

## Chapter 21 SUMIDA RIVER

### Symbol of Edo and Tokyo Which Revived at the Olympic Games...

#### 1 Introduction

Sumidagawa River is the typical one that flows in the center of Tokyo from an old time, and which have appeared in poems, songs and literature mostly. In days of old, it was a down stream part of the Arakawa River. A bypass was made to prevent the damage of the large flood, which leaned a lesson for the typhoon in 1912. Now, a down stream from Iwabuti sluice gate (23.5km of length) is called Sumidagawa River. The width of Sumidagawa River is about 100m in upper part, while it is about 150m in a downstream. The depth of Sumidagawa River is 4-6m near Ryougokubasi bridge. The area of Sumidagawa River basin is 331.9 km<sup>3</sup>, including its branches. Sumidagawa basin is the main part of the capital where 4,318,000 peoples (40% of the whole population in Tokyo) live. Singasigawa River, Syakujiigawa River, Kandagawa River, etc. flow into Sumidagawa River . A great portion of Sumidagawa River is tidal area and drainage of four sewerage treatment plants has influenced river water greatly and water of Sumidagawa River is exchanged for water of Arakawa river. For this reason the

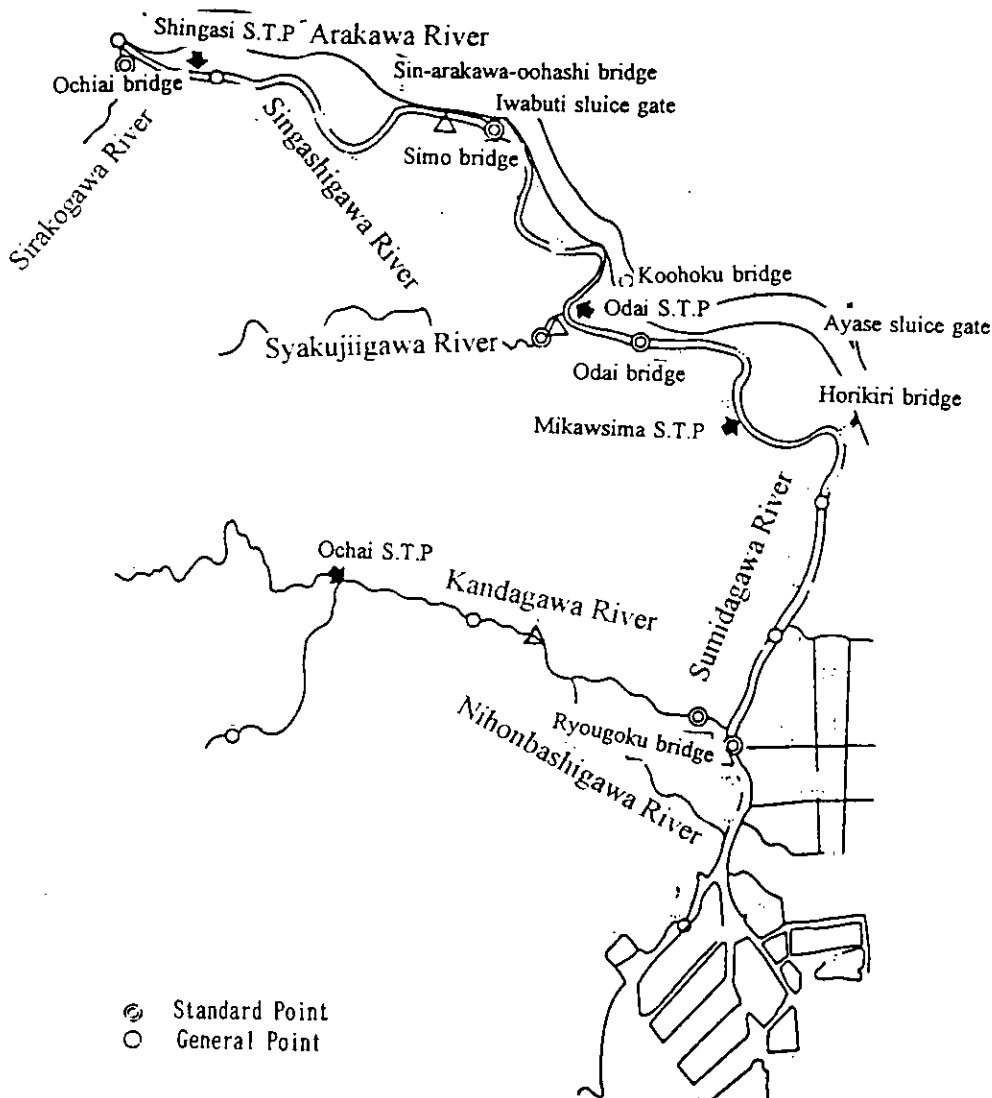


Fig.21-1 Location and components of Sumidagawa River Watershed

flow of Sumidagawa river is completely complicated. The hydraulic gradient of the river is small about in 1/10,000 and winds along greatly area. It takes 3-4 days to flow from Iwabuti sluice gate to the mouth of the river, since it tend to stagnate in response to the influence by low and high tide.

Once, in Sumidagawa River, people enjoyed swimming, or the regatta , and ate Japanese Icefish and corbiculae and had scene of peace and quietude that Pon-pon ship were going up and down. In Showa, times became good by special war demand and city development was promoted and the conditions in which river exists got worse. According to the investigation report which the Tokyo Metropolitan Health Experiment Station performed in 1940, chemistry factories and dyeing factories began to increase at the upstream part of Sumidagawa River , so that BOD indicated 10 PPM at the Senjyuohasi bridge point, while it was 5 PPM at Ryougokubasi bridge (all was examined by sewerage examination method of those days).

Outbreak of war, and end of the war. Japanese economy recovered from damage of second world war, and industrial recovery was accelerated with special industrial demand by the Korean War. It was around 1952 that Japanese economy recovered from war damage and population and economy returned to the level of prewar days mostly. From these days, water pollution of the Sumidagawa River begins to be became unable to survive. The fish, Colbiculae, Sand worms, and Itome became to live, the right of fishery were lost in 1962. On after the year in which Japanese economy exceeds a level prewar days and began new growth , Sumidagawa River which is the symbol of Tokyo deteriorated to the dirty river that produced offensive odors. The river died. The toxic gas corroded the metal products and metal parts at



Fig.21-2 Water Pollution at Asakusa bridge

the riverside home, shop and factory etc. and that made changed color the Buddhist altar fittings and image of Buddha at the Temple Sensouji. And which injured the inhabitant's health, the cough and nausea had became chronic sick. The cause of pollution at Sumidagawa River was the inflow from the non-seaward area, majority of basin. Specially, the factory sewage from the Singashi riverside area, in which crowded about 1,000 large and small factories had exerted specially influence. According to the damage became serious, Tokyo Human Right Protect Committee had appealed hard the improvement conditions to the relational institutions, and the water pollution at Sumidagawa River had become seriously the social problems. In 1961, Ryougoku Fireworks Convention and Soukei Regatta, that was sociable Sumidagawa River Features had unavoidable canceled.

## 2. Transition of Social and Natural Conditions of Sumidagawa River

### 2.1 Transition of water quality of Sumidagawa River

According to the change of water quality after 1959 as shown in Fig. 16-3, water quality became bad remarkably from around 1955. Sumidagawa River was heavily in 1962-3 polluted so that BOD was 63 PPM at Odaibasi bridge. After 1964-5, it improves quickly about 20 PPM of water quality. It becomes after that cleaner and after 1985 were set to 10 PPM or less. However, almost all water quality is not improved after that.

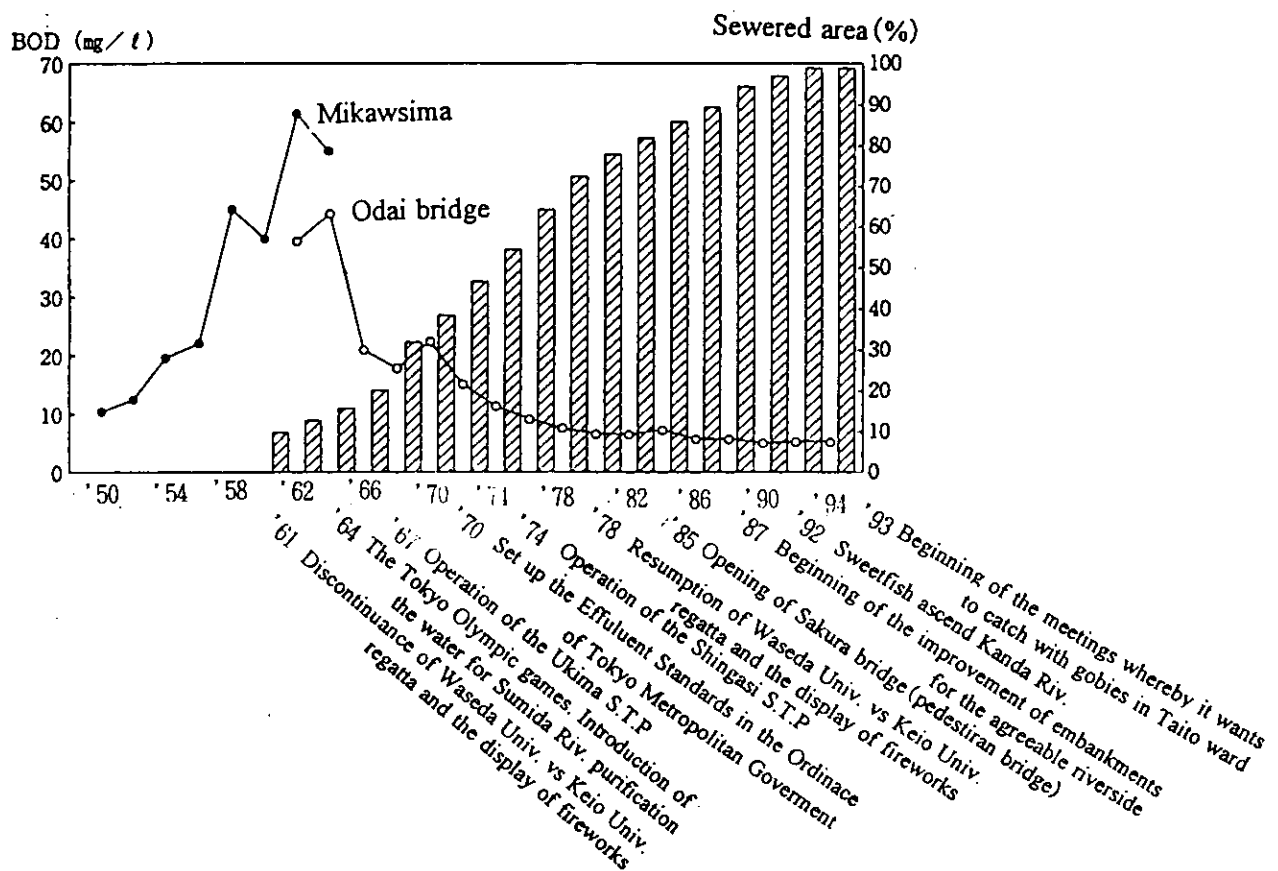


Fig.21-3 Change of water quality of Sumida Riv. and sewered area

## 2.2 Transition of Cause of Sumidagawa River Water Pollution

According to Economic Planning Agency data, the BOD load discharged to Sumidagawa River was 195 ton per day around 1960. As for the items, 32% was discharged from household and 68% from factories (among those 53% large-scale factories). So large-scale factories had much BOD load. And the drainage volume was almost double upper river flow rate in those days. Then in 1995 when 35 years passed from the investigation of Economic Planning Agency, the drainage discharged into Sumidagawa River is mostly from sewerage facilities have spread in the most part of Sumidagawa River basin. Therefore, almost all discharge water to Although household wastewater drains to Sumidagawa River a little, it ceases to drain from factories to the river. The BOD load in 1995 was 15.7t/d. It is below 10% of that around 1960.

## 3 Match to the Improvement (before 1969)

### 3.1 Regulation of Factory Effluent

After the war, industrial activity recovered rapidly and complaints about smoke, industrial activity. Such a problem over a very wide area began to advance. In response, in August 1949, Tokyo Metropolitan Government enacted "Industrial Pollution Prevention Ordinance" which is the first pollution regulation ordinance, by local government in Japan. It establishes that a developer needs to get the governor's approval before building or extending his factory. It would be dependent on an administrative guidance. It was unable to define the effluent standard and structural standard.

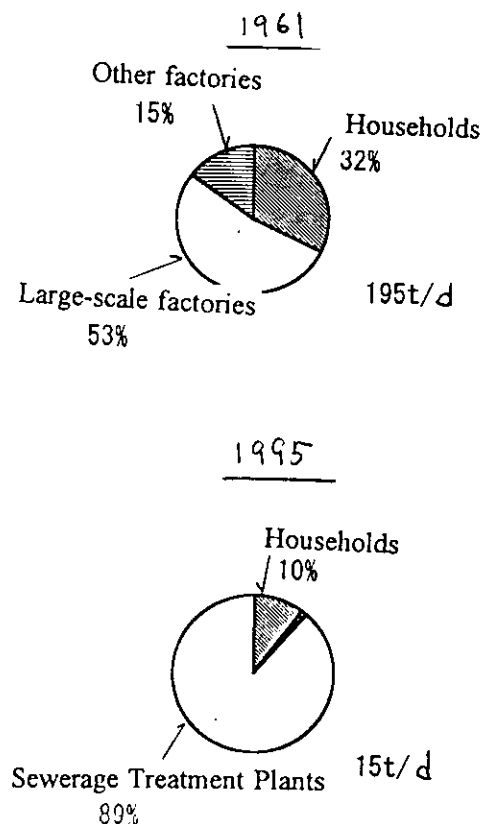


Fig.21-4 BOD load into Sumida Riv.

According to the industry development, the water pollution, of river began to have been conspicuous from around 1952-53 years. The antipathy of fishermen increased suddenly to the factory which was passing drainage. At last, in June 1958, about 1000 fishermen crowd to Honsyuu Seishi Edogawa paper mill factory, and a violent crash occurred. Since the Semi Chemical Pulp Production equipment which began to operate in March discharged effluent into Tokyo Bay via Edo River and it annihilated fish, shellfish, etc. that incident broke out. It was the incident against which it protested that a company resumed discharge while it had not agreed (fishermen's groups had required that effluent purified to a company frequently). This incident gave a big shock to not only Tokyo Metropolitan Government but National Government. National Government proclaimed " the Public Water Zone Conservation Law ( abbreviation PWZCL )" and "Industrial Effluent Control Law" by state in December, 1958.

Then specified water area and its water quality standard of Edo River were designed in 1962. However, it was 1964 when specification and water quality standard of Sumidagawa River were designed since it took much time in the procedure of a specified water area system. It passed 6 years since PWZCL was established. As mentioned above, various factories had large rate in pollution source into Sumidagawa River. Then, National Government considered the system which differs from the case where the water quality standard of Edo River or Tamagawa river is defined, about the water quality standard of Sumidagawa River. That is, although it set up a standard uniformly to all types of industry in principle, it took the following conditions into consideration further, the public sewerage system stage, planed area, the existing factory or the new factory. This is called system of urban type river. It was specified as Arakawa River basin Kou(it is Sumidagawa River basin) in 1964. A water quality standard was also set up. As a desirable goal, it considered revival of extraction of Japanese icefish in Sumidagawa River. However, the water pollution of Sumidagawa River of those days and concept of PWZCL which harmonizes industrial activity with the environmental preservation were taken into consideration. Since it judged that early realization of desirable goal was difficult, it will be decided that water of Sumidagawa River does not generate a bad smell at least. At the last moment, as water quality of the minimum level, BOD decided on 10 PPM or less, and DO decided on 1 PPM or more.

Tokyo Metropolitan Environmental Pollution Ordinance and a smoke prevention ordinance (enacted from a law before) overlapped a law. A pollution phenomenon is expanded quantitatively and diversified. Therefore, July, 1969, Tokyo Metropolitan Government collects these ordinances, and enacted Tokyo Metropolitan Environmental Pollution Ordinance. Moreover, each division and a city get the section take charge of, office work is expanded, and an administrative net spread.

### 3.2 Construction of Joint Wastewater Treatment Plant for Only Industrial Effluent (Ukima Treatment Plant)

Although it traced back a time, it determined holding of an Olympic Games Tokyo convention in 1959. Main concepts of the enterprise relevant to Tokyo Olympic Games considered as the holding city (probably, it will attract attention in the world) were a environmental protection

and institution maintenance suitably and wonderfully. However, Sumidagawa River which is the symbol of Tokyo became lifeless river. The greatest point of the measures for Sumidagawa River purification which started in 1962 was construction of Ukima Treatment Plant which collected and processed the industrial effluent located along with Singasigawa River. Since most factories located along with Singasigawa River were minor, Tokyo Metropolitan Government built Treatment Plant for only industrial effluents. That is, in order to carry out waste water treatment for every factory, there are restrictions of management, narrow space, etc. and the direction which treated together was considered that the effect of waste water treatment can expect immediately.

Construction of Ukima Treatment Plant started from February 1964. Ukima Treatment Plant collected and treated effluents (210,000m<sup>3</sup>/day) of 730 factories and household effluents (80,000m<sup>3</sup>/day) which were located in 1,087ha in alignment with Singasigawa River. The target of the treated water quality was BOD 120 PPM which was the effluent standard of Sumidagawa River. The treatment water of Ukima Treatment Plant was sent to Singasi sewerage treatment plant. It was further treated to the effluent standard of sewerage treatment plant (BOD 20 PPM) by Singasi sewerage treatment plant. April 1966 Ukima Treatment Plant began treatment with a part of institution. And it also started charge collection of treatment expense. Since it decided that it collected from the factory which drained more than 1000,000m<sup>3</sup>/day, it only collected charge from about 15 factories.

However, the system was a new system without a similar example. Therefore it received criticism which is not few. When the effluent from various factories was mixed, problems were included in the system of waste water treatments (technical level of those days). For example, since it was disadvantageous to the whole treatment, chemical treatment was stopped soon. Furthermore the investigation result that Activated Sludge Process has not treated the heavy metal contained in industrial effluents was also announced. Ukima Treatment Plant was one urgent measure trial to the last. Social requests changed about treatment of industrial effluents. Effluent regulation was also strengthened. Therefore Ukima Treatment Plant was abolished. However, in each factory instruction, it mentioned the result not obtained. And it is estimated that it brought noteworthy results to water-quality purification of Singasigawa River and down-stream Sumidagawa River.

### 3.3 Introduction of Water for Purification

It was the unusual water shortage called "Tokyo desert" in 1964. The rate of restriction water supply became 50%. Since Tokyo Olympic Games was due to be held soon, it needed to secure water-service resources. Therefore it was constructing the institution for leading river water of Tonegawa River to Arakawa River hurriedly. It will be used also for the thing with which the surplus of introduced water diluted polluted Sumidagawa River and which it also purified. The amount of use was provisionally set to a maximum of 23.4 m<sup>3</sup>/s. Use conditions were as follows. (1) It divides into Singasigawa River at the time of ninety-five days discharge of Arakawa River, and it introduced into Sumidagawa River further. It has purified Sumidagawa River. (2) When surplus water is in Tonegawa River and a margin was in the

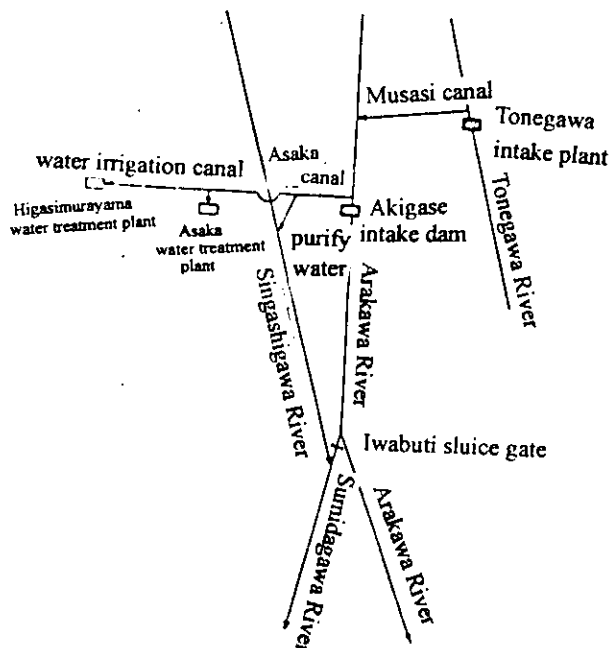


Fig.21-5 Water system for cleaning up Sumidagawa River

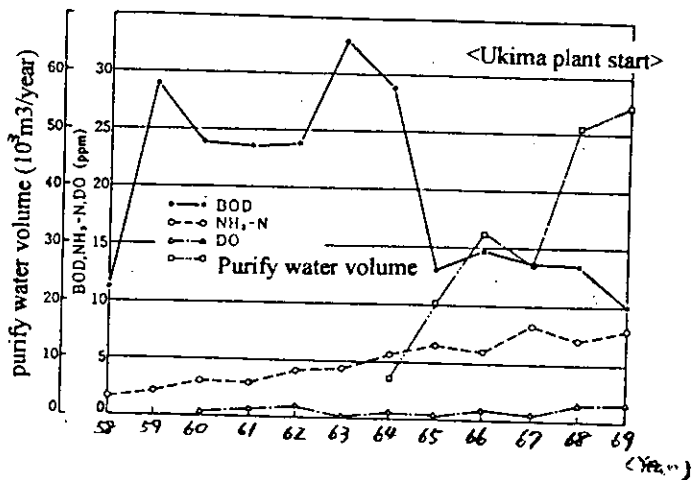


Fig.21-6 Change of Sumidagawa River quality(Ryogoku bridge) And Flow rate for river cleaning up

capacity of the connection waterway between Tonegawa River and Arakawa River (Musasi waterway), it was that which introduces the surplus of introductory water from Tonegawa River to Arakawa River into Singasigawa River.

The price of the construction expense of a purification waterway was 2,750,000,000 yen. National Government paid 10%. The prediction and the actual result about the effect of the measure against purification are shown at figure 16-6. Also by Ryogokubasi bridge located in the lower stream of a river of Sumidagawa River, water quality has been improved greatly these days. It tried introduction of water in September and October, 1964. May, 1965 or later, when a margin is in the river flux of Arakawa River, it has always introduced water for purification into Singasigawa River. Therefore, it cannot necessarily secure fixed flux continuously. The result introduced into Singasigawa River in 1994 fiscal year as water for purification was as follows. The maximum flux is 21 m<sup>3</sup>/s. Flux was 4.5 m<sup>3</sup>/s above the half of the days of the fiscal year. Incidentally, 4.5 m<sup>3</sup>/s (about 400,000 m<sup>3</sup>/d) is equivalent to the amount of effluents of Ochiai Treatment Plant (Kandagawa River basin).

### 3.4 Public Sewerage System Construction

In 1959 Tokyo Metropolitan Government improved ten-year extension sewerage system plan. It will spread sewerage works powerfully. The plan was large revision which increased project cost from 36.6 billion yen to 65 billion yen and which planned to have raised severed

rate (area) from 28% to 42% at 1966 ends of the year. Furthermore Tokyo Metropolitan Government decided upon Program for Sewerage Construction newly in January,1961. Furthermore since purchase of the land by which road construction was planned was settled temporarily these days, it invested capital in spread of sewerage system intensively. Thus, as a result of promoting spread of sewerage works powerfully at the time of the Olympic Games, Sewerage rate (against area) became 26% 1964. In the inner side of Japan Railway Ltd. Yamanote Line, spread of sewerage works was completed mostly. Odai Treatment Plant started sewer treatment in 1962. Otiai Treatment Plant also attracted in March,1964. Consequently, in the ward area, it began to treat sewage by five Treatment Plants with Mikawasima Treatment Plant, Sunamati Treatment Center, and Sibaura Treatment Center.

### 3.5 Monitoring, Regulation, and Instruction

#### (1) Actual regulation instruction to factories

Since water resources accessed our country comparatively easily, it did not have idea in the device which uses water rationally. Rather, the thought of flushing impurity with water is deep-rooted. After almost all factories thinned their effluents, it had discharged.

As it already stated, it took time in State setting up the water quality standard of Sumidagawa River, as for the time of PWZCL. In the meantime, Tokyo Metropolitan Government created the instruction standards of a waste water treatment uniquely. It had begun large-scale establishments instruction as a starter by it. Especially about metal product manufacture business (plating business), Bureau of Environmental Protection, Bureau of Sewerage, and Bureau of Public Health have a liaison committee, and it tried hard so that it might not become scattering instruction. Bureau of Environmental Protection created and guided the structure standard about the waste-water-treatment institution from plating business.

The personnel of those days are telling as follows. "Those days, there were no reference book and instruction document to waste-water-treatment institution. There were not personnel who did instruction experience, at all. Therefore, we investigated the water quality and the flux for every process together with the person in charge of the factory. In order to treat a effluent stable efficiently, we investigated the effluent from which process has influenced bad. Consequently, it was able to make BOD concentration of a effluent low as a result by recovery and reuse of solvent or materials. In plating, we proposed installing a recovery tub at a washing process, and changing the flush method into the multi-stage cascade flush method in the plating company. Consequently, effluent concentration became low. And the quantity of water which it used for washing decreased. The company, it was thankful to us".

Although direct penalty regulation was incorporated by Water Pollution Control Law, Tokyo Metropolitan Government guided an improvement by the means of notice and warning based on the analysis result of the effluent which it sampled when the personnel were the inspection. Moreover, we assemble the enterprise person and held schools. They were because it helps understanding of the principle of a waste water treatment, the waste-water-treatment method, and maintenance management and it puts practice into practice. Furthermore, the person who does not improve enough emits an improvement command and performed



sanction of having released nomination to society simultaneously. Occasionally, we guide a middle-scale factory intensively and made it improve first. It made the improved institution take and inspect big factories after that. And we also adopted the method of making make learn and improve from the factory of a scale smaller than they (in order breaking their stubborn attitude not to accept our improvement policy simply).

(3)Instruction of the waste water treatment of a housing complex. A large-scale housing complex came to be built by Tokyo area one after another from around 1960. These housing complexes were the upper-layers buildings from the request of a sudden rise of a land price, nonflammable housing, the increase in efficiency, etc. of a residence. As for a rest room, a flush system began to be adopted. The population density was 300-600 per 1ha. The population scale was mainly about 2,000 from 20,000 persons. Population density (per ha) was larger than an average of 158 persons and a maximum of 285 (that time) in the ward area. The population was equivalent to the population of the towns and villages of Tokyo area. If such a large-scale high-density set residence appears in the country zone which is not perfect not to mention sewerage works even as for the construction of a effluent wastes. When a human waste and a other kinds of liquid waste are discharged there, water quality about there will deteriorate remarkably by them. In therefore, the district considered that sewerage works does not spread soon. Therefore, we taught the chief mourner who builds a set residence, after Showa 38, in the district considered that sewerage works probably will not spread soon so that it might install community plant based on the structure standard which Tokyo Metropolitan Government made uniquely. The structure standard as the system which it purifies after uniting a human waste and a other kinds of liquid waste. The purification capability was the same as the water quality treated by public sewerage system Treatment Plant almost. By 1970, installation of community plant became the scale which can purify about 500,000 persons' sewage a total, including a plan.

### 3.6 Dredging

After the war, earth and sand had flowed and deposited from the upstream each river in the city of Tokyo. Wreckage, such as the building destroyed by war, was thrown away into river. Dust was also so. Industrial effluents and sewage flowed in further. Therefore rivers were polluted remarkably. 1957, sludge accumulates on the bottom of Sumidagawa River, and it floated as scum or the bad smell of hydrogen sulfide came to occur. It was the necessity on a flood control. It also came to cause trouble again to operation of a ship. Then Tokyo Metropolitan Government added measure against river pollution to a river enterprise newly. Water pollution control and the improvement in water quality will be aimed at. Since it obtained national subsidies as a river water-pollution measure enterprise in the 1958 fiscal year, it started dredging, such as Sumidagawa River. Based on the river dredging emergency 5-year plan in the Showa 34 fiscal year, and the Long Term Planning for the Tokyo Metropolis which started from the 1961 fiscal year, the dredging enterprise was performed further. It carried out the dredging of all the rivers 3 times for 10 years till the 1967 fiscal year. The total of the amount of dredging was shown in figure 21-7. It is understood that a dredging was intensively carried out in three terms at the first. The amount of dredging was about 6000,000

Then, in the Tokyo Environmental Pollution Control Plan, It gives priority to deposited dirty mud of the remarkable river of water pollution, it starts a dredging, and it expected purification of river water quality. Every year, a part of Sumidagawa River is put on the list which should give priority to a dredging. It is carrying out the dredging (it also appointing a zone one by one every year now) of the Sumidagawa River. The amount of dredging is 70,000 - 90,000 m<sup>3</sup>. And, these costs have exceeded 200,000,000 yen every year in recent years.

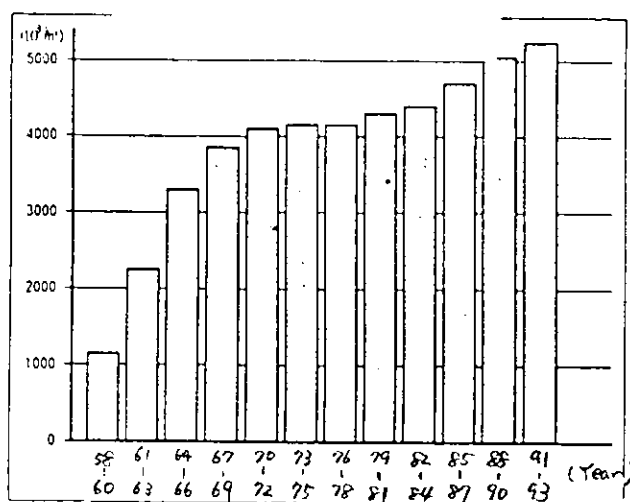


Fig. 21-17 Dredged up sludge from Sumida Riv. (cumulative)

### 3.7 Relocation of Factories

#### (1) Relocation of large-scale factories

In order to restrict new extension of a large-scale factory, a university, etc. considered to be the important factor of the increase of population in an established city area. The Law about Restriction of the Industry in the established city area of a metropolitan area etc. (The Law of Restriction for Industry Development) was enacted in March, 1959. The new extension of the factory where work area is larger than the area restricted by the law became impossible in the restriction area. The Law of Restriction for Industry Development, and The Cabinet Order of PWZCL and Industrial Effluent Control Law proclaimed by making the time the same. There were also companies which transferred from a metropolitan area or relocated the production section out of a capital in the company which aims at an enterprise expansion and new deployment of factories.

Transition of the number of factories in Sumidagawa basin area in the 1950s is shown in figure 21-8. The population of Tokyo Metropolis continued increasing in spite of the Law of Restriction for Industry Development enforcement. Population in Sumidagawa River basin and the factories located in the area, it has changed from the second half of the 1950s to leveling off or reduction first in the 1960s.

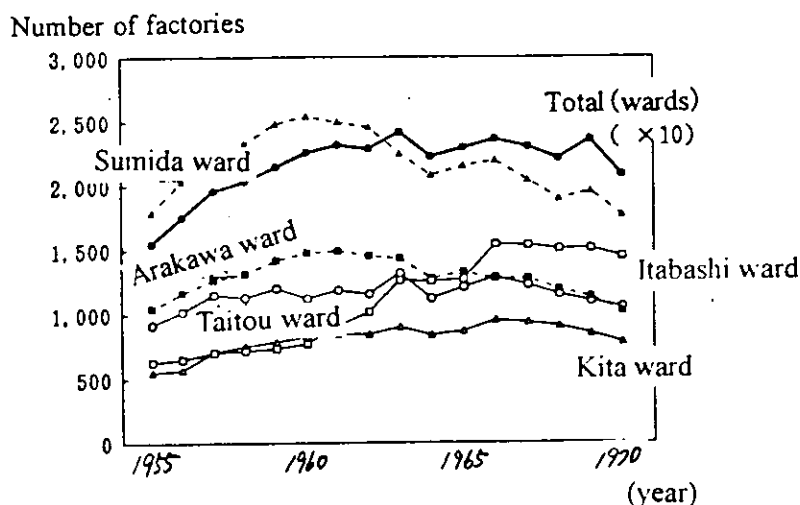


Fig. 21-8

Change of the number of factories of Sumida Riv. watershed (more than 10 employees)

(2) Support, relocation and collectivization for the environmental protection to the factory of a minor scale

In the city of Tokyo, about 80,000 factories were in 1968. That these factories were intermingled with dwellings had caused complaints and petitions of residents. For these solutions, those cause persons install environmental-protection equipment, and public hazard must be made not to generate them. Relocation itself hardly contributes to production. Considerable expense is required for relocation. Therefore, especially relocation has large economical burdens for minor enterprises. As for Tokyo Metropolitan Government, minor enterprises have promoted the constructions of the measure against a environmental protection. Tokyo Metropolitan Government facilitated the provision of financial aid, such as capital for facility improvement, capital for factory relocation, recommendation to financial institutions and subsidizing interest payments. Prevention of public hazard was difficult for pollution-causing factory, such as casting factories and "the bowel and bone of fishes" factories (it carries out heating cooking of the internal organs and the bone of fish, and it extracts oil etc.), very technically. Therefore, effective measure was dividing the area of residences and factories, i.e., group relocation was carried out to the place suitable for the factory working. In order to promote factory relocation, Tokyo Metropolitan Government purchased their former sites. It purchased the relocation former sites of 57 companies 62 factories, and about 700,000 m<sup>2</sup> by 1969 fiscal year. In the land which it purchased, it built 7899 residences, 27 parks, seven playing space, etc.

#### 4 Match of Improvement ( Later 1970)

##### 4.1 Setup and Reinforcement of Environmental Quality Standards (EQSs)

The Basic Law of Environmental Pollution was enacted in 1970. Based on it, it specified E category of Sumidagawa River. In this way, EQSs of Living Environment became less than BOD 10ppm by cabinet-meeting determination. In order to attain the standard, promoting spread's of sewerage system much more and dredging were needed. The water quality of Sumidagawa River has improved and a social request changed. The EQSs of Sumidagawa River was ranked with D category (BOD8ppm) in 1975 .

##### 4.2 Reinforcement of Effluent Regulation

The two old water pollution control laws were abolished, and The Water Pollution Control Law was enacted in December, Showa 45. Nationwide coverage of standard of enforcement standards was provided. In the law, it set the effluent uniform standards from establishments such as BOD120ppm (day average) in the whole country. And power was delegated to prefecture governor regulation to authorize stricter if necessary to achieve environmental quality standards. Since the Law was enforced, a capital revised Tokyo Metropolitan Environmental Pollution Control Ordinance which it was preceding enforcing in January, Showa 47. The effluent standard of establishments with many effluents ( it prepares newly ) set up severe value, such as BOD 20ppm ( it considered as limit of effluent treatment of those days). Then, the effluent standards was revised in Showa 53. Even when it was existing, BOD is set to a maximum of 20 PPM, and established sewerage treatment plant also came to correspond to this.

Moreover, although regulation of direct penal regulations was defined, since Tokyo performs the fine administrative guidance to the violation enterprise place which had the beginning near the half, and it raised efficiency application was few. One time of those days, on the other hand, the Metropolitan Police Department often performed criminal accusation without warning.

##### 4.3 Reinforcement of monitoring system

For prevention of water pollution, while strengthening regulation of generation sources in one side, it always needs to monitor river water quality continuously. It needs to be useful also to early detection of unusual water quality (for example, accidents of which fish died by the effluent containing toxic substances) while using for judging effect of the measure for water-pollution prevention. Tokyo Metropolitan Government is investigating the water quality with the duty which it defined by Article 16 in Water Pollution Control Law. In addition to this, it prepares monitoring stations in rivers from 1972, it transmits water quality in telemeter, and it always monitors intensively in the control center. When it became late after 1965, the accidents of fish dying by outflow of cyanide from factories occurred frequently. Therefore, it installed cyanide meter to 120 factories by initiative of the Ministry of International Trade and Industry among 607 factories which were using cyanide. State and Tokyo Metropolitan Government paid expense equally. It gave priority to and installed the factories which discharge effluents to the river used as the source of waterworks. There were unsolved

problems on measurement. For example, as for the measurement by cyanide meter, chloride existence caused with error. Installation of meter had a big meaning of having carried out self-management, in effluent water quality.

#### 4.4 Spread of Sewerage Works, and improvement in treatment technology

By spread of sewerage works, the industrial-effluent and households wastewater which discharge to Sumidagawa River directly was also exhausted. BOD has already attained EQSs and has been improved with about BOD 2-4 PPM by Ryougokubasi bridge on a lower stream of the river. Transition of the amount of BOD loads from Showa 51 is shown in figure 21-9. It is because that excellent sewage treatment technology introduced and maintenance management technology improved by sewerage treatment plant that the amount of loads is not increasing so much although sewerage works spreads. Now, most effluents are sewerage treatment plants in the river basin, and it came to occupy 60% of river flux. Therefore, it came to depend on the treated water quality for the water quality of river greatly. Moreover, DO becomes low especially in summer and is set to 5 PPM or less (the lowest DO that fish can survive is called). Thus, nevertheless, DO is not recovered [ to which BOD of Sumidagawa River fell ] so much, A cause is in the above-mentioned smallness of that ammonia oxidizes to nitric acid, and the purification capability of Sumidagawa River. The tidal river like Sumidagawa River is a gentle stream. Since a retention time is long while the oxygen supply from the atmosphere is small, consumption of DO becomes large and, as a result, DO tends to become low. River basin is anxious also about water pollution by to prevent polluted first flush of 23 Discharge Pump Stations from flowing into the receiving water in the early stage of rainfall.

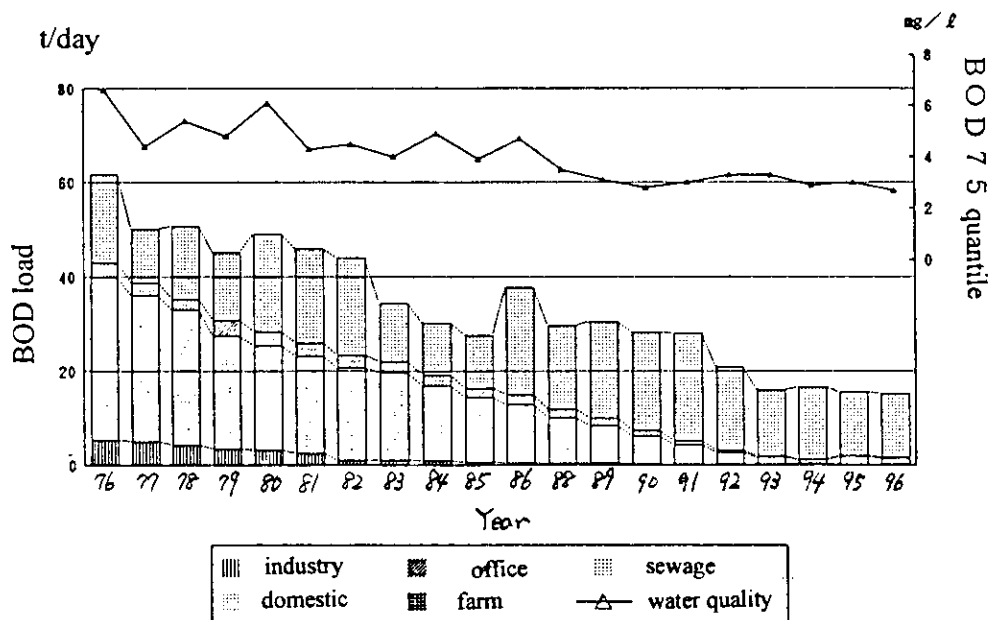


Fig.21-9 Change of BOD load into Sumidagawa River and its water Quality

#### 4.5 The example according to Principle of PPP

There is example of dredging where the pollution person undertook a burden. The following thing became clear by 'Check Investigation, such as the national mercury contamination', in 1973. The mercury manufacture factory in the upper part right bank in corner Sumidagawa River, discharged sludge containing inorganic mercury to corner Sumidagawa River in the manufacture process of sodium hydroxide by the 1955 mercury electrolytic method. Because of it, the mercury concentration in bottom deposit of a river exceed 25 PPM which is a removal standard, it is detected, and there were the highest value 180 and 8400 m<sup>3</sup> of an average of 66 PPM mud a total. The enterprise puts investigation and examination on the responsibility of an enterprise under the administrative guidance of Tokyo according to the principle (Principle of PPP) of the pollution person burden of public hazard, and it carried out dredging, supervising by applying for 6 month from December,1975. It send high concentration pollution soil to Hokkaido and it is processed, and after placing the polluted mud temporizing, others are confined into the concrete wall prepared in site underground after medicine processing, and became Harappa (free open space) of a public lot behind. This company also has the location restricting methods, such as industry, and the trend of drainage regulation, and it transferred it to the industrial complex of Kashima and Ichihara ignited by these incidents.

#### 4.6 Improvement Works for creating an Agreeable Riverside Environment

In Sumidagawa River, tankers, the cargo boats and the water-buses of about 200 boats have gone back and forth on one. The riverside terrace which people brought close to the water's edge was also extended considerably (14.6km of cumulating , the end of the Heisei 6 fiscal year). The transparency has become about 40 cm, a little muddy, and, by the way, as for the water surface which it sees to 1m of views, a sewerage smell is felt. According to the latest living-thing investigation, both the number of the kinds and the number of individuals are few. Recently carp and crucial carp were collected by at Odaibasi bridge, and Sardinella zunasi, sea basses etc at Ryougokubasi bridge. At Sakurabasi bridge (It being down-stream from Odaibasi bridge) Gobies fishing convention was started from Heisei 6. By Kandagawa River which is branch of Sumidagawa River, natural sweetish had gone back also 1994. We conjectured which passed through near Ryougokubasi bridge of Sumidagawa River. However, it only passed these fish. It has not recovered Sumidagawa River which fish can live. As these causes, we have considered river structure besides the problem of the water quality (DO and NH<sub>4</sub>-N are included) which it mentioned above. Even when it becomes familiarization with water terrace, mostly, since concrete and sheet piles are continuing all of the water's-edge, so the aquatic plants is absent. Therefore habitation of water student living things is difficult. tideland transitionally made in the Sirahigebasi bridge upstream on the terrace under construction ,There was a newspaper report that Little Egret was coming. There, the small fish which Little Egret eats was breeding.

#### 5 Postscript

Population and operating central functions concentrate extremely and the rivers which

became serious illness have revived as the symbol of Tokyo by effort of people at the time of the Olympic Games. Although Sumidagawa River did not necessarily drink the river water directly, it was what which moistens the heart and the body of people's, who live from the ancient times of Edo there, is important. Now, it is returning for our hand. In order to cancel uneasiness which faces a calamity, it improved the Super Embankments and Sirahige disaster-prevention district. As it stated until now, it recovered water quality. By building familiarization with water terrace, it enabled to approach the water surface. It began effort that it is regaining prosperity in water-buses, houseboats, fireworks conventions, etc. and it will call backing things. We attempt to revive ferry boat.

In the Sitamachi, peoples and administration will try hard so that Sumidagawa River may revive friendly and freshly.

#### Reference

- 1) Tokyo Metropolitan Government: Environmental Pollution and Tokyo Metropolitan Government, (March, 1970)
- 2) Tokyo Metropolitan Government: The history of Tokyo Metropolitan Government 50 years (December, 1994)
- 3) Tokyo Metropolitan Government, Bureau of Sewerage : Centenary of sewerage works in Tokyo (May, 1989)
- 4) Tokyo Metropolitan Government Environmental White Paper (1995)
- 5) Economic Planning Agency Social Policy Bureau: Specifying the region of specified water area and water quality standards, Explanation Paper, No1 (1970)
- 6) Tokyo Metropolitan Government Fishery Laboratory : Tokyo Metropolitan Government About the water quality of each river, Tokyo Marine Laboratory publication, serial number 157 (March, 1963).
- 7) Tokyo Metropolitan Government Pollution research-institute water-quality part : Water pollution in Tokyo (March, 1972)
- 8) Tokyo Metropolitan Government Bureau of Environmental Protection: 1995 fiscal year Water-quality measurement of the public water body (generalization section)
- 9) Tokyo Metropolitan Government Bureau of Environmental Protection: Living-thing Investigation report in the public water body (March, 1995)
- 10) Tokyo Metropolitan Government : Tokyo water's-edge environmental-protection plan (March, 1993)
- 11) Tokyo Metropolitan Government Bureau of Environmental Protection overview
- 12) Tokyo Metropolitan Government Bureau of Sewerage overview
- 13) Tokyo Metropolitan Government Bureau-of-Construction overview (1996 edition)
- 14) Masayuki, Sima: Sumidagawa River, Meityo Edition (August, 1988)
- 15) Akinori, Sugiki: water-pollution, a phenomenon and the measure, Gyhoudo
- 16) Mitsui Kazuo: The vessel-character about the water pollution of Edogawa, Sumidagawa, and Nakagawa, water-pollution research of No. 2, 1962 ( Resources Science Research Institute)

□