

Environmental status and management in Chiba Prefecture

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Abstract—Chiba Prefecture is located in the east of Tokyo Metropolis. A large scale development of industrial and residential areas began in the late 1950s until then the main industries of the prefecture were agriculture and fisheries. During the past 30 years rapid industrialization and urbanization took place resulting in occurrence of various environmental problems.

In an attempt to establish a better environment condition towards 21st century Chiba Prefecture has made Environmental Plan which all the municipal governments, enterprises and inhabitants should observe to realize better environment.

Keywords: environmental status; environmental management; Chiba Prefecture; Japan.

INTRODUCTION

Chiba Prefecture is located to the east of Tokyo and the western part is within the so-called greater metropolitan area (Fig. 1). Until the mid 1950s the main industries were agriculture and fisheries supplying food stuffs to Tokyo.

A large scale development of seaside industrial areas began around 1955 first through reclamation along the Tokyo Bay then development of inland industrial and residential areas followed. The total reclaimed area along Tokyo Bay reaches 10000 ha's.

Now these areas are occupied by various types of industries and new residents with the result that the population which was 2.2 millions in 1955 has jumped to 5.47 millions in 1988. The rate of increase of population has been extremely rapid in the western part as is indicated in Fig.1. Recently, place of population increase is moving eastward. More dramatic rate of increase is seen in number of registered cars reaching approximately 2 millions or 72 times of that in 1955. As an inevitable result the burden on the environment has increased and various types of environmental problems have emerged. In this report recent status of pollution with an emphasis on air and water is described then the environmental plan for the 21st century will be described.

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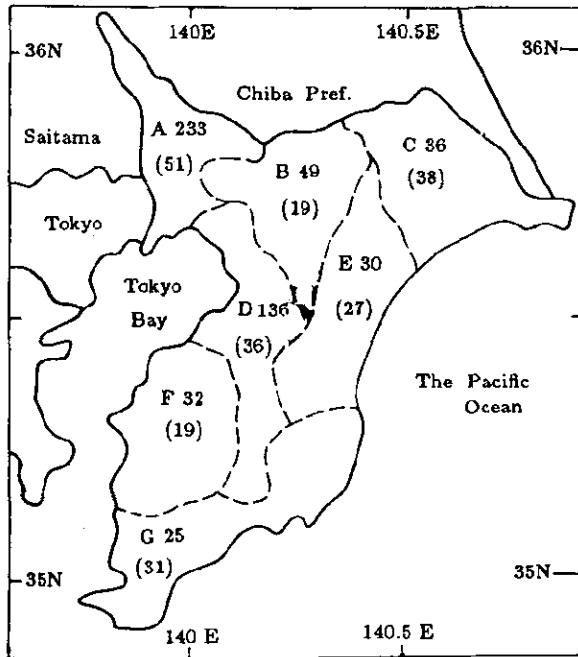


Fig. 1 Geographical location of Chiba Prefecture. Numerals indicate population in 1987 and those in () are that in 1955. The unit is 10000

MEASURES FOR ENVIRONMENTAL DETERIORATION

“Pollution Control Ordinance of Chiba Prefecture” was first enacted in April 1963 to meet with the unexperienced situation.

In July 1971 Environmental Agency (national agency) was established and laws on environment were enforced. To cope with new situation the ordinance was completely amended. The local environmental problems such as noise, vibration and offensive odor are controlled by ordinances of cities, towns and villages while the use of ground water is controlled through the system of permission and so on.

“Ordinance for Provision of Emission Standard based on Air Pollution Control Law” and “Ordinance for Provision of Drainage Standard based on Water Pollution Control Law” were enacted in December 1971 to strengthen the control under the more strict standard than that of the law which was revised in December 1980 to cover floating particulates, COD and other pollutants which are harmful for health.

Along with strengthening of control by the ordinance, the necessity for an overall measures of pollution control became recognized. The pollution control programs in accordance with the Article of the Basic Law for Environmental Pollution Control were practiced for Chiba and Ichihara Area (area D of Fig.1) in December 1970 and Zone along the Edo River in December

1972 under the approval of the national government. Then in December 1974 "Pollution Control Program in Chiba Coastal Area" was made covering these two areas to carry out various measures. As further improvements were found necessary, the program was revised and extended in March 1980 to take all-round measures for early solution and prevention of pollution problems.

Since the improvement of the environment can not be expected merely through the control by laws and ordinances, Pollution Control Agreement was concluded between leading enterprises and prefectural government of city offices to control the sources of pollution. At present 60 companies and 54 factories have concluded the agreement for which guidances and instructions are given by respective organizations whenever they become necessary.

For wastes, Wastes Disposal and Public Cleaning Law was enacted in 1970 to preserve the living environment and to improve public health. According to the law, disposal of industrial wastes is responsibility of the industry while general wastes from individual homes are responsibility of city offices. For the industrial wastes, instruction on installation and Management on Wastes Disposal was made in July 1986 and has been practiced under the guidance of the prefectural government. To maintain a good environmental condition and comfortable and healthy life towards the 21st century, a future Environmental Plan of Chiba Prefecture was completed in March 1986. Utmost effort will be made to realize the plan.

ENVIRONMENTAL STATUS

Air pollution

1. General condition

The number of business establishments which have "soot and smoke emitting facility" stipulated in the Air Pollution Control Law in the coastal industrial area along Tokyo Bay is 76% of the prefectural total, while the emission volume of sulfur oxides from leading enterprises in this area is 89% or more of the prefectural total. On the other hand increasing emissions from motor vehicles and concentrated small and medium sources of smoke can not be overlooked.

SO₂ and NO_x

The trend of annual average of SO₂, NO₂, NO at 105 monitoring stations and those at 13 monitoring stations along the major roads are shown in Fig.2 through 4. As to sulfur oxides, the attainment of the environmental quality standard of 0.04 ppm/day standards was 100% while in case of nitrogen oxides the attainment of the standard of 0.04-0.06 ppm/day was 90.1% which was a little worse than the preceeding year of 99.1%.

Photochemical oxidant

Measurements of photochemical oxidant at 85 monitoring stations in 1987 show the satisfaction of the Environmental Quality Standard was 95.4%. The frequency of photochemical oxidant warnings (0.12 ppm) in the past 15 years (Fig. 5) is large in July and August and small in September and October.

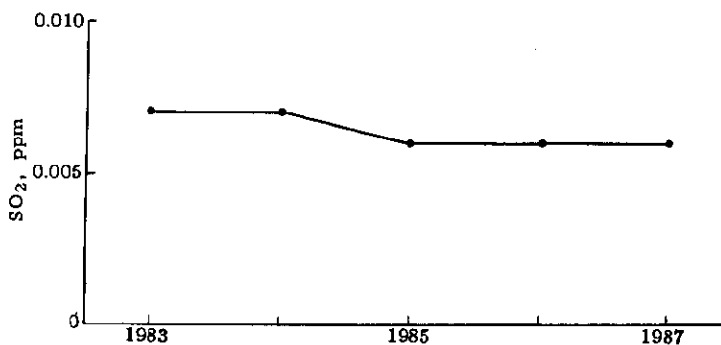


Fig. 2 Annual average of SO₂ at 105 monitoring stations in Chiba Prefecture

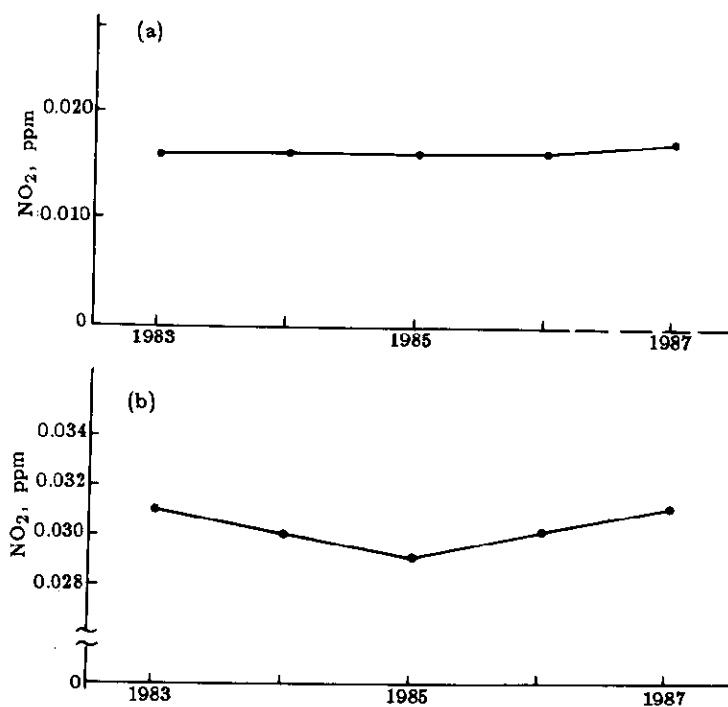


Fig. 3 Annual average of NO₂ at 105 regular (a) and 13 automobile (b) stations

Carbon monoxide

Annual average at 7 monitoring stations is between 0.5 and 0.6 ppm and below the Environmental Quality Standard. As is shown in Fig. 6, the average value at automobile monitoring stations along the major road also satisfies the standard.

Suspended particulate matters

Particulate matters smaller than 10 micro-meter in diameter is called suspended particulate matter and the Environmental Quality Standard is 0.1 mg per cubic meter for daily average

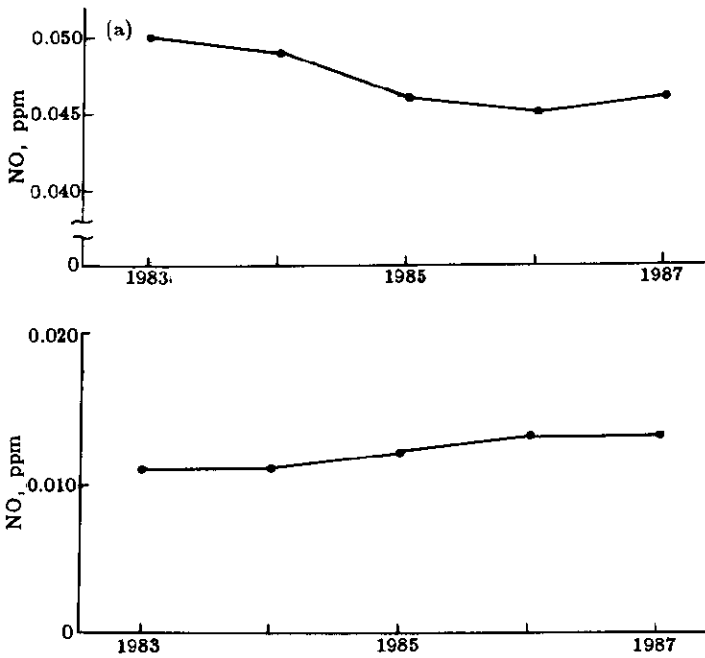


Fig. 4 Annual average of NO at 105 regular(b) and 13 automobile (a) monitoring stations

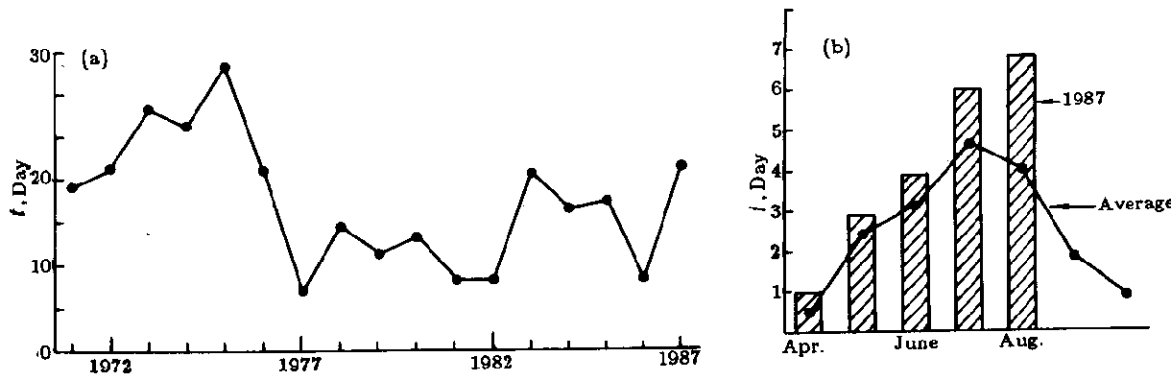


Fig. 5 Number of days of photochemical smog warning (a) Annual, (b) Monthly

and 0.2 mg/m³ for 1 hour average. The result of the monitoring since 1982 shows the standard has not been satisfied.

Others

The monitoring of hydrocarbon, dustfall and acid rain and so on were also made. As to acid rain (rain of pH less than 5.6), monitoring has been made since 1982 during rainy season (May-Aug.) at 10 stations. The minimum value of pH 3.6 was recorded at Sawara City located

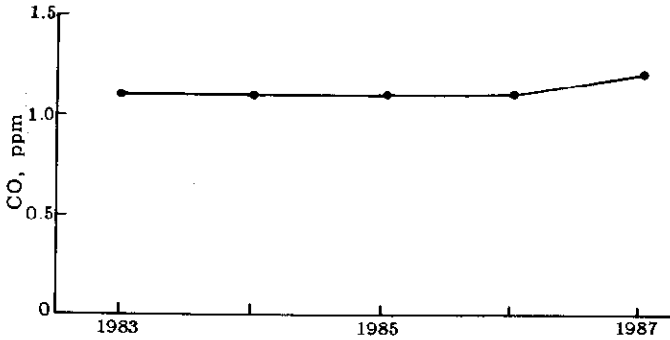


Fig. 6 Annual average of CO at 14 automobile monitoring stations

in the northeastern part in 1986 and 1987. General situation shows more acid rain in the industrial and heavy traffic areas in the western part. So far no serious damage on the forest was observed.

2. Countermeasures

The prefecture has made agreement with major enterprises and factories on pollution control which is more strict than the provisions in the laws and regulations. Particularly for nitrogen oxides, the prefecture has set up its own environmental standard. The spot inspections were made to examine the implementation of these laws and the agreement. Simultaneously main factories are placed under continuous monitoring telemeter system. This telemetering system has been strengthened through the increase of monitoring stations and improvement of instruments.

For the mobile pollution sources such as automobiles, regulations on exhaust gas control have been gradually strengthened at the same time a request on further strengthening has been made to (national) Environmental Agency.

Water pollution

Water pollution is controlled by "Water Pollution Control Law" and related laws. Water Pollution Control Law stipulates the effluent discharged into public water areas, the definition of which are those devoted to the public usages including rivers, lakes, ponds, harbours, coastal sea and the water channels connecting them. Public sewerage connected to its terminal treatment plant is excluded since it is controlled by Sewerage Law.

There are two types of standards for water pollution: (1) standard relating to human health (hazardous substances) such as cadmium, cyanide, organic phosphorous, lead, hexavalent chromium, arsenic, total mercury, alkyl mercury, PCB (polychlorinated biphenyl), (2) Standard relating to living environment such as pH, BOD, COD, SS, N-hexane extract, phenols, copper, zinc, dissolved iron, dissolved manganese, chromium, fluorine, coliform bacteria.

1. The status in 1987

The ratio of satisfaction of the standard for human health was 100% in 1987 while the

attainment of environmental standard in 1987 was low with the following values for BOD or COD: rivers 36.1, lakes and ponds 0, coastal zones 45.5% respectively. The attainment ratio of rivers for others are: pH 98%, SS 91%, number of coliform groups 19%. Primary cause of this situation is due to shortage of sewerage facility especially in an area where rapid urbanization was taking place. Concerning the waste water from industrial sources, the volume of pollution load has been decreased.

As to Tokyo Bay, the achievement rate of environmental quality standard for N-hexane extracts and number of coliform groups were almost 100% while the achievement rates for pH, DO and COD are 91, 75 and 67% respectively.

2. Major countermeasure and future course

For surveillance of water quality in the public waters, measurements have been continuously made at 152 places, namely 52 rivers, two lakes of Inba and Tega, Tokyo Bay and the sea area of Kujukuri (Pacific Ocean).

To watch waste water from factories and business establishments, on-the-spot inspections have been carried out. If violation of effluent standards was found, administrative measures, such as an order for improvement and so on were taken to have necessary improvements made. Great efforts have been made for improvement of the rivers in cities, sewerage systems and preservation of water quality in harbors.

Ground subsidence

1. The status in 1987

The area of the subsided land throughout the prefecture in 1987 was 1526 km² and decreased by 18% from the preceding year (1870.8 km²). However the area of the land subsided more than 2 cm was 201.8 km² which was larger than the preceding year (98.7 km²).

2. Principal countermeasures and future course

For extraction of groundwater, the groundwater extraction regulations, the guidance for rationalized use of groundwater and change to substitute water sources of surface water is promoted based on the Pollution Control Ordinance of Chiba Prefecture and the pollution control agreement (ground subsidence).

The extraction of brine of natural gas and the excavation of new gas wells are controlled based on the agreement on prevention of ground subsidence.

Natural environment

The area of the forest is about 170000 ha which is 33.4% of the total land of the prefecture. This ratio is about half of the national average of the forest area of 66.9%. Almost all of the forests are secondary forests.

There are a few natural forests in the prefecture. For conservation of the remaining natural environment in prefecture, 23 regions with a total area of 1240 ha have been designated as natural environmental conservation areas under the Natural Environment Conservation Ordinance. For guidance and inspection of natural environment conservation, 115 persons were

designated. To secure a comfortable living environment and to maintain and preserve greenery in cities, the master plan for green areas will be made to promote forestation.

ADMINISTRATIVE ORGANIZATION OF ENVIRONMENT AND ANNUAL BUDGET

Administrative organization

The organization of Environment Department of Chiba Prefecture is shown in Fig. 7.

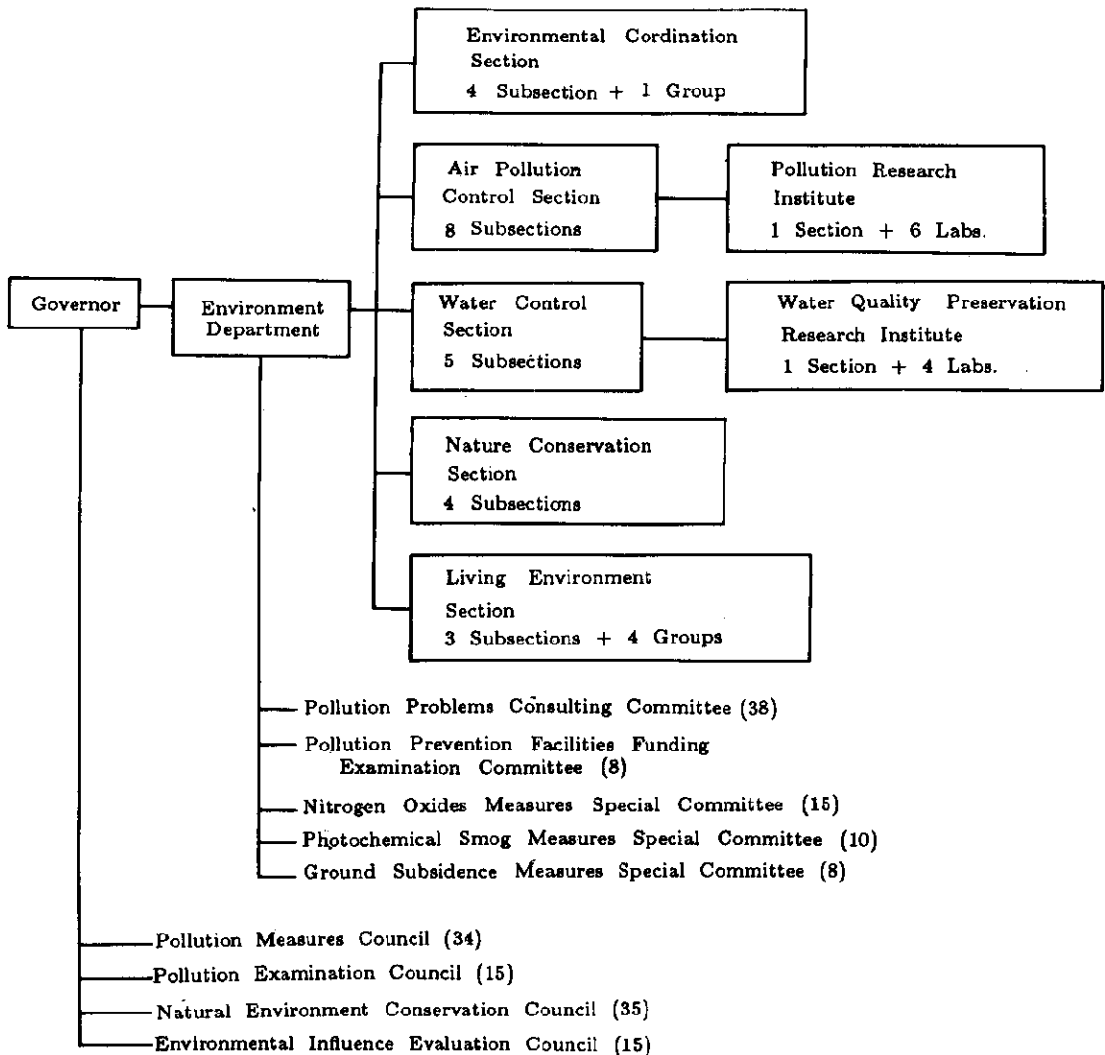


Fig. 7 The organization of Environmental Department of Chiba Prefectural Government. Numerals in () are number of members.

The total number of persons excluding the members of councils and committees is 229.

Among the councils, Pollution Measures Council is the highest authority consisting of 4 prefectural assembly members, 10 expertises, 7 enterprise representatives, 7 inhabitant representatives and 6 special members concerning the basic problems of pollution. Pollution Examination Council is the organization established based on the law to deal with the troubles caused by pollution.

Among the committees, Pollution Problems Consultation Committee is an organization established in the prefectural government the members of which are consisted of managers and chiefs of related departments, sections and institutes.

Annual budget of environment

Table 4 shows the annual budgets of Chiba Prefecture in the unit of million yen for 1987 and 1988. For the sake of comparison those of Chiba City, prefectural capital with population of approximately 800000, are listed in the Table as well.

Table 4 Annual budget for environment excluding salary and administration expenses

Elements	unit: million yen			
	Chiba Prefecture		Chiba city	
	1987	1988	1987	1988
General measures	1017	943	862	900
Atmospheric environment	622	614	203	156
Water quality	21936	23988	12046	15385
Ground subsidence	3971	2647	4	4
Noise, Vibration, offensive odor	65	79	10	5
Natural environment	10179	14374	6253	6433
Wastes	524	631	3929	2710
Others	227	263	15	37
Sum total	38541	43539	23322	25630

ENVIRONMENTAL MANAGEMENT PLAN

To keep a good environmental condition, the realization of importance of environment by individual persons is of the utmost importance. Chiba prefecture has published 176 pages "Chiba Environment Plan for Better Environment: consisting of 5 chapters: (1) Introduction, (2) Status of Chiba, (3) Basic problems for the better environment, (4) Environmental features in each district and themes for better environment, (5) Data. The plan is a basic philosophy and guideline that all persons in administration, business circles and inhabitants must follow. In each city, town and village now efforts are made in realizing the plan.

APPENDIX

Environmental quality standards (E. Q. S.)

1. E. Q. S. for ambient air

Sulfur dioxide (SO ₂)	Daily average of hourly value	max. 0.04 ppm
	Hourly value	max. 0.1 ppm
Carbon monoxide (CO)	Daily average of hourly value	max. 10 ppm
	Average of hourly value in 8 consecutive hours	max. 20 ppm
Suspended particulate matter*	Daily average of hourly value	max. 0.1 mg/m ³
	Hourly value	max. 0.2 mg/m ³
Nitrogen dioxide (NO ₂)	Daily average of hourly value	within the range between 0.04 ppm and 0.06 ppm or below
Photochemical oxidants**	Hourly value	max. 0.06 ppm

Note 1 Measurement will be practiced with the designated method at the place where the polluting state can be recognized to represent the ambient condition.

Note 2 Designated industrial areas, driveways and other areas or spots where the ordinary civil life is not carried out are excluded from these standards.

* Suspended particulate matter: airborne particles of 10 micrometers or less in diameter.

** Photochemical oxidant: oxidizing substances such as ozone and peroxyacetyl nitrate (PAN) produced by photochemical reactions.

2. E. Q. S. for water quality

(Unit: mg/L unless otherwise noticed; measuring method is designated to each item)

(1) Standard relating to human health (Hazardous substances)

Standards are indiscriminate all aquatic areas

Item	Standard value, mg/L
Cadmium	0.01
Cyanide	not detectable
Organic phosphorous*	not detectable
Lead	0.1
Hexavalent chromium	0.05
Arsenic	0.05
Total mercury	0.0005**
Alkyl mercury	not detectable
PCB (polychlorinated biphenyls)	not detectable

* Organic phosphorous includes parathion, methyl demeton and E. P. N.

** Standard value for total mercury is based on the yearly average value.

(2) Standards relating to living environment
 Standards are set up by classifying the public water area into categories of utilization purposes

Category	pH	BOD		COD*		Suspended substance, max.	Dissolved oxygen, min.	No. of coliform		Others
		max	max	max	max			group bacteria, MPN/100ml**	group bacteria, MPN/100ml**	
River AA	6.5-8.5	1	—	—	25	7.5	50			
A	6.5-8.5	2	—	—	25	7.5	1000			
B	6.5-8.5	3	—	—	25	5	5000			
C	6.5-8.5	5	—	—	50	5	—			
D	6.0-8.5	8	—	—	100	2	—			
E	6.0-8.5	10	—	—	—*	2	—			* Floating matters, garbages should not be observed
Lake AA	6.5-8.5	—	1	1	1	7.5	50			
A	6.5-8.5	—	3	5	5	7.5	1000			
B	6.5-8.5	—	5	15	15	5	—			
C	6.0-8.5	—	8	—*	—*	2	—			* Floating matters, garbages should not be observed. n-Hexane extracts should not be detectable.
Sea A	7.8-8.3	—	2	—	—	7.5	1000			
B	7.8-8.3	—	3	—	—	5	—			
C	7.0-8.3	—	8	—	—	2	—			

* COD: Chemical oxygen demand measured with potassium permanganate method.

** MPN/100ml: most probable number in 100ml.

(3) Standards of nitrogen and phosphorous concentrations in lakes

Standards are set up by classifying lake areas into categories

Category	Nitrogen	Phosphorous
I	0.1	0.005
II	0.2	0.01
III	0.4	0.03
IV	0.6	0.05
V	1.0	0.1

3. E. Q. S. for noise

Standards vary depending on the area and division of hours in a day

Unit: maximum value in dB(A)

Category of areas	Day time	Morning and evening	Night time
AA	45	40	35
A	50	45	40
B	60	55	50

Different standard values are set up for main roadside areas

(Other E. Q. S. for noise for specific purposes: aircraft; shinkansen superexpress railway)

(1) E. Q. S. for aircraft noise

(2) E. Q. S. for Shinkansen (superexpress railway) noise