

CHAPTER 2

PRESENT CONDITION OF
THE TARGET AREA

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2.1 Natural and Other Conditions

2.1.1 General

The official name of the nation is the Republic of Indonesia in English (hereinafter referred as "Indonesia"). Indonesia is situated between Long.94°45'E and 141°05'E, and between Lat.6°08'N and 11°15'S. The capital city of Indonesia is Jakarta. The area of whole nation of Indonesia is around 1,937,000 km² consisting mainly of the Sumatra island, the Java island, the Nusa Tenggara islands, the Kalimantan island, the Sulawesi island, the Maluku island and the Irian Jaya.

Indonesia has 27 provinces as of 1997. Central Java Province is one of them located in the central part of the Java island neighbored West Java Province in the westward and East Java Province in the eastward between Long.108°30'E and 111°30'E, and between Lat.5°30'S and 8°30'S. The capital city of Central Java Province is Semarang City which is one of the municipalities (it is called as "Kotamadya Semarang" in Indonesian language). The area of the Province is around 32,550 km² consisting of 29 regencies (called as "Kabupaten" in Indonesian language) and 6 municipalities ("Kotamadya") as of 1997. Central Java Province faces to the Java Sea in the northward and the Indonesia Sea in the southward.

The Municipality of Semarang (hereinafter called as "Semarang City") is one of those municipalities functioning as the capital city of Central Java Province as mentioned above situated between Long.109°35'E and 110°50'E, and between Lat.6°50'S and 7°10'S. The area of Semarang City is around 370 km² consisting of several districts ("Kecamatan") facing to the Java Sea.

2.1.2 Climatic Characteristics

The Garang river basin is located in the northern central region of Java Island, where monsoon and trade wind give strong influence and two(2) distinct seasons, namely rainy season and dry season.

The average annual rainfall amounts approximately 2,480 mm according to the climatological data at BMG-Semarang station (refer to Table 2.1.1 and Fig. 2.1.1). The amount of 70 percent out of annual rainfall falls during rainy season from November to April. Usually, January has the largest quantity of rainfall and August has the least.

Areal distribution of rainfall is illustrated by isohyetal lines shown in Fig.2.1.1. Annual rainfall in lowland area near the seashore averages some 2,100 mm, but the amount in highland area near Mt.Ungaran exceeds 3,000 mm.

Temperature ranges between 23°C and 34°C and annual temperature averages 27°C. Humidity range is between 70 % and 84 %, and the average is 77 %. Temperature and humidity in this area are very high throughout a year with annual pan evaporation as high as 1,610 mm.

Monthly pan evaporation parallels monthly maximum temperature, and runs counter to monthly rainfall. Maximum pan evaporation (5.7 mm/day) occurs in September near the end of dry season, and minimum pan evaporation (3.3 mm/day) in January in the middle of rainy season.

2.1.3 Geomorphology and Geology

Geomorphology

The study area is located in the alluvial plains with elevation of about 0 to 5 m extending along shorelines and hilly area behind. Northern half of the study area (6.6 km²) is lower than 1.0 m in elevation.

Geology

The regional geology and stratigraphy in and around the study area are shown in Table 2.1.2 and Fig 2.1.2. Geology of this area is alluvial deposits which cover the base volcanic and sedimentary rocks.

Alluvial deposits consist of recent river deposits, flood plain deposits and shallow marine deposits. River deposits mainly consist of unconsolidated sand and gravel intercalated of unconsolidated sand and are generally 1 to 3 m thick. On the other hand, flood plain deposits, generally 2 to 10 m thick, are mainly composed of unconsolidated clay, sand and gravel, but contain a greater amount of silt and clay than river deposits.

Geological History of Study Area

The geological history of the Garang River Basin has started from the Tertiary Period. The study area is in the shallow marine from the Miocene Epoch of the Tertiary Period to the Pleistocene Epoch of the Quaternary Period. Penyan Formation, Banyak Member, Kalibiuk Formation, Lower Damar Formation and Lower Notopuro Formation have sedimented in this

sedimentary environment. At the same time, volcanic activity had occurred in and around the study area and supplied the Upper Damar and Upper Notopuro Formation with volcanic product. In addition, folding and faulting activity was caused by this volcanic activity.

In the Pliocene Epoch of the Quaternary Period, volcanic activity of Mt. Ungaran occurred along the North Serayu Mountains south of the study area.

2.1.4 Features of Drainage Channels

(1) Topography of the Area

Fig. 2.1.3 shows a schematic topography of the area with the configuration of the main channels. The area is divided into two areas, one of which is "the low land" (lower than EL+1.00 m) and the other is "the high land" of comparatively high elevation (higher than EL+1.00 m). A large part of "the low land" is extremely low and below the Mean High Water Level of Semarang Harbor (EL+0.25 m).

As mentioned later, "the high land" is a gravity drainage area while "the low land" is pump drainage area in this urban drainage plan.

As main drainage channels, Semarang, Asin and Baru rivers exist in the study area. According to the main drainage channels, the area is divided into Semarang River gravity drainage area, Asin River drainage area, Bandarharjo West Drainage Area and Bandarharjo East Drainage Area.

(2) Semarang River

Semarang River with its catchment area of 12.835 km² including the Asin river basin of 4.430 km² is one of the major urban drainage facilities in the central Semarang area of 27.2 km² situated between East and West Floodway as shown in Fig. 2.1.4. Semarang River with a total length of 8.25 km is diverted from Garang River at Simongan Weir, flows to the northeast in urbanized area and meets Simpang Lima drainage channel near China Town, then flows to the northwest, diverting, Baru River (at 2.8 km) and meeting its tributary, Asin River at 1.0 km upstream from the river mouth respectively. The river mouth, which is now located at 0.65 km downstream from the crossing with North Ring Road, will be extended by 0.8 km offshore in the future by reclamation works of private sectors.

The first full-scale improvement works of Semarang River was executed under Implementation of Semarang River Drainage Improvement Project (Urban V) from 1985 to 1990 with a financial assistance by the World Bank (IBRD). The river improvement plan with a 5-year frequency flood as a design scale was prepared in the detailed engineering study in 1982 in succession of the first Master Plan of stormwater drainage for Semarang City in 1976. The project consists of channel improvement of Semarang River including secondary and tertiary drains, construction of bridges, and procurement of operation and maintenance (O/M) equipment with a total project cost of approx. Rp. 12.7×10^9 . After completion of Urban V project, periodical dredging works have been carried out as annual maintenance works by Semarang City and also as undertaking in the successional project of Semarang Surakarta Urban Development Program (SSUDP) since a fiscal year of 1994/1995.

Even through Semarang River has been improved under Urban V and periodical dredging work, thick layers of sedimentation consisting of silts, solid waste, sludge and organic materials are still remained.

(a) Longitudinal Profile of Semarang River

According to the longitudinal profile of the river bed surveyed in this study, the main channel of total length of 8.25 km is divided into two parts, "the lower reaches" with mild slope (1/10,000) and "the upper reaches" with rather steep slope (1/800). The boundary between "the lower reaches" and "the upper reaches" is four (4) km upstream from the river mouth, where Agus Salim Street crosses the channel. The topographical map of the area shows that +1.0 m of ground elevation contour line crosses Semarang River at this boundary. Therefore, "the lower reaches" of Semarang River corresponds to "the low land" and "the upper reaches" to "the high land". Another fact is that the dikes along Semarang River exist only along "the lower reaches".

From the view point of urban drainage planning, the above mentioned boundary is an important line, by which the pump drainage area is defined.

(b) Width of Semarang River

The width of the channel has been normalized as the result of Urban V Project, while the sections downstream from the North Ring Road are left untouched and the width ranges between 40 m to 130 m. The channel width is over 30 m

between 1 km and 3 km point from the river mouth. The river is narrow in the upstream from 3 km point with less than 30 m wide. The narrowest width is about 10 m and it appears between 6 km and 7 km from the river mouth.

(c) Present Discharge Capacity of Semarang River

Bank-full discharge capacity of the channel was calculated based on the topographical survey results and assumed roughness coefficients ($n=0.031$ applied for the downstream from the confluence of Asin River and $n=0.024$ upstream from it) by using uniform flow formula. (refer to Fig. 2.1.3). It shows that the capacity of the channel is not enough in some reaches compared to the 5-year design discharge defined in Table 2.1.3 and Fig. 2.1.5. The capacity is limited especially in "the lower reaches".

Site inspection shows that it is very difficult to widen the channel because of the densely urbanized zones along the river.

(3) Asin River Drainage Area

Asin River drainage area covering the Asin River basin of 4,430 km² is surrounded by the left bank of Semarang River to the east, Pemuda Street to the south, some urban roads in Tanah Mas and Pondok Hasanuddin Estates to the west, and Yos Sudarso Street (North Ring Road) to the north as shown in Fig. 2.1.6. Almost 80 % of the area is fully urbanized as a residential area. The middle and high class housing areas have been developed along Imam Bonjol and Hasanuddine streets, especially in Tanah Mas, Indraprasta and Hasanuddine Housing Estates. Low income residential areas are situated along the left bank of the downstream stretch of Semarang River, around the east and west of Indraprasta Housing Estate, and along both sides of the national railway including the northern parts of Poncol railway station. The area along Imam Bonjol and Pemuda streets are mainly used for the business/commercial, government office and other institutional purposes.

The area has been provided mostly with systematic primary, secondary and tertiary storm drainage networks. Asin River, which functions as a primary drainage channel in the area, has been improved twice since 1975 in line with Tanah Mas housing development project and forms in rectangular open channel with 20 m in width, approx. 1.2 m in depth and 1,300 m in length. Fig. 2.1.7 shows the longitudinal profile of Asin River. Five (5) secondary channels situated in the southern parts covering

almost 70 % of the drainage area drain closely stormwater into the upper reaches of Asin River. The summary of these secondary channels are shown in Table 2.1.4. Some urban roads have been improved to raise in order to prevent habitual inundation in SSUDP.

Stormwater collected by tertiary drains in Tanah Mas and Hasanuddin Housing Estates is drained directly into Asin River through six (6) secondary open channels with a small pumping stations. These pumping stations were constructed in 1996 by Tanah Mas Estate itself in cooperation with the residents in order to prevent habitual floods due to a rapid progress of land subsidence in recent years. Operation and maintenance cost including a salary of both four (4) operators and labors for cleaning is shared by the residents at the rate from Rp. 1,000 to 4,500/month based on the size of their properties. Some of the urban roads including the maintenance roads along both bank of Asin River have also been undertaken the raising work since 1992. The hydraulic features of secondary channels and pumping stations in Tanah Mas and Hasanuddin Housing Estates are summarized in Table 2.1.4 and Fig. 2.1.8 respectively.

The storm drains in low-lying area along the left bank of Semarang River are connected to Semarang River through a sluice gate, however, during high tide, it is impossible to open the sluice gate and to drain out by gravity flow. The rainwater of these areas should be drained away to Asin River. During the rainy season, low-lying areas in the northern part from the national railway have been flooded several times a year. The most serious areas are situated along the left bank of Semarang River and the upper reaches of Asin River, where some low-lying areas have been regularly inundated during high tide even in the dry season. The drainage condition of these areas will be deteriorated further in the future due to the effect of the serious land subsidence.

(4) West Bandarharjo Drainage Area

The shape of West Bandarharjo drainage area (0.58 km²) is like a triangle of 0.58 km² surrounded by Semarang River to the southwest, Baru River to the east, and Usman Janatin Street, so called North Ring Road to the north. As shown in Fig. 2.1.9, the southern part of approximately 65 % of the area (0.38 km²) has been fully urbanized as a low income residential area (0.29 km²) and Marabunta warehouse (0.09 km²) along the left bank of Baru River. Semarang City Office is constructing a low cost housing like apartment buildings to develop the settlement for low income peoples as many as

possible. Moreover, Semarang City has planned to execute an urban renewal project during a fiscal year of 1997/1998 to 1998/1999 in SSUDP. However, the program will be postponed because almost all residents will not agree to follow the guideline for urban renewal project proposed by Semarang City. The northern part of remaining 35 % (0.20 km²) of the area used to be low-lying and undeveloped swamp but reclaimed by private developer for housing development in 1998. However, there is no actual construction work started as of November 1999.

The secondary and tertiary drainage network connected with Semarang River are in poor condition, due to very narrow urban roads and their complicated network. Accordingly, inundation problems in the residential area are very serious. The hydraulic features of secondary channels are summarized in Table 2.1.4. During high tide, some low-lying residential areas have been inundated by 0.1 to 0.2 m in depth without any rainstorm, due to the backwater of Semarang River. It is required to execute soon the urban renewal project mentioned above and to rehabilitate these poor secondary channels under the main urban roads.

Presently some urgent drainage improvement projects, including drainage pump facilities are on-going in this area as mentioned in Sub section 2.2.4.

(5) East Bandarharjo Drainage Area

The drainage area of East Bandarharjo is 1.605 km² as shown in Fig. 2.1.10. The area is like rectangular shape surrounded by Baru and Semarang rivers to the west, Usman Janatin Street to the north, MT Haryono and Ronggowarsito streets to the east, and Agus Salim Street and some urban roads to the south. The area is divided into two sub-drainage areas, the northern part of approx. 1.0 km² and the southern part of approx. 0.60 km² by Bangunharjo and Merak streets.

The present land use of the northern sub-drainage area is warehouse/factory in the western part and low income residential area including the national railway property in the eastern part. A secondary open channel with a rectangular shape is provided along Usman Janatin, Mpu Tantular and Ronggowarsito streets, and its outlet is connected to Baru River at the crossing with Usman Janatin Street. As an average ground elevation of this area is very low due to the rapid progression of land subsidence, inundation damage is very serious. Almost all residents have made efforts continuously to fill up the urban roads and their estates to prevent damage by habitual inundation. In recent

years, inundation with a depth of 20 - 30 cm along Ronggowarsito Street is always occurring even during season. These streets are expected to be rehabilitated soon to recover their function as a dike for high tide.

The southern sub-drainage area is commonly called as the Old City and is mainly used as business/commercial area. The secondary drains consisting of the rectangular open channels, box culverts and pipes are provided along Bangunharjo, Merak and MT Haryono streets. In the Old City area where there is a high inundation damage risk, the urban road rehabilitation project under SSUDP is being implemented in line with the tourism development program proposed by the Mayor of Semarang City. The project consists of road raising approx. 30 to 50 cm high, road pavement by brick/concrete block, and tertiary storm drain improvement. After completion of the project, the Old City will fully be included in Bandarharjo East drainage area.

Baru River is a primary drainage channel in the area. The channel width is 30 m and the length is 1,500 m from the diversion point of Semarang River to the harbor. Fig. 2.1.11 shows the longitudinal profiles of Baru River. The channel is deep downstream from the North Ring Road, where the channel is used for navigation. The hydraulic features of the secondary channels are summarized in Table 2.1.4.

2.1.5 Drainage Structures

Semarang River

(1) Revetment

By the Urban V Project mentioned before, revetments by wet stone masonry have been constructed at the upper reaches from the Section No.90 (the diversion point of Baru River) to No.241+13 and the structure is mostly sound.

(2) Bridges

There are twenty (20) bridges across Semarang River between No.0 and No.241+13 (Table 2.1.5). Among them twelve (12) bridges do not have enough clearance between the bottom of the girder and the Design High Water Level as shown in Table 2.1.5.

(3) Drainage Outlet

There are 122 secondary and tertiary drainage outlets along Semarang River between No. 0 and No. 241+13 (refer to Table 2.1.6). 56 of them are located in the lower reaches from the 4.0 km where the boundary of pump drainage and gravity drainage area. Some of those 56 outlets are being equipped with gates in the JRATUNSELUNA Projects mentioned in Sub-section 2.2.4.

Asin River

Wet stone masonry revetments exist along the present Asin River on both sides, which were constructed by Tanah Mas Estate. There are two bridges across Asin River constructed by Tanah Mas Estate. Since their abutment structures are hindering the channel flow because of narrow span, they shall be reconstructed. (Fig. 2.1.12). There are six (6) pump stations installed and operated by Tanah Mas Estate and association of the residents as mentioned in Sub-section 2.1.4. Those pumping stations are to be demolished and the pumps are to be hand over to the association. There are two water pipes and one telephone cable duct across the river .

Baru River

There is one pedestrian bridge across the river which is to be reinforced together with revetment work. There are four secondary drainage outlets along the river.

2.1.6 Land Use Pattern

According to the land use map of Semarang City prepared in 1993 by BAPPEDA, housing area covers about 13,540 ha of land corresponding to 36.4% of the total area, whereas agricultural land and conservation area are estimated at 10,720 ha and 6,750 ha accounting for 28.8% and 18.1% respectively. It should be noted that the industrial zone is concentrated in the coastal area, but it is minor portion showing as small as 2.8% of the total area.

Fig. 2.1.13 presents the land use of Semarang Municipality in 1993, and its summary is tabulated below.

Land Use Pattern of Semarang Municipality

Classification	Land Use in 1993	
	Area (ha)	Share (%)
Agricultural Land	10,723	28.8
Water Area	3,068	8.3
Conservation Area	6,752	18.1

Industrial Area	1,043	2.8
Business Area	684	1.8
Housing Area	13,538	36.4
Others	1,421	3.8
Total	37,229	100.0

2.1.7 Land Subsidence

In this section, some facts reported and observed regarding land subsidence in Semarang City area are studied.

(1) Study on Effect of Groundwater Exploitation in Semarang and Suburbs

This study has been carried out in December 1995 by Institute of Technology Bandung (ITB). The study objectives are to define groundwater resources in Semarang City and its surrounding areas, to assess the environmental impact caused by groundwater development and to define the areas to be recharged, conserved groundwater and regulated land use in Semarang City and its surrounding areas.

Several kinds of computer simulation models have been used for the analysis of groundwater flow, sea water intrusion and land subsidence in the study area. Calibrations based on the collected data, such as topographic map, deep well and drilled well data, geological and bore holes data, groundwater table, and etc. made the following conclusions:

- (a) Aquifer in Semarang City area consists of sand layer with a lens form distributed irregularly, which may cause sea water intrusion.
- (b) This aquifer with a thickness of 10 to 15 m found at 60 to 90 m in depth under the ground spreads in southwest to northeast direction.
- (c) Excessive pumping up may cause the progress of sea water intrusion and land subsidence.
- (d) The groundwater table in Tambaklorok, which is located north eastern edge of the Study Area, was estimated to drop about 2 to 3 m/year, which meets the field data of 2.2 m/year.

A drop of groundwater table in Semarang Area from 1982 to 2002 was estimated to be 0.5 to 2.3 m/year.

- (e) Annual land subsidence rate from 1985 to 2002 was estimated to be 0.5 to 1.6 cm/year, which are 1.0 cm/year at STM Perkapalan, 0.9 cm/year at Simpang Lima, 1.6 cm/year at Tambaklorok, 0.7 cm/year at P3B Pelayaran, 0.5 cm/year

at Jomblang and 0.9 cm/year at Kaligawe. Fig. 2.1.14 shows the simulated land subsidence of Semarang area in the year of 2002.

- (f) The sea water intrusion into groundwater has reached to 2.5 km from the shore line, which include Brumbungan, Wotgandul, Pengapon, Simpang Lima, Pedurungan, Puspowarno, Kenconowungu, Tanah Mas, and Krapyak.

The report emphasizes the necessity of control or management for the existing groundwater pumping, regulation for new groundwater development and establishment of data base and periodically monitoring system

(2) Semarang Harbor

Semarang Harbor has been expanded continuously since the end of 1970's by the financial assistance of OECF. According to the information from Japan Port Consultants Ltd., which is a leading consultants of Semarang Harbor Development Project, some piers supported by a steel pile and completed in 1985 had to be raised by 1.0 m because of land subsidence. The filling work has been done once in three years. The Consultant informed that design high water level for a pier which was +1.00 m in 1980 was changed to +1.35 m in 1989 and to +1.90 m in 1997. It has risen 90 cm during 17 years. It can be interpreted that the pier has sunk almost 5.3 cm per year.

Semarang Port Authority (SPA) has observed a tide of Semarang Harbor in a automatic gauging system since 1980. According to the tidal series from 1983 to 1995, it is estimated that Mean Water Level (MWL) of Semarang Harbor has risen about 4.0 cm in average per year as shown in Fig. 2.1.15. This means that the surrounding ground of the tide level station has sunk about 4.0 cm in average per year due to consolidation and land subsidence.

(3) TTG Bench Mark in Semarang City

There are nine (9) Titik Tinggi Geodesi (TTG), which is the national bench mark system based on MSL of Jakarta Harbor, Bench Marks (B.M.) in Semarang City as shown in Fig. 2.1.16. These B.M.s, except two B.M., TTG 447 and 449 were established along the coastal main road situated in flood plain from 1983 to 1984. Among these B.M., TTG 447 and 449 have never been affected by land subsidence because these were established in a hilly area. In fact, it has been confirmed by the leveling survey conducted in this study. So, elevations of other seven (7) B.M. have

been surveyed based on the elevation of original B.M., TTG 447 (104.987 m above MSL of Jakarta Harbor).

According to the survey results as shown in Fig. 2.1.16, it is noted that the land subsidence along Siliwangi Street (Semarang to Kendal), Kaligawe Street (Semarang to Demak) and near Tugu Muda are estimated to be about zero, 7.0 and 1.4 cm per year respectively. Flood plain along Kaligawe Street in eastern part of Semarang has been affected the most serious land subsidence due to much groundwater development by factories.

(4) Tanah Mas Estate

There are 20 deep wells in Tanah Mas Estate, which have been installed since 1980. Though the estate are connected already with PDAM water supply, the residents will use it for only drinking water because of high tariff of the PDAM water supply. Groundwater from these deep wells is still used for washing, bathing and others, which are pumping up about 90 to 100 m in depth.

An existing deep well 90 m deep located at near the center of the estate has stuck out more than 50 cm above the ground since 1980 due to the effect of land subsidence. It means that the annual land subsidence rate in the estate will be assumed to be about 2.5 cm/year.

(5) Survey Result

In the Study, a leveling survey was conducted to measure the annual land subsidence in the area. Fig. 2.1.17 shows the point of B.M.s. for the land subsidence survey. Fig. 2.1.17 also shows the amount of land subsidence detected by survey in 1997 and 1998. According to the survey the rate of land subsidence ranges between 1 cm/year and 10 cm/year with the average rate of 4.0 cm/year in the Study Area.

(6) Mechanism of Land Subsidence by Groundwater Extraction

The mechanism of land subsidence caused by groundwater extraction is explained schematically as shown in Fig. 2.1.18.

There exists a main confined aquifer composed of sandy layer 80 m to 100 m below the ground surface. The piezometric head of this aquifer used be high as indicated in the figure. After 1980, the amount of groundwater extracted has increased rapidly and has

reached as much as 100,000 m³ a day in Semarang Area. Because of this excess utilization of the confined aquifer, the piezometric head has dropped and the groundwater table has lowered in the whole region especially in the eastern part of the city. The lowered piezometric head induced a vertical flow of groundwater from the upper layer to the main confined aquifer whose geological characteristics mentioned below.

Above the main confined aquifer, there are two layers, namely upper alluvial soft clay layer of 20 to 30 m thick and the lower fluvial hard clay layer of 60 to 70 m thick. Both above layers has shrunken because of squeezing out ground water contained in the layers into the main aquifer below. However, it is not clear which of the two layers above contributes more in the total land subsidence.

2.2 Socio-Economic Condition

2.2.1 Population and Labor Force

(1) Population

According to the statistical data, population in Indonesia has increased from 147 million in 1980 to 198 million in 1996 with 1.87 % of an annual average population growth ratio as shown in Table 2.2.1. The annual average population growth rate was decreased from 1.98 % during the period between 1980 and 1990 to 1.69 % between 1990 and 1996.

Average family size of whole Indonesia was also decreased from 4.86 persons per household (HH) in 1980 to 4.27 persons per HH in 1996 through 4.52 persons per HH in 1990.

Population of Central Java Province was 29,881 thousand in 1996 as shown in the above mentioned table. However, the population of regencies and municipalities in Central Java Province was reported only up to 1995 even by the newest provincial level statistical data named as "the Central Java in Figures" (Jawa Tengah Dalam Angka).

In 1995, the population of Central Java Province was 29,653 thousand as shown in Table 2.2.2 with 1.04 % of the annual average increasing ratio for 15 years since 1980. The annual average population growth rate was decreased from 1.19 % during the

period between 1980 and 1990 to 0.74 % between 1990 and 1995. Average family size of Central Java Province was also decreased from 4.53 persons per HH in 1990 to 4.51 persons per HH in 1995 .

In Semarang City, the population was 1,252 thousand in 1996 according to the municipality level statistical data named as "the Semarang City in Figures" (Kotamadya Semarang Dalam Angka) with 1.21 % of annual average increasing ratio from 1,096 thousand in 1985. This annual population increasing ratio was increased from the said one to 1.47 % since 1990, and 2.06 % since 1993 as shown in Table 2.2.3. It seems that Semarang City is under developing municipality. It is supported by population density shown as, for example, the higher density of 15,814 person per km² in a district of Semarang Tengah than that of 14,068 persons per km² in Jakarta, and those in other districts as Semarang Selatan, Gayamsari, Semarang Timur, Candisari, Semarang Utara are almost near that of the said Jakarta's one. The Semarang Legislative Assembly has agreed a legislative bill on a new administration unit system submitted by the Mayor of Semarang in 1992. Therefore, the number of districts has been set as 16 districts from 9 districts since 1993 to ease to govern taking into account of the above mentioned population growth.

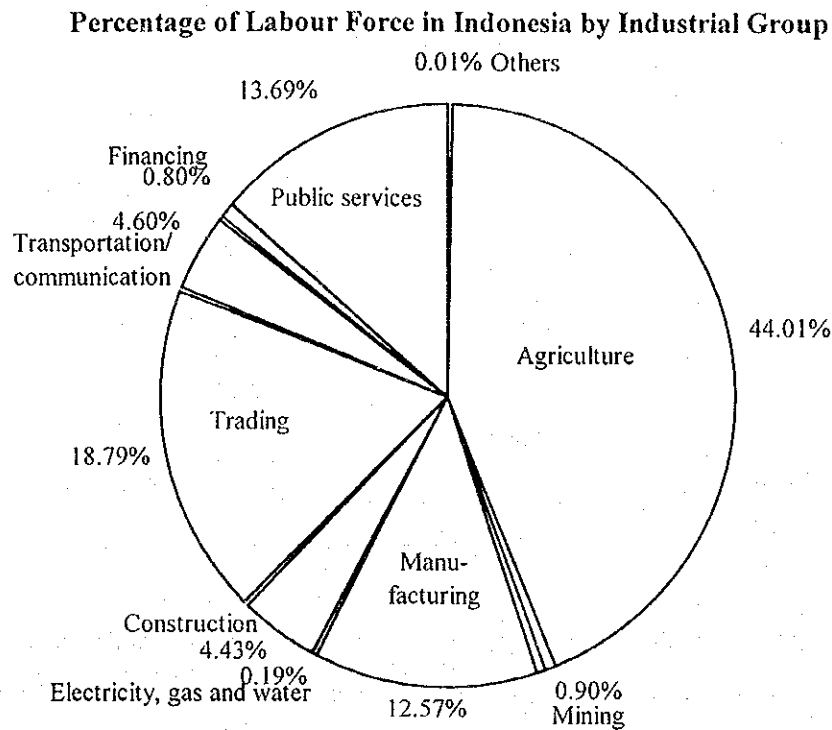
On the other hand, the family size in Semarang City has decreased from 4.86 persons per HH in 1985 to 4.50 persons per HH in 1996. But, this rate is still slightly higher than that in average of whole Indonesia as 4.27 persons per HH in the same year shown in Table 2.2.1.

(2) Labour Force

Among the household population who are 10-years and over in age of 110 million in 1985, 153 million in 1995 and 154 million in 1996 in Indonesia, the economic active population was 60 million, 86 million and 90 million with participation rates of 54 %, 57 % and 58 % respectively as shown in Table 2.2.4.

The actual labour force among the economic active population in Indonesia mentioned above in 1985, 1995 and 1996 was fluctuated as 58 million, 80 million and 86 million with the employed rate of 97 %, 93 % and 95 % respectively. Thus, the unemployed rates in Indonesia were 3 % in 1985, 7 % in 1995 and 5 % in 1996.

Following figure shows the share rates of actual labour forces by industrial group in both sexes in Indonesia as of 1996:



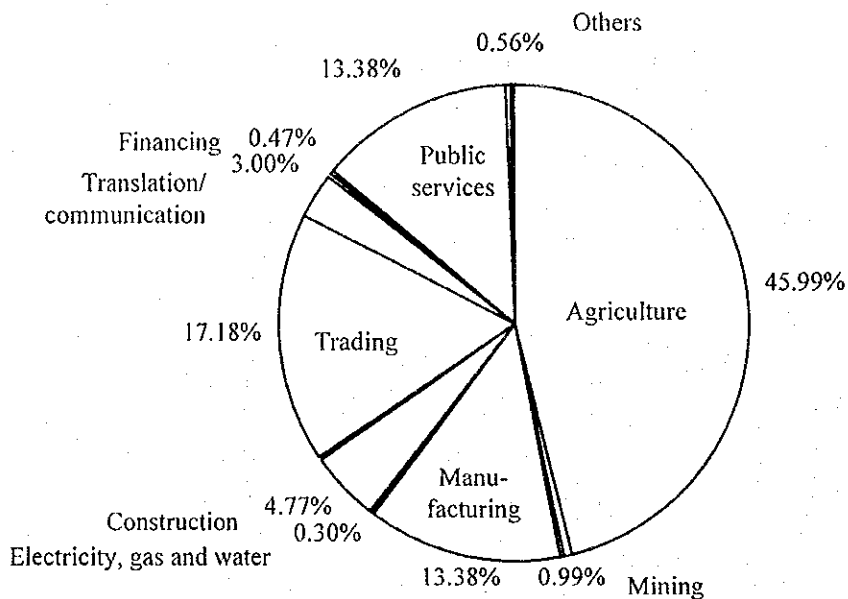
As shown in the above figure, Indonesia is still the agricultural established country from the viewpoint of the labour force as indicated at 44 % in its share rate to the total labour force as of 1996.

On the other hand, among the household population who are 10-years and over in age of 18 million in 1980, 21 million in 1988 and 24 million in 1995 in Central Java Province, the economic active population was 10 million, 13 million and 15 million with participation rates of 55 %, 63 % and 62 % respectively as shown in Table 2.2.5.

The actual labour force among the economic active population in Central Java Province mentioned above in 1980, 1988 and 1995 was fluctuated as 10 million, 13 million and 14 million with the employment rate of 99 %, 98 % and 96 % respectively. Thus, the unemployment rates in Indonesia were 1.34 % in 1980, 2.02 % in 1988 and 3.96 % in 1995.

Following figure shows the share rates of actual labour forces by industrial group in both sexes in Central Java Province as of 1995:

Percentage of Labour Force in Central Java Province by Industrial Group



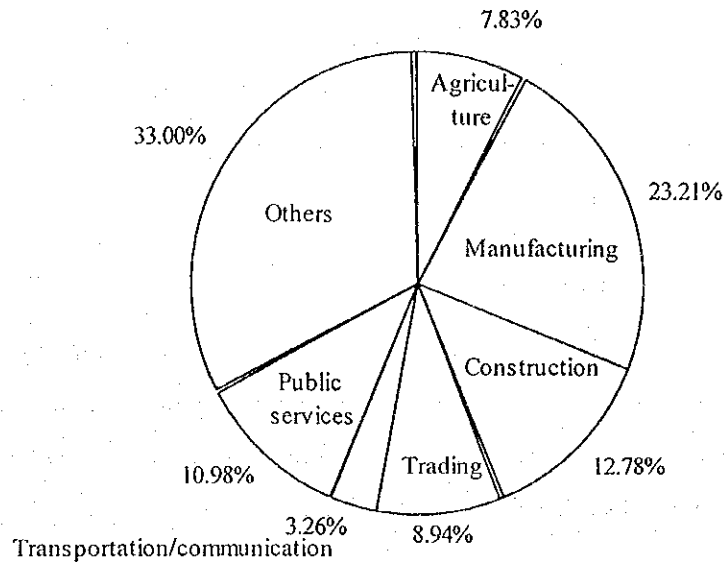
Sharing pattern of labour forces by industrial group in Central Java Province is almost the same with that in Indonesia as shown in the above figure, namely Central Java Province is also the agriculturally established province from the viewpoint of the labour force as indicated at 46 % in its share rate to the total labour force as of 1995.

However, Semarang City shows a different pattern. Among the household population who are 10-years and over in age of 836 thousand in 1985, 894 thousand in 1990, 993 thousand in 1995 and 1,016 thousand in 1996 in Semarang City, the economic active population was 511 thousand, 632 thousand, 841 thousand and 822 thousand with participation rates of 61 %, 71 %, 85 % and 81 % respectively as shown in Table 2.2.6.

The actual labour force among the economic active population in Semarang City mentioned above in 1985, 1990, 1995 and 1996 was fluctuated as 452 thousand, 415 thousand, 678 thousand and 655 thousand with the employment rate of 88 %, 66 %, 81 % and 80 % respectively. Thus, the unemployment rates in Semarang City were 12 % in 1980, 34 % in 1990, 19 % in 1990 and 20 % in 1996.

Semarang City has no statistical data on actual labour force by industrial group in detail. So following figure shows the share rates of economic active population by industrial group in both sexes in the Municipality as of 1996:

Percentage of Economic Active Population in Semarang by Industrial Group



Mining industry in Semarang City does not appear in the statistical data summarized as the said table. The share rate of agriculture is only 8 %, while that of manufacturing shows at 23 % which is almost two times comparing with that in whole Indonesia and whole Central Java Province. The rate of trading is only 9 %. Transportation and communication shares at 3 % which is rather low comparing with that in whole Indonesia, but is almost the same with that in whole Central Java Province.

It seems that those sharing patterns reflect a function of Semarang City as the capital city of Central Java Province. A group not be able to be classified as a specific industrial group named as “others” with 33 % of share rate looks to reflect the city-diversity too.

Unemployment rate is rather high in Semarang City comparing with that of whole Indonesia and whole Central Java Province as 20 % as mentioned above. This is also a fatal phenomenon in such a city gathering a lot of people who are seeking opportunities to work.

Table 2.2.7 shows a distribution situation of the said economic active population by district (Kecamatan). According to this table, there is no any agricultural active population except fisheries in the central area of Semarang City as the districts of Semarang Timur, Semarang Utara, Semarang Tengah, Semarang Selatan, Candi Sari,

and Gajah Mungkur. For fisheries, the district of Semarang Utara has the highest activity, especially almost of the people living in the village of Bandar Harjo are engaged in fisheries at present, so the village is called as "fishers' village ("Kampung Nelayan" in local language)" in general in Semarang City. Districts of Gayam Sari and Semarang Barat are also located around the central area of Semarang City, but those districts have a little agricultural active population. Some of these districts concern directly with this Project.

2.2.2 Family Economy

Table 2.2.8 shows a situation of household income and expenditure by commodities of consumption as of 1996 based on the result of Living Expenditure Survey in Central Java in 1996 made by the Statistic Office of Central Java Province, and as of 1997 based on a result of Property Survey made by JICA Study Team this time.

According to this property survey this time, the income level of household in the study area may be Rp. 810 thousand per household (HH) per month as of 1997, however the amount of expenditure may be a sum of around Rp.1,285 thousand per HH per month in the same year. Therefore, the actual income level also should at least be the same amount of expenditure per HH per month which is called as the estimated income level. In the study area, number of economic active persons per HH per month may be estimated at 1.94 persons as shown in the said table. Therefore, an average per capita income per month can be calculated at Rp. 662 thousand at the present.

The expenditure level of the study area is almost double comparing with that of the whole Semarang City reflecting situation of the center of the city zone of it where is a vital area for retail trading. Namely, prices of all daily articles and services are usually expensive in the central area of the city zone.

The share rate of expenditure for food is rather low as 24.05 % to the total expenditure, but that for housing shares at 41.06 % which is quite high comparing that of the whole Semarang City.

Generally speaking, the amounts of expenditure for fuel, lighting and water range from 2.5 % to 5.0 % in average to the total income in developing countries. From this viewpoint, such amount of expenditure shares as rather high at around 7.3 % to total monthly income in the study area. Especially, the amount of expenditure for electricity and water share at 2.6 %, and 1.3 % respectively to the income with amounts of Rp. 34,000 and Rp. 16,500 per HH per month.

According to an information from State Electricity Corporation (PLN = Perusahaan Listrik Negara), the average actual unit price of electricity may be estimated at Rp.155 per kWh for domestic electricity sales, and the average electricity volume used by household is counted at 76 kWh per month in 1997. So the average amount to be paid for electricity can be calculated at Rp. 11,780 (= Rp. 155/kWh x 76 kWh) per month per HH. This amount shares at 1.7 % to the amount of total expenditure (= estimated income level) of Rp. 688 thousand in the whole Semarang City which is reasonable amount of expenditure according to the said general speaking.

The above said monthly expenditure of Rp. 34,000 per month per HH for electricity is quite high comparing with the above mentioned amount of Rp. 11,780 per month per HH. Even if this figure reflects the situation of the central area of the city zone, this amount of expenditure for electricity can be said as a limited amount for ordinary households.

2.2.3 Price Fluctuation

(1) Consumer Price Indexes

Table 2.2.9 shows consumers' price indexes in Indonesia and Semarang City since 1993 and 1992 respectively. According to this table, the annual average increasing ratios of general, food, housing, clothing, and miscellaneous are 8.62 %, 11.20%, 7.95 %, 6.52 % and 6.99 % in Indonesia since 1993 respectively, and 7.62 %, 9.46 %, 6.37 %, 4.78 % and 7.29 % in Semarang City since 1992 respectively..

(2) Foreign Currency Exchange Rates

The fluctuation of exchange rates against US Dollars and Japanese Yen during the period from 1992 to December 1997 is shown in Table 2.2.10.

According to this table, the annual decreasing ratio of Indonesian Rupiah against US Dollar is 7.57 % per annum and that against Japanese Yen is decreased with a rate of 8.02 % per annum for the period from 1992 to 1997. The exchange rate of Rupiah against US\$1 may be estimated at Rp. 2,971, and that against Japanese ¥ 100 is Rp. 2,437 as of 1997.

2.2.4 Relationships with Other Related Projects

(1) Semarang Surakarta Urban Development Project (SSUDP)

In order to improve the living conditions of the rapidly increasing urban population, the Government of Indonesia intends to focus on three principal aspects regarding the provision of urban services in local Governments as:

- Expansion of basic, low-cost urban infrastructure and services in a planned and coordinated manner;
- Decentralization of the planning and much of the implementation of urban development to local Government and to strengthen the higher levels of Government to enable them to provide the technical assistance, training and project appraisal support; and,
- Stimulation of increases in local revenue to help finance new investments and improve operation and maintenance of existing facilities at the local level, and to seek measures for long-term finance.

In Central Java Province, there are 6 packages of development plan based on the said Governmental intention. Package A is for development of the Special Municipality of Yogyakarta (Daerah Istimewa Yogyakarta) and its surrounding area, Package B is for development of the municipalities of Semarang and Surakarta named as "Semarang-Surakarta Urban Development Program (SSUDP)". The other four packages are for development of the other area classified by four regions in Central Java Province.

The package which is likely to relate this Project among them is the SSUDP which is under executing financed by the World Bank (IBRD = the International Bank for Rehabilitation and Development) targeted to complete its whole works by 2000. The finance by the World Bank for this SSUDP includes 9 major programs as (1) to improve the urban roads and transport, (2) to supply water and to distribute it, (3) to drain storm water and to control floods in urban area, (4) to make solid waste collection and disposal systems, (5) to improve human waste disposal (sewerage and on-site sanitation facilities), (6) to make multi-sectoral programs for villages (Kampung = low income area) for improvements and market investments, (7) to make programs for the development and strengthening of local institutions, (8) to make programs to increase local revenue generation, and (9) to give technical assistance for implementation of the said programs.

According to SSUDP Project Preparation Report in April 1993, to reduce the flood risk for extensive flat lands and to improve the drainage system the following works were proposed:

- (a) to increase the capacity of the rivers, drainage channels and pumping stations in the densely populated central city areas expecting the greatest economic and social benefit,
- (b) to rehabilitate secondary and tertiary drainage channels, and
- (c) to provide assistance to improve the operation and maintenance of the drainage system.

The proposed urban drainage improvement projects with a total cost of US\$ 28x10⁶ (Foreign Currency: US\$ 9x10⁶, Local Currency: US\$ 19x10⁶) are as follows:

- (a) East Semarang : Improvement of Tenggang and Sringin Rivers, Secondary channel improvement of Kaligawe
- (b) Central Semarang : Improvement of Banger River, Construction of tidal gate of Semarang River
- (c) West Semarang : Bulu drainage system improvement, Drainage improvement of Pamularsih-A. Rachman Saleh area and PUOP A Yani area

Fig. 2.2.1 shows the location of the proposed drainage improvement project in SSUDP.

Presently, they are planning a new pump drainage system covering a part of the East Bandarharjo Area. The general plan is to construct a new retarding pond in front of the Tawang Station and to install a new pumping station to discharge into Baru River.

Although the new pump drainage is inside the Study Area, the facilities are temporary based as agreed between the Study Team and the Director General of Cipta Karya, it will not affect the design of the facilities of the Study.

(2) SPL Projects by JRATUNSELUNA

In 1998, JRATUNSELUNA offices initiated several SPL (Sector Program Loan) projects in the area in order to improve the drainage situation of the area urgently. It composed of five pumping stations, dike raising and dredging. Although these projects are within the study area, as facilities are temporary ones, they will not affect the design of the Study. Table 2.2.11 shows the features of these SPL projects.

TABLES

CHAPTER 2 PRESENT CONDITION OF THE TARGET AREA

Table 2.1.1 CLIMATOLOGICAL DATA AT BMG-SEMARANG STATION

Element	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (/year)	Mean	Data Period
Monthly Rainfall	mm/month	434	292	274	201	178	100	73	67	92	154	228	285	2378	198.2	1968-1996
Pan Evaporation	mm/day	3.3	3.7	3.8	4.0	4.3	4.5	4.8	5.1	5.7	5.5	4.4	3.8	1610	4.4	1978-1996
Average Temperature	deg. C	26.4	26.4	26.8	27.6	27.9	27.4	27.1	27.2	27.8	28.3	27.8	27.0		27.3	1968-1996
Maximum Temperature	deg. C	29.9	30.0	30.4	31.7	32.5	32.4	32.6	33.2	33.7	33.7	32.3	30.8		31.9	- do. -
Minimum Temperature	deg. C	23.5	23.6	23.9	24.3	24.2	23.2	22.8	22.7	23.0	23.6	23.7	23.7		23.5	- do. -
Relative Humidity	%	84.4	84.1	83.8	79.8	77.2	74.6	72.2	70.7	70.1	71.7	77.3	81.5		77.3	- do. -
Rainy Days	days	22	18	18	15	11	7	6	5	8	11	16	19	156	13.0	- do. -
Sunshine Duration	%	38	46	52	59	65	65	75	81	74	70	56	46		60.6	- do. -
Wind Velocity	m/s	2.0	2.0	1.6	1.6	1.7	1.8	1.9	2.0	2.0	1.8	1.6	1.6		1.8	- do. -

Source : Badan Meteorologi dan Geofisika, Stasiun Klimatologi Semarang

TABLE 2.1.2 GEOLOGICAL STRATA OF STUDY AREA



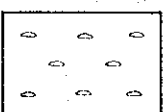
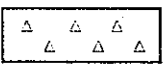
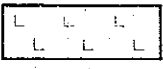
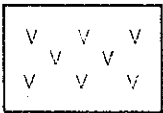
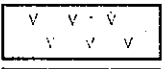
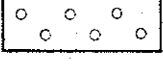
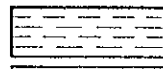
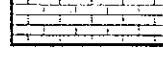
EPOCH	SYMBOL	FORMATION	NAME	LITHOLOGY	
HOLOCENE	 ts		Top Soil Talus dt	Clay, Gravel (angular)	
	 rd		River Bed dt.	Sand, gravel interbedded silt and clay	
	 Fd		Flood Plain dt	Sand, gravel, silt and clay	
PLEISTOCENE	 VB	NOTOPURO	Volcanic breccia	VB; Volcanic Breccia	
	 VS			VBs; Tuffaceous sandstone	
	 La		Lava Flow	Andesite Exposed Lava Locally	
	 Dts		DAMAR	Tuffaceous Sandstone	Dts; Tuffaceous sandstone
	 Dtg				Dtg; Conglomerate
PLIOCENE	 Kc	KALIBIUK	Blue Claystone	Kc; Blue Claystone, marl, Sandstone	
	 Kcl			Kcl Limestone	

Table 2.1.3 CALCULATION OF DESIGN DISCHARGE FOR SEMARANG RIVER

Name of Channel Section	Distance (m)	Accumulate Distance (m)	Drainage Area (km ²)	Accumulate Drainage Area (km ²)	Velocity (m/sec)	Time of Concentration (min)	Rainfall Intensity (mm/hr)	Run-off Coefficient	Peak Discharge (m ³ /sec)	Design Discharge (m ³ /sec)	Remarks
A.1 Semarang River											
H - I (Sm - 1)	895	895	0.219	0.219	1.50	25	138.7	0.650	4.39	5	
G - H (Sm - 2)	1,367	2,262	0.875	1.094	1.59	39	109.4	0.599	15.93	16	
F - G (Sm - 3)	1,024	3,286	0.508	1.602	1.47	51	94.8	0.615	20.75	21	
F - F	0	3,286	2.935	4.537	1.47	73	77.0	0.615	41.77	42	Confluence of Smpang Lima R.
E - F (Sm - 4)	1,027	4,313	0.975	5.512	1.52	85	70.6	0.593	45.29	46	
D - E (Sm - 5)	1,061	5,374	0.354	5.866	1.45	97	65.2	0.609	45.75	46	
C - D (Sm - 6)	638	6,012	0	5.866	0.75	111	58.7	0.609	45.75	46	No diversion to Baru River
B - C (Sm - 7)	1,150	7,162	0	5.866	0.75	137	50.3	0.609	33.97	46	
B' - B	0	7,162	4.252	10.118	0.75	137	50.3	0.626	64.87	65	Confluence of Asin River
B' - B	280	7,442	0.58	10.698	0.75	143	48.7	0.628	60.70	65	Inflow from Bandarharjo West
A - B (Sm - 8)	954	8,116	0.500	10.618	0.58	164	43.8	0.634	59.60	65	
A.2 Smpang Lima River											
O - P (Si - 1)	1,457	1,457	2.051	2.051	0.70	50	96.0	0.545	23.86	24	
F' - O (Si - 2)	996	2,453	0.884	2.935	0.70	73	76.8	0.545	21.30	22	Diversion to Kartini P. S. (6m ³ /s)
A.3 Asin River											
J - K (As - 1)	2,400	2,400	2.038	2.038	0.50	95	65.9	0.650	19.41	20	
B' - J (As - 2)	1,150	3,550	2.214	4.252	0.70	122	56.6	0.650	34.78	35	
A.4 Baru River											
M - D (Ba - 1)			0	0	0.60				0.00	0	
L - M (Ba - 2)			1.605	1.605	0.60			0.727			

Table 2.1.4 HYDRAULIC FEATURES OF SECONDARY CHANNELS

Name of Channel	Length (m)	Width (m)	Depth (m)	Drainage Area (ha)
1. Asin Drainage Area				
A	1,890	0.8 - 4.0	0.8 - 1.4	A=1.69 ha: Bima, Poncowolo, Plombokan and Ksatria areas
B	1,560	1.8 - 4.0	0.6 - 1.3	A=2.51 ha: Abimanyu, Indraprasta Estate, and Ksatria areas
C	1,800	1.2 - 3.0	0.5 - 1.2	A=3.24 ha: Imam Bonjol (south) and Hasanuddin areas
D	3,300	0.9 - 3.0	0.6 - 1.3	A=3.36 ha: Imam Bonjol, Purwosari, and Purwogondo areas
E	2,700	1.0 - 2.0	0.5 - 1.2	A=2.34 ha: Boomlama and Pere areas
F	550	5.0	0.7 - 1.2	A=0.72 ha: Tanah Mas Housing Estate
G	600	1.2 - 2.5	0.4 - 1.0	A=0.84 ha: Tanah Mas Housing Estate
H	600	1.8 - 2.6	1.2 - 1.6	A=0.96 ha: Tanah Mas Housing Estate
I	550	0.8 - 2.0	0.4 - 1.1	A=0.76 ha: Tanah Mas Housing Estate
J	500	1.9 - 2.0	0.7 - 1.1	A=0.99 ha: Tanah Mas Housing Estate
K	400	0.9 - 2.0	0.5 - 1.1	A=0.72 ha: Hasanuddin Housing Estate
L	980	1.0 - 2.2	0.5 - 1.2	A=1.47 ha: Tanah Mas Housing Estate
2. Bandarharjo West Drainage Area				
A	230	0.6 - 1.0	0.6 - 1.0	A=0.69 ha: Kelurahan Bandarharjo
B	1,120	0.6 - 1.2	0.6 - 1.2	A=2.16 ha: Kelurahan Bandarharjo
C	460	0.6 - 1.2	0.6 - 1.0	A=0.56 ha: Kelurahan Bandarharjo
D	420	0.6 - 1.0	0.6 - 1.0	A=0.37 ha: Kelurahan Bandarharjo
3. Bandarharjo East Drainage Area				
A	1,400	2.0 - 2.6	0.8 - 1.7	A=6.07 ha: Old City and Railway Station areas
B	2,200	1.5 - 3.5	0.6 - 1.6	A=2.90 ha: Kelurahan Tanjung Mas
C	900	0.6 - 1.0	0.6 - 0.8	A=2.34 ha: Kelurahan Tanjung Mas
D	920	2.0	1.4 - 1.6	A=1.88 ha: Kelurahan Tanjung Mas
E	1,150	2.0 - 2.5	0.7 - 1.2	A=2.86 ha: Kelurahan Tanjung Mas

Note: Location of each channel is shown in Figs. 3.3.3 to 3.3.5.

Table 2.1.5 EXISTING BRIDGES ACROSS SEMARANG RIVER (No.0 - No.241+13)

No.	Location	Name of Street	Bottom of g; Girde (EL m)	Design High Water (EL m)	Freeboard (m)
1	SMC-21+23	JL. Serskko Usmam Janatin	1.90	0.406	1.49
2	SMC-53+17	-	0.56	0.484	0.08
3	SMC-69+14	-	0.27	0.518	-0.25
4	SMC-90+11	-	1.68	0.564	1.12
5	SMC-106+13	Railway	-0.06	0.610	-0.67
6	SMC-115+14	JL.Mputantular	0.73	0.655	0.08
7	SMC-116+8	JL.Suprpto	0.89	0.659	0.23
8	SMC-121+3	-	0.60	0.682	-0.08
9	SMC-126+17	JL.Agus Salim	1.19	0.709	0.48
10	SMC-137+14	JL.Gong Gong	0.46	0.780	-0.32
11	SMC-142+23	JL.Pekajan	1.05	0.866	0.18
12	SMC-156+17	-	1.23	1.135	0.09
13	SMC-161	JL.Kimangun Sarkoro	2.32	1.230	1.09
14	SMC-168+7	JL.Sebandaran	1.77	1.356	0.41
15	SMC-183	JL.Wot Gandul	1.64	1.626	0.01
16	SMC-195+17	JL.Gajah Mada	2.85	1.859	0.99
17	SMC-211	JL.Tamrin	1.14	2.110	-0.97
18	SMC-215+22	-	2.65	2.227	0.42
19	SMC-225+10	JL.Pekenden	3.25	2.499	0.75
20	SMC-235+24	-	2.84	2.790	0.05
					not enough
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Table 2.1.6 EXISTING DRAINAGE CHANNEL OUTLETS TO BE CLOSED

No.	Location	Structure	Size (m)
1	SML-24+5	Box Culvert	W1.5XH0.95
2	SML-31+5	Pipe	Φ=0.270
3	SML-54+17	Box Culvert	W1.81XH1.23
4	SMR-22+20	Channal	W=4.0
5	SMR-42+6	Pipe	Φ=0.250
6	SMR-49+11	Box Culvert	W1.00XH1.00
7	SMR-52+29	Box Culvert	W=1.0
8	SMR-54+10	Pipe	Φ=0.460
9	SML-56+30	Pipe	Φ=0.100
10	SML-57+31	Box Culvert	W0.48XH0.24
11	SML-60+12	Box Culvert	W0.51XH0.06
12	SML-61+5	Box Culvert	W0.75XH0.50
13	SML-62+0	Pipe	Φ=0.120
14	SML-62+26	Box Culvert	W0.63XH0.59
15	SML-64+15	Box Culvert	W0.68XH0.50
16	SMR-65+11	Pipe	Φ=0.170
17	SMR-55+11	Pipe	Φ=0.370
18	SMR-55+5	Box Culvert	W0.85XH0.39
19	SMR-57+0	Box Culvert	W=1.0
20	SMR-61+22	Pipe	Φ=0.120
21	SMR-63+13	Pipe	Φ=0.160
22	SML-66+26	Box Culvert	W0.89XH0.53
23	SML-70+11	Box Culvert	W2.0XH1.1
24	SML-72+19	Box Culvert	W1.97XH0.85
25	SML-73+29	Pipe	Φ=0.170
26	SMR-72+28	Box Culvert	W0.6XH1.72
27	SML-74+33	Box Culvert	W0.48XH1.34
28	SML-81+17	Box Culvert	W1.72XH1.72
29	SMR-81+19	Box Culvert	W0.51XH1.76
30	SMR-83+8	Box Culvert	W0.54XH1.71
31	SML-83+13	Box Culvert	W2.78XH1.23
32	SML-89+27	Box Culvert	W1.6XH1.22
33	SMR-91+3	Box Culvert	(W2.72XH2.50)*2
34	SML-98+6	Box Culvert	W0.73XH0.87
35	SML-106+6	Box Culvert	W2.45XH1.44
36	SML-107+22	Box Culvert	W1.99XH0.82
37	SML-115+22	Pipe	Φ=0.600
38	SML-115+24	Box Culvert	W2.32XH1.70
39	SML-116+32	Pipe	Φ=1.000
40	SML-116+32	Iron Box	W0.91XH0.62
41	SML-116+33	Pipe	Φ=0.280
42	SMR-119+14	Box Culvert	W0.6XH0.5
43	SMR-120+22	Box Culvert	W1.17XH0.50
44	SMR-123+2	Pipe	Φ=0.600
45	SML-123+11	Box Culvert	W0.5XH0.65
46	SML-124+29	Box Culvert	W0.61XH1.1
47	SML-126+1	Box Culvert	W0.61XH0.73
48	SML-126+2	Pipe	Φ=0.600
49	SML-128+1	Pipe	Φ=1.000
50	SML-126+29	Pipe	Φ=130(Box W0.80XH0.64)
51	SMR-130+18	Pipe	Φ=0.800
52	SML-129+33	Pipe	Φ=1.000
53	SML-131+2	Pipe	Φ=1.000
54	SMR-133+20	Pipe	Φ=0.800
55	SML-139+11	Pipe	Φ=0.800
56	SML-140+32	Pipe	Φ=0.800

Table 2.2.1 AREA AND POPULATION IN INDONESIA

Province	Area (km ²)	Population			Households (HHs)			Family size (person/FH)			Annual average growth rate of population (%)			Population density as of 1996 (persons/km ²)
		1980			1990			1980			'80-'90			
		(persons in 1,000)	(persons in 1,000)	(persons in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(HHs in 1,000)	1990	1996	'80-'90	
Sumatera Island	482,393	28,016	36,502	41,840	5,375	7,474	9,202	5.21	4.88	4.55	2.68%	2.30%	2.49%	87
Dista Aceh	55,390	2,611	3,416	3,945	531	697	832	4.92	4.90	4.74	2.72%	2.43%	2.54%	71
Sumatera Utara	71,680	8,361	10,232	11,306	1,548	2,023	2,367	4.78	5.07	4.78	2.06%	1.64%	2.61%	158
Sumatera Barat	42,898	3,407	4,000	4,390	704	868	1,004	4.84	4.61	4.37	1.62%	1.56%	1.90%	102
Riau	94,561	2,168	3,304	4,037	413	679	923	5.25	4.87	4.40	4.30%	3.48%	3.99%	43
Jambi	53,436	1,446	2,020	2,439	300	438	577	4.82	4.61	4.26	3.40%	3.33%	3.37%	46
Sumatera Selatan	109,254	4,630	6,313	7,413	857	1,266	1,631	5.40	4.99	4.55	3.15%	2.71%	2.99%	68
Bengkulu	19,789	768	1,179	1,464	150	252	343	5.12	4.68	4.27	4.38%	3.68%	4.12%	74
Lampung	35,385	4,625	6,018	6,806	872	1,251	1,525	5.30	4.81	4.46	2.67%	2.07%	2.44%	192
Java Island	127,499	91,270	107,581	116,379	19,623	24,908	28,268	4.65	4.32	4.12	1.66%	1.32%	1.53%	913
DKI Jakarta	664	6,503	8,259	9,341	1,164	1,740	2,117	5.59	4.75	4.41	2.42%	2.43%	2.54%	14,068
Jawa Barat	43,177	27,454	35,384	40,118	6,101	8,180	9,575	4.50	4.33	4.19	2.57%	1.64%	2.61%	929
Jawa Tengah	32,549	25,373	28,521	29,881	5,286	6,414	7,077	4.80	4.45	4.22	1.18%	1.56%	1.90%	918
DI Yogyakarta	3,186	2,751	2,913	2,915	593	729	769	4.64	4.00	3.79	0.57%	3.48%	3.99%	915
Jawa Timur	47,923	29,189	32,504	34,124	6,479	7,845	8,730	4.51	4.14	3.91	1.08%	3.33%	3.37%	712
Nusa Tenggara Island	87,744	8,487	10,165	11,133	1,684	2,136	2,480	5.04	4.76	4.49	1.82%	1.53%	1.71%	127
Bali	5,633	2,470	2,778	2,924	485	601	704	5.09	4.62	4.15	1.18%	0.86%	1.06%	519
Nusa Tenggara Barat	20,153	2,725	3,370	3,708	594	767	883	4.59	4.39	4.20	2.15%	1.60%	1.94%	184
Nusa Tenggara Timur	47,349	2,737	3,269	3,641	496	619	715	5.32	5.28	5.09	1.79%	1.81%	1.80%	77
Timor Timur	14,609	555	748	860	109	149	178	5.09	5.02	4.83	3.03%	2.35%	2.77%	59
Kalimantan Island	547,891	6,723	9,099	10,807	1,323	1,942	2,532	5.04	4.76	4.49	3.07%	2.91%	3.01%	20
Kalimantan Barat	146,807	2,486	3,229	3,732	458	640	795	5.43	5.05	4.69	2.65%	2.44%	2.57%	25
Kalimantan Tengah	153,564	954	1,396	1,686	186	306	408	5.13	4.56	4.13	3.88%	3.19%	3.62%	11
Kalimantan Selatan	36,535	2,065	2,597	2,960	444	597	748	4.65	4.35	3.96	2.32%	2.21%	2.28%	81
Kalimantan Timur	210,985	1,218	1,877	2,429	235	399	581	5.18	4.70	4.18	4.42%	4.39%	4.41%	73
Sulawesi Island	191,800	10,409	12,521	14,019	1,923	2,558	3,019	5.04	4.76	4.49	1.86%	1.90%	1.88%	12
Sulawesi Barat	27,488	2,115	2,478	2,686	399	549	637	5.30	4.51	4.22	1.60%	1.35%	1.51%	98
Sulawesi Tengah	63,689	1,290	1,711	1,997	233	347	438	5.54	4.93	4.56	2.86%	2.61%	2.77%	31
Sulawesi Selatan	62,483	6,062	6,982	7,693	1,117	1,399	1,605	5.43	4.99	4.79	1.42%	1.63%	1.50%	123
Sulawesi Tenggara	38,140	942	1,350	1,643	174	263	339	5.41	5.13	4.85	3.66%	3.33%	3.54%	43
Maluku and Irian Jaya	499,852	2,585	3,507	4,163	445	677	900	11.60	10.35	9.27	3.10%	2.90%	3.02%	8
Maluku	77,871	1,411	1,858	2,142	229	344	435	6.16	5.40	4.92	2.79%	2.40%	2.64%	28
Irian Jaya	421,981	1,174	1,649	2,021	216	333	465	5.44	4.95	4.35	3.46%	3.45%	3.45%	5
Total in Indonesia	1,937,179	147,490	179,375	198,341	30,373	39,695	46,401	4.86	4.52	4.27	1.98%	1.69%	1.87%	102

Table 2.2.2 AREA AND POPULATION IN CENTRAL JAVA

Kabupaten/Kotamadya (Regency/Municipality)	Area (km ²)	Population (persons in 1,000)		Households (HHs) (HHs in 1,000)		Family size (person/HH)		Annual average growth rate of population (%)			Population density as of 1995 (persons/km ²)	
		1980	1990	1990	1995	1990	1995	'80-'90	'90-'95	'80-'95		
		(persons in 1,000)	(persons in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(persons/HH)	(persons/HH)					
Kabupaten (Regency)												
Cilacap	2,143	1,344	1,459	1,535	326	348	4.48	4.41	0.82%	1.02%	0.89%	716
Banyumas	1,328	1,228	1,351	1,402	304	317	4.44	4.42	96.00%	0.74%	0.89%	1,056
Purbalingga	778	671	756	786	159	165	4.75	4.76	1.20%	0.78%	1.06%	1,010
Banjarnegara	1,070	678	773	808	178	176	4.34	4.59	1.32%	0.89%	1.17%	755
Kebumen	1,283	1,038	1,151	1,182	320	244	3.60	4.84	1.04%	0.53%	0.87%	921
Purworejo	1,035	694	724	733	158	165	4.58	4.44	0.42%	0.26%	0.36%	708
Wonosobo	985	601	671	705	140	146	4.79	4.83	1.12%	0.99%	1.07%	716
Magelang	1,086	935	1,017	1,038	235	238	4.33	4.36	0.84%	0.41%	0.70%	956
Boyolali	1,015	786	870	888	191	199	4.55	4.46	1.03%	0.40%	0.82%	875
Klaten	656	1,086	1,180	1,204	250	257	4.72	4.68	0.83%	0.41%	0.69%	1,835
Sukoharjo	467	605	696	727	140	159	4.97	4.57	1.41%	0.89%	1.24%	1,557
Wonogiri	1,822	953	1,026	1,050	203	213	5.05	4.93	0.74%	0.47%	0.65%	576
Karanganyar	772	610	707	744	138	162	5.12	4.59	1.49%	1.01%	1.33%	964
Sragen	946	765	845	863	180	190	4.69	4.54	1.09%	0.43%	0.71%	912
Grobogan	1,976	1,020	1,176	1,242	202	300	4.49	4.14	1.44%	1.09%	1.32%	629
Blora	1,794	698	757	788	179	185	4.23	4.26	0.82%	0.79%	0.81%	439
Rembang	1,014	443	511	526	115	120	4.44	4.38	1.44%	0.56%	1.15%	519
Pati	1,491	971	1,070	1,110	259	275	4.13	4.04	0.97%	0.74%	0.89%	744
Kudus	425	537	610	635	127	141	4.80	4.50	1.27%	0.83%	1.13%	1,494
Jepara	1,004	701	776	827	190	203	4.08	4.07	1.03%	1.28%	1.11%	824
Demak	897	645	807	854	187	199	4.32	4.29	2.27%	1.15%	1.90%	952
Semarang	982	709	772	763	170	174	4.54	4.39	0.86%	-0.23%	0.50%	777
Terngagung	870	558	606	632	128	136	4.73	4.65	0.84%	0.82%	0.83%	726
Kendal	1,002	701	789	819	181	186	4.36	4.40	1.20%	0.74%	1.04%	817
Batang	789	531	593	616	130	135	4.56	4.56	1.10%	0.79%	1.00%	781
Pekalongan	836	653	701	734	142	146	4.94	5.03	0.72%	0.92%	0.78%	878
Pennalang	1,012	949	1,085	1,147	217	237	5.00	4.84	1.34%	1.13%	1.27%	1,133
Tejal	880	1,103	1,242	1,268	263	272	4.72	4.66	1.19%	0.43%	0.94%	1,441
Brebes	1,658	1,267	1,529	1,546	334	342	4.58	4.52	1.90%	0.23%	1.34%	932
Kotamadya (Municipality)												
Magelang	18	123	117	115	26	26	4.50	4.42	-0.47%	-0.36%	-0.43%	6,389
Surakarta	44	459	517	528	113	116	4.38	4.55	1.19%	0.44%	0.94%	12,000
Salatiga	18	80	86	140	18	30	4.78	4.77	0.80%	10.59%	3.97%	7,944
Semarang	374	996	1,147	1,221	251	274	4.46	4.46	1.42%	1.26%	1.37%	3,265
Pekalongan	45	133	235	242	48	51	4.96	4.75	5.89%	0.57%	4.08%	5,378
Tejal	34	132	230	230	48	49	4.79	4.69	5.69%	0.04%	3.77%	6,765
Total in Central Java	32,549	25,403	28,582	29,651	6,310	6,576	17,69	17,24	1.19%	0.74%	1.04%	911

Table 2.2.3 AREA AND POPULATION IN SEMARANG CITY

Kecamatan (District)	Area (km ²)	Population			Households (HHs)			Family size (person/HH)			Annual average growth rate of population (%) '80-'90	Population density as of 1996 (persons/km ²)
		1990			1990			1990				
		(persons in 1,000)	(persons in 1,000)	(persons in 1,000)	(HHs in 1,000)	(HHs in 1,000)	(HHs in 1,000)	1985	1990	1993		
Mijen	57.55	35,364	37,276	37,767	7,595	5,919	7,954	4.66	6.30	4.12	4.19	521
Gunungpati	52.63	38,185	43,946	48,591	7,862	10,797	11,378	4.86	4.07	4.27	4.20	1,031
Semarang Selatan	5.92	196,660	204,491	79,743	37,852	41,036	17,344	5.20	4.98	4.60	4.38	13,568
Banyumanik	27.73	-	-	81,561	-	-	19,025	-	-	4.29	4.52	5,378
Gajahan	10.78	-	-	52,711	-	-	10,941	-	-	4.82	4.75	5,067
Genuk	27.59	85,417	137,504	48,631	18,092	31,622	10,777	4.72	4.35	4.51	4.64	2,940
Pedurungan	20.72	-	-	98,134	-	-	22,852	-	-	4.29	4.27	2,640
Gayamsari	5.26	205,428	201,280	54,355	46,573	43,162	12,327	4.41	4.66	4.41	4.53	11,652
Semarang Timur	7.12	205,428	201,280	96,260	88,413	88,413	20,848	4.41	4.66	4.62	4.39	12,418
Candisari	6.80	-	-	76,006	-	-	15,780	-	-	4.82	4.64	1,271
Tembalang	44.20	-	-	79,148	-	-	16,646	-	-	4.75	4.64	1,932
Semarang Utara	10.97	169,330	152,457	122,705	34,366	35,182	27,090	4.93	4.33	4.53	4.65	1,787
Semarang Tengah	5.14	72,473	62,756	81,652	14,669	13,048	20,030	4.94	4.81	4.23	4.22	15,814
Semarang Barat	19.96	248,254	251,707	132,754	49,876	53,656	28,083	4.98	4.69	4.73	4.72	6,973
Ngaliyan	39.97	248,254	251,707	68,917	49,876	49,876	15,811	4.98	4.69	4.36	4.60	1,920
Tugu	39.97	248,254	251,707	132,754	49,876	49,876	28,083	4.98	4.69	4.73	4.72	3,482
Total in Semarang City	382.11	1,299,365	1,343,124	1,177,562	266,761	288,078	284,969	4.87	4.66	4.13	4.52	3,581

Table 2.2.4 LABOUR FORCE IN INDONESIA

Item	1985 ¹⁾	1995 ²⁾	1996 ³⁾
Labour Force Participation (Current) of the Household Population, 10 Years & Over in Both Sexes.			
Household Population (10-years & over)	110,441,199	152,514,964	154,464,763
Economic active population (Labour force in total)	59,598,626 53.96%	86,361,261 56.62%	90,109,582 58.34%
Participation rate (%)			
Actual Labour Force Situation			
Employed force	57,802,801 (100.00%)	80,110,060 (100.00%)	85,701,813 (100.00%)
Employed rate (%)	96.99%	92.76%	95.11%
Unemployed force	1,795,825	6,251,201	4,407,769
Unemployed rate (%)	3.01%	7.24%	4.89%
Currently Employed Persons by Major Industrial Groups in Bothe Series			
	(Share in %)	(Share in %)	(Share in %)
Agriculture, forestry, hunting & fishery	31,593,314 (54.66%)	35,233,270 (43.98%)	37,720,251 (44.01%)
Mining & quarrying	390,661 (0.68%)	643,332 (0.80%)	774,211 (0.90%)
Manufacturing	6,021,929 (10.42%)	10,127,047 (12.64%)	10,773,038 (12.57%)
Electricity, gas & water	61,666 (0.11%)	216,128 (0.27%)	164,142 (0.19%)
Construction Wholesale, retail trade, hotel and restaurant	2,146,210 (3.71%)	3,768,080 (4.70%)	3,796,228 (4.43%)
Transportation, storage & communication	8,553,919 (14.80%)	13,883,682 (17.33%)	16,102,552 (18.79%)
Finance, insurance, real estate, & business services	1,796,112 (3.11%)	3,458,155 (4.32%)	3,942,799 (4.60%)
Public services	112,859 (0.20%)	658,497 (0.82%)	689,733 (0.80%)
Others	7,125,419 (12.33%)	12,121,869 (15.13%)	11,728,495 (13.69%)
	712 (0.00%)	- (0.00%)	10,364 (0.01%)

Source:

- 1) Statistics of Indonesia 1985, Central Statistic Bureau of Indonesia
- 2) Statistics of Indonesia 1995, Central Statistic Bureau of Indonesia
- 3) Statistics of Indonesia 1996, Central Statistic Bureau of Indonesia

Table 2.2.5 LABOUR FORCE IN CENTRAL JAVA

Item	1980 ¹⁾	1988 ²⁾	1995 ³⁾
Labour Force Participation (Current) of the Household Population, 10 Years & Over in Both Sexes.			
Household Population (10-years & over)	18,392,419	21,251,543	23,650,214
Economic active population (Labour force in total)	10,101,217	13,396,583	14,642,604
Participation rate (%)	54.92%	63.04%	61.91%
Actual Labour Force Situation			
Employed force	9,966,183 (100.00%)	13,125,717 (100.00%)	14,062,056 (100.00%)
Employed rate (%)	98.66%	97.98%	96.04%
Unemployed force	135,034	270,766	580,548
Unemployed rate (%)	1.34%	2.02%	3.96%
Currently Employed Persons by Major Industrial Groups in Bothe Series			
	(Share in %)	(Share in %)	(Share in %)
Agriculture, forestry, hunting & fishery	5,408,177 (54.27%)	6,562,533 (50.00%)	6,466,506 (45.99%)
Mining & quarrying	47,336 (0.47%)	(0.00%)	138,817 (0.99%)
Manufacturing	1,191,985 (11.96%)	1,418,789 (10.81%)	1,881,367 (13.38%)
Electricity, gas & water	9,148 (0.09%)	(0.00%)	41,813 (0.30%)
Construction	344,369 (3.46%)	(0.00%)	670,068 (4.77%)
Wholesales, retail trade, hotel and restaurant	1,433,316 (14.38%)	(0.00%)	2,415,213 (17.18%)
Transportation, storage & communication	231,760 (2.33%)	2,320,670 (17.68%)	422,517 (3.00%)
Finance, insurance, real estate, & business services	31,463 (0.32%)	(0.00%)	65,413 (0.47%)
Public services	1,219,549 (12.24%)	1,940,913 (14.79%)	1,881,043 (13.38%)
Others	59,080 (0.59%)	879,912 (6.70%)	79,299 (0.56%)

Source:

- 1) Central Java in Figures (Jawa Tengah Dalam Angka) 1985, Statistic Office of Central Java Province
- 2) Central Java in Figures (Jawa Tengah Dalam Angka) 1990, Statistic Office of Central Java Province
- 3) Central Java in Figures (Jawa Tengah Dalam Angka) 1995, Statistic Office of Central Java Province

Table 2.2.6 LABOUR FORCE IN SEMARANG CITY

Item	1985 ¹⁾	1990 ²⁾	1995 ³⁾	1996 ³⁾
Labour Force Participation (Current) of the Household Population, 10 Years & Over in Both Sexes.				
Household Population (10-years & over)	835,577	893,708	993,298	1,016,433
Economic active population (Labour force in total)	510,821 (100.00%)	631,885 (100.00%)	840,903 (100.00%)	822,176 (100.00%)
Participation rate (%)	61.13%	70.70%	84.66%	80.89%
Consist of:				
Farmer	30,910 (6.05%)	32,957 (5.22%)	29,966 (3.56%)	28,749 (5.63%)
Farm Labour	31,399 (6.15%)	30,995 (4.91%)	29,980 (3.57%)	32,771 (6.42%)
Fishery	1,002 (0.20%)	1,815 (0.29%)	2,861 (0.34%)	2,852 (0.56%)
Entrepreneur	5,087 (1.00%)	10,389 (1.64%)	17,761 (2.11%)	15,442 (3.02%)
Manufacturing	90,744 (17.76%)	143,434 (22.70%)	169,212 (20.12%)	175,361 (34.33%)
Construction	83,696 (16.38%)	95,464 (15.11%)	109,328 (13.00%)	105,080 (20.57%)
Trader	38,264 (7.49%)	43,941 (6.95%)	70,468 (8.38%)	73,505 (14.39%)
Transportation & communication	16,537 (3.24%)	16,934 (2.68%)	27,137 (3.23%)	26,806 (5.25%)
Public servants & personal services	82,326 (16.12%)	82,233 (13.01%)	89,560 (10.65%)	90,270 (17.67%)
Pensionary	24,742 (4.84%)	26,884 (4.25%)	31,759 (3.78%)	27,804 (5.44%)
Other activities	106,114 (20.77%)	145,839 (23.08%)	263,172 (31.30%)	245,536 (47.68%)
Actual Labour Force Situation				
Employment force	451,599 (100.00%)	414,965 (100.00%)	677,713 (100.00%)	655,326 (100.00%)
Employment rate (%)	88.41%	65.67%	80.59%	79.71%
Unemployment force	59,222	216,920	163,190	166,850
Unemployment rate (%)	11.59%	34.33%	19.41%	20.29%

Source:

- 1) Semarang City in Figures (Kotamadya Daerah Tingkat II Semarang Dalam Angka) 1985, Statistic Office of Semarang City
- 2) Semarang City in Figures (Kotamadya Daerah Tingkat II Semarang Dalam Angka) 1990, Statistic Office of Semarang City
- 3) Semarang City in Figures (Kotamadya Daerah Tingkat II Semarang Dalam Angka) 1996, Statistic Office of Semarang City

Table 2.2.8 FAMILY ECONOMY IN SEMARANG CITY

		(Amount/HH in Rp.)	
Item	Whole Semarang (Rp./Month)		
Back Ground Data (Based on Table 2.2.3 in this Report)			
Population in Semarang as of 1996	1,251,845		
Economic active population in Semarang as of 1996	822,176		
Share rate of economic active population in Semarang as of 1996	65.68%		
Number of Households in Semarang as of 1996	278,372		
Number of economic active persons per HH in Semarang	1.94		
Item	Whole ¹⁾ Semarang as of 1996	Whole ²⁾ Semarang as of 1997	Study area ³⁾ in Semarang as of Jan. 1998
Average income	810,897		
Average expenditure (case A)	1,263,724		
Average expenditure (case B)	637,470	687,588	1,284,578
Food	232,196	254,162	308,974
Expenditure for non-food	337,852		
Housing : Average floor area (m ²)	98		
Average land area for housing (m ²)	150		
Capital investment	33,230,769		
Monthly repayment amount			
1) Repayment period of (case A): 25	506,544		
2) Repayment period of (case B): 20	202,825 *	216,495 *	527,399
Clothing	38,052	39,871	41,923
Fuel & light	-	-	77,885
Electricity	-	-	34,038
Water	-	-	16,474
Transport & communication	67,708	72,820	134,615
Education and recreation	61,894	66,567	127,692
Education	-	-	111,026
Recreation	-	-	16,667
Expenses for medical care and welfare	34,795	37,673	49,615
Laundry & cleaning	-	-	29,231
Miscellaneous	-	-	20,385
Amount of losses caused by inundation	-	-	139,744

Source :

- 1) Survey on Living Expenditure in Central Java Province (Survei Biaya Hidup 1996 di Jawa Tengah), Kanor Statistik Propinsi Jawa Tengah.
- 2) Modified the above data by using price indexes shown in Table 2.6.1.
- 3) Made by JICA Study Team in February 1998.

(Note)

*: Including the cost for fuel, light and water.

Table 2.2.9 CONSUMERS' PRICE INDEX IN INDONESIA AND IN SEMARANG CITY

(Fiscal year 1988/89 = 100)

Group/Sub group	Composite consumer price indexes of 27 municipalities in whole Indonesia at the end of each calendar year				Consumer price indexes of Semarang Municipality at the end of each calendar year				Average annual increasing ratio(%)**			
	1993 ¹⁾	1994 ²⁾	1995 ³⁾	1996 ⁴⁾	1993 ¹⁾	1994 ²⁾	1995 ³⁾	1996 ⁴⁾				
General	145.07	157.42	172.27	185.92	134.46	147.52	157.38	171.21	178.82	194.12	7.62%	
Food	136.27	151.08	171.06	187.38	139.08	147.40	164.52	183.93	188.42	218.38	9.46%	
Cereals, cassava and their products	120.56	139.97	167.89	179.67	125.73	132.28				214.13	11.24%	
Meat and its products	161.56	180.34	205.96	225.92	11.83%	169.60	174.07			250.21	8.09%	
Fresh fish	142.35	159.99	173.97	202.09	12.39%	140.74	158.71			280.41	14.78%	
Preserved fish	134.12	148.80	162.10	188.63	12.04%	129.14	141.63			177.17	6.53%	
Eggs, milk and their products	148.56	154.01	161.12	178.56	6.32%	148.40	151.20			196.16	5.74%	
Vegetables	137.20	165.16	179.34	204.91	14.31%	122.26	151.53			302.99	19.90%	
Beans and nuts	135.26	147.51	155.27	173.20	8.59%	157.02	177.38			197.76	4.72%	
Fruits	146.14	160.47	192.67	211.17	13.05%	154.25	186.26			308.16	14.84%	
Spices	141.97	150.05	158.25	191.41	10.47%	125.53	125.22			214.11	11.27%	
Fats and oils	126.61	140.41	179.49	187.04	13.89%	116.49	120.72			166.16	7.36%	
Soft drinks	144.12	154.64	176.53	182.01	8.09%	150.21	157.55			229.90	8.88%	
Prepared food and other food items	131.93	141.17	157.03	167.49	8.28%	140.08	142.68			188.06	6.07%	
Housing	154.88	170.09	185.12	194.81	7.95%	133.19	147.91	154.93	162.98	171.04	181.40	6.37%
Costs for housing	165.58	188.30	208.59	220.75	10.06%	131.91	151.03			182.79	6.74%	
Fuel, electricity and water	152.80	160.14	169.21	175.01	4.63%	134.17	153.24			174.29	5.37%	
Household equipment	131.33	136.41	143.29	148.17	4.10%	122.48	124.49			170.39	6.83%	
Household operation	131.04	136.64	145.96	154.86	5.73%	137.52	143.47			190.12	6.69%	
Clothing	135.74	144.53	153.81	164.04	6.52%	124.41	133.57	139.99	148.26	152.02	157.13	4.78%
Clothing for men	139.24	147.89	156.05	167.09	6.27%	138.09	145.33			167.72	3.96%	
Clothing for women	136.46	143.41	151.51	159.12	5.25%	122.40	131.09			149.19	4.04%	
Clothing for children	151.52	163.31	179.21	193.95	8.58%	122.80	134.62			157.63	5.12%	
Personal effects	111.61	120.45	126.38	134.52	6.42%	107.59	116.87			152.60	7.24%	
Miscellaneous	150.71	158.31	168.40	184.60	6.99%	133.81	152.19	157.45	171.90	183.99	190.20	7.29%
Medical care	137.59	157.28	173.67	191.02	11.56%	127.43	142.64			189.60	8.27%	
Personal care and cosmetics	136.60	145.86	156.43	163.43	6.59%	133.96	138.20			164.78	4.23%	
Education	144.95	159.65	177.49	196.25	10.63%	125.76	143.74			180.93	7.55%	
Recreation and sports	137.27	142.88	158.29	169.72	7.33%	129.96	147.61			185.11	7.33%	
Transportation	160.20	162.02	165.66	182.64	4.47%	139.13	163.58			200.18	7.55%	
Tobacco and alcoholic drinks	171.74	174.91	184.00	202.70	5.68%	149.78	157.99			203.59	6.33%	

Source :

- 1) Statistical Year Book of Indonesia 1995, Biro Pusat Statistik Indonesia.
- 2) Statistical Year Book of Indonesia 1996, Biro Pusat Statistik Indonesia.
- 3) Economic Indicator of Semarang City (Indikator Ekonomi Kalamadya Semarang) 1992, Kantor Statistik Kalamadya Semarang.
- 4) Economic Indicator (Indikator Ekonomi) November 1993, Kantor Statistik Kalamadya Semarang.
- 4) Economic Indicator (Indikator Ekonomi) November 1997, Kantor Statistik Kalamadya Semarang.

(Note)

* : Annual average increasing ratio from 1993 to 1996.

** : Annual average increasing ratio from the end of 1992 to November 1997.

Table 2.2.10 EXCHANGE RATE

(Unit : Rp.)

Year/month	US Dollar (Per US\$100)			Japanese Yen (¥100)		
	Buying	Salling	Mid.	Buying	Salling	Mid.
1992			2,062			1,658
1993			2,110			1,891
1994			2,200			2,206
1995			2,308			2,246
1996			2,383			2,058
1997			2,971			2,437
January			2,396			1,966
February			2,406			2,001
March			2,419			1,956
April			2,433			1,921
May			2,440			2,095
June			2,450			2,148
July			2,599			2,211
August			3,035			2,546
September			3,275			2,716
October			3,670			3,061
November			3,648			2,867
December			4,876			3,758
Dec. 5	3,910	4,010	3,960	3,013	3,092	3,053
Dec.12	4,712	4,828	4,770	3,626	3,717	3,672
Dec.19	5,212	5,338	5,275	4,036	4,137	4,087
Dec.26	5,434	5,566	5,500	4,169	4,274	4,222
Annual average fluctuation			-7.57%			-8.02%

Source : Bank Indonesia.

Table 2.2.11 (1/3) SPL PROJECT (I)

NAME OF WORK : DREDGING OF BARU RIVER AND DRAINAGE SYSTEM IMPROVEMENT FOR EMERGENCY FLOOD CONTROL, SEMARANG CITY

LOCATION : KEL. BANDARHARJO, KEC. NORTH SEMARANG, SEMARANG CITY

NO	DESCRIPTION	UNIT	QUANTITY/ VOL.	UNIT COST (RP.)	TOTAL (Rp.)
I.	<u>Preparation Work</u>				
1.	Mobilization and demobilization of equipments	ls	1.00		
2.	Reparation of access road (work road)	ls	1.00		
3.	Field office and other facilities	m ²	36.00		
Total of works cost of CHAPTER I (transferred to the recapitulation of budget)					-
II.	<u>Drainage Sub System work of West Bandarharjo</u>				
1.	Construction of tank and pumping house				
1.1	Reinforcing concrete K225 including form work and its demolition for pumping house in 4 location.	m ³	200.00		
1.2	Concrete BO	m ³	3.50		
1.3	Earth excavation for construction	m ³	370.00		
1.4	Compacted earthfill	m ³	190.00		
1.5	Reinforcing concrete K225 including form work and its demolition for pumping house in 4 location.	m ³	22.00		
1.6	Gate and leaf gate (made of iron plate) and iron gate frame (80 x 210 cm)	set	4.00		
2.	Procurement and installation of 6 units new submersible pump in 4 locations with each capacity	unit	6.00		
3.	Procurement and installation of generator set 25 HP - 15 KVA	unit	6.00		
4.	Trash rack	unit	8.00		
Total of works cost of CHAPTER II (transferred to the recapitulation of budget)					-
III.	<u>Work for Kali Baru</u>				
1.	Heightening inspection road in left side bank of Kali Baru with rockfill and sand gravel	m ²	13,000.00		
2.	Heightening inspection road in right side bank of Kali Baru with rockfill and sand gravel.	m ²	13,000.00		
3.	Dredging of river channel and removing excavation earth to the spoiled place with average transport distance 3-4 km.	m ²	26,675.00		
Total of works cost of CHAPTER III (transferred to the recapitulation of budget)					-
			TOTAL I +II		1,714,875,000.00

Table 2.2.11 (2/3) SPL PROJECT (2)

NAME OF WORK : DREDGING OF ASIN RIVER AND DRAINAGE SYSTEM FOR
EMERGENCY FLOOD CONTROL, SEMARANG CITY

LOCATION : KEL. BANDARHARJO, KEC. NORTH SEMARANG, SEMARANG CITY

NO	DESCRIPTION	UNIT	QUANTITY/ VOL.	UNIT COST (Rp.)	TOTAL (Rp.)
I.	<u>Preparation Work</u>				
1.	Mobilization and demobilization of equipments	ls	1.00		
2.	Reparation of access road (work road)	ls	1.00		
3.	Field office and other facilities	m ²	36.00		
II.	<u>Drainage Sub System work of East Bandarharjo</u>				
1.	Wet stone masonry 1 PC : 3 Sands	m ³	2,730.00		
2.	Plaster 1 PC : 3 sands	m ²	4,200.00		
3.	Construction of tank and pumping house				
3.1	Reinforcing concrete K225 including form work and its demolition for pumping tank	m ³	65.00		
3.2	Concrete BO	m ³	3.00		
3.3	Earth excavation	m ³	129.00		
3.4	Compacted earthfill	m ³	63.45		
3.5	Reinforcing concrete K225 including form work and its demolition for pumping house	m ³	11.48		
3.6	Gate and leaf gate (made of iron plate) and iron gate frame (80 x 210 cm)	set	1.00		
4.	Procurement and installation of 5 units new submersible pump with each capacity of 8 m ³ /minute	unit	5.00		
5.	Procurement and installation of generator set 25 HP - 15 KVA	unit	5.00		
6.	Trash rack	unit	2.00		
III.	<u>Work for Kali Asin</u>				
1.	Dredging of river channel and removing excavated earth to the spoiled place with average transport distance 3 - 4 km	m ³	13,614.00		
			TOTAL		999,932,385.50

Table 2.2.11 (3/3) SPL PROJCE (3)

NAME OF WORK : DREDGING OF SEMARANG RIVER AND DRAINAGE SYSTEM FOR EMERGENCY FLOOD CONTROL, SEMARANG CITY

LOCATION : KEL. BANDARHARJO, KEC. NORTH SEMARANG, SEMARANG CITY

NO	DESCRIPTION	UNIT	QUANTITY/ VOL.	UNIT COST (RP.)	TOTAL (Rp.)
I.	<u>Preparation Work</u>				
1.	Mobilization and demobilization of equipments	ls	1.00		
2.	Reparation of access road (work road)	ls	1.00		
3.	Field office and other facilities	m ²	36.00		
II.	<u>Work for Kali Semarang</u>				
1.	Dredging of river channel and removing excavated earth to the spoiled place with average transport distance 3 - 4 km	m ³	80,562.00		
1.	Wet stone masonry 1 PC : 3 Sands	m ³	3,100.00		
2.	Plaster 1 PC : 3 sands	m ²	7,200.00		
3.	Closing the culvert mouth with stone masonry 1 PC : 3 sands	m ²	50.00		
			TOTAL I + II		
			Tax 10%		
			TOTAL		1,120,343,456.50