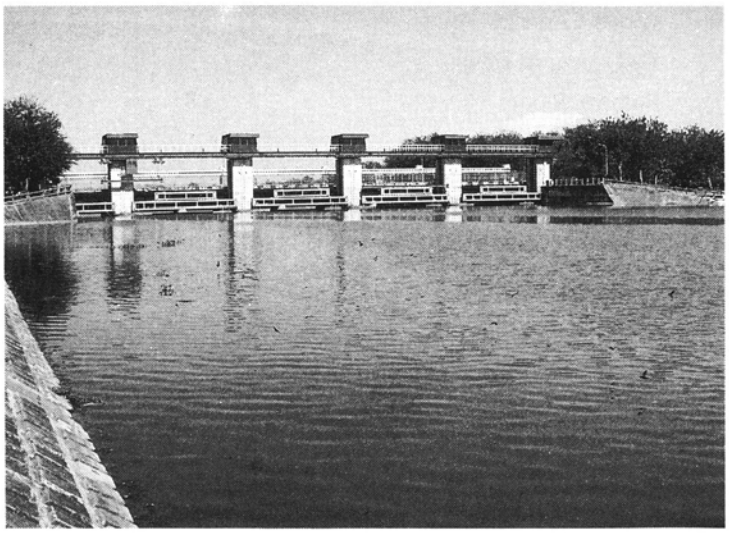
3. Sustainability of Project Effects

For more efficient utilization of the Basin's water resources, Nippon Koei was commissioned by OECF (Overseas Economic Cooperation Fund) to conduct surveys in 1987 and 1992, as previously stated. The following is a description of the survey details.

The intention of these surveys was to work out measures for sustaining and accelerating the effects of projects executed by yen loans. They included 1) the current state, 2) the effects of implemented projects, 3) major laws and regulations concerning water resources, and 4) the operation of the Public Water Management Corporation. The projects chosen for these surveys include: Selorejo Multi-purpose Dam Project; Karangkates Multi-purpose Dam Project; Brantas Delta Irrigation Project; New Lengkong Dam and Porong River Improvement Projects; Wlingi Multi-purpose Dam and Lodoyo Dam Power Station Projects, Surabaya River Improvement Project; Bening Dam across the Widas and Widas Irrigation Projects; Reconstruction Projects of Mlirip Gate, Gunungsari Dam, Jagir Gate, and Wonokromo Gate across the Surabaya.



Gunungsari Dam on Surabaya River

(1) Project effects

Internal rate of return (EIRR) was used to evaluate effects brought about by the projects. With EIRR of the Porong River Improvement Project being highest at 27.9%, all projects showed EIRR exceeding 10% except the Bening Dam Project. The Bening Dam construction had not been completed for long enough to establish its water operation and was yet to start power generation, thus showing a low EIRR. (See Table 2-33.)

As a whole, the facilities established by the projects were found to be in good maintenance, management, and repair. Specific problems found were: 1) a lack of repair on damaged sub-facilities, 2) an abnormal drop in riverbed levels due to excessive dredging of bed sand in the Porong River and a need for more thorough enforcement of the ban on dredging, and 3) the Wlingi reservoir filled due to sediment inflow caused by the February 1990 eruption of Mt. Kelud, also Lodoyo Dam, constructed as a re-regulating reservoir downstream of the Wlingi reservoir, was in advanced stages of sedimentation. Later measures were taken including the re-improvement of the Porong, dredging of the Wlingi Dam, and facility repairs.

Table 2-33 Project effects

Project	Year of completion	EIRR (%)
Karangkates Dam	1977	11.3
Selorejo Dam	1972	11.8
New Lengkong Dam	1973	16.7
Porong River Improvement	1977	27.9
Wlingi and Lodoyo Dams	1983	11.2
Surabaya River Improvement	1981	10.4
Bening Dam	1984	5.2

Remarks: Karangkates Dam percentage includes Lahor Dam

(2) Issues for accelerating project effects

Future issues to be addressed were examined based on survey results. They fell into the following three categories:

(a) Current state of water utilization

With the soaring industrial and city water demands in recent years a water resources shortage has urged efficient use of water through efficient distribution to both industrial and agricultural sectors. Competition for water is likely to become more serious as water demand from the brackish-water fishery in the Brantas Delta is on the rise. City water demand is estimated to be about 10 m^3/sec in 2000 and 17 m^3/sec in 2010 in the delta area, necessitating further development of water resources. On close examination, a comparison between the actual irrigation water intake and the crop planting volume reveals a waste of water, leaving room for improvement. This calls for the establishment of a water intake management system.

Under the approach that water resources development is actively pursued as an effective means to ease water shortages, the operation of reservoirs should be reviewed to

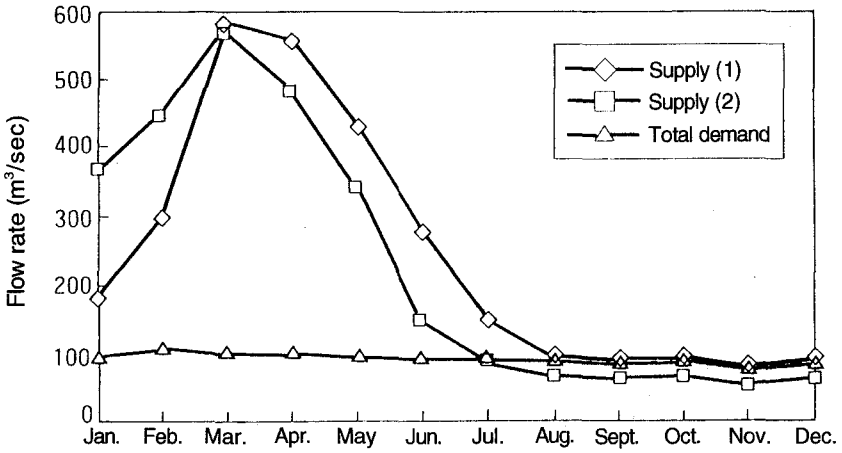
meet water demands in the lower areas including Surabaya City. For this purpose, at present the discharge amount of the Karangkates reservoir should be saved in the first half of the dry season and increased in the second half.

The Brantas River water is used mainly for agriculture, urban and domestic living, industries, brackish culture fishery, and river purification. Water demand by use in the Basin from 1988 to 1989 is shown in Table 2-34.

Table 2-34 Water demand by usage

Usage	Total water demand
Agriculture	2,298-2,448 x 10^6 m^3/year
Urban and domestic	4,330 m^3/sec
Industries	3,715 m^3/sec
Brackish-water fishery	51.6 m^3/sec
River purification	20 m^3/sec (minimum flow rate of Surabaya River in an ordinary year)

Remarks: 1) Agricultural water demand in the dry season was estimated at some 70% of that in the rainy season.
2) The data for urban and domestic use and industries, only covers water with water use rights.



Remarks: Supply (1) is for an ordinary year (1969) and (2) for a 10-year probable drought year (1981).

Fig. 2-4 Balance of water demand and supply

It should be noted that the sum of the figures in the table does not stand for the total water demand of the Brantas Basin because water is subjected to recycling as return water, especially in the case of brackish-water fishery. The sum of water demands at that time was estimated to be almost in the range of 79-106 m^3/sec though varying with seasons (see Fig. 2-4). This was barely able to satisfy demands in the dry season of an ordinary year (a year that has flow rate equivalent to that in 1969) if considering possible return water, or water supplement provided from further upstream dams. It was however estimated to run short in a drought year. Although no specific numerical data was available as of 1995, in

Surabaya City the supply shortage has been compensated by groundwater or water conveyance through pumps from the Soro River.

(b) Water quality

The water quality is rapidly deteriorating as the pollutants discharged into rivers increases in the cities of Malang and Kediri along the Brantas River and, among others, in the Surabaya River. The main cause for this is domestic waste water. Recently, in addition, the use of agricultural chemicals and fertilizers and the resultant eutrophication of reservoirs due to their drainage has also been pointed out. To be implemented in the future are the restriction of industrial effluent and the expansion and improvement of sewerage works as well.

The Brantas Office established water quality standards for the Brantas River in 1989. They define restrictions as follows:

Brantas main stream:	Class B-C	(BOD <3-10 mg/l, COD <10-40 mg/l)
The Surabaya:	Class B	(BOD <3-6 mg/l, COD <10-25 mg/l)
The Mass/Wonokromo Discharge Channel/the Porong:	Class C	(BOD <6-10 mg/l, COD <25-40 mg/l)

According to the 1987-89 BOD observations (see Attachment (9) Water quality of Brantas and Surabaya), the Brantas main stream quality was within allowable values in the rainy season and beyond limits throughout most of the basin in the dry season. The vicinity of Kediri City showed the highest values in the basin at 37 mg/l. The Surabaya River exceeded the allowable values throughout most of the year with an annual average of 12-19 mg/l. In contrast to the Brantas main stream, there was a tendency in the Surabaya of the water quality deteriorating to the extent that the highest values were recorded in the rainy season, not in the dry season, with the Gunungsari Dam having the highest level of 40 mg/l (Dec. 1987). It is said that this was the result of pollutants, which had become sediment on the bed in the dry season (small discharge period) and were subsquently swept away in the rainy season. From the average BOD value of 2.5 mg/l measured at the Gunungsari Dam it can be said that the Surabaya River is rapidly showing trends towards a decline in water quality.

(c) Basin management

Improvements in estimation accuracy are encouraged due to the occurrence of over and under estimation of inflow amounts into reservoirs, a valuable water source. The use of computer programs concerning inflow prediction models or in-basin water balance

models is necessary for low flow management. The development of such a system is essential for collecting and processing in-basin hydrological data in real time; including those of precipitation, river stages, reservoir levels, and discharge amounts.

A committee was formed as an aggregate of government offices. The concerns of this committee are the determination of water distribution in the Basin and the smooth coordination of water usage during drought periods. A legal system should be established besides this group to clearly define and sophisticate regulations.

The maintenance and management of completed water resources projects and river developments have been performed by the Brantas Office, an execution body of development projects. To change this practice, Japanese Consultant advised the establishment of an organization that had legal responsibility for these. Following this advice, the Public Water Service Corporation was founded in April 1990 intended to implement water management in the Brantas Basin including the operation and maintenance of various facilities. However the PWMC, still in its inception stage, is facing various problems to be solved. Its smooth operation requires adjustment and clarification in the aspects of administration and organization. Most important, operational costs should be secured by collecting water and electricity fees, or providing various services including those of tourism development, consulting services, and lease of equipment. Also needed are the creation of enterprise among the PWMC staff and the reinforcement of the organization through education and training.

4. Urban Surabaya Development Institution

Urban Surabaya in this survey refers to Surabaya City and the surrounding area within a radius of 60 km. It covers the regencies of Gresik, Bangkalan, Mojokerto, and Sidoarjo which are within a one-hour radius, and Surabaya City. The purpose of this survey and planning was to work out a master plan for development of the urban area in 2000 and strategies to realize it.

Upon request of the Directorate of Urban and Regional Planning under the Ministry of Public Works, JICA (Japan International Cooperation Agency) conducted the study in 1982 separately from the Brantas River Basin Development and prepared their final report in March 1983. The study, carried out by Pacific Consultant International (PCI), is related to the Brantas Project and its summary is presented in the following sections.

The details of the report deal with the establishment of projects required for Surabaya development and execution of the plans. The report also includes the purpose behind urban Surabaya development and development policies according to function and sector.

(1) Background of urban Surabaya

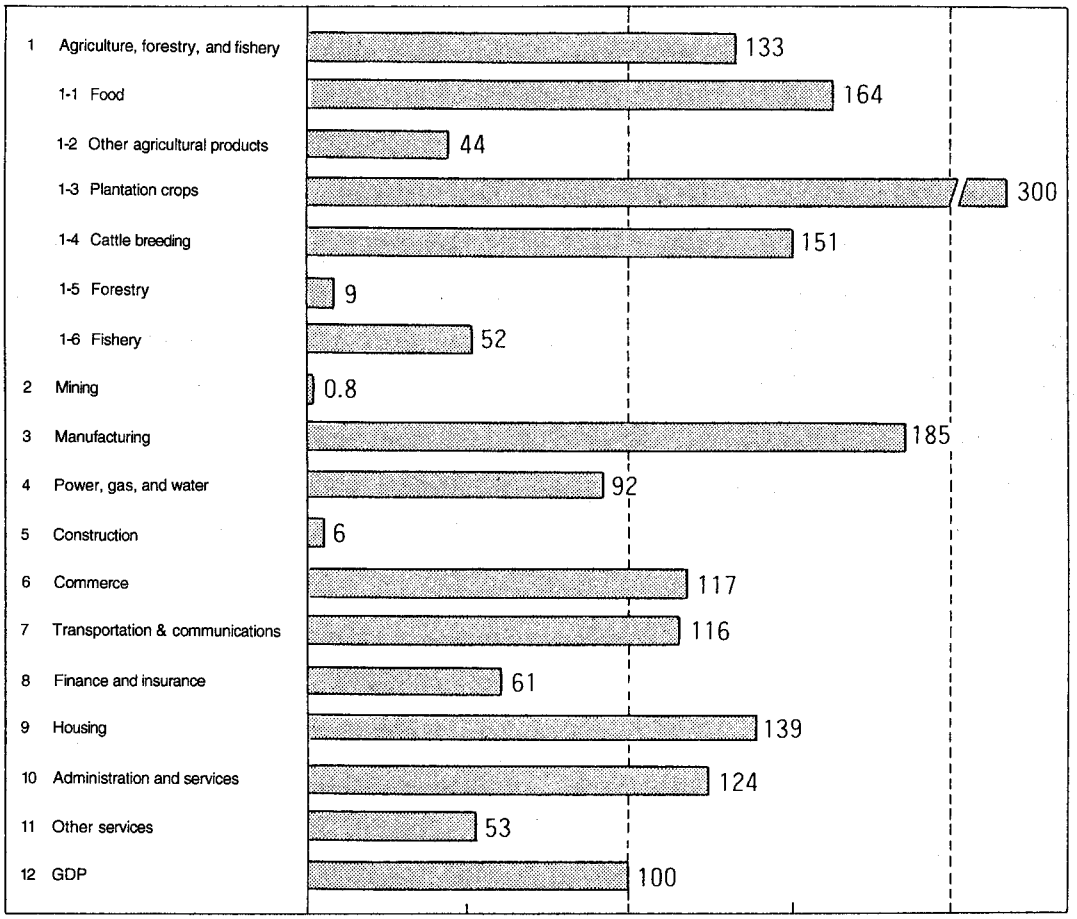
(a) Population

The population of the urban areas of Surabaya was 4.1 million in 1961; 5.0 million in 1971; and 6.1 million in 1980. This rate of increase was a little below the Indonesian average (2.07% for 1961-71; 2.39% for 1971-80). In contrast, the rate of population increase for Surabaya City alone was 3.00% and 2.85% respectively for those periods, well beyond the national and East Javan averages. This increase was characterized by a high rate for 10-35 year-olds along with a heavy concentration of population in the urban areas of Surabaya, due to its rapidly progressing urbanization (see Table 2-35).

Table 2-35 Population fluctuations

	Area (km^2)	Population			Average annual rate of increase (%)	
		Oct. 1961	Sep. 1971	Oct. 1980	1961-71	1971-80
Indonesia	1,919,443	97,085,348	119,208,229	147,490,298	2.07	2.39
Java	132,187	63,059,575	76,086,327	91,269,528	1.90	2.04
East Java	47,922	21,823,020	25,516,999	29,188,852	1.58	1.50
Urban Surabaya	5,6779.22	4,108,169	5,041,529	6,111,935	2.07	2.16
Gresik	1,136.43	592,309	610,944	728,570	0.31	1.98
Bangkalan	1,244.71	574,348	631,455	688,291	0.95	0.96
Mojokerto City	7.25	51,732	60,013	68,507	1.50	1.48
Surabaya	291.78	1,165,306	1,566,255	2,017,527	3.00	2.85
Sidoarjo	614.27	457,385	667,639	853,685	3.85	2.77
Lamongan	1,555.18	772,599	909,038	1,049,808	1.64	1.61
Mojokerto Regency	829.60	494,492	596,185	705,547	1.89	1.89

Source: Statistical yearbook of Indonesia 1994, issued by Central Bureau of Statistic Jakalta - Indonesia (1961-95)



Comparative ratio to all Indonesia

Source: JICA Final Report of Urban Development Planning Study on Surabaya Metropolitan Area

Fig. 2-5 Industries of East Java (1978)

(b) G.R.D.P. in Surabaya urban area

East Java underwent a lower rate of economic growth than the rest of Indonesia with an average GRDP growth rate over the past decade (1971-80), 3.2% at 1973 rates (see Table 2-36). East Java made up 17.9% of Indonesia's GDP in 1971 but it fell by nearly 6% to 12.0% in 1980. As for the industrial structure, the proportion of primary industry for East Java was about 30% higher than that of the national average. East Java's yield of agricultural products was three times the national average and its output of industrial products 1.8 times greater. Comparatively, the economic contribution of mining and construction industries to the economy of East Java was minimal (see Fig. 2-5).

Table 2-36 Annual growth rate of GRDP

Unit: %

	1971-75	1975-80	1971-80
Urban Surabaya	3.5	4.7	4.3
East Java	2.4	3.8	3.2
Indonesia	8.3	7.5	7.9

(1973 rates)

(c) Industry

The main product in urban Surabaya is rice. This area enjoyed a higher rice yield per unit area as of 1980, being well beyond the Indonesian average of 2.98 t/ha, Java Island's average of 3.43 t/ha, and the East Javan average of 3.85 t/ha. The land in urban Surabaya is highly utilized leaving no room for further expansion of arable area, in fact on the contrary, the tendency is towards a decrease due to residential development.

Industry in Indonesia is still under development comprising only 13% of the GDP. The growth rate was however very high between 1974 and 1979 at 11.2% whereas that of GDP was only 6.5%.

About 5,000 firms were based in urban Surabaya as of 1980, accounting for approximately 36% of the 14,000 firms in East Java. Capital-intensive industries were concentrated in the urban area with metal machining making up 67% and chemical manufacturing 78%.

The concentration of commercial businesses in Surabaya City is remarkable. The number of licensed stores and shops was 11.0 stores per 1,000 people in the city; 5.1 for urban Surabaya; and 2.6 for East Java (see Table 2-37).

Surabaya Port at Mas estuary is the largest port of trade in Java Island. It handles 2,400,000 tons of export/import cargo per year, next to that of Jakarta Port at 11,500,000 tons. For region-wide transport, Surabaya Port loaded/unloaded 2,000,000 tons/year exceeding Jakarta's 1,400,000 tons/year. The port thus serves as a hub of cargo transport

in Java Island, being one of the four key ports specified in Indonesia's regional development strategies along with the port of Jakarta .

Table 2-37 Number of licensed stores (1980)

Unit: stores/1,000 people

Area	Number of licensed stores
Surabaya City	11.0
Sidoarjo	2.4
Gresik	2.7
Mojokerto Regency and City	2.2
Lamongan	2.4
Bangkalan	1.8
Urban Surabaya total	5.1
East Java	2.55

Source: Commerce Bureau of East Java (KADIN)

(d) Traffic

The number of registered vehicles in Java Island numbered about 1,970,000 as of 1978, of which Jakarta City formed 30% and East Java 26% which includes urban Surabaya at 12%. By type, Jakarta City accounted for half of the privately owned cars and buses of Java while East Java, 19% and urban Surabaya, 9%. Truck ownership had an almost even distribution throughout the island. As for motorcycles, East Java accounted for nearly 30% of Indonesia's total, of which urban Surabaya had 12%.

Transport to Surabaya City is possible by land (bus, railway, etc.), sea, and air. Flight services are especially on the increase between Surabaya and major cities on islands other than Java.

(e) Water supply and sewage treatment

The water service diffusion rate of Surabaya City is 49.4% (46.5 liters/person/day) with Bangirang District at 14% and other districts coming in below 10%.

A sewer system is laid only in Surabaya City with two sewage treatment facilities. They were, however, constructed over 50 years ago, and as of 1980 not functioning to capacity. Sewage from commercial, industrial, and public facilities is drained into waterways or side ditches. This is also true of domestic waste water.

Refuse disposal is under the control of municipal incineration bureaus and is carried to storage yards before being conveyed to landfills for reduction of waste pollution. The construction of incineration plants involves the difficulty of acquiring land area. This is the reason some private companies have begun to install incinerators on their own land.

(2) Basic concepts for regional development projects

The Ministry of Public Works places Surabaya City as a core of East Java in its regional development system. Which is based on the Urban Surabaya Development Institution that treats multiple regions in the area as a single unit under the influence of their central city.

For future layout of the area, a radial, ring-shaped pattern has been proposed after examination of the current pattern and land use in Surabaya City. The following projects are proposed for each sector:

1) Industrial development
   The development of a total 3,270 ha of industrial area is aimed at by the year 2000, including 2,900 ha for new factories, 350 ha for transferred factories, and 20 ha for small-scale factories. Proposed developments include the industrial complexes of Tandes, Waru, and Perak, Gresik industrial area, Sidoarjo sub-regional center, and Rungkut industrial complex.
2) Sophistication of commercial activities and hub functions
   Districts of Pasar Turi, Kota, and their surrounding areas are to be redeveloped as hubs of district administration and commercial activities. The Wonokromo commercial district is to be subjected to development.
3) Housing development
   New land development totaling 9,600 ha is to be pursued by the year 2000 by providing 300,000-500,000 houses to create a park city in the western hilly areas including Surabaya City and Gresik.
4) Build-up of information functions
   With Surabaya Institute of Technology transferred to Sukolilo District to serve as the center of a science city, facilities of education, R&D, and administration are to be concentrated in this area.

(3) Surabaya City as of 1993

Until now the history of the Brantas Project has been explained centering on the development of hydroelectric power, flood protection, and irrigation development and improvement as water resources development of the Brantas River. An overview of Surabaya City is included below to provide a background of Indonesia's second largest city.

Aerial view of Surabaya City around 1980

The previously mentioned Urban Surabaya Development Institution was formulated in 1982. At that time the capital Jakarta had rapidly grown into an economic and industrial base with a resultant sharp rise in population and the problems related with such. To prevent over-population, the government was directing efforts toward the development of East Java, among others, the development of Surabaya City and its surrounding area into an industrial hub equivalent to Jakarta. Thus urban Surabaya was formed out of political rather than economic consideration. The reason for the selection of Surabaya is believed to be that the government expected Surabaya City to cooperate toward further development with its neighboring areas which were showing a larger economic growth than Surabaya. In fact Surabaya City and its surrounding area, the Brantas River Basin, have at present grown to the extent that they are a good match for Jakarta (see Table 2-38).

Table 2-38 Trends in GDP (1970 market price = 100)

City, area	1970	1975	1980	1985	1990	1993	Annual growth rate (%)	
							1970-80	1980-93
Jakarta City	100	384	1,475	4,174	8,261	13,314	30.9	18.4
Surabaya City	100	250	955	1,809	4,098	6,640	25.3	16.1
Brantas Basin (except Surabaya City)	100	319	964	2,495	5,273	7,933	25.4	17.6

As of 1993 the OECF (Overseas Economic Cooperation Fund) had provided a total of ¥221.9 billion in assistance, about ¥95.9 billion for Surabaya City, ¥59.8 billion for

development related to Surabaya, and ¥66.2 billion for the Brantas Project. This was intended for infrastructure development projects such as thermal power stations, road networks, airports, communication networks, city sewer works, waste disposal, transmission lines, and railways. The continuous development of urban infrastructure was brought about through additional assistance from various countries. Industrial complexes, land development, and building construction are being pushed forward centered around private investment. To keep pace with redevelopment efforts downtown Surabaya had a high-rise construction fever resulting in over building and too many luxury hotels. With improved roads and extended highways, inter-city commuting became easier and quicker. For example, it used to take nearly three hours by car from downtown Surabaya to Malang City in the early 1970's, while today it only takes up to two hours by highway. By sharp contrast, the inner-city traffic is plagued by traffic congestions worse than the morning and evening rush hours in Japan.

Current photo of downtown Surabaya, marked by high-rise buildings

As described above, the development of Surabaya has gone much further than was anticipated in the Urban Development Planning Study. Due to this, the city is facing various problems in urgent need of address, such as a shortage of water and sewage facilities, a low diffusion rate of sewage, and a deterioration in the quality of river water. On an individual level, the annual income per household in Surabaya City is shown in Table 2-39.

Table 2-39 Annual income per household

Unit: x $Rp10^3$

	1983	1985	1990	1993	Annual average rate of growth (%)
East Java	360	456	899	1,348	14.1
Surabaya City	654	854	1,753	2,711	15.3
Rp/US$	909.3	1,110.6	1,842.8	2,087.1	—

5. Implementation of Brantas River Basin Development

(1) Project implementation structure

The Brantas River Basin Development Project was initiated in 1959 with the South Tulungagung Diversion Project, commonly called Nejama Diversion Tunnel as stated earlier.

In those days, the civil engineering sector in Japan was in its heyday of power sources development, marked by high concrete and fill dams in heights from approximately 95 to 200 m, along with the rapid advancement of excavation techniques for tunneling. They were also trying to find their way into overseas markets while at the same time the Indonesian government was seeking civil assistance for its infrastructure development. Against this backdrop, the Brantas Project began on a contract basis with a leading Japanese general contractor, Kajima Corporation, with construction costs totaling approximately ¥1.0 billion.

Following the Nejama Diversion Tunnel Project, the Karangkates Dam Project was also executed on a contract basis with a Japanese general contractor since Indonesia was in the beginning stages of large-scale dam construction then. This form of general contract was adopted until the November 1964 completion of the diversion tunnel and temporary cofferdam works for the Karangkates Dam.

During the six years between 1958 and 1964 Indonesian engineers were enthusiastic about gaining basic knowledge about construction techniques concerning river development works employing large construction equipment.

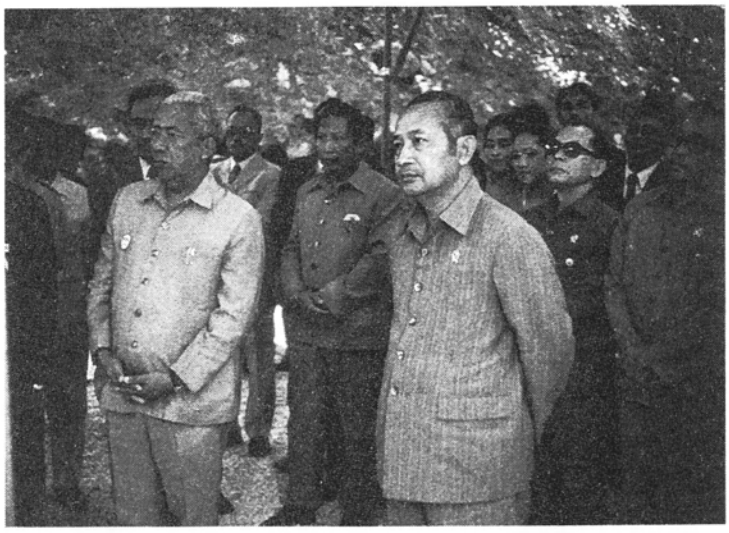
The general belief was that expertise could be successfully handed down to the local engineers especially in the case of Karangkates Dam. In the project, performed in a completely Japanese style, 115 engineers were involved. The project made progress in an OJT basis ranging from the building of staff, workers' lodgings, and canteens, training through the organization of work engineers, work operations, and construction technologies, all the while considering the welfare and recreation of all concerned. It is certain that the results of these efforts were a great contribution to the success of the project execution structure that was later adopted by the Indonesian government as the work method by direct force. The idea of taking responsibility for one's own work, was soon adopted by local engineers, which pleased their mentors immensely. Due to this cooperation the estimated completion time of the Dam Project was shortened by approximately seven months.

Toward the end of the diversion channel work for the Karangkates Dam in Nov. 1963, Waskita Karya, an Indonesian state-owned enterprise, began the temporary works

for buildings, roads, and other related structures for the Selorejo Dam. Thus shortly after commencement of the Selorejo Dam, permanent work for the Karangkates Dam began. The latter was the first project ever where Indonesia made efforts to actively become involved in construction work under the guidance of Japanese in all areas (civil engineers, mechanics, heavy equipment operators, etc.). For both dams, permanent work was executed in the Office-style basis and completed in 1972 for Selorejo and in 1973 for Karangkates.

Since around the mid-1970's, there have been only about three Japanese consultants for supervision and two or so for work instruction on site, thus shifting the main force of construction work from the Japanese to the Indonesian side. Recently, construction guidance is limited to special trades since the contract method is becoming a mainstream of construction projects.

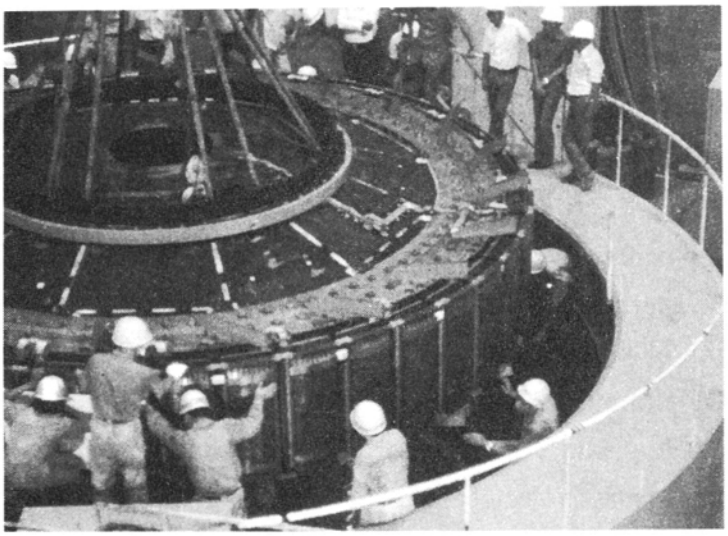
This is true in the areas of survey, planning, and design. The Brantas Office employees perform the activities under the supervision of a few Japanese engineers. Specialists are sent from Japan for short periods of time only as needs arise.



Briefing to President Suharto (on the right)

The Jatiluhur Dam, completed in 1964 with World Bank finances on a turnkey contract by a French consultant and contractor, left behind no data on design and construction. In comparison, the Brantas method yielded great results in terms of technology transfer, making for the "importance and effectiveness of technologies" and the equally important "fostering of engineers".

Over the 10 years between 1962-72, a total of 318 engineers from Japan, or 31.8 per year, participated in the Karangkates Dam Project. After this first project, directly run by the Brantas Office, the annual average of engineers engaged in the 1971 Porong River Improvement Project was 9.7 and then in the 1977 Widas Dam Irrigation Project only 2.7 engineers were needed, thus showing the gradual decrease in Japanese involvement. Finally the Wonorejo Dam was launched in 1994 on a contract basis, the intentions of which were to provide a source for tap water on the upper reaches of the Ngrowo. It is highly likely that future Brantas River Basin Development Projects will be continued mainly on a contract basis (see Table 2-40).



Installation of turbine

Table 2-40 Total number of Japanese engineers

Project		Karang-kates Dam	Selorejo Dam	Kaliporong	Wlingi Dam	Brantas River Middle Reach (I)	Widas	Brantas River Middle Reach(II)	Wonorejo Dam
Overview		Fill dam, power generation	Fill dam, power generation	Intake dam, river improvement	Fill dam, power generation	River improveme nt, barrage	Earth dam, irrigation facilities	River improve-ment	Fill dam, power generation
Period		1962-73	1963-72	1971-77	1974-83	1975-85	1977-82	1986-93	1994-2000
		318	99	68	44	39	16	30	31
		31.8	11.0	9.7	4.4	3.5	2.7	3.8	4.4

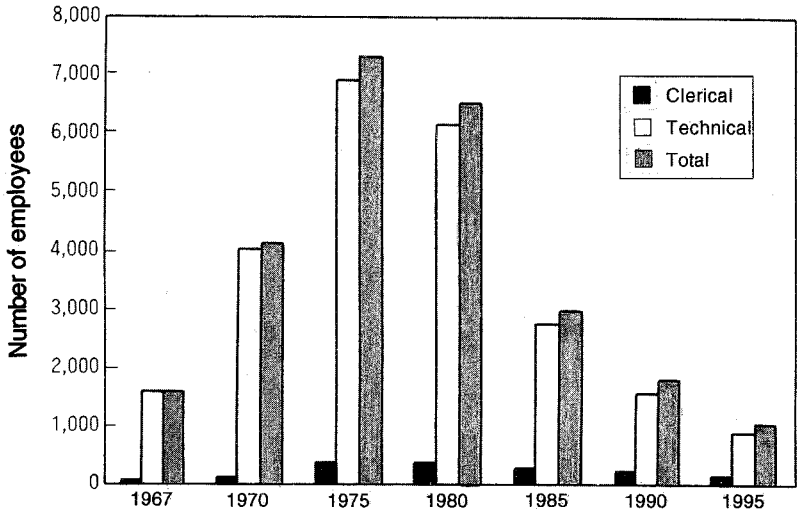
(2) Organization of project executing body

Indonesia's development projects are under control of the Ministry of Public Works (DPU) including those of water resources development. The Ministry is directly reported to by the Directorate General of Water Resources Development under which are the Directorate of Rivers and the Directorate of Irrigation, which the Brantas River Basin Development Executing Office belongs to. The State Electric Company (PLN), the government body concerned with the Brantas Project, belongs to the Ministry of Mining and Energy.

The South Tulungagung Diversion Project supported by Japan's reparations was implemented under management of the Irrigation Bureau. The dams of Karangkates and Selorejo were initially supervised by PLN and then transferred to the Irrigation Bureau in 1964. Later the Brantas River Basin Development Executing Office was newly established in Malang City in 1965, as a body directly under the control of the Public Works Ministry, to supervise all Brantas related projects. Each project office was founded on its respective site. In 1990 when the Brantas Public Company was formed, the Brantas Office was transferred to Surabaya City.

This is why the Brantas Office came to supervise related projects directly in a unified manner. It was in 1967 that the functions of this office were clearly defined and a broader range of authorities including budget administration rights were granted. The adoption of the unified execution system greatly contributed to clarifying role sharing among projects and their relationship. It also gave flexibility to the operation of human resources such as workers and engineers, materials and equipment including heavy construction machinery,

and construction funds. This facilitated the implementation of projects, largely reducing overall construction costs.



Year	1967	1970	1975	1980	1985	1990	1995
Clerical	30	74	367	346	249	227	140
Technical	1,570	4,027	6,928	6,154	2,751	1,573	908
Total	1,600	4,101	7,295	6,500	3,000	1,800	1,048

Fig. 2-6 Number of employees in Brantas Office

After a hiatus due to the 1965 coup d'état, the dam works of Karangkates and Selorejo were resumed with a newly reorganized staff of approximately 1,600 people in 1967. The trends in number of employees up to 1995 are shown in Table 2-6 (see Reference Materials for details).

The first General Manager of the Brantas Office was Mr. Ir. Suryono, the former PLN General Manager. He was followed by the second general manager Mr. Ir. Putra Duarsa, the third Mr. Ir. Almizan Abdullah (former Karangkates Dam Project Manager) and the fourth Mr. Ir. Roedjito D.M. (former second Porong Dam Project Manager). The fifth and current general manager is Mr. Ir. Marpaung, who is the former Sengguruh project manager and as of 1995 is with the Ministry of Public Works.

Mr. Almizan served as the second project manager of the Karangkates Dam, during the time when people from the Brantas Project were making their appearance. The Brantas Office was composed of many people transferred from the state enterprise contractor

Waskita Karya at the inception of the Brantas Project, providing an atmosphere of an odd mixture of people from various government offices and private firms. At present, employees from the Brantas Project and the proper employees mainly consist of the Office.

The Brantas Office enriched its organization and staff over time. It established a Contracting Company Abipraya in 1983 placing Mr. Almizan as president with approximately 400 employees transferred from the Brantas Office. Following this, the Brantas Office shifted its design engineers to a leading Indonesian consulting company, Indra Karya, for reinforcement. Then a Public Company Jasa Tirta was founded separate and independent of the Brantas Office in April 1990 to implement the operation and maintenance of facilities and also to handle water management in the Brantas Basin. Mr. Ir. Roedjito D.M., the fourth Brantas Office General Manager, took the office of President Director of Jasa Tirta. Mr. A. Rusfandi Usman succeeded him and supervised 440 employees who were transferred mainly from the Brantas Office.

(3) Development financing

Investments in the Brantas Basin (excluding Surabaya City) during the 37 years between 1958 and 1995 were ¥104.1 billion in foreign assistance including Japan and ¥113.3 billion from the Indonesian governments own capital, totaling ¥217.3 billion.

Various funds were spent on the Brantas Project: The South Tulungagung Diversion project, the first Brantas Project, was completely implemented with reparations from Japan. Other uses of reparations included preparations for the first master plan and the initial phases of Karangkates and Selorejo Dams. Other projects were all carried out with the Japanese government's, OECF, ADB, IBRD, and bilateral assistance. The second and third master plans were formulated through a Japanese grant (see Table 2-41).

Of the assistance, Japan spent ¥75.7 billion accounting for 73%, which included a high ratio of aid, ¥66.2 billion or 64%, from OECF. OECF spent ¥95.9 billion on Surabaya urban development (to Surabaya City proper such as Gresik Thermal Power Expansion, Juanda Airport Improvement, communications network improvement, city sewerage, etc.) and ¥59.8 billion on Surabaya related development (to Surabaya City and neighboring areas including East Java transmission line network, improvement of railway and communications networks, etc.), totaling ¥221.9 billion. Total OECF assistance to Indonesia from 1958 to 1993 was ¥1,970 billion, a little over 11% of which was invested on projects for the Brantas Basin, Surabaya and those related to Surabaya.

Assistance from various countries was used in various ways including the purchase of heavy construction equipment, concrete plants, high-tension gates, turbines, generators,

and other special materials and equipment; survey analyses; consulting fees for project planning and design; fees for construction supervision and guidance.

Table 2-41 Foreign assistance trends

(Brantas Basin excluding Surabaya City) Unit: ¥1 mil.

	1958-70	1971-80	1981-90	1991-93	Total
Japan, reparations, grant	9,074	200	200	0	9,474
Japan, OECF	10,764	29,459	7,767	18,200	66,190
Total Japanese assistance	19,838	29,659	7,967	18,200	75,664
Total foreign assistance	—	1,881	26,129	—	28,010
Total assistance	19,838	31,540	34,096	18,200	103,674

(4) Technical assistance and consultants

As stated earlier, in 1958 when the Brantas Project was newly initiated, the Indonesian government had plans to develop the Citarum River (basin area: 5,970 km^2) running to the east of Jakarta City in East Java. Under this plan, the Jatiluhur Multi-purpose Dam was under construction on a turnkey contract with a French consultant. Related to the project, the government asked the Japanese government for development cooperation. This request for cooperation ended up being not met, however at that time he was asked to survey the Brantas River and embarked on the preparation of the Brantas Basin development plan.

For a long time the Brantas Basin had been a rice-growing area yielding approximately 10% of Java's rice production. At the same time it was a quasi-undeveloped area with only 31,000 kW or so of developed power, although abundant in hydroelectric power potential. From the state viewpoint, agricultural development was urged for an increase in food production and also power development for industrialization. The Ministry of Public Works, in charge of the development, had a strong belief that one river basin development should be performed under a consistent development philosophy and policy. Under this "one river, one plan" policy, its goal was for comprehensive development under a single consultant.

In 1958 when a settlement was made on war-time reparations between the Indonesian and Japanese governments, it was decided to allocate part of it to the Brantas Project.

Nippon Koei formulated the first master plan on its own in 1962 and then upon the Indonesian government's approval, embarked on the development. The government not only expected tangible achievements from the Brantas Project it also considered this an opportunity for local engineers to receive training, know-how and technology transfer concerning river development. In order to meet this request from Indonesia, it was decided

that Nippon Koei would be in charge of surveys, planning, design, and construction supervision; and that Japan's largest general contractor, Kajima Corporation, would provide construction guidance, thus establishing the basic development system.

The Brantas Project, starting with the allocation of reparations as explained above, underwent changes in aid patterns over time into yen or ADB loans. Changes in the river environment caused the master plan to be reviewed and second and third plans to be prepared, which the Japanese government bodies OTCA and JICA supervised. Japan's one private consulting company began the Project, the Japanese government supported it and then after establishing the second master plan in 1972, it was pushed forward under the Japanese government's instruction. With this as a turning point, the government started to provide assistance for East Java development including Surabaya City such as the Gresik Thermal Power Station and the East Java transmission line network. Japanese consulting companies joining the Project gradually increased in number and later based on the Brantas experience moved on into Indonesia (see Table 2-42).

Table 2-42 Japanese consultants and executed projects

Period	Consultant	Number of projects	Name of Project
1958-70	Nippon Koei	3	South Tulungagung Diversion, Karangkates Dam, Selorejo Dam
1971-80	Nippon Koei	3	Kaliporong I, Lengkong Dam, Wlingi Dam, Gunungsari Dam, Lodoyo Dam, Middle Reach Brantas River Improvement I
	Sanyu	1	Brantas Delta
	Nikken	1	Surabaya River I
1981-90	Nippon Koei	5	Middle Reach Brantas River Improvement II, Sengguruh Dam, Tulungagung Power Station, Bening Dam, Tulungagung Diversion
1991-93	Nippon Koei	2	Kaliporong II, Sengguruh Dam
1976-93	Pacific Consultants	L.S.	Surabaya Urban Development, City Road Plan
	Nikken	1	Surabaya Municipal Sewerage
	Others	L.S.	Airport, Port and Harbor, Communications, and Thermal Power

Park in Malang City

Malang is a highland city in the upper reaches of the Brantas River, situated 400 m above sea level and about 100 km south of Surabaya. It is comfortable to live in having an annual average temperature of 24.1°C. Actually it used to be a resort for Dutch colonists and the streets of the city still provide an air of Holland. The Brantas River running through the city is spanned here and there by brick bridges with a white cement finish. Luxurious Dutch-style residences with spacious planted gardens line the streets. The city also has several parks and plazas. They say that Malang is one of the most beautiful cities in Indonesia. In the middle of the city is a Chinese town with shops and restaurants standing close to one another, which became very lively, drawing people starting from the sunset when it became cool. On holidays, the Japanese staff often spent a whole day in Malang dining and shopping.

With new advances in development today, the Brantas Basin requires technologies from new sectors in addition to those already acquired. They include, but are not limited to, basin management, highly sophisticated water uses, water quality conservation, the reinforcement of river management following laws and regulations, the establishment of flood warning system.