into internal and external influences on Yokohama City. As an external factor we may cite the environmental pollution damage caused in Yokkaichi City and the citizens' movements which arose in 1964 in Numazu and Mishima cities. Environmental damage due to air pollution in Yokkaichi City began to occur around 1959 and 1960 when oil refineries there started full operations, leading to a sudden increase in the incidence of asthma. Thus, environmental pollution in Yokkaichi came to be called the first case of harmful air pollution in Japan. It is supposed that the air pollution problem of Yokkaichi City had a great influence on the Yokohama municipal government as it set forth its innovational policy.

Furthermore, the movement which arose in Numazu and Mishima against the construction of a petrochemical complex, had an impact on the Yokohama municipal government, which found it necessary to introduce the so-called Yokohama system. A total of 25,000 persons gathered at a citizens' rally held in Numazu City on September 13, 1964 under the sponsorship of the Citizens' Congress of Numazu, Mishima and Shimizu Cities. Fishermen participated aboard their fishing boats, farmers by driving their cultivators and firefighters their fire engines. The mayor of Numazu City, under pressure from this citizen's movement, issued a statement opposing the petrochemical complex plan, and Fuji Oil and Sumitomo Petrochemical were compelled to give up their plant construction plans.

This not only shocked the Ministry of International Trade and Industry, which was obligated to play a supervisory role in matters related to environmental pollution, but also

the industrial world and local governments. Both administrative authorities and enterprises came to recognize the fact that it was impossible to site a factory without taking active measures against environmental pollution. This situation had a positive effect on the promotion of pollution prevention measures by the Yokohama municipal government. The mayor of Yokohama made a request to the Minister of International Trade and Industry on October 3, 1964 "to extend strict guidance and supervision over the construction of the Isogo thermal power plant so that the power company may fulfill the conditions presented by the city authorities for the prevention of environmental pollution." Responding to the mayor on October 8 of the same year, the Vice-Minister of International Trade and Industry said that his ministry would see to it that the request was respected. This meant that it was only in such critical situations that the central government was compelled to recognize a standard which was stricter than its own and that a system demanding stricter conditions than the standards of the central government was accepted by the Ministry of International Trade and Industry and enterprises concerned.

The citizens' movement organized in Yokohama City also played an important role in the development of the Yokohama system. First, environmental pollution, centering on air pollution, began to assume increasingly serious proportions in the Tokyo-Yokohama industrial area and began to have visible effects on residents in the first half of the 1960s. Anxiety about environmental pollution spread among the citizens. The Environmental Sanitation Preservation Council of Naka and Isogo Wards, a citizens' organization formed on June 1, 1964, demanded that the government conduct an advance environmental impact assessment of the petrochemical complex on Negishi reclaimed area, and kicked off movements against environmental pollution in the city. Furthermore, this organization's petition to the central government effectively urged it to recognize the severe conditions for pollution prevention which it demanded.¹⁹ The "Association to Bring Back a Blue Sky to the Tokyo-Yokohama Area" backed a proposal made by the Yokohama and Kawasaki municipal governments and the Kanagawa prefectural government in their negotiations with Nippon Kokan Kaisha for a pollution prevention agreement (concluded on December 25, 1970) concerning the Keihin Steel Works on Ogishima Island. For instance, when Nippon Kokan Kaisha insisted that the emissions limit of sulfurous acid gas for one company should be set at 0.03ppm, the association put pressure on them to incorporate into the agreement the limit of 0.01ppm, as proposed by the three local governments.²⁰ It was due largely to the support of public opinion and the efforts of the citizens' movement that the company agreed to reduce the number of smoke stacks from 90 to 28, the average SO_x concentration on land from 0.22ppm to 0.012ppm, and the total SO_x emissions from 2,038Nm³/H to 650Nm³/H or less through efforts to use LNG instead of fuel oil.

The policy innovation called the Yokohama system may be said to be internally formulated under pressure of external activities. In the first place, Mayor Ichio Asukata took a positive attitude toward environmental pollution prevention. This showed that depending on the stance of the head of a local government, there are ways and means of solving environmental problems even without the endowment of necessary powers.

b. Results of the Yokohama system

The Yokohama system for environmental pollution control, applied to specific pollution-causing large enterprises, is highly praised as being very effective for pollution control. While the agreements with the municipal authorities burdened the enterprises concerned with investments in pollution control equipment, companies were able to benefit from the development of pollution prevention technologies. For instance, Nippon Kokan Kaisha devel-

oped an NKK-Shinkoshi-type smoke desulfurization facility for flue gas from coking plants in order to achieve the standard specified by the agreement concerning NO_x emissions. It also developed a desulfurization facility for coke furnace gas, and a denitrification facility for emissions from coking plants. The agreement was effective for developing these pollution prevention technologies. Costs for pollution prevention at NKK's steel works amounted to ¥200 billion, or about 20% of the total construction cost of ¥1 trillion. Pollution prevention technologies developed in Japan from the experience of environmental pollution are said to be among the best in the world, and are expected to be utilized in solving not only environmental pollution problems in developing countries but also of the global environment.

Under the agreement concluded with Nissan Motor on March 12, 1973, the use of fuel oil at its Yokohama Factory was as much as possible to be switched to kerosene and gas, and by June 1973 the sulfur content of fuel oil to be reduced to a maximum of 0.8% at the factory and 0.5% on an average as a whole at its factories. This level was 85.1% lower than it was in 1970, and the composite concentration of NO_x on land was lowered to less than 0.01ppm.²¹ As another example, we will see how the agreement (concluded in December 1970) on environmental pollution prevention with NKK's Keihin Steel Works on Ogishima Island was implemented. The Keihin district research group (in which this writer participated as a chief researcher) inspected the factory on Ogishima Island in July 1982, 12 years after the conclusion of the agreement.

On this island with an area of about 5 million square meters, a modernized steel works was constructed, consisting of two blast furnaces and corresponding ancillary equipment, including coking plants, sintering plants, steel-making plants, continuous blooming, sheet rolling, hot rolling and other facilities. Referring to the environmental pollution prevention measures at the steel mill, Mr. Takeshi Tsubaki, then manager of the Control Department of Nippon Kokan Kaisha, stated that: "The Keihin Steel Works on Ogishima Island is the cleanest steel works in the world, and its desulfurization and denitrification facilities for flue gas from coking furnaces for the prevention of NO_x emissions are among the best in the world. We have made the most energetic efforts for environmental pollution prevention to enable our steel works to survive in a place close to urban areas. We have been heavily burdened to realize this. We anticipate soot and oxidants as future environmental problems. We want the authorities to enforce long-term environmental pollution measures on the basis of scientific findings."²² While calling for a scientific environmental administration, he emphasized the fact that the steel mill was implementing the world's highest level measures against environmental pollution.

Table 1 shows trends in the reduction of emissions from the Keihin Steel Works on Ogishima Island. SO_x emissions were reduced from 770Nm³/H in December 1970 at the time of the conclusion of the agreement to 275Nm³/H in 1981, 11 years later, achieving a reduction rate of 64.3%, and to 250Nm³/H in April 1990, recording a reduction rate of 67.6%. Furthermore, in November 1976, measures against NO_x were introduced in connection with the operations of facilities related to the first blast furnace. Then NO_x emissions of 577Nm³/H were lowered to 390Nm³/H by May 1981, registering a reduction rate of 32.5%, and to 365Nm³/H by April 1990, a reduction rate of 36.8%.

The attainment of such high reduction rates was due to the environmental pollution prevention agreement. The above-mentioned manager of the Control Department of NKK evaluated the functions of the agreement, saying, "Relations of mutual trust were established between the administrative authorities of the three municipal and prefectural governments and our company, and these relations have been well maintained because of the existence of the agreement."

Table 1 Emissions of Main Pollutants

Date of agreement	Dec. 1970 (Original agreement)	Aug. 1973	April 1974	Nov. 1974	1975		1976		July 1979 (Start-up of No. 2 blast furnace)	May 1981	April 1990	
					Oct. 1974	Nov. 1975 (Start-up of No. 1 blast furnace)	Oct. 1975	Nov. 1976 (Start-up of No. 2 blast furnace)				
Items	Emissions amount, etc.											
SOx	Emissions amount Nm ³ /h	770	480	477.1	352.8	348.5	345	320	292	280	275	250
	Reduction rate (%)	100	37.6	38.0	54.2	54.7	55.2	58.4	62.1	63.6	64.3	67.6
	Sulfur content of fuel oil (%)	0.6	10.5	0.5	0.5	0.5	0.11	0.11	0.11	0.11	0.11	0.11
	Composite average concentration on land wind velocity 5m/s(ppm)	0.015	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NOx	Emissions amount Nm ³ /h	-	-	-	-	-	577	577	407	407	390	365
	Reduction rate (%)	-	-	-	-	-	100	100	29.5	29.5	32.5	36.8
Water discharge	Amount of water discharge m ³ /D	-	125,000	119,200	119,200	119,200	110,100	110,100	110,100	93,600	93,200	87,900
	Reduction rate (%)	-	100	4.6	4.6	4.6	11.9	11.9	11.9	25.1	26.4	29.7

Sources: Liaison Council on the Ogishima Problem, *Circumstances Attending the Conclusion of the Agreement on Environmental Pollution Prevention—Additional Materials* (Keihin Steel Works, Nippon Kokan Kaisha) (August 1979), p. 8. Figures for 1990 are from data provided by the Environmental Protection Bureau, Yokohama Municipal Government.

What were the characteristic points of this Yokohama system? First, the Yokohama system did not apply the same emissions standards to all factories in a uniform way. Through this system, negotiations were held separately with individual enterprises in order to reach an agreement on environmental pollution prevention measures which would meet the conditions of each enterprise. Collectively, these agreements would achieve the goal of environmental pollution control. This system was aimed at coming to an initial agreement on feasible standard values by the conclusion of an agreement, and then gradually reducing emissions levels either through revisions of the agreement or through partial revision of an enforcement plan for environmental pollution prevention. Thus, the annex to the agreement with the Keihin Steel Works on Ogishima Island in 1970 was revised in November 1976, and the agreement itself was partially revised at the completion of the second blast furnace in July 1979. Furthermore, by 1979 the enforcement plan for environmental pollution prevention first formulated in August 1973 was partially revised to reduce the emissions levels as many as five times.

Secondly, agreements changed in content as conditions changed, so that they came to cover not only the usual seven environmental pollution items such as air and water pollution, but also issues like industrial waste and measures for green spaces. With five golf courses in the city, the Agreement on Environmental Conservation Concerning the Use of Agricultural Chemicals, concluded on March 15, 1991, is also worthy of note as indicating a new direction.

Thirdly, it is important that this system stipulates that, except in special cases, data concerning air pollution, water pollution, noise and other problems should be made open to the public. However, not all the environmental pollution agreements concluded later between local governments and enterprises provide for public disclosure of such data. For instance, an agreement concluded between the Chiba prefectural government, municipalities, and enterprises did not provide for public disclosure of data, and the contents of agreements were not made open to the public.

Fourthly, the Yokohama system permits the entry of local government officials onto the premises of enterprises concerned. This right makes it possible for them to enter factories to investigate the enforcement of pollution prevention measures agreed upon, and to fulfill their duty to enforce the regulations aimed at enterprises. Many of the environmental pollution prevention agreements concluded throughout the country thus far, provide local authorities with the right to enter the premises of enterprises.

Fifthly, the Yokohama system has been spread nationally and influenced the environmental pollution control of local governments throughout the country, playing an effective role in pollution prevention.

Next, the following may be cited as reasons for the success of the Yokohama system. (i) In critical situations which kicked off the surging movements against environmental pollution in Yokkaichi City, Mishima and Numazu Cities and by the nationwide deterioration of environmental conditions, enterprises and administrative authorities were compelled to take active measures for pollution prevention. (ii) That pollution prevention agreements were concluded mainly with the specified factories of large enterprises is one of the reasons for the success of this system. (iii) Mayor Asukata of Yokohama City stressed the importance of research work, saying, "Trying to solve environmental pollution problems without scientific data is like sailing in the sea without a compass." Scientific research, he said, was one of the characteristics of the Yokohama system.²³ The administrative authorities accumulated enough strong scientific facts and data to get enterprises to comply. (iv) Under the leadership of the mayor, citizens' organizations and trade unions were fully utilized to apply pressure on enterprises.

(2) The Yokohama system and administrative guidelines

The Yokohama municipal government was entrusted with the task of implementing the Kanagawa prefectural ordinance against environmental pollution, and so did not formulate its own laws. It differed from the Kawasaki municipal government in this respect, which formulated its own ordinance against environmental pollution. As already mentioned, the Yokohama municipal government formulated the "Environmental Targets for Yokohama City" in December 1973, and implemented various measures to attain these targets. It decided that laws and prefectural ordinances were not sufficient to attain these targets, and so formulated a guideline for the purpose of spreading environmental protection throughout the city. This guideline formed another pillar of the Yokohama system, along with, pollution prevention agreements with enterprises.

III. CONCLUSION

Many local governments, beginning with the Yokohama municipal government, endeavored to solve environmental pollution problems prior to the central government by utilizing such control measures as environmental pollution agreements with enterprises, guidelines and municipal and prefectural ordinances for environmental protection. In this sense, we can learn lessons from the measures taken by the Yokohama municipal government.

First, Japan learned a bitter lesson about the consequences of industrial development without regard to the environment, and about the tremendous efforts and sums of money needed to recover the lost environment. It is necessary to start development projects only after paying sufficient advance consideration to the environment.

Second, basic local governments, the administrative authorities closest to the people, have important roles to play: (1) The role of taking the policy initiative and setting a policy framework; (2) the role of implementing environmental policy by providing research, inspections and analysis capabilities for environmental pollution control and environmental administration organizations; (3) the role of maintaining and opening pollution and environmental information to the public; (4) the role of extending support to citizens' and NGOs' environmental activities; (5) the role of establishing environmental administration based on scientific findings; and (6) the role of promoting the development and dissemination of environmental pollution technologies, and others.

Third, it is also necessary to realize that local governments can only succeed in environmental pollution control with the support and cooperation of citizens.

Notes

1. OECD, *Environmental Policies in Japan*, Paris, 1977.
2. Environment Conservation Bureau, Yokohama Municipal Government, *White Paper on the Environment of Yokohama City*, 1992 edition, p. 3.
3. *Op. cit.*, 1992 edition, Table 3-1-2 on p. 50.
4. Environment Measures Bureau, *Kogai tono Tatakai* (Fight against Environmental Pollution), 1980 edition, p. 46.
5. *Op. cit.*, 1981 edition, p. 50.

6. Environment Conservation Bureau, Yokohama Municipal Government, *White Paper on the Environment of Yokohama City*, 1992 edition, p. 63.
7. Sanitation Bureau, Yokohama Municipal Government, *Actual Conditions and Forecasts of Environmental Pollution in Yokohama City—For the Solution of Problems in the Negishi and Hommonku Industrial Areas*, July 1964. p. 4.
8. Regarding this point, Mr. Katsumi Saruta, then manager of the Pollution Measures Bureau of the city, points out the lack of independence in matters related to environmental pollution prevention. See Katsumi Saruta, "Past Achievements and Future Tasks of Local Governments—Centering on the Development of the Yokohama System," *Compendium on Energy and Environmental Pollution*, (Energy Journal Co., 1978), pp.19-20. This is a very important point in as much as it shows that local governments are not only required to face the responsibility of addressing existing internal problems but also the creative task of anticipating future problems.
9. For information on the Environmental Sanitation Protection Council, refer to the "Overall Evaluation and Examination of Environmental Policy" fiscal 1984, *The Philosophy of Environment and Methods of Environmental Protection*, March 1985, and the special study of environmental science of the Education Ministry, pp. 104-105.
10. Examples of earlier agreements with enterprises on environmental pollution prevention are those concluded on March 18, 1952 by the Shimane prefectural government with the Etsu Factory of Sanyo Pulp and the Masuda Factory of Daiwa Spinning. See Japan Industrial Siting Center, *Jurisprudential Studies on Agreements on Pollution Prevention*, July 1970, p. 2.
11. Katsumi Saruta, *op. cit.*, p. 22.
12. *Op. cit.*, *Actual Conditions and Forecasts of Environmental Pollution in Yokohama City*, p. 17.
13. OECD, *op. cit.*, p.11.
14. *White Paper on the Environment—Itemized Discussions—for Fiscal 1993*, edited by the Environment Agency, June 1993, p. 317.
15. Yokohama Municipal Government, *Yokohama Plan for the 21st Century—in Search of a New Affluence*, December 1981, pp. 54-55.
16. Yokohama Municipal Government, *Environmental Control Plan for Yokohama City—Environmental Plan 21*, March 1986.
17. This is an important case which shows that even without regulatory powers, a local government can address environmental problems if it acts wisely. Here, too, the role of local governments is important.
18. Environment Conservation Bureau, Yokohama Municipal Government, *op. cit.*, *White Paper on the Environment of Yokohama City*, fiscal 1992 edition, list of agreements concluded with enterprises on environmental pollution prevention, pp. 232-233.
19. Environmental Pollution Center, Sanitation Bureau, Yokohama Municipal Government, *A Historical Review of Environmental Problems Related to the Siting of a Thermal Power Plant in the Negishi and Hommoku Industrial Area*, February 1965, p. 15.
20. The Federation of Citizens' Movements in Yokohama, *For a New Yokohama—Citizens' Movement News*, July 15 and Sept. 15, 1970.
21. Pollution Measures Bureau, Yokohama Municipal Government, *op. cit.*, *Agreements on Environmental Pollution Prevention Volume 2, Outline of Agreements on Environmental Pollution Prevention Part II*, p. 85.
22. Inspection of the Keihin Steel Works of Nippon Kokan Kaisha, July 27, 1982.
23. Ichio Asukata, "On the Yokohama System as a Measure for Environmental Pollution Prevention," *Monthly Inochi*, No. 21, June issue of 1968, p.4.