Environmental Assessment/Analysis Reports

Indonesia - Semarang-Surakarta Urban Development Project
EA Category A

Environmental Assessment Summary
August 1993

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Directorate Bina Program

SSUDP

SEMARANG-SURAKARTA

Urban Development Program
Appraisal and Implementation Support

ENVIRONMENTAL ASSESSMENT SUMMARY
WORLD BANK FORMAT

AUGUST 1993

DHV Consultants BV
in association with

Lahmeyer International GMBh

PT Indah Karya
PT Ciria Jasa
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1. INTRODUCTION

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 municipalities:

- expansion of infrastructure and services in a planned and coordinated manner and improvement of operation and maintenance;
- decentralization of preparation and much of the implementation of urban development policies to local government level and strengthening of all levels of government by institutional development and human resources development;
- increasing financial capability of local governments by increasing local revenues.

Against this background the "Integrated Urban Development Programme" (IUIDP) has been initiated. The IBRD supports a number of IUIDP projects in Indonesia. The scope of the IUIDP programme covers the following sectors: urban planning, water supply, sanitation, urban roads, drainage, solid waste management, kampung improvement (KIP), market infrastructure improvement (MIIP) and urban renewal.

A directive of the Directorate General Cipta Karya (DGCK/1-4-1985) requires all local and provincial governments wishing to participate in any DGCK sector programme to formulate IUIDP proposals. It is envisaged that these IUIDP programmes are prepared as multi-sectoral multi-year (5-7 years) development plans, called Program Jangka Menengah (PJM).

The Semarang Surakarta Urban Development Project (SSUDP) fits within the national IUIDP approach. Implementation is planned to start in fiscal year 1994/95. All projects under the programme have been screened for environmental impact. Preliminary environmental assessments (PIL) were prepared for all sectors. The assessments showed that for most sectors the potential adverse environmental impact of the program is limited. Only for four sectors it was recommended that full environmental impact assessments (ANDAL) be prepared: for the Sanitation programs in both Semarang and Surakarta, for the Kali Banger drainage project in Semarang-and for the Solid Waste Disposal Site (TPA Jatibarang) in Semarang. (see figure 1 and 2)

The legal base for environmental protection and management is formulated in Act (UU) number 4 of 1982 and Government Regulation (PP) number 29 of 1986 which requires any proposed project which is likely to have significant impact on the environment to be accompanied by an environmental impact assessment. There are more than 20 subsequent acts, regulations, decrees and guidelines relating to environmental management issued by the Ministry of Population and Environment, the Ministry of Home Affairs, the Ministry of Public Works, the Governor of Central Java and the Mayors of Semarang and Surakarta.

The four ANDAL studies were prepared in the period from August 1992 until January 1993. The first draft summary reports were submitted to the IBRD in November 1992. The draft findings of the study were discussed with the local governments of Semarang and Surakarta, with the Central Java Regional Commission for the Environment (Komda) and local NGO's in October 1992. The Central Government Commission for the Environment (Kompus) discussed the draft reports in December 1992 and approved the final reports in April 1993.

Each of the four ANDAL studies consists of the following volumes:
Separate volumes were prepared covering the Resettlement Plan for the Kali Banger drainage project and the Site Operation Plan for the Jatibarang solid waste disposal site. This brings the total number of volumes at 18.

2. PROJECT DESCRIPTION

Semarang is the capital city of Central Java Province and has a population of about 1,300,000 people. Surakarta is the second largest city of Central Java with a population of about 540,000. The Semarang Surakarta Urban Development Project is an integrated programme for the sectors urban planning, water supply, sanitation, urban roads, drainage, solid waste management, kampung improvement, market infrastructure improvement and urban renewal. It includes all expenditure in these sectors for investment and operation and maintenance for the period 1994/95 - 1998/99. It also includes improvements in urban management, programme management and financial management through institutional improvements, human resources development and technical assistance.

The main project components are summarized in Table 2.1.

3. BASELINE DATA

3.1 Semarang

3.1.1 Regional Context

Semarang is the provincial capital and main port of Central Java Province. It is located on the north coast of Java, the most densely populated island in the Republic of Indonesia and lies 540 km east of the capital Jakarta at longitude 108° East, latitude 7° South.

Topographically the Kotamadya consists of a flat coastal plain with an elevation of 0-25m, which gives way to hilly areas to the south (elevation up to 325m). Traditionally development was concentrated on the coastal plain and lowland areas. In recent years, the lack of building land has led to increasing development in the hilly areas and along the main roads.

The Municipality (Kotamadya) of Semarang covers an area of about 373 km². The IUIDP planning area covers part of the Kotamadya and includes all areas that have a clear urban character, be it residential or industrial, that have already been developed or that will be developed in the near future.

3.1.2 Population

The population of Semarang has grown from 1,025,000 in 1980 to 1,249,500 in 1990. This represents an average growth rate of 2%. This population growth is twice as high as the provincial average. During the IUIDP planning period an average annual population growth of 1.86% is assumed. The population in the year 2000 is estimated at 1,511,000 people of which about 1,420,000 (=94%) is considered to be urban population.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Programme Semarang</th>
<th>Programme Surakarta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Urban Planning</td>
<td>- Preparation of Urban and Metropolitan Master Plan</td>
<td>- Preparation of Urban and Metropolitan Master Plan</td>
</tr>
<tr>
<td></td>
<td>- Preparation of Urban and Land Information Systems</td>
<td>- Preparation of Urban and Land Information Systems</td>
</tr>
<tr>
<td></td>
<td>- Preparation of District Plans and Detailed Plans</td>
<td>- Preparation of District Plans and Detailed Plans</td>
</tr>
<tr>
<td></td>
<td>- Preparation of Building Preservation Plans</td>
<td>- Preparation of Building Preservation Plans</td>
</tr>
<tr>
<td>2. Water Supply</td>
<td>- Rehabilitation and upgrading of a Water Treatment Plant</td>
<td>- Development of 10 new deepwells</td>
</tr>
<tr>
<td></td>
<td>- Construction of two new Drink Water Treatment Plants</td>
<td>- Wall maintenance programme</td>
</tr>
<tr>
<td></td>
<td>- Well maintenance programme</td>
<td>- Water losses (UFW) reduction programme</td>
</tr>
<tr>
<td></td>
<td>- 550 km of new distribution pipelines</td>
<td>- Water Resources study</td>
</tr>
<tr>
<td></td>
<td>- 88,000 new house connection and 300 new public taps</td>
<td>- Extension and infill of the distribution network</td>
</tr>
<tr>
<td>3. Sanitation</td>
<td>- Waste Water Treatment Plant (29 ha)</td>
<td>- Rehabilitation of the Mojosongo Sewer System (55 ha)</td>
</tr>
<tr>
<td></td>
<td>- 7 Pumping stations</td>
<td>- Rehabilitation of the Jepres Sewerage System (55 ha)</td>
</tr>
<tr>
<td></td>
<td>- Septage Treatment Plant (4 ha)</td>
<td>- Septage Treatment Plant (1.5 ha)</td>
</tr>
<tr>
<td></td>
<td>- 14 km sewer interceptor and trunk sewers</td>
<td>- Credit Scheme On-Site Sanitation (2300 households)</td>
</tr>
<tr>
<td></td>
<td>- 79 ha pilot project separate sewer system</td>
<td>- 200 MCK's and 2 desludging trucks</td>
</tr>
<tr>
<td></td>
<td>- Credit Scheme On-Site Sanitation (4500 households)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 272 MCK's and 5 desludging trucks</td>
<td></td>
</tr>
<tr>
<td>4. Drainage</td>
<td>- Improvement of 28 km primary drains</td>
<td>- improvement of 3 km primary drains</td>
</tr>
<tr>
<td></td>
<td>- Improvement of 120 km of secondary and tertiary drains</td>
<td>- improvement of 17 km of secondary and tertiary drains</td>
</tr>
<tr>
<td></td>
<td>- periodic maintenance and equipment</td>
<td>- improvement of Demangan and A. Yani pumping stations</td>
</tr>
<tr>
<td></td>
<td>- periodic maintenance and equipment</td>
<td>- periodic maintenance and equipment</td>
</tr>
<tr>
<td>5. Urban Roads</td>
<td>- Improvement of 78 km of urban roads</td>
<td>- construction of 4.7 km of new-roads (ring road)</td>
</tr>
<tr>
<td></td>
<td>- periodic maintenance of 78 km of urban roads</td>
<td>- improvement of 36 km of urban roads</td>
</tr>
<tr>
<td></td>
<td>- construction of 4 new bridges</td>
<td>- periodic maintenance of 60 km of urban roads</td>
</tr>
<tr>
<td></td>
<td>- traffic management program</td>
<td>- construction of 3 new bridges (part of ring road)</td>
</tr>
<tr>
<td></td>
<td>- Traffic Management Program</td>
<td>- traffic management program</td>
</tr>
<tr>
<td></td>
<td>- Improvement of the Jatibarang Final Disposal Site</td>
<td>- preparation of an urban transportation plan</td>
</tr>
<tr>
<td></td>
<td>- Closure works at the old Disposal Sites</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Site location study for new Final Disposal Site</td>
<td>- Upgrading of the Putri Cempo Final Disposal Site</td>
</tr>
<tr>
<td></td>
<td>- Land acquisition for new disposal site (11 ha)</td>
<td>- Site location study for new Final Disposal Site</td>
</tr>
<tr>
<td></td>
<td>- 4 open dump trucks, 65 armroll trucks, 5 compactor trucks</td>
<td>- 32 open dump trucks, 14 armroll trucks, 2 compactor trucks and a transportation pool</td>
</tr>
<tr>
<td></td>
<td>- 1 tracked loader, 1 back hoe and 182 gerobaks</td>
<td>- 1 wheel loader, 1 bulldozer, 1 back hoe and 91 gerobaks</td>
</tr>
<tr>
<td>6. Solid Waste Management</td>
<td>- Infrastructure development in low income housing area</td>
<td>- Infrastructure development in low income housing area</td>
</tr>
<tr>
<td></td>
<td>- Housing rehabilitation through credit scheme</td>
<td>- Housing rehabilitation through credit scheme</td>
</tr>
<tr>
<td></td>
<td>- Kampung Improvement Programme 412 ha</td>
<td>- Kampung Improvement Programme 389 ha</td>
</tr>
<tr>
<td></td>
<td>- Market Improvement Programme 10 markets</td>
<td>- Market Improvement Programme 29 markets</td>
</tr>
<tr>
<td>7. Urban Renewal/ KIP/ WHIP</td>
<td>- Improvement Operation and Maintenance for all infrastructure sectors</td>
<td>- Improvement Operation and Maintenance for all infrastructure sectors</td>
</tr>
<tr>
<td></td>
<td>- Institutional improvements and human resources development</td>
<td>- Institutional improvements and human resources development</td>
</tr>
<tr>
<td></td>
<td>- local revenue improvement action plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Technical Assistance</td>
<td>- Technical Assistance</td>
</tr>
<tr>
<td>8. Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Household size is decreasing rapidly. According to the Census the average household size decreased from 5.18 in 1980 to 4.65 in 1990. As a result the need for residential land increases faster than the growth of the population would indicate. Population densities are as high as 210 people per ha in the central part of town and are below 10 people per ha in the Kecamatan Wijen and Gunung Pati which are semi rural. The built-up or partly built-up area of the Kotamadya is around 13,500 hectares, just over 1/3rd of the total area of the Kotamadya.

3.1.3 Geology

The geological condition of Semarang municipality is identified to consist of lithological units, as follows:
- The greater part of northern Semarang is covered by surface sediment forming alluvium as a result of Kali Garang delta formation; in general this consists of sand, clay and gravel layer.
- The southern part of Semarang has lithological bracket and lava andesite in the volcanic sediment.
- The hilly area, such as East Srondol, Banyumanik and surroundings, consists of volcanic breccia and red soil with thickness of 50-200m.

Soil permeability greater than 10 l/m²/day is categorized as water intrusive ground, whereas soil permeability smaller than 10 l/m²/day is water non-intrusive ground (impermeable). Previous percolation tests found that the ground infiltration capacity in the northern areas is 21 l/m²/day which classifies it as permeable soil.

3.1.4 Hydrology and Climate

The table below shows hydrological and climatological data based on records of the Semarang Airport Meteorological Station between 1980 and 1989. Air quality is generally good and there is no major noise and dust nuisance.

<table>
<thead>
<tr>
<th>Description (monthly)</th>
<th>Average (monthly)</th>
<th>Dry season</th>
<th>Wet season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rainfall (mm)</td>
<td>205</td>
<td>62</td>
<td>495</td>
</tr>
<tr>
<td>2. Rainy days (days)</td>
<td>12</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>3. Temperature (°C)</td>
<td>27.4</td>
<td>28.4</td>
<td>26.5</td>
</tr>
<tr>
<td>4. Direction of wind</td>
<td>-</td>
<td>E &amp; SE</td>
<td>NW</td>
</tr>
<tr>
<td>5. Force of wind (knot)</td>
<td>-</td>
<td>17</td>
<td>45</td>
</tr>
</tbody>
</table>

3.1.5 Groundwater

Groundwater in the southern hilly areas is in general of good quality but in northern Semarang the groundwater is of too poor quality to be used for consumption. High levels of HCO₃ and SO₄ were found. Continuous quality monitoring data are not available. The groundwater table stands at -0.60m.

3.1.6 Infrastructure Deficiencies

The rapid increase in the urban population and the extension of the urbanised area has not been matched with corresponding development of infrastructure and urban services. Improvements were carried out by the Municipal and Provincial
authorities but these have been limited due to lack of funds. This has resulted in many sectors in a deterioration of the standard of services available whereas in newly developed areas not all essential services could be provided. The roads network needs to be improved especially in the fast developing eastern parts of town. The water supply system needs to be extended to cover newly developed urban areas. Raw water supply must be increased to match with the demand for piped water supply. Drainage urgently needs to be improved i.e. in the older parts of town where flooding occurs frequently. Infrastructure in existing low income residential areas and in and around markets needs to be improved in close cooperation with the residents involved.

3.2 Surakarta

3.2.1 Regional Context

Surakarta which is also known as Solo is situated at a position between latitude 7° South and longitude 110° East.

Surakarta is the second largest city in Central Java Province. It is centrally located in the fertile lowland areas of Central Java which are one of the most densely populated rural areas in the world. Its wider hinterland (Kabupaten Boyolali, Wonogiri, Karanganyar, Sragen, Klaten and Sukoharjo) has a population in excess of 5 million. Topographically the Kotamadya is flat with an average elevation of 92 meters. Only to the North (Kecamatan Gondang Rejo), does the land rise appreciably. The city is partly bounded by Bengawan Solo, the largest river in Java and is crossed by several of its tributaries.

The pace of development today is substantial. Surakarta is the third most important location in Central Java (after Semarang and Pekalongan) for private investment projects (commercial, industrial and residential) notified to BKPMU.

The area of the Kotamadya is 4,400 hectares of which only 12% (400 hectares) is not built-up. Much of the new development is occurring outside the Kotamadya boundaries to the East, South and West. Apart from Solo Baru new town in the South this concerns mainly ribbon development along the main roads. Within the town, redevelopment is creating large new banks, shopping centres and cinema complexes. The planning area for IUIDP covers the entire Kota yya area.

3.2.2 Population

According to the Census the population of Surakarta has grown from 469,413 in 1980 to 503,827 in 1990. The modest growth rate of 0.71% per year is due to the lack of developable land within the Kotamadya boundaries. The population in many areas adjacent to the Kotamadya is increasing rapidly. The current population of Greater Surakarta is one million and could increase to around 1,140,000 by the end of the century (1.3% growth per annum).

For population growth during the PJM period an average rate of 0.98% per annum was used. The population in the Kotamadya in the year 2000 is estimated at 584,000 people. Because of the high degree of urbanization the entire population is considered to be urban.

Household size is decreasing rapidly. According to the Census the average household size dropped from 5.0 in 1980 to 4.6 in 1990. As a result the number of households increased by 1.7% annually as against 0.71% for population. This
trend is likely to continue, which implies that the need for residential land increases faster than the population growth would indicate. The gross population density is around 117 persons per hectare. Especially in the central parts of town high densities occur.

3.2.3 Geology

The geological condition of Surakarta is for the greater part classified as clay and sand (grey regosol). The land surface in the eastern part and in the city centre consists of mud sediment. The northern hilly area consists of chalky rocks. Sedimentation due to erosion is found along Bengawan Solo river. The soil condition can be described as follows:
- upper layer of sandy clay, thickness 20 - 30 m;
- lower layer with different composition depending on the location consisting of sandy clay, gravel and sand gravel, etc.

In general soil permeability is high. Several locations were measured, e.g. Putri Cempo solid waste disposal site (585 l/m²/day), WWTP Kedung Tungkul (711 l/m²/day) and Sangkrah at the Kali Jenes (357 l/m²/day).

3.2.4 Hydrology and Climate

Surakarta has a tropical climate. The maximum yearly temperature is 34°C and the minimum is 21°C. The average humidity is 74.8%. The average wind velocity is 10.5 knots with direction varying according to the season. The rainy season lasts from November to April, with average rainfall of 2,200 mm annually. Average rain frequency is 12-15 days/month. The highest rainfall is in February and the lowest in August.

3.2.5 Groundwater

The groundwater table in Surakarta varies. In the older parts of the city the table is 2-3m below ground level and in the outer parts of town, especially in the north (Mojosongo) the water table stands at 15-30m below ground level, depending on the season.

3.2.6 Infrastructure Deficiencies

In the peripheral areas the infrastructural problems are less severe than in the city itself. The IIDP programme will therefore focus on the Kotamadya area. The piped water supply network needs reinforcement; drainage problems affect many residential areas; roads are poorly maintained and in need of realignment and reconstruction; sanitation is inadequate and living conditions in several kampungs urgently need improvement.

4. IMPACTS

Environmental impacts of the project have been identified at the various stages of project implementation from planning through to commissioning and operation and maintenance. Impacts have been presented in the Preliminary Environmental Assessment (PIL) reports in the form of matrices of impact on the physical, biological and sociological environment against project activities. Broad mitigating measures have also been identified and discussed in the Environmental Management and Monitoring (RKL and RPL) reports.
The SSUDP project is expected to have a positive overall impact on the environment. It would provide a clean water supply to many more families, reduce the non-sanitary disposal of human and solid wastes, decrease flooding and improve the living environment especially in the low income residential areas through the Urban Renewal component, including a KIP program and for market places a MIIP program. Negative impacts of the project such as noise, dust emission, socio-economic problems and traffic disruption during the construction phase are minor and relatively short term. No land use changes of significance would result from project implementation. Land acquisition requirements of the project are relatively small and would not create undue social hardship except for the following projects in the drainage and the urban roads sector.

Drainage sector
- the normalization and widening of Kali Banger in Semarang will have a positive impact on the living and business environment of the 41 ha area that is drained by this river. At present the area is frequently flooded. The project will improve public health and the value of properties is expected to increase. However, the project necessitates the resettlement of 790 families. The project will be implemented in a period of three years. Some key data about the areas of land and number of people affected are summarized in the table below. An ANDAL study has been prepared, including mitigating measures and a resettlement plan.

Table 4.1: Key Data Kali Banger Drainage Project

<table>
<thead>
<tr>
<th>NO</th>
<th>DESCRIPTION</th>
<th>Section of Kali Banger</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation Schedule</td>
<td>length of section (m)</td>
<td>1,043</td>
<td>1,159</td>
</tr>
<tr>
<td>LAND ACQUISITION &amp; CLEARING</td>
<td>Right of Way (m)</td>
<td>57</td>
<td>43</td>
</tr>
<tr>
<td>1</td>
<td>Private land (m²)</td>
<td>27,780</td>
<td>10,4x9</td>
</tr>
<tr>
<td>2</td>
<td>Government land (m²)</td>
<td>1,487</td>
<td>7,645</td>
</tr>
<tr>
<td>3</td>
<td>Buildings (m²)</td>
<td>18,902</td>
<td>7,145</td>
</tr>
<tr>
<td>PEOPLE AFFECTED</td>
<td>Not moving, because land/house only partially affected</td>
<td>45 hh</td>
<td>45 hh</td>
</tr>
<tr>
<td></td>
<td>Moving (resettlement) because land/house fully demolished</td>
<td>395 hh</td>
<td>195 hh</td>
</tr>
</tbody>
</table>

Urban Roads Sector
- four road widening projects in Semarang could result in the need for resettlement: Jl.Pedurungan-Citarum, Jl.Pamularsih, Jl.Genuk-Pedurungan and Jl.Pedurungan-Mrican. These projects are last minute additions to the program initiated by central government (Bina Marga) and scheduled to be implemented in the fourth and fifth year of the programme. Alignments have not yet been fixed. Environmental assessments could therefore not yet be prepared, but will be submitted to the Bank in the year before actual implementation is to take place. These projects should be considered as programmatic parts of the programme.
Apart from the resettlement element, the preliminary environmental impact assessment (PIL) process identified major environmental issues as a result of the SSUDP project in the Sanitation sector and in the Solid Waste Management sector. Full ANDAL studies have been prepared for these infrastructure sectors to further clarify the implications and to propose mitigating measures.

**Sanitation Sector**

- The project includes the construction of the first phase of a sewer system for Semarang. Semarang has no sewer system yet. The first phase includes the construction of a waste water treatment plant and the installation of interceptor sewers along both sides of Kali Semarang. This will prevent raw sewage from reaching the river and thus will drastically improve the quality of the water in Kali Semarang. As a pilot project an area of 59 ha in the old city will be fully provided with sewers. Depending on the results of the pilot project, the sewer system will be extended to serve other areas of the city.

  The project will benefit 131,000 people living in the Kali Semarang catchment area. Adverse effects are expected because of the land needed for the Treatment Plant (29 ha). This land is at present privately owned by 12 different owners and is being used for fish ponds providing a living for 98 families. Other adverse impacts concern the construction of the interceptor sewers under the narrow, 3 to 4 m wide, inspection roads along the Semarang river. These sewers with diameters ranging from 0.45 up to 1.5 m will be constructed to a maximum depth of 7 m over a length of about 4 km along both sides of the Kali Semarang. During the construction period the accessibility of the buildings along these roads will be problematic. This affects about 4,700 households, some shops, home industries and schools. Apart from that, the buildings along the inspection roads as well as the river banks could be damaged because of the construction activities.

  For Surakarta city the project includes the rehabilitation of two existing sewer systems: Mojosongo and the Old Dutch system. The effluent of both systems will be treated in two separate Treatment Plants to be built under the project. At present all septage flows without any treatment in the rivers draining the urban area ending up in the Bengawan Solo river. Treatment will improve the surface water quality i.e. of the Bengawan Solo. This river is included in the national clean river program (Prokasih).

  The Mojosongo sewer system serves a 65 ha low income residential area with a population of 18,000 people who will directly benefit from the project. Adverse environmental impacts are expected as a result of the construction of the treatment plant for which 3 ha of agricultural land has to be cleared.

  The Old Dutch sewer system will serve a population of about 168,000 people. Adverse environmental impact is expected because resettlement might be needed to clear land for construction of one or more treatment plants totalling 11 ha. The proposed aerator in the Kali Jenes could result in flooding because of backwater flowing into the drainage system and could cause odour, noise and mosquito breeding problems in a residential environment.

The ANDAL study for the Sanitation sectors in Semarang and Surakarta deals with the impact of the construction as well as the operation of the systems, proposes
mitigating measures and includes a management and monitoring plan.

Solid Waste Management Sector
- An ANDAL study for the Solid Waste Management sector has been prepared for Semarang. The study covers environmental considerations of the operation of the existing final solid waste disposal site (TPA) in Jatibarang which only started operating in March 1992. However, the site is very difficult to manage in an environmentally sustainable manner due to the extremely difficult terrain. Not far from the TPA is Bambangkerap village. The 180 families living there experience nuisance of flies, odour and other inconveniences. The ANDAL study includes a site operation plan with mitigating measures and also results in the recommendation to relocate the disposal site as soon as possible.

Other adverse impacts
No significant adverse impact is expected with respect to the projects proposed for the Water Supply, Urban Renewal, KIP and MIIP sectors. However, minor impacts like traffic disruption, noise and dust nuisance could occur during construction. This relates to all projects in all sectors. Problems with odour, flies and rodents could occur in case drains and sewers are not regularly cleaned, if solid waste is not properly handled and if treatment plants are not properly operated. The RKL's and RPL's describe the measures needed to mitigate these impacts.

A summary of population affected by the project, beneficially or adversely, is presented in table 4.2.

5. ANALYSIS OF ALTERNATIVES

Drainage Sector
The normalization of Kali Banger results from the drainage master plan and is a continuation of the drainage improvement programme (DRIP) of the Urban V Extension Project. The existing 2 to 10 m wide channel is to be widened to between 7 and 25 m over a total length of about 5,000 m. The new right of way has been approved by local government regulation (Perda 2/1985). About 1,700 m of the normalization of Kali Banger has already been implemented in 1988/89, the last part of 3,300 m will be implemented under the present SSUDP project.

Realistic alternatives for widening of Kali Banger do not exist. The river flows through the downtown area into the Java Sea. Widening is a must to solve the frequent and heavy flooding problems of the densely populated catchment area of Kali Banger. The scale of resettlement required cannot be reduced because people live on the present embankments.

The Provincial and Municipal authorities have proposed that the affected families be resettled to Keluruhan Karangroto because this area houses the families that have been relocated in earlier stages of the Kali Banger normalization program. These families appear to be satisfied with their new living environment and are happy to accept the people from their previous kampung. Government owned land is still available in Karangroto.

Urban Roads Sector
The need for improvement of the road system of both cities has been studied extensively during the five year plan preparation process. The only new road links included in the program are the proposed Northern Surakarta Ring Road and
<table>
<thead>
<tr>
<th>Sector</th>
<th>Beneficiaries</th>
<th>Adversely Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>The entire population of Semarang (1,384,000) and Surakarta (540,000) will benefit from the improved roads and transport system</td>
<td>Resettlement might be needed for a limited number of people living along 4 roads to be widened in Semarang. Precise numbers depend on further detailed studies</td>
</tr>
<tr>
<td>Drainage</td>
<td>Improved drainage will benefit the entire population of both cities. About 185,000 people live in areas currently prone to flooding in Semarang (854 ha) and 55,000 people in Surakarta (281 ha)</td>
<td>Resettlement is needed for 790 households living along Kalijanger. The property of 165 hh will partly be appropriated but the people can stay.</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>In Semarang 797,000 and in Surakarta 436,000 people are being served by the Solid Waste collection system.</td>
<td>Adversely affected are 160 households living in Sambankerap village close to TPA Jatiwangi.</td>
</tr>
</tbody>
</table>
| Sanitation                     | In Semarang 131,000 people will benefit from the new sewer system.  
In Surakarta 186,000 people will benefit from the rehabilitated and expanded sewer systems.  
People living downstream Surakarta along the Bengawan Solo river will have cleaner water                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | For the new 29 ha Treatment Plant in Semarang 12 people lose their land and 98 families lose their livelihood (fishfarm)  
In Surakarta 3 ha of agricultural land is lost to build a Treatment Plant.  
The construction of the interceptor sewers in Semarang affects the accessibility of 4,700 households, some shops and businesses during the construction period.  
Nuisance during construction for people living near the sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Water Supply                   | In Semarang 545,000 people receive piped water supply, in Surakarta 224,000.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Nuisance during construction for people living near the sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Urban Renewal/KIP/NIIP         | In Semarang 30,000 people will have an improved living environment, in Surakarta 45,000. The improved markets will benefit the entire population                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Nuisance during construction for people living near the sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
the extension of the Northern Semarang Ring Road. All other projects concern improvement of existing roads, periodic maintenance and traffic management. Only few roads will be widened. All project proposals are in conformity with existing urban master plans.

Four road widening projects, all scheduled to be implemented in the fourth and fifth year of the programme in Semarang could result in the need for limited resettlement: Jl.Pamularsih, Jl.Pedurungan-Mrican, Jl.Pedurungan-Citarum and Jl.Genuk-Pedurungan. The first two projects are to create a continuous east-west secondary collector in the southern part of the city which is badly needed and already included in the Urban Master Plans since 1975. In this densely populated urban area existing alignments will be followed in order to prevent demolition of buildings and resettlement as much as possible. Different design options will be considered during the design stage to minimize the need for resettlement.

Jl.Pedurungan-Citarum and Jl.Genuk-Pedurungan need to be widened to give better access to new residential areas in the fast developing eastern part of the city where the road network is hardly developed. Until recently this area was mainly rural and still now large patches of open land exist. Alternative alignments and design options can and will be considered to minimize disruption. This will be done in the first two years of the project concurrent with the preparation of the new metropolitan and urban master plans.

Environmental assessments (Andal) could not yet be prepared, but will be submitted to the Bank in the year before actual implementation is to take place. These projects should be considered as programmatic parts of the programme.

Sanitation Sector Semarang
Semarang has no sewer system yet. The existing open storm water drains are being used to collect both storm water and sanitary flows. This leads to insanitary conditions and pollution of the rivers and ground water, representing a health risk especially for people living along the rivers and people using shallow well water.

It is not possible to deal with the problem in the same way throughout the city. In the central, low laying areas of town the population densities are high (above 200 people per ha) and the soil and groundwater conditions not suitable to use septic tanks because of the high ground water table and the impervious soil. The only proper solution for this part of town is a sewer system. In other areas of the city, where population densities are lower and soil and groundwater conditions more favourable, on-site sanitation by means of private septic tanks and leaching pits is a suitable option. The project includes the provision of private and public on-site facilities, as well as the construction of a sludge treatment plant.

For the off-site sanitation system, two alternatives have been considered: a combined system for sewage and storm water and a totally separate system. Because of practical, financial and economical considerations a combined system is selected, although a separate system would be preferable on grounds of health and appearance. A pilot project for a separate sewer system is included in the program to gain experience.

Because of budgetary reasons, the project only includes a first phase consisting of the construction of interceptor sewers along Kali Semarang, a Waste Water Treatment Plant (15 ha) and a Sludge Treatment Plant (3 ha), and a full separate
sewer system in a pilot project area of 59 ha. The project will serve 131,000 people, which is approximately 69% of the population of Semarang living in the 878 ha catchment of Kali Semarang.

The interceptor sewers will be constructed along both sides of Kali Semarang under the inspection roads. It has been considered to build the interceptors in the river bed which would reduce traffic disruption during the construction phase. However, it appeared that this alternative option would create technical problems concerning the design of manholes and regulators and difficulties with operation and maintenance, i.e. access, inspection and dewatering.

The long term sewerage plan (after 1999) envisages to serve the main part of the city using additional interceptors along other rivers, expansion of the treatment plant and increasing the number of house connections. All areas with population densities of more than 150 people per ha will then be served.

Sanitation Sector Surakarta

Surakarta has two independent off-site waste water disposal systems. One is the central city system, a combined sewerage and waste water system constructed in 1940 in the Dutch colonial period and serving the city centre area of approximately 1140 ha. The second is a separate sewerage system, constructed in 1983 and serving a low income housing area of 65 ha in Mojosongo in the northern part of Surakarta. Both systems collect and discharge the waste water flows without any treatment into rivers.

The Mojosongo system is operational and in relative good condition. The “Old Dutch” system was not operational for quite some time because of sedimentation and lack of maintenance. However, local government has recently (1991) rehabilitated about 70% of the system.

The long term sewerage plan, prepared in 1992, includes the construction of interceptor sewers along rivers to collect the flows from the existing, to be upgraded systems, and to treat the flows before discharging them into the rivers. All areas with high population densities (above 150 people per ha) will thus be served. The remainder of the city, where population densities are lower and ground water and soil conditions in general more favourable, will be served with on-site facilities.

The project includes the construction of a sludge treatment facility at the existing land-fill site, the purchase of pumping vehicles and the provision of private and public on-site facilities.

The off-site component of the present project includes a first phase of the long term plan. The Mojosongo system will be repaired and rehabilitated where needed and the waste water flows will be collected and transported to a Treatment Plant to be built as part of the project.

The rehabilitation of the “Old Dutch” sewer system will be completed in 1993 (Jebres area, 55 ha). According to the urban master plan, the sewage of the system was intended to be treated in one central treatment plant in the southern part of the city. However, it appeared to be very difficult to find a suitable and affordable location. A follow-up study by a local consultant proposed to build three separate smaller treatment plants on specified locations. Another proposal was to temporarily treat only part of the sewage by constructing an aerator in the Jenes river until a more suitable solution would be found.
The Andal study was instrumental in deciding to return to the original master plan proposal and build one central treatment plant for the Old Dutch system. The plant is included in the SSUDP project. A location has been found at the confluence of Kali Pepe and the Bengawan Solo rivers. Construction of part of the interceptor system is postponed for budgetary reasons until after 1999.

**Solid Waste Management Sector**

Problems in the Solid Waste Management sector concentrate on the final disposal site (TPA) in Semarang. The Jatibarang TPA started operating in March 1992 but already now presents an unacceptable environmental management problem due to the extremely difficult terrain. The Andal study clarifies the problems and proposes mitigating measures and has more or less served as an eye opener for local officials. Alternatives considered include direct closure of the site, an emergency plan to mitigate the direct environmental hazards and the possibility of finding an alternative site to start operating immediately. However, an alternative site is not readily available. The Andal study therefore proposes to select a new site for final solid waste disposal as soon as possible. For the existing site a strict site operation plan has been prepared as part of the Andal to achieve a more acceptable situation for as long as the site is still operated. All actions needed have been included in the project.

6. **MITIGATION PLANS**

Full Andal studies, including mitigating measures and environmental management (RKL) and monitoring plans (RPL) have been prepared for sectors where potentially serious adverse environmental impacts have been identified:

1. Drainage sector: Kali Banger Semarang resettlement;
2. Solid Waste sector: Final Disposal Site Semarang;
3. Sanitation sector: Sewerage Semarang;

Environmental assessments for the national government roads projects will be submitted to the Bank in the year before actual implementation is to take place.

6.1 **Drainage sector: Kali Banger Semarang resettlement:**

Mitigating measures have been based on a thorough analysis of the present situation in the Kali Banger area and in the proposed resettlement location in Karangroto in East Semarang. The population to be relocated as well as the receiving population were interviewed and discussions with the affected population have taken place. Local community leaders and NGO's have been involved in the entire process. The main findings are summarized below.

6.1.1 The population to be resettled

The socio-economic survey among the population to be resettled received a response of 797 households out of a total of 953 affected households (84%). The majority of the respondents are employed by private companies (30%) as labourers. Other professions include businessmen (20%), government employees & military (9%), industrial sector (3%), informal sector (18%), and (20%) others (no clear employment, brokers and no answers). Education levels are in general low with 15% of the respondents without any formal education and 61% primary school education.

Table 6.1 presents a breakdown of the status of land ownership.
Table 6.1: Status of land ownership

<table>
<thead>
<tr>
<th>Land Title</th>
<th>full appropriation needed</th>
<th>partial appropriation needed</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Sertifikat Hak Milik</td>
<td>157</td>
<td>66</td>
<td>223</td>
</tr>
<tr>
<td>b. Sertifikat Hak Bangunan</td>
<td>261</td>
<td>70</td>
<td>331</td>
</tr>
<tr>
<td>c. Sertifikat Hak Usaha</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>d. Tanah Yasan</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>e. Letter D</td>
<td>29</td>
<td>4</td>
<td>33</td>
</tr>
<tr>
<td>f. Tanah Negara</td>
<td>49</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>g. Others</td>
<td>21</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>519</strong></td>
<td><strong>145</strong></td>
<td><strong>664</strong></td>
</tr>
</tbody>
</table>

Out of the 664 title holders, 43 live somewhere else and have rented out their property. The national land regulation (UU No. 5/1960 and Permendagri 15/1975) states that people will receive compensation if they have a land certificate and/or land from prescriptive law. Group a, b and c, in total 555 households (hh), have full formal land rights and will receive full compensation for their land and buildings. People holding adat (traditional law) land titles (d + e = 35 hh) will receive 100% compensation for their buildings and 90% for the land. People living on state owned land (Tanah Negara = 50 hh) and the group without formal land titles ("others") will receive 100% compensation for their buildings and 75% for the land.

Furthermore, additional to the households mentioned in the above table, a group of 169 households living in the area as houserenters will be affected. These people have no formal right to compensation. Finally, the land status for an additional group of 120 households is not yet clear. These people have claimed property rights but this could not be confirmed.

The average income of respondents is about Rp.135,000.-/month and average expenditures about Rp.119,000,-/month. A vast majority (79%) has an average household income of less than of Rp.150,000,-/month.

As the majority of respondents have low incomes their capability to pay instalments for a new house is limited: 34% of the respondents say they can only afford a maximum monthly instalment of Rp.10,000,-; 61% of the respondents are willing and capable to pay between Rp.10,000 and Rp.25,000.-/month and 5% can spend more than Rp.25,000.-/month.

The need for widening and normalization of Kali Banger is in general acknowledged by the people interviewed: 88% of the respondents agrees fully with the program, 2% of the respondents disagrees and 10% did not express an opinion.

6.1.2 The resettlement area

Karangroto is situated in East Semarang at a distance of approximately 7 km from the Kali Banger area. The population in Karangroto consists of 1,176 hh of which 457 hh were resettled into this area during the previous Semarang Drainage Project under Urban V.
The Karangroto area covers about 296 ha. At present 10% of the land is being used for residential purposes and 90% for agriculture i.e. bananas, non-irrigated rice fields, food crops, etc. The residential area for previous Urban-V resettlers covers 8.7 ha. The area available for new resettlers from Kali Banger is about 7.5 ha divided in three separate blocks. The land is government owned.

For the previous resettlement project some facilities were constructed, like an access road, public sanitary facilities (MCK) and two elementary schools. A public hall is now under construction. Clean water of good quality is provided through three deep wells.

The socio-economic survey among the receiving population covered 99 households consisting of 49 hh from the original population and 50 hh from the previously resettled population. The results of the survey show that the entire population in Karangroto agrees with the proposed resettlement program. However, only 6% of the respondent agreed completely whereas about 94% of the people interviewed agreed but expressed the need to provide additional facilities and services like a public health centre (57%), local market (37%), rehabilitation of access roads and street lighting (41%), public transport, sanitary facilities, additional electricity connections and clean water supply.

6.1.3 Mitigating measures

The resettlement plan details the measures deemed necessary to mitigate the impact of the resettlement component of the Kali Banger drainage project. Most important will be to give fair compensation for property at stake, to disseminate information and discuss relevant issues with the affected population and to provide adequate facilities in the resettlement area.

The affected population will be compensated in cash and in kind. The cash compensation is based on government regulations. The Mayor will issue a decree concerning the basic land price. The compensation for buildings depends on the type of construction, age, size and utilities, regulated under a decree of the Directorate of Cipta Karya.

The compensation in kind consists of serviced plots of 80 m², 100 m² or 120m² in the Karangroto resettlement area for which the resettled people will receive full formal property rights. The plots will be at least the size of the property lost. The SSUDP program includes the provision of infrastructure in the resettlement area as part of the KIP program. This includes access roads, drainage, public sanitary facilities (MCK’s) and additional water supply. Other facilities like a public health centre, mosque, power supply etc. will be provided under concurrent programs. The local municipal housing agency (Dinas Perumahan) will be in charge of provision of facilities and infrastructure through their KIP project unit.

The total amount of compensation in cash and in kind can be considered equal to market value.

For a group of 120 households the land status is not fully clear. This will be clarified in the near future, facilitated by the ongoing IBRD funded community consultation assistance project. This project serves as a follow-up of the Andal study and includes continued NGO involvement. The NGO’s will also provide assistance to renters who have no formal right to be compensated and who will have to negotiate with the lessors.
The resettlement plan has been discussed with local government and agreement in principle has been reached.

6.2 **Solid Waste sector: Final Disposal Site Semarang**

The solid waste collection system covers most of the urbanized area of Semarang. The population served is about 797,000 persons in the year 1993 and is planned to increase up to 1,165,000 persons in 1999 (80% of the total population). The total volume of waste produced is projected to increase from 174,000 m$^3$/year in 1993 to 235,000 m$^3$/year in 1999. Four sites for solid waste disposal (TPA) have recently been closed because they either reached their design capacity or they were not manageable in an environmentally sustainable manner (Mangunharjo, Gombel Lama, Kedungmundu and Tapak). Currently only one site is being operated: Jatibarang (44.5 ha), located in a remote area in the hills approximately 10 km southwest of the city centre. The nearest village is desa Bambankerap to the east of the TPA at a distance of approximately 800 m with a population of 180 households. About 40 scavengers live at the site in a residential facility provided by the Dinas Kebersihan.

Operations at Jatibarang started in March 1992. The total number of trucks operating is about 50 and one truck makes 3-4 trips/day on average. Waste is being dumped directly over the edge of a very steep, almost vertical slope. Compaction does not take place and the wastes are not being covered with soil because of the difficult accessibility of the terrain for heavy equipment. In January 1993, the accumulated waste became supersaturated from the heavy rains and started sliding downhill towards a small river in the valley below the site. Consequently a cut-off drain was constructed in an effort to divert the storm water to stop the slide and to reduce leachate generation. A leachate treatment plant was taken into operation in August 1993.

The Andal study concluded that the way TPA Jatibarang is being operated presents an unacceptable environmental management problem. A new site must be selected as soon as possible. Funds for Technical Assistance to conduct a site selection study and to buy land have been included in the SSUDP program. For as long as the Jatibarang TPA is still being operated the following mitigating measures as included in the Site Operation Plan are urgently required:
- construction of a sealed all weather access road to the lower levels of the site which are not so steep and can be operated properly;
- operations should be restricted to properly manageable sections totalling about 15 ha;
- the provision of a new tracked loader to provide a pressure at the tracks of the machine of 70 Kpa;
- the provision of additional pre-treatment of the leachate produced at the TPA. This will involve the construction of an additional anaerobic pond and continuous pumping and recirculation of the leachate over the refuse prior to discharge through the existing oxidation ponds to the Kali Cebong;
- the provision of fire fighting equipment;
- the provision of subsurface leachate collection and stormwater collection together with the construction of silt traps;
- additional excavation to provide cover material and additional landfill capacity.

The SSUDP program includes funds needed for the above actions, civil works and equipment. It is also envisaged to provide training to the field operators. The
RKL/RPL and the Jatibarang Site Operation Plan describe all measures in more detail especially the actions needed to achieve sanitary landfill conditions as well as an emergency plan to mitigate the present hazardous situation. It is estimated that the Jatibarang site will offer enough capacity for another 6-7 years provided that proper compaction can be achieved.

The SSUDP program also includes funds for proper closure of the other Solid Waste Disposal sites that were taken out of operation recently. Actions needed for proper site closure as detailed in the RKL/RPL include fences, leachate and gas management, soil cover and erosion control, surface water management and environmental monitoring.

6.3 Sanitation sector: Sewerage Semarang

The Waste Water Treatment Plant will be built on a 15 ha site close to the sea with possible future extension of another 14 ha. The land is at present privately owned by 12 different owners. Nobody lives on the land. The nearest settlement is more than 1,000 m away. The land is being used for fish ponds, providing a living for 98 families. Proper compensation for land needed for the treatment plant must be provided. During the Andal study, discussions between land owners, land users and local authorities were held aiming at mutual agreement about compensation and procedures. This resulted in consensus about the compensation to be paid: on average Rp.8,916,000 for each land owner and Rp.1,620,000 for each cultivating fish farmer.

Disruption of accessibility of houses and businesses along the Kali Semarang as a result of the construction of the interceptor sewers will be minimized as much as possible. Possible damage to buildings along the inspection road and to the river banks must be prevented. The main mitigating measures proposed in the Andal study are:
- dissemination of information and consultation with the affected population throughout the construction period;
- traffic management measures to be detailed in the final engineering design stage;
- the contractor should guarantee access for emergency vehicles and should not be allowed to store materials at the construction site;
- the contractor will receive detailed instructions on prevention of damage to buildings and river banks;
- dissemination of information to the general public through local newspapers and radio.

6.4 Sanitation sector: Sewerage Surakarta

As a result of the Andal study the original proposals for the Surakarta sewerage project have been changed drastically in an effort to minimize adverse environmental impact.

Mojosongo System
The Mojosongo system treatment plant was planned to be build on a site where people had already settled. Construction of the plant would result in substantial resettlement. This was acknowledged in an early stage of the Andal study. After intensive consultation with local government an alternative site of 3 ha was found not far from the original location. This site is suitable from a technical as well as an environmental point of view. The land is not inhabited but is used for dry agriculture. Half the area is privately owned, the other half is
government land. Costs for land acquisition and proper compensation for people cultivating the land have been included in the program.

"Old Dutch" System

According to the urban master plan, the sewage of the "Old Dutch" sewer system was intended to be treated in one central treatment plant of about 11 ha in the southern part of the city. However, it appeared to be very difficult to find a suitable and affordable location because most of the land is densely populated and land prices are high. A follow-up study by a local consultant proposed to build three separate smaller treatment plants of about 11 ha in total on specified locations. Another proposal was to temporarily treat only part of the sewage by constructing an aerator in the Jenes river until a more suitable solution would be found.

All these proposals have been considered during the Andal study. The proposed aerator has been dropped because the environmental costs far outweigh the benefits. The three separate treatment plant locations as proposed by the local consultant appear to be inhabited by large numbers of people. Resettlement will be very costly and will have a serious social impact.

Because of the social and environmental constraints the Andal study proposes to use more advanced technology for treatment meaning that a much smaller site would be sufficient which would minimize the need for resettlement and reduce the adverse environmental impact. After intensive consultation with all levels of government this approach was endorsed. A location for the plant was found at the confluence of the Kali Pepe and Bengawan Solo rivers. This area of 2.5 ha is suitable when using UASB, Carousel or related technology. The land is not inhabited so there is no need for resettlement. Investment costs and expenditure for operation and maintenance of the plant have been included in the program. Construction of part of the interceptor system is postponed for budgetary reasons until after 1999.

7. MONITORING and EVALUATION

The environmental monitoring plans (RPL) detail the actions required for monitoring and evaluation in compliance with environmental standards. The main actions are summarized below and in table 7.1.

7.1 Land Acquisition and Resettlement

7.1.1 Kali Banger Semarang

The data collected with interviews and additional surveys in the affected areas will be used as a base for monitoring during the actual plan implementation, land acquisition and resettlement. Six months after the land acquisition is completed a follow-up questionnaire survey is scheduled to ascertain that the arrangements were indeed fair and satisfactory. Another survey is planned two years later to evaluate the situation in the resettlement area and to monitor the provision of facilities and services. In this way it will be possible to make timely adjustments if necessary.

The evaluation will be the responsibility of the municipal environmental protection agency (Bapedalda) established in Semarang in April 1993. The process will be monitored by a local NGO that was also involved in plan preparation. Monitoring of progress with provision of infrastructure and social facilities in
<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation</th>
<th>Responsible Agency</th>
<th>Monitoring</th>
<th>Responsible Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Land Acquisition and Resettlement</td>
<td>- community consultation - resettlement to Karangroto - compensation in cash and kind - provision of urban services in resettlement area</td>
<td>PIU Drainage</td>
<td>Follow-up survey based on Andal questionnaire</td>
<td>NGO</td>
</tr>
<tr>
<td>1.1 Mali Banger drainage project resettlement</td>
<td>- TP3T</td>
<td>Bapedalda</td>
<td>NGO assistance</td>
<td>Dinas Perumahan</td>
</tr>
<tr>
<td>1.2 Possibly resettlement for outer years roads projects</td>
<td>Andal will be prepared and submitted one year before project implementation. Careful study of alternative design options should minimize the need for resettlement</td>
<td>Bina Harga</td>
<td>The central and local government agencies involved in plan preparation should take care of timely preparation of Andal; monitoring by PPHO/PMO</td>
<td></td>
</tr>
<tr>
<td>1.3 Loss of fishponds and farmland for construction of waste water treatment plants</td>
<td>- use more advanced technology to reduce need for land (SKA) - community consultation - proper compensation</td>
<td>Land Acquisition Committees (Panitia-S,TP3T)</td>
<td>Evaluation survey 6 months afterwards</td>
<td>NGO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PIU Sanitation</td>
<td>NGO assistance</td>
<td>TKP2S DALH (SKA)</td>
</tr>
<tr>
<td>2. Solid Waste Environmental hazards Disposal Site Semarang, TPA Jatibarang</td>
<td>- treatment of leachate - construct access road - Implement Site Operation Plan - Commission study to find a new TPA location - Proper closure of old TPA's</td>
<td>Dinas Kebersihan</td>
<td>Monitor leachate, groundwater and surface water quality</td>
<td>Bapedalda</td>
</tr>
<tr>
<td>3. Sanitation 3.1 Discharge of polluted effluent</td>
<td>All sewage and leachate will be treated before being discharged. The old Dutch system in Surakarta will also be completed with a Treatment Plant</td>
<td>PDAH</td>
<td>Regular testing of groundwater, surface water and leachate</td>
<td>Bapedalda</td>
</tr>
<tr>
<td>3.2 Damage of River Banks and Buildings (Sewarage Semarang)</td>
<td>Strict instructions to contractors to be included in contracts</td>
<td>PIU Sanitation</td>
<td>Regular inspections and strict supervision of construction activities</td>
<td>DPU</td>
</tr>
<tr>
<td>3.3 Sedimentation (Drains and Sewers)</td>
<td>Regular cleaning, maintenance; improve solid waste collection system</td>
<td>PDAH</td>
<td>Regular inspections and six monthly sediment testing</td>
<td>Bapedalda</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DPU</td>
<td>TKP2S DALH (SKA)</td>
<td></td>
</tr>
<tr>
<td>4. Traffic Disruption (Drainage, Roads, Sanitation)</td>
<td>Traffic management and public information</td>
<td>DLLAJR</td>
<td>Monitoring of traffic flows and changes of traffic patterns during the construction period</td>
<td>Bapedalda</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polantas</td>
<td>TKP2S DALH (SKA)</td>
<td></td>
</tr>
<tr>
<td>5. Noise and Dust (Drainage, Roads, Sanitation)</td>
<td>Strict instructions to contractors to be included in contracts; Traffic management</td>
<td>DPU</td>
<td>Regular inspections and strict supervision of construction activities</td>
<td>Bapedalda</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DLLAJR</td>
<td>TKP2S DALH (SKA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polantas</td>
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</tbody>
</table>
the resettlements area will be the responsibility of the housing agency (Dinas Perumahan).

7.1.2 Central Government Roads Projects

The eventual need for land acquisition and resettlement as a result of the outer year roads projects initiated by central government needs to be studied indepth by the national agency Bina Marga. This agency will also prepare the Andal studies and resettlement plans required. The provincial and municipal project management offices (PPMO and PMO) and Bapedalda will monitor the timely preparation and submission of Andal studies and resettlement plans one year before actual implementation is to take place.

7.1.3 Waste Water Treatment plants in Semarang and Surakarta

For the waste water treatment plants in Semarang and Surakarta land will be acquired and cleared. Nobody is living there but the land is used for agriculture and fishponds. Consensus about compensation has been reached. The local Teams for Land Acquisition (TP3T and Pantia-9) will be responsible for the follow-up. Evaluation will take place six months after completion of land acquisition. The process will be monitored by a local NGO, by Bapedalda in Semarang and in Surakarta by a similar municipal environmental team as Bapedalda with similar responsibilities but organised on an ad hoc basis, TKP2SDALH. Surakarta does not have a Bapedalda yet.

7.2 Solid Waste Disposal Semarang (TPA Jatibarang)

The implementation of the Site Operation Plan for the Jatibarang disposal site in Semarang is the responsibility of the local Dinas Kebersihan (DKP) under supervision of the local environmental protection agency (Bapedalda). In close cooperation with the Sanitary Engineer of the Bapedalda, the DKP will monitor the situation, i.e. the quality of the leachate as well as the groundwater in the neighbouring Bambankerap village. The data collected during the Andal study, i.e. concerning surface water quality, will serve as base data for evaluation of future water quality testing. Key parameters to be monitored are Ph and DO (site measurement) and laboratory testing of BOD$_5$, COD, NO$_3$, NO$_2$, Fe and heavy metals (Zn, Ni, Cd, Cu, Cr and Pb). In case alarming levels of pollution are found, Bapedalda will first warn all agencies involved about the pollution and will advise the Mayor who will then issue instructions on actions required. DKP and Bapedalda will step up the monitoring frequency to see whether the pollution levels change or not and will advise about additional actions including information to the public.

7.3 Sanitation

7.3.1 Effluent and Groundwater Quality around Waste Water Treatment Plants

The environmental parameters to be monitored are the influent, effluent, receiving stream and groundwater quality related to the waste water and septage treatment plants. Groundwater quality must be controlled in an area of 2 km$^2$ around the site. The data collected during the Andal study, i.e. concerning surface water quality, will serve as base data for evaluation of future water quality testing. Key parameters to be monitored and the frequency of monitoring are listed in table 7.2. The responsible agency is the PDAM, assisted and supervised by Bapedalda in Semarang and by TKP2SDALH in Surakarta.
Table 7.2: Key Parameters for Monitoring of Water Quality

<table>
<thead>
<tr>
<th>Key Parameters</th>
<th>unit</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. pH</td>
<td></td>
<td>m</td>
<td>m</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>2. BOD₅</td>
<td>mg/l</td>
<td>m</td>
<td>m</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>3. DO</td>
<td>mg/l</td>
<td>m</td>
<td>m</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>4. Suspended Solid</td>
<td>mg/l</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>5. NO₂⁻</td>
<td>mg/l</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>s</td>
<td>m</td>
</tr>
<tr>
<td>6. FC – Faecal coliform</td>
<td>MPN/100ml</td>
<td>m</td>
<td>m</td>
<td>s</td>
<td>s</td>
<td>m</td>
</tr>
<tr>
<td>7. Discharge (Q)</td>
<td>1/sec</td>
<td>d</td>
<td>d</td>
<td>-</td>
<td>m</td>
<td>-</td>
</tr>
<tr>
<td>8. Faecal streptococci</td>
<td>MPN/100ml</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>m</td>
</tr>
<tr>
<td>9. NO₃⁻</td>
<td>mg/l</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>m</td>
</tr>
</tbody>
</table>

Notes:
A: Influent parameter (monitoring and frequency)
B: Effluent parameter (monitoring and frequency)
C: Sludge parameter (monitoring and frequency)
D: River water (100 m upstream and 50 m downstream of discharge point)
E: Ground water parameter (monitoring and frequency)
d: daily frequency
m: monthly frequency
s: six monthly frequency

7.3.2 Damage to River Banks and Buildings

The interceptor sewer system to be constructed under the narrow inspection roads along both sides of Kali Semarang could potentially damage the river banks and the buildings close to the construction site. Construction work is under responsibility of PIU Sanitation. The situation will be monitored daily by the construction engineer of the local public works office (DPU) and by Dinas Tata Kota (DTK).

7.3.3 Sedimentation

Sedimentation and dumping of solid wastes in the drainage channels may restrict the flows in the drains and their capacity and cause odours and mosquito breeding because of stagnant water and rotting processes. The Solid Waste Management component of the SSUDP program for which the Dinas Kebersihan is responsible, will improve the solid waste collection system drastically which is expected to reduce the volumes of wastes being dumped illegally in drains and rivers. The situation will be monitored by the Drainage Engineer of the local Public Works Office (DPU).

Sedimentation in the Interceptor Sewers will hamper proper functioning of the sewer system and may cause unnecessary overflow of sewage into rivers and drains. The substance of the sediment should be monitored as well. Pollutant parameters to be analyzed on a six monthly basis are COD, BOD₅, organic content and fat, oil and grease. Responsible for monitoring sedimentation in the sewer system is the Sanitary Engineer of the PDAM, assisted and supervised by Bapedalda in Semarang and by TKP2SDALH in Surakarta.

7.4 Traffic Disruption

Traffic disruption as a consequence of the drainage, roads and sewerage projects will be minimized. Responsible for monitoring the implementation of the mitigating measures is the Traffic Engineer of the Local Traffic Agency (DLLAJR)
and Polantas. The Traffic Engineer will also monitor the traffic flows and changes in traffic patterns as a result of construction activities and assure that appropriate measures will be taken and that affected people will receive timely information. Supervision and monitoring will be done by Bapedalda (Semarang) and TKP2SDLH (Surakarta).

7.5 Noise and Dust

Noise and dust nuisance may result from all construction activities, especially in the drainage, roads and sanitation sectors. The Bapedalda in Semarang is responsible for monitoring of sound and dust emission at construction sites, based on the Provincial Regulation (Perda 1/1990) for environmental monitoring. The responsible agency in Surakarta is the local environmental team (TKP2SDLH). The local Public Works Office (DPU) supervises construction activities and will cooperate with the environmental agencies to keep noise and dust at acceptable levels. The maximum ambient standard for dust is 0.26 mg/m³. Noise levels in residential areas should not exceed 60 dBA. Observations are planned on a weekly basis. Traffic noise will be reduced by traffic management measures under responsibility of DLLAJR and Polantas.

8. INSTITUTIONAL ARRANGEMENTS

The institutional arrangements for the implementation of the SSUDP program have been detailed in the Local Institution Development Action Plan (LIDAP). The main actions can be summarized as follows.

Separate project implementation units (PIU's) at local government level will be responsible for the implementation of the program. These units will be assisted by supervising agencies especially established at local level, the so-called PMO and PMU. Training of staff and consultancy assistance will be provided under the project. At provincial level support will be provided by the PPMO and PPMU agencies.

In Semarang a local environmental protection agency (Bapedalda) has recently been established. This agency will be responsible for supervision and monitoring of all environmental aspects. In Surakarta a similar agency, with similar responsibilities but organised on an ad hoc base, is the local environmental team (TKP2SDLH).

The sewerage systems will be managed by the local Water Enterprises (PDAM). The Solid Waste Disposal site is managed by the municipal Dinas Kebersihan (Public Cleansing Department).

Land acquisition is the responsibility of the local Team for Land Acquisition (Panitia-9), chaired by the Municipal Secretary (Sekwiloa). In case the land to be acquired is less than 5 ha a local team called TP3T, chaired by the PIU Project Manager (Pemimpin Proyek) is in charge.

Implementation of the drainage works is the responsibility of the PIU Drainage unit within the Public Works office (PU). Implementation of infrastructural works in the resettlement area is the responsibility of the PIU-KIP unit within the municipal housing agency (Dinas Perumahan). This Dinas Perumahan is also responsible for monitoring provision of social infrastructure by the relevant municipal agencies.
9. COMMUNITY PARTICIPATION

Community consultation has been an integrated part of the plan preparation process. Home questionnaire surveys were held to establish the real demand and preferences for urban services and to assess affordability based on income of the target population.

The Andal studies included more active community involvement. The affected population was interviewed and draft proposals were discussed in specially organized meetings. Specific attention was given to the population to be resettled as a result of the project. Home questionnaire surveys were conducted among the affected population and in the resettlement area. The results of the surveys and the draft plans were discussed intensively. In September 1992 meetings were organized with the people to be resettled. Almost 100 people attended the meeting, including local community leaders, religious leaders and representatives from local NGO's. Another meeting was organized to discuss the draft resettlement plan with the receiving population in Karangroto and their community and religious leaders. About 70 people attended this meeting. The discussions were held in a very positive atmosphere. Local NGO's were involved during the entire process. The aspirations of the people were taken into account in the final drafting of the resettlement plan. An ongoing IBRD funded follow-up study is especially intended to further enhance community participation and includes active NGO involvement.

Active community participation will be encouraged in the kampung improvement programs (KIP). The government acknowledges that emphasizing development of physical facilities without simultaneously giving attention to community involvement may have caused inefficiencies and lack of community commitment in the past. Therefore the government wishes to enhance community involvement in every stage of the KIP programs: planning, implementation, monitoring, utilization and maintenance. To this purpose the community based development approach was launched, the so-called New National KIP Strategy. The strategy is based on three key elements called Tri Bina: (1) development of the physical environment, (2) human resources and social development and (3) economic development. The existing neighbourhood organisations (LKMD) will play an important role in the enhancement of community participation in the KIP programs. Training for LKMD staff is included in the project.