

## INITIAL ENVIRONMENTAL EXAMINATION

### EXECUTIVE SUMMARY

#### A. Key Findings

1. An initial environmental examination (IEE) was undertaken to ascertain the Project's impact on the environment and to identify measures to prevent or mitigate any adverse environmental impacts that could arise from its implementation. In line with the Asian Development Bank (ADB) environmental safeguard requirements an initial environmental screening, using Rapid Environmental Assessment (REA) checklists, was carried out for all proposed subcomponents listed in the city government's subproject appraisal report (SPAR).

2. All proposed subprojects are categorized as "B" or lower in accordance with ADB's *Environmental Policy and Environmental Assessment Guidelines* (2003). The Project will not include Category A subcomponents. There will be no additional subcomponents after loan approval. None of the category "B" sub-projects were likely to result in significant adverse environmental impacts. However, temporary, transient adverse impacts can be expected during the construction phase. Permanent damage to the environment by the Project depends on the quality of operation and maintenance work to be carried out by contractors of the Ministry of Public Works (MPW) and the city governments. Current standards of operations are generally low which has caused permanent damage to environmental resources in the country. This SIEE summarizes the main findings of the environmental assessment conducted for the sub-components.

3. No AMDAL (EIA) or UKL/UPL (Simplified Environmental Management and Monitoring Plan) in line with national environmental assessment standards was prepared by the implementing agencies (IAs) by the end of April 2009. For individual subprojects that would require only UKL-UPL (EMP), an IA is allowed to adopt a report format of their choice as long as five key environmental information sets are included as outlined in Ministry of Environment Decree No. 82 of 2002. This would mean that the IA could use an ADB formatted sector-wide IEE document prepared for the individual cities and submit it with some modifications and translated into Indonesian to satisfy national environmental assessment requirements for UKL-UPL. In general, the city environmental authorities had agreed to facilitate the synchronization of the environmental assessment process for this Project. This provides opportunities to reduce duplication and volume of environmental assessment reporting to satisfy both ADB and national standards and has the potential to substantially reduce the timeframe needed. Review and updating of environmental management action plans (EMAP) and environmental monitoring programs (EMoP) shall be undertaken during the detailed design phase.

#### B. Environmental Impacts and Mitigation Measures

4. The IEEs reviewed potential environmental problems associated with design, location, construction and operation, for the two cities. Under a "do-nothing" scenario, non-existing or inefficiently operated sanitation systems will continue to cause major environmental damage. However, as with all infrastructure development, the intended sanitation projects could cause temporary or permanent environmental impacts, if not properly implemented. The IEE reports contain Project subcomponents with limited significant environmental impact potential. If successfully managed by the IAs in the project cities, the project will contribute to long-term environmental improvements in the areas of surface- and groundwater quality, flooding, vector

control (i.e. mosquitoes), I, physical destruction of terrestrial and aquatic ecosystems and greenhouse gas emissions.

5. **Environmental impacts related to project location.** Most subcomponents are located within the highly urbanized city boundaries and linked to existing urban infrastructure. These are generally areas of low ecological sensitivity due the high degree of disturbance and hence the potential adverse impacts would be minor and likely limited to only the construction phase. Project locations further outside the urban centres may experience moderate to significant impacts on community livelihood (e.g. farming) and other environmental services (e.g. water supply from groundwater). Needs for relocation of local communities has not been identified at this stage. A Resettlement Framework in line with ADB standards has been drawn up, in case resettlement issues become pressing.

6. **Environmental impacts related to project design.** Existing sanitation systems in the project cities are mostly only partially available, or they are lacking components and are not fully functional. A more comprehensive assessment at this stage is not possible, due to lack of DED plans. As such, updating of EMAPs and EMoPs shall be undertaken during detailed design phase. A lack of environmental specifications for contractors in bidding documents and environmental clauses for construction contracts may lead to insufficient provisions of recommended environmental mitigation measures during the construction process. It will be a mandatory requirement to make EMAP tables part of the tender documents with costing required by bidders for EMAP/subcomponent implementation.

7. **Environmental impacts related to construction stage.** A large number of proposed subcomponents involve the construction or repair/up-grade of existing sewer lines with a great deal of commonality in the construction methods. Replacing water pipes and extending the network into new areas for example, will involve the same basic trenching techniques as used when replacing or building new sewers. Similarly, construction and rehabilitation of pumping stations will involve the same types of small building work and installation of pumps and pipes. Construction of the MPW wastewater/sludge treatment/tank systems and will also be similar in that they will occur at expansion sites and involve larger-scale excavation.

8. **Environmental impacts related to operations.** Covered drains and buried sewers will remove the smell and appearance of excrement, and the waste should be removed rapidly and effectively to treatment works located well away from the urban area. The environment of the cities should therefore improve. Air and visual quality will improve, but the most significant benefit will be in the health of the people. Better sanitation combined with a better water supply and greater understanding of the risks of poor standards of hygiene, should ensure that the project delivers improvements in public health. There should be other benefits including: increased incomes as people spend less on healthcare and miss fewer working days; increased business productivity; and improved social capital in city if people spend more on educating their children and following social and cultural pursuits.

9. Mitigation measures include (i) adequate supervision of construction operations, with due regard for limiting noise and dust pollution, (ii) the use of silt traps when and where appropriate, (iii) careful deposition of spoil arising from excavation works, ensuring that it is not cast directly over canal embankments. To the extent possible, spoil should be used as fill. In all cases, it must be compacted and treated either using bioengineering techniques. In the event, fill materials are needed, borrow sites have to be chosen at sufficient distance from waterways and environmentally sensitive areas and (iv) providing designated areas with for vehicle fuelling and fuel storage with bunds and simple oil-water separators.

### **C. Institutional Requirements and Environmental Monitoring Plan**

10. **Implementing agencies (IA).** The IAs for the proposed subcomponents are the city governments, which will establish Subproject Management Units (SPMU) in the respective Bappeda. Subproject implementation units (SPIUs) will be formed in each participating local government technical agency, and in the case of Medan and Yogyakarta, also provincial government level entities. The responsibility of the IAs is to carry out the environmental assessment process according to the national environmental legislation and to obtain environmental clearance from the relevant project approving authority (Dinas LH) and ADB for environmental compliance before awarding contracts for the subcomponents. In both cities, the government agency in charge of the on-site sewerage projects related to government housing projects is DGHS. Sludge collection from on-site wastewater treatment (septic tank, communal STP, etc.) is the responsibility of Dinas Kebersihan in both Medan and Yogyakarta.

11. **Environmental monitoring.** During construction, compliance monitoring will be conducted in accordance with the EMoP. The IA will submit a quarterly monitoring report to Dinas LH. No later than 1 month before the completion of the construction work, the IA will collect material from all contractors and provide a construction completion report to the stakeholders. The environmental section of this report will indicate the timing, extent, and success of mitigation completed and the maintenance and monitoring needs during operations.

12. **Public consultation.** Such consultations were held parallel with Focus Group Discussions (FGD) at city level during September/October 2007 in both cities. A series of meetings were held with approximately 15 to 20 stakeholder groups in each cities as part of the environmental assessment process, including representatives of NGOs (nongovernment organizations), private sector, partner organizations of international donor funded projects (USAID and JICS in Medan) and local government officials of relevant departments, most importantly Dinas LH. Mostly the discussion focused on the environmental impacts of the implementation and post-implementation periods and mitigation measures were reviewed with the help of ADB's rapid environmental assessment checklists (REA). The discussion with NGOs was done separately from FGD and showed rampant weaknesses in sanitation management and the enforcement of the AMDAL process, especially related to the prescribed environmental monitoring plan for project activities.

13. **Capacity development:** To ensure that the sanitation facilities are properly maintained, the project will involve capacity building/ institutional development and project implementation support component designed to (i) strengthen institutional capacity in sanitation strategy development, management, operations and maintenance, and financial skills, (ii) strengthen institutional capacity in health and hygiene awareness raising and behavioral change programs, (iii) support the executing and implementing agencies, and participating communities, in the implementation of the various activities under the Project, and (iv) make the facilities built or improved from the investment more sustainable. The Project will provide consulting services packages to support these activities.

14. **Cost:** For budget estimation purposes of environmental mitigation costs, approximately 1-2% of total contract value shall be allowed for mitigation measure implementation for construction. This amount will be included in the project cost estimates.

## **D. Conclusions**

15. The Project aims at improving sanitation management, and hence improves public health conditions and living standards of Project cities' residents. Wastewater will be collected and treated prior to discharge, which will improve environmental conditions in the project's areas of influence.

**DRAFT**

---

**INITIAL ENVIRONMENTAL EXAMINATION (IEE)  
FOR  
METROPOLITAN SANITATION MANAGEMENT AND  
HEALTH PROJECT  
KOTA MEDAN**



**December 2009**

---



## CURRENCY EQUIVALENTS

(as of 14 December 2009)

Currency Unit	–	rupiah (Rp)
Rp 1.00	=	\$ 0.0001059603
\$1.00	=	Rp 9,437

## ABBREVIATIONS

ADB	–	Asian Development Bank
AH	–	affected household
AMDAL	–	<i>Analisa Mengenai Dampak Lingkungan</i> (environmental impact assessment process, which includes ANDAL, RKL and RPL)
ANDAL	–	<i>Analisis Dampak Lingkungan</i> (environmental impact assessment)
APBD	–	<i>Anggaran Pendapatan dan Belanja Daerah</i> (local government budget)
APBN	–	<i>Anggaran Pendapatan dan Belanja Negara</i> (central government budget)
BAPPEDA	–	<i>Badan Perencanaan Pembangunan Daerah</i> (city/district development planning agency)
Bapedalda	–	city/district environmental agency)
BAPPENAS	–	<i>Badan Perencanaan Pembangunan Nasional</i> (National Development Planning Agency)
BPS	–	<i>Biro Pusat Statistik</i> (Central Statistical Agency)
CPMU	–	Central Project Management Unit
CSS	–	city sanitation strategy
CSWT	–	city sanitation working team
DGHS	–	Directorate General of Human Settlements
DPRD	–	<i>Dewan Perwakilan Rakyat Daerah</i> (city/district legislative assembly)
EA	–	executing agency
EARP	–	environmental assessment and review procedure
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMAP	–	environmental management action plan
EMoP	–	environmental monitoring program
ENPV	–	economic net present value
ETESP	–	Earthquake and Tsunami Emergency Support
FIRR	–	financial internal rate of return
FNPV	–	financial net present value
GIS	–	geographical information system
GOI	–	Government of the Republic of Indonesia
G(R)DP	–	gross (regional) domestic product
HWL	–	highest water level
IA	–	implementing agency
IEE	–	initial environmental examination
IP	–	indigenous people
IPDF	–	Indigenous People Development Framework
IPDP	–	Indigenous People Development Plan
I(P)SA	–	initial (poverty) and social assessment
KepMen	–	<i>Keputusan Menteri</i> (ministerial decree)
LIDAP	–	local institutional development action plan

MDG	–	Millennium Development Goals
MIS	–	management information system
MOE	–	Ministry of Environment
MOF	–	Ministry of Finance
MOH	–	Ministry of Health
MoU	–	memorandum of understanding
MPW	–	Ministry of Public Works
NGO	–	non-government organization
OCR	–	ordinary capital reserves
O&M	–	operation and maintenance
PDAM	–	<i>Perusahaan Daerah Air Minum</i> (regional government water supply enterprise)
PDK	–	<i>Perusahaan Daerah Kebersihan</i> (city/district cleaning enterprise)
PP	–	<i>Peraturan Pemerintah</i> (government regulation)
PSA	–	poverty and social analysis
RF	–	resettlement framework
RG	–	regional government
RKL	–	<i>Rencana Pengelolaan Lingkungan</i> (environmental management plan)
Rp.	–	Indonesian Rupiah
RP	–	resettlement plan
RPL	–	<i>Rencana Pemantauan Lingkungan</i> (environmental monitoring program)
SANIMAS	–	<i>Sanitasi Masyarakat</i> (sanitation by communities)
SES	–	social and environment section of SPIU
SPIU	–	subproject implementation unit
SPMU	–	subproject management unit
TA	–	technical assistance
TOR	–	terms of reference
UKL	–	<i>Upaya Pengelolaan Lingkungan</i> (environmental management effort, similar to IEE)
UPL	–	<i>Upaya Pengelolaan Lingkungan</i> (environmental management effort, similar to EMP)
WWTP	–	wastewater treatment plant

## 1. INTRODUCTION

1. This initial environmental examination (IEE) was prepared by Black and Veatch as part of the consultant services contract for the Asian Development Bank's Metropolitan Sanitation Management and Health PPTA (ADB TA No. 4763-INO). The overall project objective is to provide improved infrastructure in the sanitation management sectors leading to better public health in selected metropolitan centres in Indonesia, with financing from an ADB loan.

### 1.1 Sub-Component Assessment Process

2. As part of this PPTA's first phase, participating cities formulated City Sanitation Strategies (CSS) that included a list of proposed sub-components in the following sectors:

- community mobilization, empowerment and promotion of public health awareness;
- infrastructure development for sewerage and main drainage;
- solid waste management; and
- institutional development and sub-component implementation support.

In the first half of 2009, the Executing Agency made important changes to the scope of the project scope, by excluding solid waste management and drainage sectors. As a result, the IEE only cover subprojects in the following sectors:

- community-based sanitation;
- infrastructure development for sewerage; and
- institutional development and sub-component implementation support.

3. In line with ADB environmental safeguard requirements an initial environmental screening, using Rapid Environmental Assessment (REA) checklists (see Annex 3a) was carried out for all proposed sub-components listed in the CSS. This included mainly infrastructure physical works for sewerage. In addition, an environmental screening and scoring matrix was used, combining environmental criteria such as scale of a proposed sub-component and environmental sensitivity of proposed sub-component location. The following details on the environmental screening criteria are provided

- (i) *Decree No. 11/2006 Screening (scale/magnitude) criteria:* In order to facilitate the environmental assessment process, GOI has issued a Ministry of *Environment Decree No. 11, 2006*, which up-dates the Ministerial of Environment Decree Number 17 Year 2001 titled "Proposed Uses or Activities that require an ANDAL or full EIA report". The *magnitude of change* arising from the implementation of the proposed sub-component can be rated as negligible, small, intermediate or large and can be quantified as a percentage (%) of the threshold figure (=100%), triggering an AMDAL under the Decree No. 11, 2006.
- (ii) *Environmental Sensitivity Area criteria:* screening can further address the environmental sensitivity of an area, for which a sub-component has been proposed. Factors affecting the evaluation of the sensitivity of ecosystems include quality of ecosystem; importance and rarity; ability of the ecosystem to accommodate change; significance of the change in local and regional context, and maturity of the ecosystem.
- (iii) *Significance Threshold (combined) criteria:* The above two screening criteria do not allow a clear prediction of the significance of an environmental impact, if taken alone. For instance, a larger sub-component in an area of low environmental sensitivity may have overall a less significant impact than a small sub-component in a highly sensitive

environment. The combination of these two criteria in a matrix will better indicate the potential significance or severity of environmental impacts. The significance threshold matrix below produces a combined rating as significant, moderate, slight or negligible, based on a final score.

**Table S11-1: The Significance Threshold Screening Matrix**

<b>Magnitude of Change caused by Proposal</b>	Large	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)	Moderate/ Significant Impact (EIA/AMDAL)	Significant Impact (EIA/AMDAL)
	Intermediate	Slight / Moderate Impact (IEE/UKL/UPL)	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)	Moderate/ Significant Impact (EIA/AMDAL)
	Small	Slight Impact (IEE/UKL/UPL)	Slight / Moderate Impact (IEE/UKL/UPL)	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)
	Negligible	Negligible Impact (no EA needed*)	Negligible Impact (no EA needed*)	Negligible/ Slight Impact (IEE/UKL/UPL)
		Very Low to Low	Medium	High to Very High
	<b>Ecosystem Sensitivity To Change</b>			

\* Corresponding to ADB category C for projects not involving physical works

4. For individual subprojects that would require only UKL-UPL (EMP), i.e. falling under the national threshold criteria for full AMDAL, the IA is allowed to adopt a report format of their choice as long as five key environmental information sets are included as outlined in *Ministry of Environment Decree No. 82 of 2002*. This would mean that the IA could use an ADB formatted sector-wide IEE document such as the one presented here and submit it with some modifications and translated into Bahasa Indonesia to satisfy national environmental assessment requirements for UKL-UPL. This would facilitate the environmental compliance process by shortening it substantially, given that the overall goal of this project is to improve sanitary and environmental conditions with expected overall positive environmental impacts. In a meeting with KLH Kota Medan (May 9, 2007), the city environmental authority has agreed to facilitate the synchronization of the environmental assessment process for this project. This provides opportunities to reduce duplication and volume of environmental assessment reporting to satisfy both ADB and national standards and has the potential to substantially reduce the timeframe needed (*"One Environmental Assessment satisfies Two Standards (ADB/GOI)"*). The consultant encourages this approach, which has been successfully applied by the ADB Earthquake and Tsunami Emergency Response Project (ETESP) in Indonesia.

5. Based on the findings of the environmental screening with REA checklists and matrix, all proposed sub-components were assigned in one of the following environmental assessment categories:

Category A: Projects that could have significant adverse environmental impacts. An Environmental Impact Assessment (EIA) is required.

Category B: Projects that could have some adverse environmental impacts, but of a lesser degree or significance than those for category A projects. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects are categorised as “C” if they are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

Category FI: Projects are classified as category “FI” if they involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all sub-components will result in insignificant impacts.

6. Classification is an ongoing process and the category can be changed (with the approval of the Bank’s Chief Compliance Officer) as the project develops and more information becomes available. This IEE covers all proposed sub-components that were assigned the Category B, which includes the majority of proposed physical works. There will be no additional sub-components after loan approval. All proposed Category B sub-components have been further assessed in this IEE in a city-wide approach, as they are generally within the city’s boundaries and of a similar nature.

## **1.2 Purpose of the Initial Environmental Examination (IEE)**

7. The purpose of this IEE report is to:

- (i) Describe the proposed sub-component interventions;
- (ii) Describe the baseline environmental and socioeconomic setting of Project area;
- (iii) Undertake a screening to identify proposed sub-component interventions that may result in significant environmental impacts;
- (iv) Predict and assess characteristics and magnitude of impacts for those interventions identified in the screening that may result in negative potential impacts;
- (v) Recommend appropriate mitigation measures to minimize negative potential impacts, and predict and assess residual impacts
- (vi) Present an environmental management plan that facilitates mitigation implementation, monitoring and reporting, and;
- (vii) Describe the public consultation process undertaken.

8. For proposed sub-components that are exceeding GoI AMDAL scale thresholds (e.g. total length/area for new sewer lines per city), a full AMDAL is mandatory, even for minor physical works, such as secondary or tertiary drainage construction, as these may cause significant, but temporary environmental and socio-economic impacts, mainly during construction.

## **2. DESCRIPTION OF THE PROJECT**

### **2.1 Existing Conditions**

9. As the centre of spatial development, Kota Medan suffers the impact of accelerated urbanization and influx of commuters (more than 500,000 people per day). Population growth has become almost uncontrollable and has transformed Medan into a densely populated city from the influx of settlers and limited space. In addition to population problems (urbanization), the massive shape of the city presents another problem as the city is seen to be divided into two (2) parts; the North and the South. This division causes unequal development of the city. The development of the southern area is faster than the northern part and gives the impression of the North being left behind. This development gap is caused by limited facilities and infrastructure in North Medan, i.e. the only road connecting the area is through Jalan Yos Sudarso and the Balmera toll road while the South can be accessed through various avenues and is located closer to the centre of the city and therefore more attractive for developers.

10. Investor's interest in constructing tall buildings in Medan to improve the city's economy is being dampened by limited space/land and the high price of land in Kota Medan. The presence of Polonia airport in the centre of the city prevents vertical development and growth turns horizontal instead and restricts the maximum use of land, which is why the airport should be immediately relocated to Kuala Namu.

11. Most of Kota Medan dwellers use septic tanks and on-site absorption for disposing domestic wastes. Actually, Kota Medan has built underground sanitation facilities/ underground sewage systems to dispose of domestic wastes in an integrated manner; however, not all of the people have access to this facility. This city-wide off-site system currently only serves 2% of the whole city or just 3% of the city population. Medan's domestic sewage system is maintained by PDAM Tirta Nadi Sewage Division (Provincial) who still faces difficulties in improving this service. Several constraints include the lack of funds for new investment, even though the sewerage tariff meanwhile covers operation and maintenance costs.

12. The disposal of domestic wastes in Medan is managed through an underground sewage system which depends on gravity. Referring to the Master Plan, Phase I of Kota Medan domestic waste management covers 520 ha and will serve 168,000 people or equivalent to 18,000 clients. Existing installations are already equipped with IPAL (sewage system) at a capacity of disposing 60,000 m<sup>3</sup>/day. Currently, there are only about 11,000 households utilizing the Kota Medan sewage system because parts of the installed sewage pipes are in need of repairs and therefore inoperable. The installed pipes are made of concrete and are of poor quality (non precision). Small gaps occur between each pipe joints causing leakage and soil erosion which eventually causes the pipes to sag and the whole road above them to slump.

13. Service level is still far from that targeted in the Master Plan, and for PDAM Tirta Nadi Sewage Division it is still hard to improve the services due to lack of funds for investment. Conditions were aggravated by the economic crises which swamped Indonesia in mid-1997, and deflated PDAM Tirta Nadi's financial capacity. According to the Kota Medan Master Plan, construction of the city's drainage system is divided into three stages, these are:

- Phase I covering a service area of 520 ha.
- Phase II covering a service area of 480 ha.
- Phase III covering a service area of 1200 ha.

14. There are approximately 150 small and medium scale industries in Medan. Only 10% use wastewater treatment installations for their industrial wastes while the remaining 90% do not have their own wastewater treatment installations. This negatively impacts the water and air around the nearest settlements. The same situation occurs for hospital, hotel, shopping centres, restaurants and other businesses in Medan. Wastewater is generally directly channelled into the river, without going through wastewater treatment installations. This contaminates the river and other water resources.

15. The Kota Medan government through the Housing and Settlements Office (Perkim Kota Medan) in collaboration with USAID-ESP North Sumatra is currently installing communal wastewater treatment facilities in several sites, i.e. in the rented public housing (capacity: 500 people), and communal Wash/Bath/Toilet (MCK) facilities in the submunicipality of Bagan Deli (capacity: 400 people). In the submunicipality of Kampung Baru (Gang Lampu 1), USAID-ESP North Sumatra has completed installing a Communal MCK facility for 100 people. The area had also received a small grant to improve access to clean water.

## 2.2 Proposed Main Works

16. As mentioned, the City Sanitation Strategies (CSS) included a list of proposed sub-components for Kota Medan, of which proposed infrastructure development for sewerage forms the major part of the physical works. This IEE has been prepared concurrently with final SPAR documents being readied for each proposed sub-component, and reflects the status of the SPAR documents as per 30 June 2009.

### Infrastructure Development for Sewerage

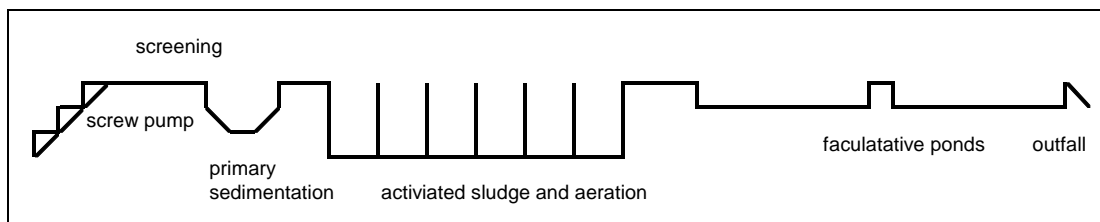
17. **Off-site Sewerage System.** In order to increase the number of house connections and utilize the idle capacity of the Pulo Brayan Bengkel WWTP, sewer pipes need to be installed Zone 6, and the pipe network in Zones 1-5 and Zones 7 and 8 needs to be optimized. Specific activities are listed below:

Centralized system (off-site):

- Installation of primary and secondary pipe network for in Zone 6, and zones 9-12.
- Rehabilitation/replacement of secondary pipes in Zones 1-5 and Zone 8, and new construction in zones 9-12.
- Replacement of pumping units, including trunk sewer pumps.
- Installation of 4,250 house connections in Zones 1-6 and Zone 8, and 9,000 house connections in zones 9-12.
- Conduct socialization to the community in the service area on the piped wastewater treatment system.
- Maintenance of the sludging system in each sector, initially with the sludge hauled manually by using carts and labor, and improved by using three-wheel motorized vehicles.

**Pulo Brayan WWTP.** This WWTP uses primary sedimentation followed by an activated sludge process with maturation ponds. However the plant suffers from regular power outages and effluent quality is variable on separate visits effluent appeared “good” on the first visit and “nutrient rich” on a subsequent visit. There are large areas available for sludge drying. This sub-component will involve replacement of electro-mechanical equipment and repair or replacement of sewers.

**Figure S11-1: Schematic drawing of current treatment process at Pulo Brayan WWTP**



18. **Community-based Sanitation systems.** These consist of:

- construction of 20 units of MCK Plus in 13 locations;
- construction of communal WWTPs in four locations (with total pipe length of 6.5 km); and
- sludge treatment for MPW housing complexes (2 twin blocks); it is assumed that the proposed decentralized wastewater treatment plants will be emptied on a six-monthly cycle, with the sludge to be taken to the Pulo Brayan WWTP for treatment.



**Table S11-2: Proposed Sub-Components for Infrastructure Development in Kota Medan**

Sub-Component / Activity		Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
<b>1. Community-based Sanitation</b>					
Construction of MCK 'Plus' units (sub-district Belawan Bahari)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Labuhan Deli)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Pekan Labuhan)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Kota Bangun)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Bagan Deli)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Simpang Selayang)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Medan Johor)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Marelán)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Denai)		1	unit	300	300
Construction of MCK 'Plus' units (sub-district Medan Maimun)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Labuhan)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Tuntungan)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Deli)		2	unit	300	600
Construction of MCK 'Plus' units (sub-district Medan Tembung)		1	unit	300	300
Construction of communal WWTP (Lingk. IV-V, sub-district Belawan Bahagia)		1,760	m	0.4	704
Construction of communal WWTP (Lingk. 19-21, sub-district Belawan Bahagia)		2,000	m	0.8	1,600
Construction of communal WWTP (Lingk. 22-24, sub-district Pekan Labuhan)		1,200	m	0.8	960
Construction of communal WWTP (Lingk. 22-24, sub-district Pekan Labuhan)		1,500	m	0.8	1,200
Sludge treatment facilities for MPW housing program (DEWATS)		2	twin-block	450	900
<b>2. Infrastructure development for sewerage</b>					
Installation of primary pipes, dia. 400 mm (Zone 6)		456	m	5.25	2,394
Installation of primary pipes, dia. 300 mm (Zone 6)		126	m	2.73	344
Installation of primary pipes, dia. 250 mm (Zone 6)		1,920	m	2.31	4,435
Construction of WWTP storage area		1	unit	300	300
Construction of reservoir		1	unit	3,500	3,500
Generator house and workshop		1	unit	500	500
Grit chamber		1	unit	3,000	3,000
Sludge storage area		1	unit	200	200
Sludge drying bed		2	unit	1,500	3,000
Construction of WWTP building (400 m <sup>2</sup> )		1	unit	1,000	1,000
Installation of primary pipes, dia. 100 mm (Zone 2)		360	m	0.30	108

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Installation of primary pipes, dia. 150 mm (Zone 2)	60	m	0.50	30
Construction of manhole, type A (Zone 2)	1	unit	7.50	9
Construction of manhole, type B (Zone 2)	1	unit	3.00	2
Construction of inspection chamber (Zone 2)	60	unit	0.50	30
Construction of pipe repair area (Zone 2)	204	m	0.25	51
Installation of primary pipes, dia. 100 mm (Zone 2)	13,716	m	0.30	4,115
Installation of primary pipes, dia. 150 mm (Zone 2)	2,286	m	0.50	1,143
Construction of manhole, type A (Zone 2)	46	unit	7.50	343
Construction of manhole, type B (Zone 2)	23	unit	3.00	69
Construction of inspection chamber (Zone 2)	2,286	unit	0.50	1,143
Construction of pipe repair area (Zone 2)	7,772	m	0.25	1,943
Installation of primary pipes, dia. 100 mm (Zone 3)	3,900	m	0.30	1,170
Installation of primary pipes, dia. 150 mm (Zone 3)	650	m	0.50	325
Construction of manhole, type A (Zone 3)	13	unit	7.50	98
Construction of manhole, type B (Zone 3)	7	unit	3.00	21
Construction of inspection chamber (Zone 3)	650	unit	0.50	325
Construction of pipe repair area (Zone 3)	2,210	m	0.25	553
Installation of primary pipes, dia. 100 mm (Zone 3)	4,572	m	0.30	1,372
Installation of primary pipes, dia. 150 mm (Zone 3)	762	m	0.50	381
Construction of manhole, type A (Zone 3)	15	unit	7.50	114
Construction of manhole, type B (Zone 3)	8	unit	3.00	23
Construction of inspection chamber (Zone 3)	762	unit	0.50	381
Construction of pipe repair area (Zone 3)	2,591	m	0.25	648
Installation of primary pipes, dia. 100 mm (Zone 4)	360	m	0.30	108
Installation of primary pipes, dia. 150 mm (Zone 4)	60	m	0.50	30
Construction of manhole, type A (Zone 4)	1	unit	7.50	9
Construction of manhole, type B (Zone 4)	1	unit	3.00	2
Construction of inspection chamber (Zone 4)	60	unit	0.50	30
Construction of pipe repair area (Zone 4)	204	m	0.25	51
Installation of primary pipes, dia. 100 mm (Zone 4)	9,558	m	0.30	2,867
Installation of primary pipes, dia. 150 mm (Zone 4)	1,593	m	0.50	797
Construction of manhole, type A (Zone 4)	32	unit	7.50	239
Construction of manhole, type B (Zone 4)	16	unit	3.00	48
Construction of inspection chamber (Zone 4)	1,593	unit	0.50	797

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Construction of pipe repair area (Zone 4)	5,416	m	0.25	1,354
Installation of primary pipes, dia. 100 mm (Zone 5)	360	m	0.30	108
Installation of primary pipes, dia. 150 mm (Zone 5)	60	m	0.50	30
Construction of manhole, type A (Zone 5)	1	unit	7.50	9
Construction of manhole, type B (Zone 5)	1	unit	3.00	2
Construction of inspection chamber (Zone 5)	60	unit	0.50	30
Construction of pipe repair area (Zone 5)	204	m	0.25	51
Installation of primary pipes, dia. 100 mm (Zone 5)	3,804	m	0.30	1,141
Installation of primary pipes, dia. 150 mm (Zone 5)	634	m	0.50	317
Construction of manhole, type A (Zone 5)	13	unit	7.50	95
Construction of manhole, type B (Zone 5)	6	unit	3.00	19
Construction of inspection chamber (Zone 5)	634	unit	0.50	317
Construction of pipe repair area (Zone 5)	2,156	m	0.25	539
Installation of primary pipes, dia. 100 mm (Zone 6)	4,500	m	0.30	1,350
Installation of primary pipes, dia. 150 mm (Zone 6)	750	m	0.50	375
Construction of manhole, type A (Zone 6)	15	unit	7.50	113
Construction of manhole, type B (Zone 6)	8	unit	3.00	23
Construction of inspection chamber (Zone 6)	750	unit	0.50	375
Construction of pipe repair area (Zone 6)	2,550	m	0.25	638
Installation of primary pipes, dia. 100 mm (Zone 6)	6,852	m	0.30	2,056
Installation of primary pipes, dia. 150 mm (Zone 6)	1,142	m	0.50	571
Construction of manhole, type A (Zone 6)	23	unit	7.50	171
Construction of manhole, type B (Zone 6)	11	unit	3.00	34
Construction of inspection chamber (Zone 6)	1,142	unit	0.50	571
Construction of pipe repair area (Zone 6)	3,883	m	0.25	971
Installation of primary pipes, dia. 100 mm (Zone 7)	360	m	0.30	108
Installation of primary pipes, dia. 150 mm (Zone 7)	60	m	0.50	30
Construction of manhole, type A (Zone 7)	1	unit	7.50	9
Construction of manhole, type B (Zone 7)	1	unit	3.00	2
Construction of inspection chamber (Zone 7)	60	unit	0.50	30
Construction of pipe repair area (Zone 7)	204	m	0.25	51
Installation of primary pipes, dia. 100 mm (Zone 7)	3,354	m	0.30	1,006
Installation of primary pipes, dia. 150 mm (Zone 7)	559	m	0.50	280
Construction of manhole, type A (Zone 7)	11	unit	7.50	84

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Construction of manhole, type B (Zone 7)	6	unit	3.00	17
Construction of inspection chamber (Zone 7)	559	unit	0.50	280
Construction of pipe repair area (Zone 7)	1,901	m	0.25	475
Installation of primary pipes, dia. 100 mm (Zone 8)	360	m	0.30	108
Installation of primary pipes, dia. 150 mm (Zone 8)	60	m	0.50	30
Construction of manhole, type A (Zone 8)	1	unit	7.50	9
Construction of manhole, type B (Zone 8)	1	unit	3.00	2
Construction of inspection chamber (Zone 8)	60	unit	0.50	30
Construction of pipe repair area (Zone 8)	204	m	0.25	51
Installation of primary pipes, dia. 100 mm (Zone 8)	12,888	m	0.30	3,866
Installation of primary pipes, dia. 150 mm (Zone 8)	2,148	m	0.50	1,074
Construction of manhole, type A (Zone 8)	43	unit	7.50	322
Construction of manhole, type B (Zone 8)	21	unit	3.00	64
Construction of inspection chamber (Zone 8)	2,148	unit	0.50	1,074
Construction of pipe repair area (Zone 8)	7,303	m	0.25	1,826
Pump (Zone 1, Q = 50 l/s)	2	unit	200	400
Pump (Zone 7, Q = 50 l/s)	2	unit	200	400
Pump (Zone 8, Q = 50 l/s)	2	unit	200	400
Screw pump (Q = 1310 m3/hour)	1	unit	1,500	1,500
Sludge truck (Q = 5000 l)	1	unit	3,000	3,000
Vacuum pump + pontoon	1	unit	1,000	1,000
Installation of generator (450 KvA)	2	unit	2,000	4,000
Installation of generator (250 KvA)	2	unit	1,000	2,000
Installation of generator (55 KvA)	6	unit	700	4,200
Instruments and wiring	1	unit	1,500	1,500
Debit flow meter	1	unit	200	200
Pump (Cemara Asri, Q = 50 l/s, H = 40m)	2	unit	350	700
Trunk sewer pump (Zone 1-8, Q =250 l/s)	2	unit	1,385	2,770
Submersible aerator (45 hp) + pontoon	2	unit	500	1,000
Sludge Pump (3 KW)	1	unit	150	150
Drainage Pump (Q = 104 m3/hour)	1	unit	200	200
Pump for cleaning of pond, including pontoon	1	unit	1,000	1,000
Pipe flushing equipment	1	unit	3,000	3,000
Laboratorium equipment	1	unit	1,500	1,500

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Installation of house connections (Zone 2)	360	unit	1.90	684
Installation of house connections (Zone 3)	950	unit	1.90	1,805
Installation of house connections (Zone 4)	360	unit	1.90	684
Installation of house connections (Zone 5)	360	unit	1.90	684
Installation of house connections (Zone 6)	1,500	unit	1.90	2,850
Installation of house connections (Zone 7)	360	unit	1.90	684
Installation of house connections (Zone 8)	360	unit	1.90	684
Review of wastewater masterplan and DED for Phase 2 priority areas	1	ls	1,729	1,729
Installation of primary pipes, dia. 500 mm (Zone 9)	384	m	2.80	1,074
Installation of primary pipes, dia. 450 mm (Zone 9)	82	m	2.33	190
Installation of primary pipes, dia. 400 mm (Zone 9)	131	m	2.18	285
Installation of primary pipes, dia. 350 mm (Zone 9)	78	m	1.52	118
Installation of primary pipes, dia. 300 mm (Zone 9)	649	m	1.24	804
Installation of primary pipes, dia. 250 mm (Zone 9)	675	m	1.04	702
Installation of secondary pipes, dia. 200 mm (Zone 9)	12,572	m	0.93	11,691
Lift pump station (Zone 9)	1	unit	8,515	8,515
One-off licensing fee (Zone 9)	12,238	m2	0.01	165
Installation of primary pipes, dia. 800 mm (Zone 10)	1,222	m	4.32	5,279
Installation of primary pipes, dia. 600 mm (Zone 10)	735	m	3.80	2,795
Installation of primary pipes, dia. 500 mm (Zone 10)	221	m	2.80	620
Installation of primary pipes, dia. 400 mm (Zone 10)	59	m	2.18	129
Installation of primary pipes, dia. 350 mm (Zone 10)	179	m	1.52	271
Installation of primary pipes, dia. 300 mm (Zone 10)	885	m	1.24	1,098
Installation of primary pipes, dia. 250 mm (Zone 10)	633	m	1.04	659
Installation of secondary pipes, dia. 200 mm (Zone 10)	13,966	m	0.93	12,988
One-off licensing fee (Zone 10)	15,995	m2	0.01	216
Installation of primary pipes, dia. 500 mm (Zone 11)	270	m	2.80	757
Installation of primary pipes, dia. 450 mm (Zone 11)	89	m	2.33	207
Installation of primary pipes, dia. 400 mm (Zone 11)	155	m	2.18	338
Installation of primary pipes, dia. 350 mm (Zone 11)	444	m	1.52	674
Installation of primary pipes, dia. 300 mm (Zone 11)	963	m	1.24	1,194
Installation of primary pipes, dia. 250 mm (Zone 11)	1,490	m	1.04	1,550
Installation of secondary pipes, dia. 200 mm (Zone 11)	12,375	m	0.93	11,508
One-off licensing fee (Zone 11)	13,272	m2	0.01	179

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Installation of primary pipes, dia. 800 mm (Zone 12)	1,525	m	4.32	6,588
Installation of primary pipes, dia. 600 mm (Zone 12)	341	m	3.80	1,295
Installation of primary pipes, dia. 400 mm (Zone 12)	202	m	2.18	440
Installation of primary pipes, dia. 350 mm (Zone 12)	351	m	1.52	533
Installation of primary pipes, dia. 300 mm (Zone 12)	1,530	m	1.24	1,897
Installation of primary pipes, dia. 250 mm (Zone 12)	1,848	m	1.04	1,922
Installation of secondary pipes, dia. 200 mm (Zone 12)	20,903	m	0.93	19,440
Lift pump station (Zone 12)	1	unit	8,515	8,515
One-off licensing fee (Zone 12)	23,348	m2	0.01	315
Installation of house connections (Zone 9)	1,500	unit	1.90	2,850
Installation of house connections (Zone 10)	2,500	unit	1.90	4,750
Installation of house connections (Zone 11)	2,500	unit	1.90	4,750
Installation of house connections (Zone 12)	2,500	unit	1.90	4,750
Social marketing of wastewater service charges (PDAM)	5	package	200	1,000
Social marketing for compulsory connection to sewerage system	4	package	200	800
Technical assistance for preparation of by-law on wastewater connections	1	ls	1,000	1,000

Table S11-3: Implementation Schedule

No. Activity	2009				2010				2011				2012				2013				2014			
<b>1. Community-Based Sanitation</b>																								
1.1 Social marketing for communal sanitation facilities																								
1.2 Construction of community based sanitation facilities																								
1.3 Social marketing on piped sewerage																								
1.4 Community awareness programs for health and hygiene																								
1.5 Improved knowledge and practices related to health and hygiene																								
1.6 Women are trained to lead community-wide hygiene promotion																								
<b>2. Infrastructure Development for Sewerage</b>																								
2.1 Clarification of institutional responsibilities for O&M of facilities																								
2.2 Topographic surveys and DED for civil works contracts																								
2.3 Tender documents for civil works contracts (sewerage and drainage)																								
2.4 Award of civil works contracts (sewerage and drainage)																								
2.5 Completion of rehabilitation and expansion of off-site wastewater facilities																								
2.6 Completion of construction of new sewerage system																								
2.7 New customer connections to existing/new piped sewerage systems																								
2.8 Procurement of equipment, as required																								
<b>3. Capacity Development and Project Implementation Support</b>																								
3.1 PPMS set up and operational																								
3.2 Baseline survey																								
3.3 Issuing of relevant regulations																								
3.4 Legislation on customer connections to piped sewerage systems																								
3.5 Policies on wastewater tariffs and connection fees																								
3.6 Capacity building and training of sanitation management and O&M staff																								
3.7 Community technical training																								
3.8 Improvement of role of NGOs and private sector in sanitation																								
3.9 Improved accounting, financial management and budgeting systems																								
3.10 Project Implementation Support																								

### 3. DESCRIPTION OF THE EXISTING ENVIRONMENT

#### 3.1 Physical Resources

19. Administratively, the whole of Kota Medan borders with the District of Deli Serdang, i.e. in the West, South and East. Along the northside, it borders with the Malacca Strait which is known as the most frequented waterway in the world. The district of Deli Serdang is an area rich with natural resources, especially in crops and forest products. As a region located along the sea corridors of Malacca Straits, Kota Medan maintains a strategic position as a gateway to commerce and services, notably domestic and international trade (export-import). To date, Kota Medan's geographical position has promoted the physical growth of the city towards two poles, namely Belawan and the centre of Kota Medan.

20. **Climate.** Climatological information is based on monthly averages for the 30-year period 1961-1990. Provided by World Meteorological Organization. The total local precipitation rate is 3,087 mm/year (2004). Detailed climatological information for Kota Medan is shown in Table S11-4.

**Table S11-4: Climatological Information for Kota Medan**

Month	Mean Temperature °C		Mean Total Rainfall (mm)	Mean Number of Rain Days
	Daily Minimum	Daily Maximum		
Jan	22.2	31.6	92	14
Feb	22.6	32.0	115	19
Mar	23.2	32.7	97	13
Apr	23.5	32.9	157	18
May	23.3	33.4	178	22
June	23.6	33.3	141	15
Jul	23.5	32.9	167	13
Aug	22.8	33.3	185	17
Sep	22.2	31.9	263	24
Oct	22.6	31.7	387	22
Nov	23.0	31.0	253	20
Dec	22.5	30.9	228	19

21. **Topography.** Kota Medan covers an area of 26,510 hectares (265.10 km<sup>2</sup>), or 3.6% of North Sumatra Province. Geographically, the city is located at 3° 30'-3° 43' North latitude and 98° 35'-98° 44' east longitude. Its topography tends to incline to the north and the city is located at an elevation of 2.5-37.5 meters above sea level.

22. **Surface and Groundwater Quality.** Kota Medan is criss-crossed by 4 river systems and tributaries; they are:

1. Belawan River system.
2. Deli River system and its tributaries:
  - a. Sikambing River and its tributaries:
    - i. Sei Selayang
    - ii. Sei Putih
  - b. Babura River and its tributaries:
    - i. Sei Siput
    - ii. Sei Berkala.
3. Kera River systems and its tributaries:
  - a. Parit Emas

- b. Parit Martondi.
- 4. Percut River and Sei Tuan with its tributaries:
  - a. Buncong river
  - b. Pelangkah river, and
  - c. Sei Percut Denai.

23. Large floods due to river overflow occur on average every 25 years. Major floods occurred in 1956, 1990 and the latest was in 2002. The situation is worsened by indiscriminate garbage disposal into the city's watercourses. An USAID ESP/Local NGO initiative started in January 2007. The program encourages peri-urban communities in 11 hamlets, or 2,962 households, along Deli river to collect plastic waste—which constitutes 40% of the waste dumped into the river daily—to be recycled into plastic pellets using a machine developed by Bis Peduli. These pellets are then distributed to a nearby plastic factory that uses them as material for various household products, including water buckets and trash baskets. With prices for the pellets ranging from Rp. 2,500 to Rp. 7,000 per kilogram, it is expected that the community groups organized in the 11 hamlets will be encouraged to collect at least 4.4 tons of plastic waste daily.

24. A recent report (2006) for Kota Medan provides results from a large number of river water and wastewater samples at different points along the polluted Deli River, covering a 3-year period (2003-2006). The same report also provides GPS coordinates for sites where solid waste has been dumped along riverbanks of the Deli River.<sup>1</sup> Most of the sources of pollution come from domestic rather than industrial wastes. The report recommends a major public campaign, targeting a 50% reduction in contamination within four years. According to NGOs, sampling of groundwater conducted by the provincial government's Dinas Kesehatan (Health Department) show that from 700 groundwater samples, only 10% are within acceptable limits, 90% are exceeding thresholds for clean water standard as stipulated in PerMenKes decree 416/1991. About 60% of samples were taken from shallow groundwater wells, which are likely to serve for the supply of drinking water to local communities.

25. Anecdotal evidence and own observations indicate that the high numbers of septic tanks in private households contribute to the pollution of groundwater sources, where seepage fields of septic tanks are in proximity to drinking water wells and overflowing occurs frequently. High pollution with organic matter seems to be predominant, also affecting the surface watercourses, receiving a mixture of urban stormwater and sewerage.

26. As the FDS is unlined, landfill leachate is entering surface and groundwater at the Terjun site. No detailed investigation of the water pollution caused by the FDS has been carried out. Bacteriological water contamination with fecal bacteria, including *Klebsiella pneumonia* (confirmed by throat swab taken from consultant), can be assumed for the WWTP in Medan.

27. **Air Quality.** Kota Medan experiences problems with transportation, air pollution, traffic congestion, and vehicular growth rates. The number of vehicles in this region has been increasing year by year in accordance with the economic and population growth. The number of registered vehicles in 2002 was 234,295 (4- wheels) and 558,236 (2 wheels). Air quality monitoring results averaged "moderate",  $PM_{10} = 75.32 \text{ Ug/m}^3$ ,  $SO_2 = 54.12 \text{ Ug/m}^3$ ,  $CO = 3.89 \text{ Ug/m}^3$ ,  $O_3 = 76.85 \text{ Ug/m}^3$  and  $NO_2 = 39.59 \text{ Ug/m}^3$ . It has been reported by the city's air quality

<sup>1</sup> JICA, 2006. DEMS Project. *Laporan Pemantauan Kualitas & Upaya Penanggulangan Pencemaran Sungai Deli*, April 2003 – Maret 2006.

monitoring system (AQMS) that the air quality is derorating further. A noticeable odour was also reported from the open dump site and WWTP.

28. **Noise.** Due to the traffic congestion and rapid urbanization in Kota Medan, vehicular and air traffic noise can be assumed as a major contributor to noise pollution in the city.

### 3.2 Ecological Resources

29. **Terrestrial Biology.** Due the degree of urbanization in Kota Medan, very limited ecological resources have been identified: Sub-components within the city boundaries are likely to be located in areas of low ecological sensitivity. Outside the city area, at the locations of the WWTP and FDS, a more rural environment is found, including disturbed ecosystems. At the FDS, rice fields, smallholder oil palm plantations, fishponds, and natural riverine vegetation (*Nypa Fruticans*) were surrounding the solid waste open dump site.

30. **Aquatic Biology.** Due to rampant water pollution, a reduced biodiversity in rivers can be expected, only the hardiest fish and other aquatic species will survive. No detailed data were available. However, watercourses further outside the city, near the FDS in Terjun may still be a source of livelihood and drinking water supply.

31. **Wildlife.** The Project activity areas are developed, with limited natural wildlife remaining within these areas.

32. **Forest.** The Project activity areas are developed, with no or little natural forests remaining within these areas.

33. **Rare or Endangered Species.** No data on rare or endangered species were available. However, it can be assumed that rare or endangered species found in the city are transient.

34. **Protected Area.** There are no known protected areas at or nearby project activity areas.

### 3.3 Economic Development

35. Although Medan experienced negative growth in 1998 (-20%), economic growth rebounded during 2000-2004 at an average of 5.19% per year. Medan's economic capacity is relatively large as reflected by its Gross Domestic Regional Product (GDRP) which currently reaches Rp 26.38 trillion, and a per capita income of Rp13.12 million. The tertiary sector contributes the highest revenue (66.84%), followed by the secondary sector (29.06%), and the primary sector (4.18%). The volume of economic activities consequently contributes at least 21% to the North Sumatra Province GDRP.

**Table S11-5: Economic Indicators for Kota Medan (2005)**

Population	2,036,185 people
GDRP	26.38 trillion
Economic growth	5.49 %
Per capita income	Rp 13,119,669
Inflation level	6.64 %
Productive population	682,826 people
Unemployment	13.01 %
Total export (FOB,000 US\$)	2,229,125

Total import (CIF,000 US\$)	679,000.00
-----------------------------	------------

### 3.4 Socio-Cultural Environment

36. **Population.** According to population statistics in 2005, Kota Medan has an estimated population of 2,036,185 people, where females (1,024,145 people) number more than the males (1,012,040 people). The number of non- resident commuters is estimated at over than 500,000. In 2007, Kota Medan was populated by approximately 1,377,715 productive aged residents (aged 15-59 years). Its residents have, on average, enjoyed 10.5 years of schooling.

37. Population growth in Medan during 2000-2004 increased from 0.09% in 2000 to 0.63% in 2004. By 2020, it is projected that the total population of Medan will be 2,506,416 people. Most of the population is concentrated in the subdistrict of Medan Deli, followed by the subdistrict of Medan Helvetia and Medan Tembung. The least populated areas are found in the subdistricts of Medan Baru, Medan Maimun and Medan Polonia. The highest population densities are found in the subdistricts of Perjuangan, Medan Area and East Medan.

38. The population density of Kota Medan is 76 people/hectare. Most of the population lives in the Subdistrict of Medan Deli, followed by the Subdistricts of Medan Helvetia and Medan Tembung. The least populated areas are in the Subdistricts of Medan Baru, Medan Maimun and Medan Polonia. The highest population density is in the Subdistrict of Medan Perjuangan, Medan Area and East Medan. SUSENAS data 2004 estimate the number of poor people in Kota Medan at 7.13% or 32,804 households or 143,037 people. By distribution, North Medan (Medan Deli, Medan Labuhan, Medan Marelan and Medan Belawan) constitute the largest pockets of poverty (37.19%) from the overall population social indicator categorized as poor.

**Table S11-6: Social Indicators for Kota Medan (2005)**

• Population (people)	2,036,185 people
• APK	
- Primary/MI <sup>2</sup> (%)	112.40
- Junior Secondary/MTs <sup>3</sup> (%)	101.60
- Senior Secondary/MA <sup>4</sup> (%)	76.05
• APM	
- Primary/MI (%)	90.00
- Junior Secondary/MTs (%)	74.83
- Senior Secondary /MA (%)	62.45
• Life expectancy	
-Male	69
-Female	71
• Crude Birth Rate	2.26
• Crude Death Rate	1.70
• TPAK (%)	52.92
• Unemployment	
- Open unemployment (%)	13.01
• Poor population (%)	7.13

<sup>2</sup> MI = Madrasah Ibtidaiyah (primary moslem school)

<sup>3</sup> MTs = Madrasah Tsanawiyah (junior secondary moslem school)

<sup>4</sup> MA = Madrasah Alawiyah (senior secondary moslem school)

39. There are 88,166 units of houses in the slum areas of North Medan (Medan Belawan, Medan Labuhan, Medan Marelan). The slum areas in Central Medan are located in Medan Tembung, Medan Denai, Medan Sunggal and Medan Johor. The slum areas north of Medan consist of fisherman villages in Medan Belawan and along the banks of Deli River. Slum areas in the centre of the city are located along river banks and railway tracks, and occupied by drifters and beggars.

40. **Public health.** Other than education, the level of community health conditions is an important factor indicating the level of development in a city. According to statistics in 2001-2005, the death rate in Kota Medan has not shown any significant change from 13.00% in 2001 to 12.21% in 2005.

**Table S11-7: Public Health Indicators for Kota Medan (2001-2005)**

	2001	2002	2003*)	2004*)	2005**)
Crude birth rate	2.48	2.47	2.39	2.37	2.34
Life expectancy	69.50	69.40	71.70	71.70	72.30
Crude death rate per 1000 people	3.33	3.33	2.45	1.70	1.59
Maternal mortality rate per 1000 births	165	165	163	162	.59
Mortality rate (%)	13.00	12.50	12.30	12.30	12.21

Source: Medan Statistics Office (BPS Kota Medan)

Note : \*) Corrected figures; \*\*) Temporary figures

#### **4. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

41. Based on the environmental screening of project components and interventions using ADB Environmental Assessment Guidelines (2003, the sub-component activities are assessed based on the individual Rapid Environmental Assessment (REA). Checklists and a screening matrix for sanitation projects are shown in **Annex 3a**. This chapter only discusses environmental impacts of physical subprojects included in the SPAR of 30 June 2009 (community-based sanitation and piped sewerage only).

##### **4.1 Baseline (Without Project Option)**

42. The no action option would mean that the non-existing or inefficiently operated sanitation systems will continue to cause environmental damage and public health risks.

##### **4.2 Environmental Impacts and Mitigation Related to Project Location**

43. Most sub-components are located within the highly urbanized city boundaries and linked to existing urban infrastructure. These are generally areas of low ecological sensitivity due the high degree of disturbance, thus potential adverse impacts would be minor and likely linked to the construction phase. Project locations further outside the urban centres may experience moderate to significant impacts on community livelihood (e.g. farming) and other environmental services (e.g. water supply from groundwater). The need for relocation of local communities has not been identified at this stage. A Resettlement Framework in line with ADB standards has been drawn up, in the unlikely event that resettlement issues would arise.

### 4.3 Environmental Impacts and Mitigation Related to Project Design

44. It is assumed that the intended designs of the proposed sub-components will improve current sanitation systems. Existing systems are only partially available, or they are lacking components and are not fully functional. A potential source of negative environmental impacts are sub-standard DED, e.g. for overly complex designs that are susceptible to operational and maintenance problems. A lack of environmental specifications for contractors in bidding documents and environmental clauses for construction contracts may lead to insufficient provisions of environmental mitigation measures during the construction process. It will be a mandatory requirement to make EMAP tables part of the tender documents with costing required by bidders for EMAP/sub-component implementation.

### 4.4 Environmental Impacts and Mitigation Related to Construction

45. **Physical impacts.** A large number of proposed sub-components involve the construction or repair/up-grade of existing sewer lines with a great deal of commonality in the construction methods. Replacing and installing pipes and extending the network into new areas for example, will involve the same basic trenching techniques as used when replacing or building new sewers. Generally, physical environmental impacts from these subcomponents will be slight to negligible. Similarly, construction and rehabilitation of pumping stations will involve the same types of small building work and installation of pumps and pipes. Construction of the MPW wastewater/sludge treatment/tank systems and MCK Plus units will be in new or existing housing estates, with limited excavation work required. Thus, physical impacts will only be small and temporary during construction.

46. Trenches to remove existing structures or create voids for new sewer pipes will probably be dug by a small backhoe digger, with extracted soil being placed in mounds nearby. New pipes (probably pre-cast) will be brought to site on trucks, and offloaded and placed into trenches by hand, or using a small rig for heavier pipes. Once pipes are in place and joined, soil will be replaced by shovel or digger, and the surface will be compacted by vibrating machine. Excess soil will be taken in trucks for off-site disposal. Prior to excavation works, the contractor shall obtain approval from local authorities for sites that will be used for disposal of excess spoils; such sites shall be stabilized and located at least 100 meters from surface water bodies. The physical environment may be disturbed by the construction of trenches (during detailed design, the use of trenchless technologies will be considered wherever possible). Though the individual excavation may be limited, the proposed sub-components will continue over years. As construction will focus on short lengths at a time, effects will be localised and short in duration (1-2 weeks at most at each site). The replacement of material into the trench and compaction of soil afterwards also mean that the physical disturbance will be temporary.

47. **Water pollution.** Rainwater will collect in exposed trenches, so construction shall be planned to avoid excavation and trenching during the monsoon season (when working conditions are difficult anyway). Construction of canals across steep side slopes can cause slope instability, land-slipping and landslides. The same is the case for the construction of access roads, if any, along steep side slopes, especially if cross-sewer structures are not provided. This leads to sedimentation of canals, water pollution and deposits of silt downstream from the work sites. These impacts are expected to be slight and of temporary and limited nature. Surface run-off over construction storage sites could lead to leakage of diesel, petroleum and lubricants into soil and groundwater resources.

48. Mitigation measures include (i) adequate supervision of construction operations, (ii) the use of silt traps when and where appropriate, (iii) careful deposition of spoil arising from

excavation works, ensuring that it is not cast directly over drain embankments, and (iv) providing designated areas with for vehicle fuelling and fuel storage with bunds and simple oil-water separators (if fuelling and maintenance of vehicles is carried out at site). To the extent possible, spoil shall be used as fill. In the event, additional fill materials are needed, borrow sites have to be chosen at sufficient distance from waterways and environmentally sensitive areas.

49. **Air quality and noise.** Trucks will be required for the construction so there are temporary air quality and noise impacts anticipated in form of dust and other matters at construction sites and along access roads. However, in congested urban settings, additional construction traffic and the temporary traffic closure at construction sites may cause additional traffic congestions and related air and noise pollution. As early as possible traffic authorities will be consulted for necessary rerouting of traffic during construction phase. The following additional precautions should be adopted to avoid effects on traffic: (i) planning transportation routes so that heavy vehicles do not enter the main city area, as much as possible; (ii) scheduling the transportation of spoils to avoid peak traffic periods and other important times; (iii) do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) public roads are not blocked; (v) excavated soils/mud is not deposited on public roads; and (vi) speed limits are imposed. These additional impacts can be expected to be slight and of temporary nature.

50. A moderate impact specific to the work on the sewers is the effect on air quality from the noxious smell of faecal material in existing sewers (receiving domestic effluent/overflow from septic tanks), which is also a significant hazard to human health. To provide a safe environment for both residents and workers this material shall be pumped out into tankers before the work begins as part of the mitigation measures. The removed material would then provide an opportunity to improve the physical environment by enhancing the quality of agricultural soil if it were used as a fertilizer. This must, however, only be done with strict precautions to prevent transmission of pathogens or parasites to cattle or people. This can be achieved by allowing the material to dry thoroughly in sunlight for several weeks, or by spraying wet material onto fallow fields, from which animals and people are excluded (also for several weeks) whilst the slurry percolates into the ground.

51. The handling and disposal of screenings, if not properly managed, may have adverse environmental and occupational impacts. Proposed mitigation measures are: (i) provision of inert, sturdy, and corrosion-proof containers on each pumping station as temporary storage of screenings; (ii) provision of covers for the containers to prevent access by insects and vermins; (iii) scheduling for the timely collection of screenings from the sites by city-authorized waste disposal contractor ; and (iv) provision of trainings and appropriate personal protective equipment (such as gloves, boots, aprons, face masks, goggles, etc.). A plan to address abnormal conditions such as uncollected screenings over long period of time will include provision of a storage area that is: (i) lined with impermeable materials such as HDPE, (ii) bunded to prevent leaching to the surrounding environment; (iii) designed with leachate canal to return the accumulated liquid wastes to the system; (iv) covered to prevent soaking during rainy season, dust generation during dry season, and infestation by insects and vermin; and (v) secured to prevent access by unauthorized personnel.

52. Dust pollution during construction can be minimized by spraying water on construction sites and vehicles during dry weather periods, and by ensuring that trucks shipping loose construction materials are covered with tarpaulin by the contractor, in order to minimize dust emission. This shall be carried out in densely populated residential areas. Construction noise shall be limited to permitted hours and shall cease at night and on public holidays, as much as

possible. To minimize traffic congestions, local authorities shall establish traffic diversion plans and assisted by traffic police directing traffic during construction activities.

53. **Ecological resources.** There are no ecological resources of note in the area, and that the urban areas contain few plants, and only those animals such as birds, small mammals and insects that are common in inhabited areas and able to live in proximity to man. Construction of the network improvements should therefore have no significant ecological impacts.

54. **Economic development.** There is a great deal of small business activity in the city, particularly in the main streets where the work on the main water pipes and sewers may occur. Mounds of soil and open trenches will impede access to shops, which could lose customers as a result. These slight to moderate impacts shall be mitigated by maintaining access to shops during trench construction by leaving spaces between earth mounds and providing small wood bridges across trenches. Transportation will be disrupted where trenches are dug in roadways, as roads may need to be closed temporarily, and where they remain open the width available for traffic will be restricted by the trench and displaced soil. As roads in the centre of the town are quite congested already, actions to reduce further disturbance shall be taken, including:

- careful planning of the work to ensure that roads are closed only when necessary, and that suitable diversions are provided,
- increasing the size of the workforce in these areas to complete the work quickly, and
- ensuring that earth removed from trenches is placed off the road wherever possible, to limit the width restriction.

55. **Social and cultural resources.** Access to locations of social and cultural importance (clinics, schools, mosques, etc) will be temporarily impeded by work on water and sewerage networks in the vicinity, so here again spaces between the earth mounds and pedestrian walkways across trenches shall be provided. Where facilities like hospitals require vehicular access, more substantial structures will be needed. The construction work will not affect population or community numbers, locations or composition, but individual inhabitants could be affected by noise and dust (slight impacts) when work is conducted near their houses, and by the inconvenience of interrupted access to their homes. This shall be reduced by a combination of measures suggested above, including:

- increasing numbers of workers in these areas to complete work quickly,
- providing temporary bridges to maintain access where required,
- covering exposed soil during wind to prevent dust, and
- informing affected communities about the work in advance, and where possible, scheduling the work to comply with community preferences.

56. Covering of sewers in the neighbourhoods will mean that some residents lose structures they have built to provide access to houses, and again these will not be replaced as the new sewer pipes will be covered. Mitigation will require the same measures as applied when slabs and steps are removed from shops, which involves:

- informing owners in advance of the need to remove structures, the reasons for removal and the programme for the work, and
- providing temporary access boards and steps during the construction work.

57. **Employment opportunities.** The construction works offers the potential to positively contribute to the improved welfare of the local population. During the construction phase, job opportunities mainly in form of semi-skilled and unskilled labour demand will be created.

Preference in recruitment shall be given to local communities or people in affected neighbourhoods.

#### 4.5 Environmental Impacts and Mitigation Related to Operational Stage

58. **Physical impacts.** In maintaining the sewer lines, the IA shall ensure that removed material is not piled on the adjacent street as at present, and instead is taken to the treatment ponds by trucks. If pipeline leaks are repaired this should not cause major physical impacts as areas affected will be small, the work will be short in duration, and the physical environment will be reinstated as pipes will be re-buried. If leaks are repaired this will be done in the same way as the sewers were installed, by sealing off the affected sewer and pumping the contents into tankers, digging trenches to reveal the faulty section, and repairing or replacing the pipes.

59. **Water pollution.** The sewer pipes will not function without maintenance, because the topography does not allow large gradients, and sewer pipes may therefore become blocked with silt in time. Using the experience of many previous projects, inadequate O&M can be anticipated in operations. Poor O&M may also responsible for a continuous water pollution and public health risk, restricted access to clean drinking water and proper sanitation facilities. The project's proposed sub-components will therefore provide better equipment for cleaning sewers. Regular use of this equipment, which needs to be kept in good working conditions, will ensure a reduced risk of water pollution. To ensure that the sanitation facilities are properly maintained, the project will involve capacity building/ institutional development and project implementation support component designed to (i) strengthen institutional capacity in sanitation strategy development, management, operations and maintenance, and financial skills, (ii) strengthen institutional capacity in health and hygiene awareness raising and behavioral change programs, (iii) support the executing and implementing agencies, and participating communities, in the implementation of the various activities under the Project, and (iv) make the facilities built or improved from the investment more sustainable. The Project will provide consulting services packages to support these activities.

60. The PDAM Tirta Nadi WWTP will also need to maintain the treatment ponds by removing sewage sludge every four or five years. This is a simple process that does not require a comprehensive Sludge Management Plan. Ponds are allowed to dry out naturally and the solid sludge is removed by backhoe digger. The treatment and drying processes kill bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer.

61. **Ecological resources.** Although the improved and expanded sewerage system will improve the environment, there are unlikely to be significant ecological benefits as there are no natural habitats or rare or important species affected.

62. **Economic development.** If pipeline leaks are repaired in the vicinity of shops or other enterprises, impacts should not be significant as few businesses will be affected, and the repairs will be short in duration. Nevertheless, the local government should minimise disruption by similar measures as applied during the construction period, including:

- informing businesses and residents of the work in advance and providing resources to ensure that work is completed quickly,

- providing temporary bridges to maintain access and covering exposed soil with tarpaulins during windy weather to reduce dust, and
- planning work to reduce traffic disruption, and providing suitable diversions if roads need to be closed.

63. **Social and cultural resources.** Covered and buried sewers will remove the smell and appearance of excrement, and the waste shall be removed rapidly and effectively to treatment works located well away from the urban area. The environment of the city should therefore improve. Air and visual quality will improve, but the most significant benefit will be in the health of the people. Better sanitation combined with a better water supply and greater understanding of the risks of poor standards of hygiene, should ensure that the project delivers major improvements in public health.

64. There should be other benefits including: increased incomes as people spend less on healthcare and miss fewer working days; increased business productivity; and improved social capital in city if people spend more on educating their children and following social and cultural pursuits. To maintain these gains and particularly the health of the environment and the people, it will be very important for the local government and the citizens to keep the system in full working order, by clearing any blocked sewers, and by the local/provincial government maintaining the treatment works. To avoid any health risks the local government must also ensure that affected sewers are sealed before work begins and that the contained faecal material is pumped into tankers and taken to the treatment works for disposal.

## 5. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

### 5.1 Institutional Requirements

65. Currently, the management of environmental issues in Kota Medan is still in the development stage. The government applies socialization and dissemination of information to the people, business enterprises and other activities in Medan. Cooperation between local government departments and between city level and provincial level technical agencies in managing and monitoring the environmental impacts is limited. Coordination in order to resolve problems is not well established. In view of the above, in 2004 the Kota Medan government represented by the Office of Environment, Energy and Mineral Resources, decided to focus on the application of environmental management by enforcing the Environmental Law.

66. In 2004, in addition to applying national laws on Environmental Management through Laws, Government Regulations, and Ministerial Decrees, the city government also issued a Medan City Government Regulation No. 13/2003 on Wastes Management and Utilization Permit. This regulation was to restructure Medan city through sustainable and environmentally friendly development, and to make Medan a friendlier, brighter and environmentally healthier city. With District Regulation No. 13/2003, business enterprises are obliged to submit a semester report on how the environment is managed and monitored according to Medan Mayor Letter No. 660/5458 dated 14 April 2004 on Notification and Submission of Semester Report Formats on Environmental Management and Monitoring. This report serves as input data for the Office of Environment, Energy and Mineral Resources semester report to the Minister of Environment in Jakarta.

67. **Implementing agencies.** The implementing agency of subprojects financed from the city governments' own budgets (APBD-Kota) will be the governments of Kota Medan. The mayor will appoint a subproject management unit (SPMU) in Bappeda Kota to coordinate implementation with subproject implementation units (SPIU) in the respective city government

technical agencies. Provincial government agencies appointed by the EA will be responsible for the procurement and implementation of subprojects financed from DGHS budgets (including ADB loan proceeds), as well as for subprojects financed from provincial government budgets (APBD-Provinsi). These are: Dinas PU, Dinas Kesehatan, Dinas Lingkungan Hidup and Dinas Tarkim. The governors of the provinces in which the participating cities are located will appoint a subproject management unit (SPMU) in Bappeda Provinsi to coordinate implementation with subproject implementation units (SPIU) in the respective technical agencies.

68. The responsibility of the IA is to carry out the environmental assessment process according to the national environmental legislation and to obtain environmental clearance from the relevant project approving agency (Dinas LH) and from ADB for environmental compliance before awarding any ADB-financed contracts for proposed sub-components. For Kota Medan, the provincial government agency in charge of the procurement of the piped sewerage works is Dinas PU Provinsi Sumatera Utara, and DGHS for on-site sewerage projects related government housing projects. The operation of off-site sanitation (central WWTP) including sludge treatment is the responsibility of the provincial level PDAM Tirta Nadi. Sludge collection from on-site wastewater treatment (septic tank, communal STP, etc.) is part of Dinas Kebersihan (Cleansing/Solid Waste Management Dept.) tasks.

69. **Dinas Lingkungan Hidup (LH).** On city government level, Dinas LH (Environmental Bureau) will be consulted by the IA for submission and approval of required AMDAL documents or respectively UKL/UPL (simplified environmental management and monitoring plans). For this purpose, LH will form the required technical evaluation committees, including stakeholders from the city's agencies and communities to assess the environmental documents. When approved, the AMDAL or UKL/UPL submissions will also satisfy the Indonesian EIA compliance requirements. During the public consultation, *Dinas Lingkungan Hidup* Kota Medan declared strong commitment to provide assistance to other city government agencies. Dinas LH has AMDAL certified staff and is conducting environmental monitoring of sanitation systems in hospitals, shopping malls and industries on a quarterly basis, in other facilities less frequently.

70. There seem to be substantial under-funding of environmental monitoring activities for other waste sectors. The lack of adequate funding by the City Government for environmental management and monitoring activities is likely to impact on the effective implementation of ADB/GOI approved environmental management action plans (EMAP) and environmental monitoring plans (EMoP) for sub-components under this project during the pre-construction, construction and operational stages.

71. In an earlier meeting with LH it was confirmed that the city government applies the Ministry of Environment Decree No. 11 of 2006 as thresholds for the AMDAL process in Medan, the Decree No. 86 of 2002 for UKL/UPL applies as well. LH Medan will facilitate the synchronization of the environmental assessment process for new proposed sub-components under this PPTA. This provides opportunities to reduce duplication of EIA reporting to satisfy both ADB and national standards and potentially substantially reduces timeframes for environmental assessment processes. In loan negotiations with GOI, ADB shall require the cities to allocate sufficient funds for O&M in the overall project budget. Initial estimates for EMAP and EMoP costs are provided below for budgeting purposes.

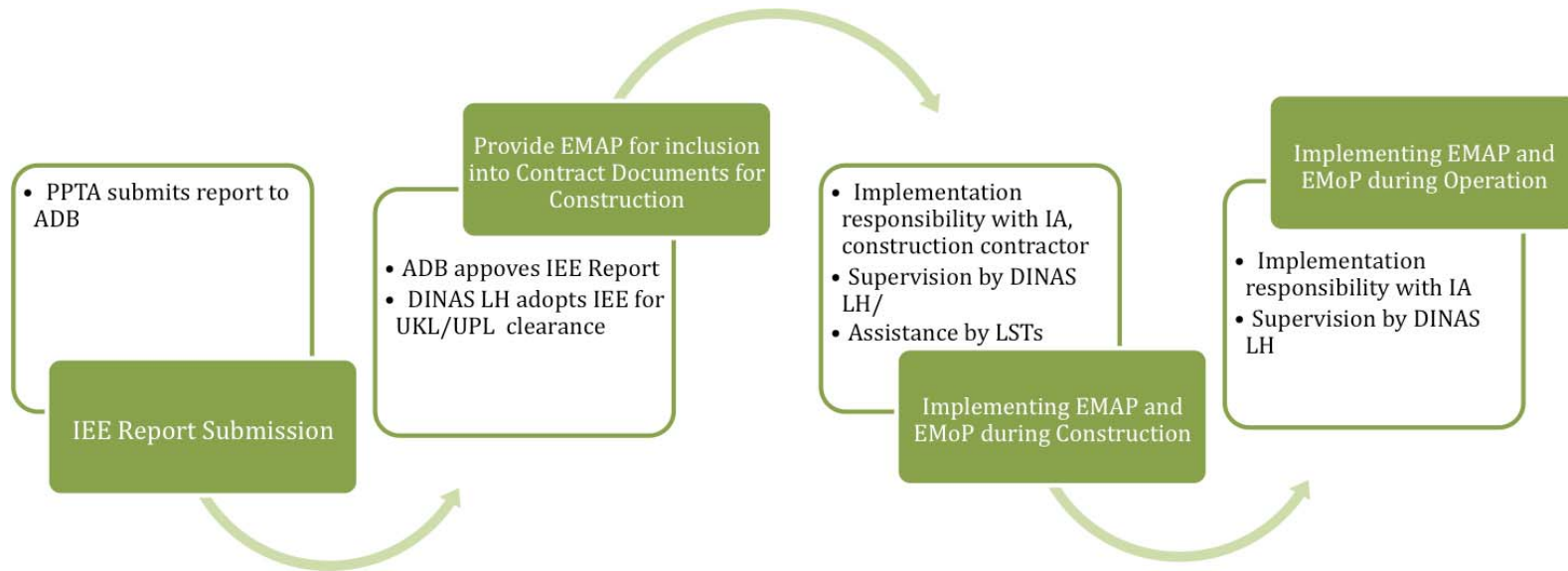
72. The wastewater treatment plant (WWTP) in Medan is under management by the provincial government's PDAM Tirta Nadi. Thus, the responsibilities on environmental management and monitoring rest with BAPEDALDA Provinsi Sumatera Utara (a provincial government agencies), and not with Dinas LH Kota Medan. This may lead to some coordination

problems with regards of environmental management matters. Provincial level environmental management and monitoring capacity of environmental agency staff is further developed as those agencies have been established earlier than their counterparts on city-level.

73. **Consultant Teams/ Central and Local Support Teams (CST/ LST).** These teams are proposed to support the implementing agency and affiliates (SPMU and SPIUs) with technical advice. It is proposed that at least one environmental specialist is included in the central and local support teams to compile and manage environmental capacity building efforts in the city and conduct environmental impact monitoring or provide impact mitigation advice to the SPIUs. It is proposed that the environmental consultants assist the IAs in updating the EMAP and EMoP by taking into account the additional information obtained during the detailed design (DED). Appropriate mitigation measures shall be added, as necessary, in the updated EMAP. The IAs shall also ensure that mitigation measures are included in the subcomponent design. These measures, i.e., updating of EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design shall be included in the IEE's EMAP and EMoP.

74. **Environmental monitoring.** Compliance monitoring will be conducted in accordance with the work plan in Table S11-12. Aspects to be monitored are as follows: (i) pre-construction: updating of EMAP and EMoP during detailed design phase and inclusion of environmental clauses in bid and contract documents; (ii) construction: environmental performance of contractors with regard to sludge disposal, control measures to pertaining to erosion, siltation, air quality, noise, sludge disposal and traffic management; and (iii) operation: O&M practices and environmental effects (soil, surface water and groundwater quality).

**Figure S11-2: Flow Chart for Milestones in Environmental Assessment and Management Activities**



75. The IA will submit a quarterly monitoring report to Dinas LH. No later than 1 month before the completion of the construction work, the IA will collect material from all contractors and provide a construction completion report to the stakeholders. The environmental section of this report will indicate the timing, extent, and success of mitigation completed and the maintenance and monitoring needs during operations. A proposed monitoring report format is included in this IEE to serve as guideline for the IA in preparing environmental monitoring reports during project implementation.

76. The CST/LST shall support the IA in conducting environmental monitoring of construction activities and in compiling the quarterly reports during construction. A copy of the reports shall be submitted to ADB for review and comments and kept for project review purposes. During operations environmental mitigation will be monitored by the Dinas LH; a report will be prepared and submitted semi-annually. The Dinas LH shall conduct soil, surface and ground water monitoring on semi-annual basis at sampling sites to be determined.

## **5.2 Capacity Building in Environmental Management and Monitoring**

77. Technical monitoring/auditing training as well as training in environmental data processing and reporting is advised for Dinas LH staff as capacity building measures. These training efforts should be extended to aid civil society capacity building, enabling local NGOs to become actively involved and qualified to conduct own environmental audits.

78. It is proposed that one or two senior staff of the environmental sections of Dinas LH and the IA staff be involved in the implementation of the EMAP and EMoP will be sent to training courses on environmental impact mitigation and monitoring to Jakarta or overseas ("train the trainers"). Trained and qualified staff shall then develop more city-specific training programs. These training programs can be tailor-made in consultation with Dinas LH to suit the needs of the agency and projects on the ground. These capacity building efforts shall be in addition to other community empowerment and IA technical staff training programs under this PPTA.

79. The capacity building efforts will only be effective if the City Government would provide sufficient operational funding for EMAP and EMoP and supervision by Dinas LH during the pre-construction, construction and operational phases of this project's sub-components. The City will provide sufficient funds for EMAP and EMoP, supervision by Dinas LH and respective capacity building programs. Indicative budget estimates for EMAP and EMoP are given under 5.3.

## **5.3 Budget Estimate for Implementation of EMAP and EMoP**

80. The below budget is based on average national costs of equipment and services.

**Table S11-7. Estimated One-Time (Nonrecurring) Mitigation Costs – Kota Medan**

<b>Mitigation Measures</b>	<b>Unit Cost (Rp million)</b>	<b>Total Estimated Cost (Rp million)</b>
<b>Siltation Control</b> Silt retaining structures along slopes and canals, reinstatement of spoil disposal/ cut sites (if required), mainly for larger canals and structures	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission
<b>De-sludging of Existing Drains and Sewers</b> Cleaning and Sludge pumping in drains and sewers prior to repair of existing drain and sewer lines, proper disposal of removed sludge	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission
<b>Prevention of Water Contamination</b> Construction of fuel and lubricant storage area with concrete floors/bunds and oil/water separator at vehicle park	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission

81. For budget estimation purposes of environmental mitigation costs, approximately 1-2 % of total contract value shall be allowed for mitigation measures as stated above for implementation during construction. This amount will be included in the project cost estimates.

82. The following estimates are presented for recurring environmental EMoP costs for construction and operation phases.

**Table S11-8: Estimated Recurring Environmental Costs – Kota Medan**

<b>Item</b>	<b>Unit Cost/Year (Rp. million)</b>	<b>Total IDR (Rp. million)</b>
<b>During Construction mainly monthly Compliance Monitoring is advised</b>  Costs include travel to the sites, preparation and submission of records and monitoring reports, follow up meeting with contractors, etc.  Sampling of ambient environmental parameters will only provided in case of major environmental pollution/violations of EMAP	5	30
<b>Quarterly Environmental Monitoring and Compliance Checks</b> by Dinas LH and other city government agencies (includes per diem, honorarium, quarterly monitoring report review and approval by agencies)  The participation of these agencies in physical monitoring will build capacity and improves the quality of the environmental monitoring review and approval process.	50	300
Environmental Capacity Building for Technical Staff of Dinas LH and IA for Operations (one year course) for two persons, conducted during late construction phase	250	250
<b>Total Costs During Construction Period</b>		<b>580</b>

83. The following estimates are presented for recurring environmental costs over a 20-year operating period.

**Table S11-9: Recurring Costs over 20-year Operating Period (per Subproject)**

<b>Description</b>	<b>Per Year (Rp. million)</b>	<b>Number of Years</b>	<b>Total Cost (Rp. million)</b>
Ambient soil, surface and ground water quality monitoring twice a year, including laboratory and reporting:			
Manpower: Four person months/year @ Rp 5 million/month	20	20	400
Laboratory: 6-10 parameters per sample @ maximum Rp. 250,000/parameter tested			
Environmental Parameters to be tested:			
Soil: PAH, VOC, Lead, Arsenic, Heavy metals (2)	15	20	300
Surface/Groundwater:			
BOD, COD, DO, TSS, Lead, Arsenic, Heavy metals, Total coliform/E.coli	25	20	500
<b>Total Operating Period (20 years)</b>			<b>1,200</b>

## 6. PUBLIC CONSULTATION AND DISCLOSURE

84. A series of meetings were held with stakeholders in the cities as part of the environmental assessment process, including representatives of NGOs (non-government organizations), private sector, partner organizations of international donor funded projects and local government officials of relevant departments. Meetings took place in Kota Medan between September 17 and 19, 2007 (See **Annex 2** for list of attendance from meeting). Mostly the discussion focused on the environmental impacts of the implementation and post-implementation periods and mitigation measures were reviewed with the help of ADB's rapid environmental assessment checklists (REA).

85. The informal discussion with NGOs, private sector and partner organizations of international donor funded projects highlighted the following aspects:

- According to NGOs, sampling of groundwater conducted by the provincial government's Dinas Kesehatan show that from 700 groundwater samples, only 10% are within acceptable limits, 90% are exceeding thresholds for clean water standard as stipulated in PerMenKes decree 416/1991. About 60% of samples were taken from shallow groundwater wells, which are likely to serve for the supply of drinking water to local communities.
- The USAID-funded Environmental Services Program (ESP) has prioritized a program for existing wastewater collection and treatment optimization leveraging on central government funding from Jakarta. The program, which aims to improve sanitary conditions in Zone 1, including pipes and pumps. Additional aerators for the PDAM Tirta Nadi WWTP are also proposed as part of the optimization program for existing facilities. It was also mentioned that 3,000 households in Medan are waitlisted to be connected central sewerage / trans sewerage system.

86. Further meetings with local government representatives were held in Kota Medan. They included staff of the Dinas Kebersihan (Solid Waste Management Services), PDAM Tirta Nadi

(Water Supply and Wastewater Management) and Dinas Lingkungan Hidup (Environmental Bureau). The WWTP in Medan is managed by the provincial PDAM, servicing about 11,000 connections in the city and the surrounding. The plant operating, but power shortages and some technical problems may lead to sub-standard performance. In particular, the treated effluent shows low levels of Dissolved Oxygen (DO) and visible substantial growth of algae, indicating eutrophic conditions. PDAM Tirta Nadi shared their plans for further connections of households to the plant. There have been complaints by nearby local house owners that the quality of treated effluent discharge of the WWTP has contributed to lower groundwater quality. An investigation by PDAM revealed, however, that these households had septic tanks located in proximity to shallow groundwater wells and that contamination by septic tank discharge is more likely the source for the poor quality of groundwater.

87. In the discussion with Dinas Lingkungan Hidup (Environmental Bureau) Mr. Zulfahmi (Head of Planning) declared that Dinas LH has a strong commitment to provide assistance to other city government agencies, for instance, the Dinas already had proposed budgets for environmental monitoring twice (2005-2006 and 2006-2007) at the Terjun FDS, addressing the potentially significant contamination from leachate, odour, poor health condition for works. The City Government has not approved the proposal until now. This poses a major obstacle for Dinas LH, since according to their 'TUPOKSI' (SOP, responsibility, bureau task obligation, etc), it falls within their responsibility to monitor environmental impacts of activities in the City. On wastewater treatment, environmental control of the provincially managed PDAM Tirta Nadi is the responsibility of the BAPPEDALDA on provincial level. However, administratively the area receiving the treated effluent is part of Kota Medan. This bureaucratic paralysis has resulted in the lack of data for physical and chemical treated effluent qualities.

**Table S11-10: Environmental and Social Issues Raised during Consultation and Proposed Action to address those Issues**

Issue/Concern Raised by Public	Proposed Action to address Issue/Concern
Polluted groundwater wells	Project will improve sewerage piping network, thus reducing leakage into groundwater, house connections to sewer system will do the same, installation of off-site/on-site treatment facilities will reduce seepage of highly polluted wastewater into groundwater.
Public complaints about poor groundwater quality in vicinity of WWTP Medan	Review of master plan for wastewater services and full EIA/AMDAL prior to further expansion. Confirm observation that poor groundwater quality stems from septic tanks rather than from WWTP effluent.

## 7. FINDINGS AND RECOMMENDATIONS

88. Based on the performed screening no long-term significant environmental impacts are expected in the foreseeable future during the implementation of these sub-components. This is largely due to the expected environmental improvements and benefits resulting from this project in the long-run and the identification of mainly transient slight to moderate environmental impacts during construction phase. This IEE itself becomes the completed environmental assessment for those sub-components mentioned here and no follow-up EIA will be needed as part of the proposed Phase I of this project.

89. However, as this IEE was prepared concurrently with the finalization of the SPAR documents, it is recommended to up-date the EMAP and EMoP as more information on location, lay-out, technical and other aspects of the subcomponents becomes available during the detailed design phase.

## 8. CONCLUSIONS

90. The report concludes that there is no need for further studies at this time. This IEE report becomes the completed environmental assessment for the sub-components covered in this report.

**Table S11-11: Environmental Management Action Plan (EMAP)**

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
1.Preconstruction Phase						
1.1 Up-Dating of EMAP and EMoP during Detailed Design for Sub-components	i. Updating of EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design  ii. Allocating and revise budgets etimates for EMAP and EmoP	IEE, Section V	Entire Project	During DED	IA (city level) Central/ Local Support Team (LST)	Ministry of Public Works, DG Human Settlement
1.2 Lack of Environmental Specifications for Contractor in Bid Documents, Environmental Clauses for Contracts	i. Prepare relevant environmental sections in the tender documents for bidders ii. Prepare a bid evaluations section for environment, according to ADB bid evaluation format iii. Prepare environmental contract clauses for contractors (cf. EMAP and EMoP)	-	Entire Project	Before construction starts	IA (city level) Central/ Local Support Team (LST)/	Ministry of Public Works, DG Human Settlement
2.Construction Phase						
Physical Environment						
2.1 Soil Erosion and Siltation/ Sedimentation of drains/sewers	i. Adequate supervision of construction operations, ii. Use of silt traps iii. Careful deposition of spoil arising from excavation works, ensuring that it is not cast directly over canal embankments. To the extent possible, spoil shall be used as fill, either where required for the scheme or to construct level surfaces, as desired by farmers. In all cases it must be compacted and treated either using bio-engineering techniques, or by using dry stone walls or stone pitching. In the event, fill materials are needed, borrow sites have to be chosen at sufficient distance from waterways and environmentally sensitive areas. iv. Stabilisation of temporary and permanent works such as cuts in steep slopes (if required) for canal alignments	Contract terms and conditions  IEE, Section IV	Throughout the project corridors, all access roads, and spoil disposal or borrow sites	During the construction period	Construction Contractor /IA (city level)	Central/Local Support Team (LST)/ Dinas LH

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	or canal embankments by slope stabilisation methods if design cannot avoid such works, construction roads need to be properly built with cross drainage structures.					
2.2 Air Quality, Noise, Traffic Congestion	i. Dust pollution addressed by spraying water on construction sites and vehicles during dry weather periods. This shall be carried out in densely populated residential areas. ii. Construction noise shall be limited to permissible hours and shall cease at night and on public holidays, as much as possible. iii. Establish traffic diversion plans assisted by traffic police directing traffic during construction activities.	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads, and construction camps and vehicle parks	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH
2.3 Proper de-sludging of drains and sewers prior to repair	i. Pumping of sludge and proper drying and disposal of dried sludge, potential use for agriculture or a FDS for sludge; ii. Prevent leakages of sewerage and contact contamination with humans in residential, commercial and industrial areas by removal of sludge and contaminated materials.	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas Kebersihan/ Dinas Pertanian
<b>Socio-cultural Environment</b>						
2.4 Rise in Employment Opportunities	i. With job openings for semi-skilled or unskilled labour, priority shall be given on recruiting workers from local communities ii. Requirement for local labour recruitment in the contract of the contractors.	Contract terms and conditions IEE, Section IV	City/ Kecamatan (Sub-district)	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas Tenaga Kerja
2.5 Access impediments to public buildings and locations of cultural and social importance and	i. Increase number of workers in these areas to complete work quickly ii. Providing temporary bridges to maintain access when required. iii. Covering exposed soil during wind to prevent dust	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads,	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
businesses	iv. Informing affected communities about work in advance and scheduling the work to comply with community preferences v. Informing business owners in advance vi. Providing temporary access to businesses during construction.					
<b>3. Operational Phase</b>						
3.1 Sludge management	i. Regular removal of sludge from WWTP ponds every few years, sewer lines and drains.	IEE, section IV	Kecamatan Sub-districts	During the operational period	PDAM Tirta Nadi	Dinas LH
3.2 Poor Operations and Maintenance (O&M)	i. The project will address this issue by specific training and clearly placing more responsibility on excellence in O&M to protect the sustainability of the investments.	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH
3.3a Ecological Resources	i. Planting of native trees along new access and operation roads as well as along newly laid pipes.	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH
3.3b Long-term Cumulative Impacts on Soil, Surface and Groundwater Quality	ii. Improved sanitation and waste management in the city and regionally	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH/ BAPEDALDA Province
3.3c Access impediments to public buildings and locations of cultural and social importance and businesses during repair works	i. Increase number of workers in these areas to complete work quickly ii. Providing temporary bridges to maintain access when required. iii. Covering exposed soil during wind to prevent dust iv. Informing affected communities about work in advance and scheduling the work to comply with community preferences v. Informing business owners in advance vi. Providing temporary access to businesses during construction.	Contract terms and conditions  IEE, VI	Throughout the project corridors, all access roads,	During the repair work phase	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH

**Table S11-12: Environmental Monitoring Program (EMoP)**

EMAP Reference No. and Item	Monitoring Details	Timing	Executing Unit	Reporting Responsibility
<b>1. Pre-construction Period</b>				
1.1 Up-Dating of EMAP and EMoP during Detailed Design for Sub-components	Compliance check for updated EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design	In time for inclusion as part of bid documentation and environmental clauses in contracts	IA (city level) Central/ Local Support Team (LST)/	(CPMU) of the EA
1.2 Environmental Specifications for Contractor and Environmental Clauses in Contracts and Loan Covenant	Compliance with provision of key environmental inputs for inclusion in bid preparation documents and contractor contracts.	In time for inclusion as part of bid documentation and environmental clauses in contracts	IA	(CPMU) of the EA
1.3 Mitigation Plans and Timetables	Compliance with provision of documents for environmental mitigation and monitoring measures and timetables are translated into Indonesian language for submission (as UKL/UPL) and distribution to contractors.	For use by construction contractors/ for approval by Dinas LH	IA	(CPMU) of the EA / Dinas LH
<b>2. Construction Phase</b>				
2.1. Erosion and Siltation	Compliance inspection and file report (tabular format) on whether erosion control measures are in place and functioning as specified	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.2 Surface Water Quality	Compliance inspection at equipment/material storage sites, visual inspection for signs of leakages in soil and water-oil separator, general cleanliness	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.3 Air Quality (Dust), Noise, Traffic Congestion	Compliance inspection at construction sites, visual inspection for signs of dust pollution during dry weather periods  Compliance inspection at construction sites of noise pollution restrictions outside permissible hours/ ambient noise measurements upon resident complaints	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.4 De-sludging of sewer lines	Compliance inspection of adequate sludge removal and disposal adequate in line with recommended methods, no hazard to residential, commercial and industrial areas	Inspect sites weekly  Inspect sites quarterly	IA supported by LST  Dinas LH/Dinas Kebersihan	IA submits report to Dinas LH and copy to stakeholders
2.5. Rise in Employment	Compliance inspection of the total number	Monthly, starting with	IA supported by LST	IA submits report to

EMAP Reference No. and Item	Monitoring Details	Timing	Executing Unit	Reporting Responsibility
Opportunities/ Work Safety	of local workers, the workers' qualifications, workers' place of origin and total cases of work-related accidents	recruiting construction workers and during the construction period	Dinas Tenaga Kerja	Dinas LH and copy to stakeholders
<b>3. Operational Phase</b>				
3.1 Sludge Removal and Disposal	Compliance inspection of WWTP ponds, sewer lines and drains to be de-sludged at adequate frequencies	Inspect sites monthly or as adequate Inspect sites quarterly	PDAM Tirta Nadi Dinas Kebersihan Dinas LH	IA submits report to Dinas LH and copy to stakeholders
3.2 Poor O&M	Compliance inspection on number of maintained trainings and capacity building and improved O&M practices	Inspect sites quarterly	IA Dinas LH	IA submits report to Dinas LH and copy to stakeholders
3.3 Cumulative / Long-term Impacts	Ambient soil, surface and groundwater quality will be monitored at: WWTP and main sewer lines  Environmental Parameters to be tested: Soil: PAH, VOC, Lead, Arsenic, Heavy metals (2) Surface/Groundwater: BOD, COD, DO, TSS, Lead, Arsenic, Heavy metals, Total coliform/E.coli	Semi-annually	Dinas LH/ BAPEDALDA Province	Dinas LH/ BAPEDALDA to stakeholders

## References

- 1) Environmental Assessment Guidelines of the Asian Development Bank (2003)
- 2) Guide and Reference Book on Environmental Assessment and Environmental Safeguard Requirements (Version 1, October 2005):
- 3) Environmental Policy of the Asian Development Bank (2002)
- 4) Disclose the Findings of The IEE, and Summary IEE in the According with the requirement under the ADB Environmental Policy (2002), and Disaster and Emergency Assistance Policy (2004).
- 5) Ministerial Decree of Environment number 17. About Plan of Effort Activity Which is obliged to AMDAL, 2001.
- 6) Ministerial Decree of PU number 58/KPTS/1995. Guide of Managery AMDAL PU, 1995.
- 7) Regulation of Government number 22 about Arrangement and number 23 about Irrigation, 1982 and number 27, about AMDAL, 1999.

## **IEE Annex**

## **Annex 1: Projects Locations – Photographic Record**



WWTP in Medan shows low Dissolved Oxygen (DO) levels in Aerobic Ponds. Fish dies when DO are too low (~3mg/l).



WWTP in Medan: Excessive algae growth indicates eutrophic conditions in treated effluent, high nutrient levels.



WWTP Medan treated effluent discharge: Color and foaming indicates high loading of nutrients in discharge. The WWTP does not have tertiary treatment.

## **Annex 2: Public Consultation Notes – Attendance of Meeting**

Date : 17 SEPT 2007, 14:00-16.30

Place : PDAM Tirta Nadi

Participants :

1	Mr. Zulkarnaen	Plant Manager	PDAM Tirta Nadi
2	Mr. Carsten Huttche	International Environmental Expert	MSMH PPTA
3	Ms.Nila Oktaviany	Local Environmental Expert	MSMH PPTA

Date : 18 SEPT 2007

Place : USAID ESP Medan Meeting Room

Participants :

1	Nirwan Juniadi	General Coordinator	Bina Inspirasi Sahabat Peduli (NGO)
2	AR. Piliang	Deputy Division Manager	JKM- Network for Community Welfare and Health (NGO)
3	Edi RAG Nst	-	JKM- Network for Community Welfare and Health (NGO)
4	Triyanto Efendy	Environmental Engineer	CTI Engineering Co., Ltd./ Medan Flood Control Project
5	Syuriani G.	-	CTI Engineering Co., Ltd./ Medan Flood Control Project
6	Julyon	-	Bina Inspirasi Sahabat Peduli (NGO)
7	Julian Syah	Municipal WATSAN Consultant	USAID Environmental Services Program (ESP)
8	Mr. Carsten Huttche	International Environmental Expert	MSMH PPTA
9	Ms.Nila Oktaviany	Local Environmental Expert	MSMH PPTA

Date : 19 SEPT 2007, 10:00-11.30

Place : Dinas Kebersihan Kota Medan Meeting Room

Participants :

1	Mrs. Yusna	Head of Planning and Development	Dinas Kebersihan
2	Mr. Carsten Huttche	International Environmental Expert	MSMH PPTA
3	Ms Pratiwi Andharyati	Sanitation Specialist/ Co Team Leader	MSMH PPTA
4	Ms.Nila Oktaviany	Local Environmental Expert	MSMH PPTA
5	Ms. Teti Kartini	Local Solid Waste Management Expert	MSMH PPTA
6	Agus Witono	Local Financial Expert	MSMH PPTA
7	Dewi Andriyani	Local Facilitator	MSMH PPTA

Date : 19 SEPT 2007, 14:00-16.30  
 Place : BAPPEDA Kota Medan Meeting Room  
 Participants :

1	Ms. Natal Lely	City Working group	BAPPEDA
2	Mr. Zulfahmi	City Working group	Dinas Lingkungan Hidup
3	Mr. Murtadi	City Working group	Dinas PU
4	Mr. Khaerudin	City Working group	Dinas Permukiman
5	Mr. Rawalludin	City Working group	Dinas Permukiman
6	Mr. Carsten Huttche	International Environmental Expert	MSMH PPTA
7	Ms Pratiwi Andharyati	Sanitation Specialist/ Co Team Leader	MSMH PPTA
8	Ms. Nila Oktaviany	Local Environmental Expert	MSMH PPTA
9	Ms. Teti Kartini	Local Solid Waste Management Expert	MSMH PPTA
10	Agus Witono	Local Financial Expert	MSMH PPTA
11	Dewi Andriyani	Local Facilitator	MSMH PPTA

**Annex 3 a-b: Environmental Categorization Form and REA Checklist**

### Annex 3: Rapid Environmental Assessment (REA) Checklist

SEWAGE TREATMENT

#### Instructions:

- ☐ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ☐ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ☐ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- ☐ Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

**Country/Project Title:** ADB TA No. 4763-INO Metropolitan Sanitation Management and Health/ **Medan City**

**Sector Division:** SEA Department/ Infrastructure Division

SCREENING QUESTIONS	Yes	No	REMARKS
<b>B. PROJECT SITING</b>			
IS THE PROJECT AREA...			
▪ DENSELY POPULATED?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	There are rivers passing through the city where sanitation facilities are to be built
• CULTURAL HERITAGE SITE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• WETLAND	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• MANGROVE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• ESTUARINE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BUFFER ZONE OF PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BAY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<b>A. POTENTIAL ENVIRONMENTAL IMPACTS</b>			
WILL THE PROJECT CAUSE...			

SCREENING QUESTIONS	Yes	No	REMARKS
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lining and construction of stormwater drains (185km/55km) and new sewer lines (13km) may cause temporary access blockage
▪ <i>dislocation or involuntary resettlement of people</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The project is aiming to improve sanitation and public health, it can not be ruled out that new systems fail due to poor design/construction or O&M
▪ overflows and flooding of neighboring properties with raw sewage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current stormwater ditches serve as open sewer that overflow when flooding occurs
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ noise and vibration due to blasting and other civil works?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Current WWTP with sufficient land reserve and buffer
▪ social conflicts between construction workers from other areas and community workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ road blocking and temporary flooding due to land excavation during the rainy season?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Provided major works is carried out during drier season
▪ noise and dust from construction activities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ traffic disturbances due to construction material transport and wastes?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ temporary silt runoff due to construction?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ contamination of surface and ground waters due to sludge disposal on land?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in sewage flow and exposure to pathogens in sewage and sludge?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Possible for lining works on drainage works which doubles as open sewer system

## Annex 4: Proposed Monitoring Report Format

### SUGGESTED FORMAT OF EMAP PERFORMANCE AND ENVIRONMENTAL EFFECTS MONITORING REPORTS FOR PRE-CONSTRUCTION, CONSTRUCTION AND OPERATION PHASES

<b>EMAP Monitoring Report</b>					
<b>1. Introduction and Project Overview</b>					
<i>Reporting period:</i>					
<i>Last report date:</i>					
<i>Key sub-project activities since last report:</i>					
<i>Report prepared by:</i>					
<b>2. Environmental Performance Monitoring</b>					
<b>a. Summary of Compliance with EMAP Requirements (Environmental Performance)</b>					
<i>EMAP Requirement</i>	<i>Compliance Attained (Yes, No, Partial)</i>	<i>Comment on Reasons for Non-Compliance</i>	<i>Issues for Further Action</i>		
1.					
2.					
3.					
<b>b. Issues for Further Action</b>					
<i>Issue</i>	<i>Cause</i>	<i>Required Action</i>	<i>Responsibility</i>	<i>Timing</i>	<i>Resolution</i>
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					
<b>3. Environmental Effects Monitoring</b>					
<b>a. Environmental Inspection and Monitoring Results</b>					
<i>Monitoring Parameter</i>	<i>Comparison to Relevant Standard / Criteria</i>	<i>Comment on Incidences of Exceedance</i>	<i>Issues for Further Action</i>		
1.					
2.					
3.					

**b. Issues for Further Action**

<i>Issue</i>	<i>Cause</i>	<i>Required Action</i>	<i>Responsibility</i>	<i>Timing</i>	<i>Resolution</i>
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

**4. Appendices**

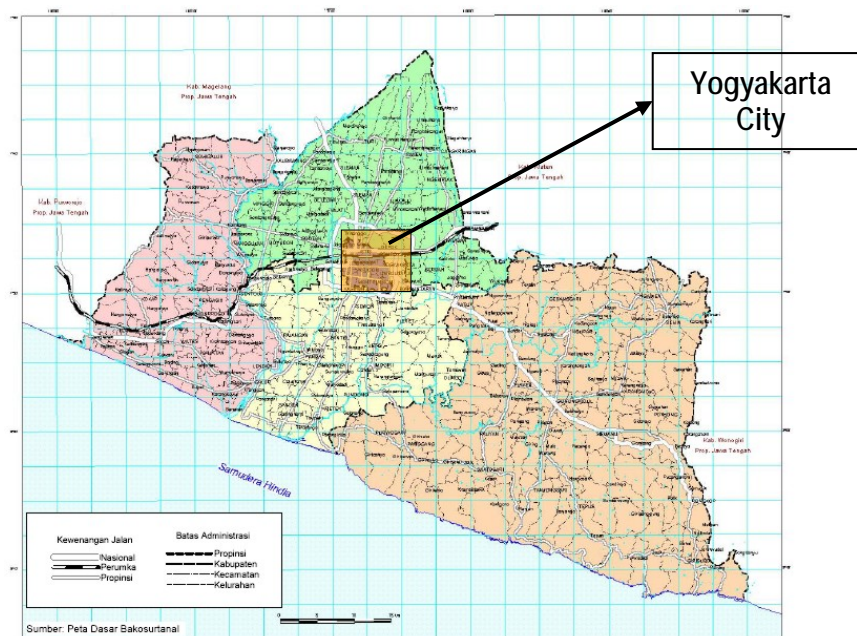
- a. Correspondence**
- b. Monitoring Results**
- c. Etc.**

**DRAFT**

---

**INITIAL ENVIRONMENTAL EXAMINATION (IEE)  
FOR  
METROPOLITAN SANITATION MANAGEMENT  
AND HEALTH SUB-PROJECTS**

**KOTA YOGYAKARTA**



**December 2009**

---

## CURRENCY EQUIVALENTS

(as of 14 December 2009)

Currency Unit	–	rupiah (Rp)
Rp 1.00	=	\$ 0.0001059603
\$1.00	=	Rp 9,437

## ABBREVIATIONS

ADB	–	Asian Development Bank
AH	–	affected household
AMDAL	–	<i>Analisa Mengenai Dampak Lingkungan</i> (environmental impact assessment process, which includes ANDAL, RKL and RPL)
ANDAL	–	<i>Analisis Dampak Lingkungan</i> (environmental impact assessment)
APBD	–	<i>Anggaran Pendapatan dan Belanja Daerah</i> (local government budget)
APBN	–	<i>Anggaran Pendapatan dan Belanja Negara</i> (central government budget)
BAPPEDA	–	<i>Badan Perencanaan Pembangunan Daerah</i> (city/district development planning agency)
Bapedalda	–	city/district environmental agency)
BAPPENAS	–	<i>Badan Perencanaan Pembangunan Nasional</i> (National Development Planning Agency)
BPS	–	<i>Biro Pusat Statistik</i> (Central Statistical Agency)
CPMU	–	Central Project Management Unit
CSS	–	city sanitation strategy
CSWT	–	city sanitation working team
DGHS	–	Directorate General of Human Settlements
DPRD	–	<i>Dewan Perwakilan Rakyat Daerah</i> (city/district legislative assembly)
EA	–	executing agency
EARP	–	environmental assessment and review procedure
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMAP	–	environmental management action plan
EMoP	–	environmental monitoring program
ENPV	–	economic net present value
ETESP	–	Earthquake and Tsunami Emergency Support
FIRR	–	financial internal rate of return
FNPV	–	financial net present value
GIS	–	geographical information system
GOI	–	Government of the Republic of Indonesia
G(R)DP	–	gross (regional) domestic product
HWL	–	highest water level
IA	–	implementing agency
IEE	–	initial environmental examination
IP	–	indigenous people
IPDF	–	Indigenous People Development Framework
IPDP	–	Indigenous People Development Plan
I(P)SA	–	initial (poverty) and social assessment
KepMen	–	<i>Keputusan Menteri</i> (ministerial decree)
LIDAP	–	local institutional development action plan

MDG	–	Millennium Development Goals
MIS	–	management information system
MOE	–	Ministry of Environment
MOF	–	Ministry of Finance
MOH	–	Ministry of Health
MoU	–	memorandum of understanding
MPW	–	Ministry of Public Works
NGO	–	non-government organization
OCR	–	ordinary capital reserves
O&M	–	operation and maintenance
PDAM	–	<i>Perusahaan Daerah Air Minum</i> (regional government water supply enterprise)
PDK	–	<i>Perusahaan Daerah Kebersihan</i> (city/district cleaning enterprise)
PP	–	<i>Peraturan Pemerintah</i> (government regulation)
PSA	–	poverty and social analysis
RF	–	resettlement framework
RG	–	regional government
RKL	–	<i>Rencana Pengelolaan Lingkungan</i> (environmental management plan)
Rp.	–	Indonesian Rupiah
RP	–	resettlement plan
RPL	–	<i>Rencana Pemantauan Lingkungan</i> (environmental monitoring program)
SANIMAS	–	<i>Sanitasi Masyarakat</i> (sanitation by communities)
SES	–	social and environment section of SPIU
SPIU	–	subproject implementation unit
SPMU	–	subproject management unit
TA	–	technical assistance
TOR	–	terms of reference
UKL	–	<i>Upaya Pengelolaan Lingkungan</i> (environmental management effort, similar to IEE)
UPL	–	<i>Upaya Pengelolaan Lingkungan</i> (environmental management effort, similar to EMP)
WWTP	–	wastewater treatment plant

## 1. INTRODUCTION

1. This initial environmental examination (IEE) was prepared by Black and Veatch as part of the consultant services contract for the Asian Development Bank's Metropolitan Sanitation Management and Health PPTA (ADB TA No. 4763-INO). The overall project objective is to provide improved infrastructure in the sanitation management sectors leading to better public health in selected metropolitan centers in Indonesia, with financing from an ADB loan.

### 1.1 Sub-Component Assessment Process

2. As part of this PPTA's first phase, participating cities formulated City Sanitation Strategies (CSS) that included a list of proposed sub-components in the following sectors:

- community mobilization, empowerment and promotion of public health awareness;
- infrastructure development for sewerage and main drainage;
- solid waste management; and
- institutional development and sub-component implementation support.

In the first half of 2009, the Executing Agency made several important changes to the scope of the project. In particular, it decided to exclude solid waste management and main drainage, and to limit the sector "community mobilization, empowerment and promotion of public health awareness" to "community-based sanitation" only. As a result, the IEE only covers subprojects in the following sectors:

- community-based sanitation;
- infrastructure development for sewerage; and
- institutional development and sub-component implementation support.

3. In line with ADB environmental safeguard requirements an initial environmental screening, using Rapid Environmental Assessment (REA) checklists (see Annex 3a) was carried out for all proposed sub-components listed in the CSS. This included mainly infrastructure physical works for sewerage. In addition, an environmental screening and scoring matrix was used, combining environmental criteria such as scale of a proposed sub-component and environmental sensitivity of proposed sub-component location. The following details on the environmental screening criteria are provided

- (i) *Decree No. 11/2006 Screening (scale/magnitude) criteria:* In order to facilitate the environmental assessment process, GOI has issued a Ministry of *Environment Decree No. 11, 2006*, which up-dates the Ministerial of Environment Decree Number 17 Year 2001 titled "Proposed Uses or Activities that require an ANDAL or full EIA report". The *magnitude of change* arising from the implementation of the proposed sub-component can be rated as negligible, small, intermediate or large and can be quantified as a percentage (%) of the threshold figure (=100%), triggering an AMDAL under the Decree No. 11, 2006.
- (ii) *Environmental Sensitivity Area criteria:* screening can further address the environmental sensitivity of an area, for which a sub-component has been proposed. Factors affecting the evaluation of the sensitivity of ecosystems include quality of ecosystem; importance and rarity; ability of the ecosystem to accommodate change; significance of the change in local and regional context, and maturity of the ecosystem.
- (iii) *Significance Threshold (combined) criteria:* The above two screening criteria do not allow a clear prediction of the significance of an environmental impact, if taken alone.

For instance, a larger sub-component in an area of low environmental sensitivity may have overall a less significant impact than a small sub-component in a highly sensitive environment. The combination of these two criteria in a matrix will better indicate the potential significance or severity of environmental impacts. The significance threshold matrix below produces a combined rating as significant, moderate, slight or negligible, based on a final score.

**Table S12-1: The Significance Threshold Screening Matrix**

<b>Magnitude of Change caused by Proposal</b>	Large	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)	Moderate/ Significant Impact (EIA/AMDAL)	Significant Impact (EIA/AMDAL)
	Intermediate	Slight / Moderate Impact (IEE/UKL/UPL)	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)	Moderate/ Significant Impact (EIA/AMDAL)
	Small	Slight Impact (IEE/UKL/UPL)	Slight / Moderate Impact (IEE/UKL/UPL)	Moderate Impact (EIA or IEE/AMDAL or UKL/UPL)
	Negligible	Negligible Impact (no EA needed*)	Negligible Impact (no EA needed*)	Negligible/ Slight Impact (IEE/UKL/UPL)
		Very Low to Low	Medium	High to Very High
	<b>Ecosystem Sensitivity To Change</b>			

\* Corresponding to ADB category C for projects not involving physical works

4. For individual subprojects that would require only UKL-UPL (EMP), i.e. falling under the national threshold criteria for full AMDAL, the IA is allowed to adopt a report format of their choice as long as five key environmental information sets are included as outlined in Ministry of Environment Decree No. 82 of 2002. This would mean that the IA could use an ADB formatted sector-wide IEE document such as the one presented here and submit it with some modifications and translated into Bahasa Indonesia to satisfy national environmental assessment requirements for UKL-UPL. This would facilitate the environmental compliance process by shortening it substantially, given that the overall goal of this project is to improve sanitary and environmental conditions with expected overall positive environmental impacts. This provides opportunities to reduce duplication and volume of environmental assessment reporting to satisfy both ADB and national standards and has the potential to substantially reduce the timeframe needed ("One Environmental Assessment satisfies Two Standards (ADB/GOI)"). The consultant encourages this approach, which has been successfully applied by the ADB Earthquake and Tsunami Emergency Response Project (ETESP) in Indonesia.

5. Based on the findings of the environmental screening with REA checklists and matrix, all proposed sub-components were assigned in one of the following environmental assessment categories:

- Category A: Projects that could have significant adverse environmental impacts. An Environmental Impact Assessment (EIA) is required.
- Category B: Projects that could have some adverse environmental impacts, but of a lesser degree or significance than those for category A projects. An Initial Environmental Examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is

not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects are categorized as “C” if they are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

Category FI: Projects are classified as category “FI” if they involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all sub-components will result in insignificant impacts.

6. Classification is an ongoing process and the category can be changed (with the approval of the Bank’s Chief Compliance Officer) as the project develops and more information becomes available. This IEE covers all proposed sub-components that were assigned the Category B, which includes the majority of proposed physical works. There will be no additional sub-components after loan approval. All proposed Category B sub-components have been further assessed in this IEE in a city-wide approach, as they are generally within the city’s boundaries and of a similar nature. The project will not include any Category A sub-components.

## **1.2 Purpose of the Initial Environmental Examination (IEE)**

7. The purpose of this IEE report is to:

- (i) Describe the proposed sub-component interventions;
- (ii) Describe the baseline environmental and socioeconomic setting of the sub-component study area;
- (iii) Undertake a screening to identify proposed sub-component interventions that may result in significant environmental impacts;
- (iv) Predict and assess characteristics and magnitude of impacts for those interventions identified in the screening that may result in negative potential impacts;
- (v) Recommend appropriate mitigation measures to minimize negative potential impacts, and predict and assess residual impacts
- (vi) Present an environmental management plan that facilitates mitigation implementation, monitoring and reporting, and;
- (vii) Describe the public consultation process undertaken.

8. For proposed sub-components that are exceeding GoI AMDAL scale thresholds (e.g. total length/ area for new sewer lines per city), a full AMDAL is mandatory, even for minor physical works, such as secondary or tertiary drainage construction. These sub-components may cause significant, but temporary environmental and socio-economic impacts, mainly during construction.

## **2. DESCRIPTION OF THE PROJECT**

### **2.1 Existing Conditions**

9. Yogyakarta City is the capital city of Yogyakarta province and covers a very small area (32.3 km<sup>2</sup>) with extremely high density and mobility, and requires immediate, appropriate, and sustainable services. One of the most urgent services needed is sanitation.

10. Yogyakarta is a typical big city with complicated social problems, related to urban settlements, especially sanitation. However, limited budget allocations have not allowed the city to improve the sanitation sector. In addition, sanitation has not been handled by a directly

responsible institution. Meanwhile, public understanding of sanitation is also extremely low. Their behavior and poor sanitation management due to a capacity gap in hygienic life style are evidence of this limited understanding, which makes the urban sanitation condition even worse.

11. Basic data on environmental health facilities in each subdistrict in 2006, it was revealed that there are 39,204 private dug wells and 1,728 public dug wells. From the sampling test of sanitation inspection of 19,714 dug wells in 2006, those in risk for moderate to high-level pollution accounted for 49.51%. The risk occurs due to groundwater pollution from wastewater discharge system, which does not meet health requirements. The geographical condition of Kota Yogyakarta also contributes to the spread of groundwater pollution from north to south, therefore Kota Yogyakarta should bear the pollution load, which flows, from Kabupaten Sleman.

12. **Domestic wastewater management.** Some households (HH) are served with the centralized sewer system (off-site) and others with on-site system, both individual and community based. The centralized system with new pipeline serves about 10,000 house connections, while those not covered by the centralized piped wastewater system are served by community based sanitation systems. At present there are 43 units which serve in the range of 50–100 HHs each.

13. Since January 1996, Kota Yogyakarta has built a city scale centralized sewer system, which was built with a JICA grant, APBN and APBD-Provinsi at a total cost of Rp. 68 billion. This system consists of a network of lateral pipes, main pipes, and a wastewater treatment plant (WWTP) located in Sewon. The sewer system is designed to cover about 1,250 ha service area for about 18,420 connections (17,330 house connections, and 1,090 other connections), including the area of Kota Yogyakarta, and parts of Kabupaten Bantul and Sleman. WWTP Sewon is located in Kabupaten Bantul, about 6 km southwest of Kota Yogyakarta.

14. Almost all subdistricts in Kota Yogyakarta have a wastewater network, excluding Kecamatan Kotagede and Kecamatan Wirobrajan.<sup>1</sup> The number of existing connections is about 10,000, serving about 50,000 persons or 11% of the total urban population.

**Table S12-2: Profile of Wastewater Service of Yogyakarta Urban Agglomeration (GYA)**

No.	Description	2002	2010
1	Total Population of GYA (persons)	1,458,039	1,513,648
	Number of population served (persons)		
	- centralized WWTP system	53,285 (4%)	96,910 (6%)
2	- communal system	2,520 (0.2%)	5,145 (0.34%)
	- individual system (pit latrine with septic tank, etc)	397,000 (27%)	399,000 (33%)
	- has not been served (pit latrine without septic tank, into river, etc)	1,005,234 (69%)	1,012,593 (67%)

Source: YUDP Analysis

15. **Capacity of Sewon WWTP.** The WWTP is operated with high treatment efficiency (95%), but the number of users is below its design capacity. The capacity of Sewon WWTP utilized is about 50% of its design capacity, namely 9,700 users instead of 18,400 users. It is planned to gradually increase the coverage by 2012 when it is expected to serve 59% of the urban area of Kota Yogyakarta or 273,000 persons.

<sup>1</sup> Kecamatan Mergansan has the largest wastewater network (30.4 km); followed by Kecamatan Kraton (26.2 km); and Kecamatan Jetis (20.6 km).

**Table S12-3: Service Area of Sewon WWTP**

Service Area	Unit	2002	2012
1. Width of city	Ha	3,257	3,257
2. Sanitation service	Ha	1,330	2,433
- Housing		1,112	2,133
- Non housing		218	300
3. Total urban population	Person	436,294	468,975
4. Number of population served		110,000	273,000
5. house connection unit		21,090	53,505
- house connection		17,330	42,650
- non house connection		4,300	10,855

16. **Communal systems.** For communities that live beyond the coverage of the pipe wastewater service, especially those who live on the floodplain, wastewater treatment is served through community based systems. Since 1997 43 units have been built each serving 50-100 HHs. Location of the plants is in Table S12-4.

**Table S12-4: Communal WWTPs in Kota Yogyakarta**

Subdistrict	# Units	Population Served	Built in
Mantrijeron	1	285	2005
Mergangsan	3	700	1997, 2005
Umbulharjo	7	2,010	2005
Kotagede	3	550	2003, 2004, 2005
Gondokusuman	1	160	2005
Danurejan	3	610	2004, 2005
Pakualam	1	285	2005
Gondomanan	1	185	2005
Ngampilan	4	1,290	2001, 2005
Wirobrajan	7	1,620	2003, 2004, 2005
Gedongtengen	2	460	2005
Jetis	5	1,285	2005
Tegalrejo	5	1,205	2005
<b>TOTAL</b>	<b>43</b>	<b>10,645</b>	

Source: DLH Kota Yogyakarta, May 2007

17. Based on routine monitoring carried out by DLH Kota Yogyakarta, from the 43 communal WWTPs built, 36 units are functioning. The total population served by communal system is about 2,129 HHs or about 10,645 persons in 13 *kecamatan*.

18. Methods for communal WWTP development by the Kota Yogyakarta Dept. of Environment:

- Funding assistance amounting to Rp. 104 million is given to Subdistrict Community Empowerment Organizations (LPMK).
- Communities contribute share funding around Rp. 10–20 million towards the construction of 1 communal WWTP. Sharing will be in the form of (i) land, (ii) pipe connection from houses to main pipes, and (iii) labor.

- The technology used is the Dewats Technology (Decentralization Water and Sanitation).
- O&M costs are borne by users at a tariff of Rp 1,500-5,000 per HH.
- O&M costs are needed to pay for: (1) 2 staff to clean debris from screen chambers once every 2 weeks, and (2) 60% is used for staff salary, and 40% for savings and repairs.
- The Department of Environment will conduct inspections every three months and monitor the quality of water by taking and testing samples from the inlet and outlets once every year.
- Selection of location and technology to be used is determined in consultation with the community and according to conditions of available land.
- The Department of Environment prepares standard operating procedures (SOP) and training for implementation during the evening and separated between men and women participants, for a period of 9-11 meetings.
- Physical construction to be implemented by the community under the supervision of the Dept. of Environment and NGO. There are 4 NGOs currently cooperating with the Dept. of Environment.
- Criteria for communal system design include: (i) radius of service coverage of 200-400m; (ii) serving 30-50 houses/units; (iii) retention time of 8 hours; (iv) BOD capacity of 46 gr/person/day; and (v) 70% WWTP efficiency.

19. **On-site systems.** Communities which have not been served by the piped system generally use on-site systems such as pit latrine with septic tank or pour-and-flush. From 53,073 HHs visited, 47,360 HHs do not have any wastewater treatment system. From sanitation inspection sampling of 3,829 houses in 2006, 860 houses do not have a wastewater discharge Channel (SPAL), and 2,332 houses have SPAL which does not meet health requirements.

20. There are several industries discharging their wastewater into the piped sewerage system, especially from home industries such as screening, printing, *batik*. DLH conducts periodical monitoring - monthly, quarterly, and annually. Some large industries such as dairy, textile, and leather, pre-treat the industrial wastes and routinely report to DLH.

## 2.2 Proposed Main Works

21. As mentioned, the City Sanitation Strategies (CSS) included a list of proposed sub-components for Kota Yogyakarta, of which proposed infrastructure development for sewerage forms the major part of the physical works. This IEE has been prepared concurrently with final SPAR documents being readied for each proposed sub-component, and reflects the status of the SPAR documents as per 30 June 2009.

### Infrastructure Development for Sewerage

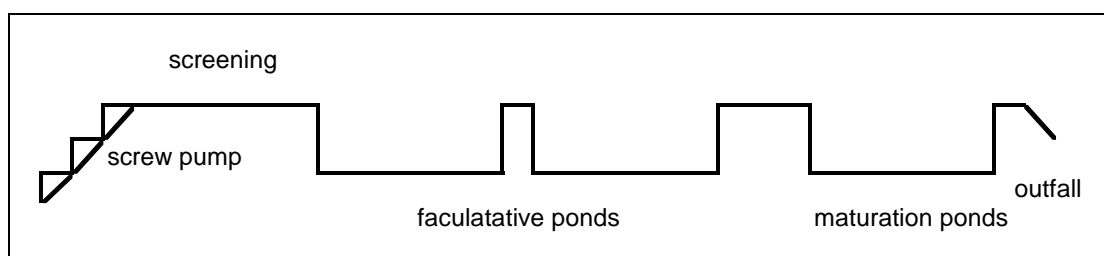
22. **Off-site sewerage.** The sewerage system development is based on the technical design for city scale sewage according to the detailed drawings (DED) and plans. The system development is implemented according to the sewerage system master plan in the Kota Yogyakarta Agglomeration plan, i.e. the area coverage expansion plan for the east of Kali Code and west of Kali Gajahwong. Specific activities include:

- Installation of main and lateral sewers, manholes, road crossing drains, concrete and PVC pipelines.
- Supply and installation of 12,600 house connections, of which 8,600 in Kota Yogyakarta and the remainder in the neighboring *kabupaten* of Sleman and Bantul (which, in 2009, are already installing a total of 2,070 sewer connections).
- Rehabilitation of tertiary sewers.

- Improve maintenance of sewerage systems (desludging) in each sector by effecting sludge removal.

23. **Sewon WWTP.** The WWTP at Sewon includes, inlet works: 3 archemedian screws; screening and screenings removal; two parallel streams of two facultative ponds (with aeration) followed by maturation ponds and outfall. Sludge is sucked from the base of the facultative ponds at approximately six monthly intervals and transferred to sludge drying beds. The Sewon WWTP runs at around 10% of capacity. In spite of the long transfer distance the sewage entering at the inlet works had a mild sewage smell without trace of septicity. It is conjectured that upstream arrangements that introduce flushing water dilutes raw sewage with river water increasing volume flowing to the WWTP while reducing sewage strength. Given the high dilution and a plant running under capacity effluent standards should be met under the current loadings. In the longer term achievable standards on a sliding scale for the increasing loads as areas come on line should be considered. This sub-component will involve replacement of electro-mechanical equipment.

**Figure 1: Schematic drawing of current treatment process at Sewon WWTP**



24. **Community-based sanitation.** This component consists of the following subprojects:

**Construction of communal sanitation facilities**

- 259 communal septic tanks
- public toilets (*MCK umum*) for households, and water supply for 45 units

**Other**

- Optimization of commercial 20 WWTPs
- construction of communal WWPTs in two locations (to be identified)

**Table S12-5: Proposed Sub-Components for Infrastructure Development in Kota Yogyakarta**

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
<b>1. Community-based Sanitation</b>				
Construction of communal WWTP, including MCKs - Sanimas	45	Unit	406	18,270
Construction of communal WWTP, including MCKs - other	2	Unit	250	500
Optimization of commercial WWTP	20	Unit	40	800
Construction of communal septic tank, including water purification	259	Unit	42	10,878
<b>2. Infrastructure development for sewerage</b>				
Preparatory works (new development, Sleman)	8,630	meter	0.03	257
Installation of secondary pipes, dia. 200 mm (new development, Sleman)	1,124	meter	0.38	427
Construction of manholes (new development, Sleman)	28	unit	11.72	328
Installation of primary pipes, dia. 300 mm (new development, Sleman)	6,441	meter	0.56	3,630
Installation of primary pipes, dia. 400 mm (new development, Sleman)	1,005	meter	0.75	755
Construction of manholes (new development, Sleman)	323	unit	11.72	3,786
Installation of house connections (new development, Sleman)	1,340	unit	2.00	2,680
Construction of pipe jacks (new development, Sleman)	60	meter	7.20	432
Construction of manholes at road crossings (new development, Sleman)	4	unit	11.72	47
Construction of chambers (new development, Sleman)	646	unit	1.12	724
Construction of pavement (new development, Sleman)	8,630	meter	0.33	2,861
Preparatory works (new development, Bantul)	4,291	meter	0.03	128
Installation of primary pipes, dia. 200 mm (new development, Bantul)	168	meter	0.38	64
Construction of manholes (new development, Bantul)	3	unit	11.72	35
Installation of secondary pipes, dia. 400 mm (new development, Bantul)	4,056	meter	0.75	3,047
Construction of manholes (new development, Bantul)	88	unit	11.72	1,031
Installation of house connections (new development, Bantul)	730	unit	2.00	1,460
Construction of pipe jacks (new development, Bantul)	67	meter	7.20	482
Construction of manholes at road crossings (new development, Bantul)	2	unit	11.72	23
Construction of chambers (new development, Bantul)	176	unit	1.12	197
Construction of pavement (new development, Bantul)	4,291	meter	0.33	1,422
Preparatory works (Package 1, Yogya)	40,000	meter	0.03	1,189

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Installation of secondary pipes, dia. 300 mm (Package 1, Yogya)	40,000	meter	0.56	22,540
Construction of manholes (Package 1, Yogya)	2,288	unit	11.72	26,815
Construction of chambers (Package 1, Yogya)	4,575	unit	1.72	7,869
Construction of pavement (Package 1, Yogya)	40,000	meter	0.33	13,259
Preparatory works (Package 2, Sleman)	8,539	meter	0.03	254
Installation of primary pipes, dia. 300 mm (Package 2, Sleman)	1,281	meter	0.56	722
Installation of primary pipes, dia. 400 mm (Package 2, Sleman)	1,353	meter	0.75	1,016
Installation of primary pipes, dia. 500 mm (Package 2, Sleman)	1,833	meter	0.94	1,721
Installation of primary pipes, dia. 600 mm (Package 2, Sleman)	48	meter	1.13	54
Construction of manholes (Package 2, Sleman)	201	unit	11.72	2,356
Installation of secondary pipes, dia. 300 mm (Package 2, Sleman)	1,921	meter	0.56	1,083
Installation of secondary pipes, dia. 400 mm (Package 2, Sleman)	2,029	meter	0.75	1,525
Construction of pipe jacks (Package 2, Sleman)	75	meter	7.20	540
Construction of manholes at road crossings (Package 2, Sleman)	6	unit	11.72	70
Construction of chambers (Package 2, Sleman)	3,000	unit	1.12	3,360
Construction of pavement (Package 2, Sleman)	8,539	meter	0.33	2,830
Preparatory works (Package 2, Yogya)	20,418	meter	0.03	607
Installation of primary pipes, dia. 300 mm (Package 2, Yogya)	2,735	meter	0.56	1,541
Installation of primary pipes, dia. 400 mm (Package 2, Yogya)	7,230	meter	0.75	5,432
Installation of primary pipes, dia. 500 mm (Package 2, Yogya)	3,404	meter	0.94	3,197
Installation of primary pipes, dia. 600 mm (Package 2, Yogya)	2,845	meter	1.13	3,207
Construction of manholes (Package 2, Yogya)	580	unit	11.72	6,798
Installation of secondary pipes, dia. 300 mm (Package 2, Yogya)	4,103	meter	0.56	2,312
Construction of pipe jacks (Package 2, Yogya)	100	meter	7.20	720
Construction of manholes at road crossings (Package 2, Yogya)	10	unit	11.72	117
Construction of chambers (Package 2, Yogya)	3,045	unit	1.12	3,410
Construction of pavement (Package 2, Yogya)	20,418	meter	0.33	6,768
Preparatory works (Package 3, Bantul)	19,850	meter	0.03	590
Installation of primary pipes, dia. 300 mm (Package 3, Bantul)	18,250	meter	0.56	10,284
Installation of primary pipes, dia. 500 mm (Package 3, Bantul)	1,600	meter	0.94	1,503
Construction of manholes (Package 3, Bantul)	500	unit	11.72	5,860

Sub-Component / Activity	Volume	Unit	Unit Cost (IDR m)	Base Cost (IDR m)
Construction of pipe jacks (Package 3, Bantul)	40	meter	7.20	288
Construction of manholes at road crossings (Package 3, Bantul)	2	unit	11.72	23
Construction of chambers (Package 3, Bantul)	1,000	unit	1.72	1,720
Construction of pavement (Package 3, Bantul)	19,850	meter	0.33	6,580
Rehabilitation of tertiary sewers	3,000	meter	0.43	1,290
Construction of manholes	300	unit	5.50	1,650
Database for the wastewater system (Kec. Gondo Kusuman)	1	ls	100	100
Sewer inventory	1	ls	150	150
Connections inventory	10,000	unit	0.01	100
Installation of house connections (Yogyakarta)	8,570	unit	1.50	12,855
Installation of house connections (Sleman)	3,000	unit	1.50	4,500
Installation of house connections (Bantul)	1,000	unit	1.50	1,500
CCTV for sewer maintenance	1	package	1,000	1,000
Maintenance equipment	1	package	3,100	3,100
Procurement of tractor unit for mobile toilet	1	unit	205	205
Procurement of 3-wheel vehicle	3	unit	22	66
Procurement of sludge truck (replacement)	2	unit	235	470
Procurement of pickup for wastewater treatment	2	unit	150	300
Procurement of mobile toilet	3	unit	130	390
Review of plan for wastewater and DED for priority areas	1	package	1,556	1,556
Social marketing for optimizing communal wastewater treatment plants	30	package	25	750

Table S12-6: Implementation Schedule

No. Activity	2009				2010				2011				2012				2013				2014			
<b>1. Community-Based Sanitation</b>																								
1.1 Social marketing for communal sanitation facilities																								
1.2 Construction of community based sanitation facilities																								
1.3 Social marketing on piped sewerage																								
1.4 Community awareness programs for health and hygiene																								
1.5 Improved knowledge and practices related to health and hygiene																								
1.6 Women are trained to lead community-wide hygiene promotion																								
<b>2. Infrastructure Development for Sewerage</b>																								
2.1 Clarification of institutional responsibilities for O&M of facilities																								
2.2 Topographic surveys and DED for civil works contracts																								
2.3 Tender documents for civil works contracts (sewerage and drainage)																								
2.4 Award of civil works contracts (sewerage and drainage)																								
2.5 Completion of rehabilitation and expansion of off-site wastewater facilities																								
2.6 Completion of construction of new sewerage system																								
2.7 New customer connections to existing/new piped sewerage systems																								
2.8 Procurement of equipment, as required																								
<b>3. Capacity Development and Project Implementation Support</b>																								
3.1 PPMS set up and operational																								
3.2 Baseline survey																								
3.3 Issuing of relevant regulations																								
3.4 Legislation on customer connections to piped sewerage systems																								
3.5 Policies on wastewater tariffs and connection fees																								
3.6 Capacity building and training of sanitation management and O&M staff																								
3.7 Community technical training																								
3.8 Improvement of role of NGOs and private sector in sanitation																								
3.9 Improved accounting, financial management and budgeting systems																								
3.10 Project Implementation Support																								

### 3. DESCRIPTION OF THE EXISTING ENVIRONMENT

#### 3.1 Physical Resources

25. Kota Yogyakarta covers an area of 3,250 Ha or 32.5 km<sup>2</sup> (or 1.0 % of the total area of Yogyakarta province), with the farthest distance from north to south approximately 7.5 km and from west to east approximately 5.6 km. Administratively, Kota Yogyakarta consists of 14 *kecamatan* (subdistrict), 45 *kelurahan*, 614 RW, and 2,523 RT. Most land is allocated for housing, i.e., 2,103 Ha, and there is small part of unoccupied land of 20.2 Ha. Kecamatan Umbulharjo represents the largest subdistrict, i.e., 812 Ha or equal to 25.0% of Kota Yogyakarta, while the smallest subdistrict is Kecamatan Pakualaman with an area of 63 Ha (1.9 % of the total). The area of each subdistrict in Kota Yogyakarta is shown in Table S12-3.1.

**Table S12-7: Administrative Division and Width of Kota Yogyakarta (2006)**

No	Kecamatan	Kelurahan	Area (km <sup>2</sup> )	# RW	# RT
1.	Mantrijeron	1.Gedongkiwo	0.90	18	86
		2.Suryodiningratan	0.85	17	69
		3.Mantrijeron	0.86	20	75
			<b>2.61</b>	<b>55</b>	<b>230</b>
2.	Kraton	1.Patehan	0.40	10	44
		2.Panembahan	0.66	18	78
		3.Kadipaten	0.34	15	53
			<b>1.40</b>	<b>43</b>	<b>175</b>
3.	Mergangsan	1.Brontokusuman	0.93	23	83
		2.Keparakan	0.53	13	57
		3.Wirogunan	0.85	24	76
			<b>2.31</b>	<b>60</b>	<b>216</b>
4.	Umbulharjo	1.Giwangan	1.26	13	42
		2.Sorosutan	1.68	16	63
		3.Pandeyan	1.38	12	46
		4.Warungboto	0.83	9	38
		5.Tahunan	0.78	11	48
		6.Muja Muju	1.53	12	55
		7.Semaki	0.66	10	34
			<b>8.12</b>	<b>83</b>	<b>326</b>
5.	Kotagede	1.Prenggan	0.99	13	57
		2.Purbayan	0.83	14	58
		3.Rejowinangun	1.25	13	49
			<b>3.07</b>	<b>40</b>	<b>164</b>
6.	Gondokusuman	1.Baciro	1.06	21	88
		2.Demangan	0.74	12	44
		3.Klitren	0.68	16	63
		4.Kotabaru	0.71	4	21
		5.Terban	0.80	12	59
			<b>3.99</b>	<b>65</b>	<b>275</b>
7.	Danurejan	1.Suryatmajan	0.28	15	45
		2.Tegalpanggung	0.35	16	66
		3.Bausasran	0.47	12	49
			<b>1.10</b>	<b>43</b>	<b>160</b>

No	Kecamatan	Kelurahan	Area (km <sup>2</sup> )	# RW	# RT
8.	Pakualaman	1.Purwokinanti	0.30	10	47
		2.Gunungketur	0.33	9	36
			<b>0.63</b>	<b>19</b>	<b>83</b>
9.	Gondomanan	1.Prawirodirjan	0.67	18	61
		2.Ngupasan	0.45	13	49
			<b>1.12</b>	<b>31</b>	<b>110</b>
10.	Ngampilan	1.Notoprajan	0.37	8	50
		2.Ngampilan	0.45	13	70
			<b>0.82</b>	<b>21</b>	<b>120</b>
11.	Wirobrajan	1.Patangpuluhan	0.44	10	51
		2.Wirobrajan	0.67	12	58
		3.Pakuncen	0.65	12	56
			<b>1.76</b>	<b>34</b>	<b>165</b>
12.	Gedongtengen	1.Pringgokusuman	0.46	23	89
		2.Sosromenduran	0.50	14	55
			<b>0.96</b>	<b>37</b>	<b>144</b>
13.	Jetis	1.Bumijo	0.58	13	55
		2.Gowongan	0.46	13	52
		3.Cokrodiningratan	0.66	11	60
			<b>1.70</b>	<b>37</b>	<b>167</b>
14.	Tegalrejo	1.Tegalrejo	0.82	12	46
		2.Bener	0.57	7	25
		3.Kricak	0.82	13	61
		4.Karangwaru	0.57	14	56
			<b>2.91</b>	<b>46</b>	<b>188</b>
	<b>TOTAL</b>		<b>32.50</b>	<b>614</b>	<b>2.523</b>

Source: Governance Division of Setda Kota Yogyakarta.

26. **Geographical location.** Geographically, Kota Yogyakarta lies between 110° 24' 19" and 110° 28' 53" East Longitude, and 7° 49' 26" and 7° 15' 24" South Latitude, with average altitude of 114 m above mean sea level. The north part of Kota Yogyakarta has a boundary with Kabupaten Sleman, while to the East it has a boundary with Kabupaten Bantul and Sleman, to the south, it has a boundary with Kabupaten Bantul and to the west with Kabupaten Bantul and Sleman. Scrutinizing from geographical factors, problems in Kota Yogyakarta may come from two main factors: natural and human factors. Natural factors are those inherently available in the region, and beyond human control, such as the geographical position of Kota Yogyakarta, which is near volcanoes and the Indian Ocean. The geomorphology of Kota Yogyakarta gives an advantage, but on the other side, it also causes problems related to natural disasters of earthquakes induced by volcanic and tectonic activities.

27. Kota Yogyakarta, which lies on the slope of Mount Merapi, is relatively flat (between 0-2%) and located at an average elevation of 114 meters above mean sea level (msl). Most of the area, i.e., 1,657 Ha, lies at an elevation less than 100 meters msl and the remaining 1,593 Ha lies at an elevation between 100-119 meters msl.

28. Most of the soil falls into type regosol. There are three rivers that flow from north to south, namely the Gajah Wong River, which flows in the eastern part of the city, the Code River (central part of the city), and the Winongo River (west).

29. **Topography.** Based on its elevation from mean sea level Kota Yogyakarta can be divided into two classes, namely elevation < 100 m and elevation of 100-199 m from mean sea level. Elevation of < 100 m from mean sea level covers 1,657 ha area or 52% of the region in Kecamatan Mantriweron, Kraton, Mergangsan, Umbulharjo, Kotagede, Gondomanan, Ngampilan, and Wirobrajan. Elevation of 100-119 m from mean sea level covers 1,593 Ha area or 48% of the region in Kecamatan Mergangsan, Umbulharjo, Kotagede, Gondokusuman, Danurejan, Pakualaman, Gondomanan, Ngampilan, Wirobrajan, Gedong-Tengen, Jetis, and Tegalrejo.

30. **Climate.** In general, the highest average rainfall during 2006 occurred in March, i.e., 387.5 mm and the lowest occurred in June to September, i.e., 0 mm. The average raining days per month was 11.08 days and average temperature 27.8°C, and quite high average humidity occurred in March, i.e., 87% and the lowest humidity occurred in June to September, i.e. 72%. In general the wind blows the monsoon wind, and during the rainy season the wind blows south west at direction of 240° with wet characteristics and triggers rain, during the dry season blows south east monsoon wind which is relatively dry at direction of  $\pm 90^\circ - 140^\circ$  with average speed at 2-3 knot/hour.

31. **Land use.** Land use is differentiated according to its types covering housing, services, commercial, industries, agriculture, vacant land (DPK) and others. Dominant land use for Kota Yogyakarta in 2005 is for housing. Refer to Table S12-8 for a detailed overview.

**Table S12-8: Land Use Based on Land Allocation in 2005 in Kota Yogyakarta**

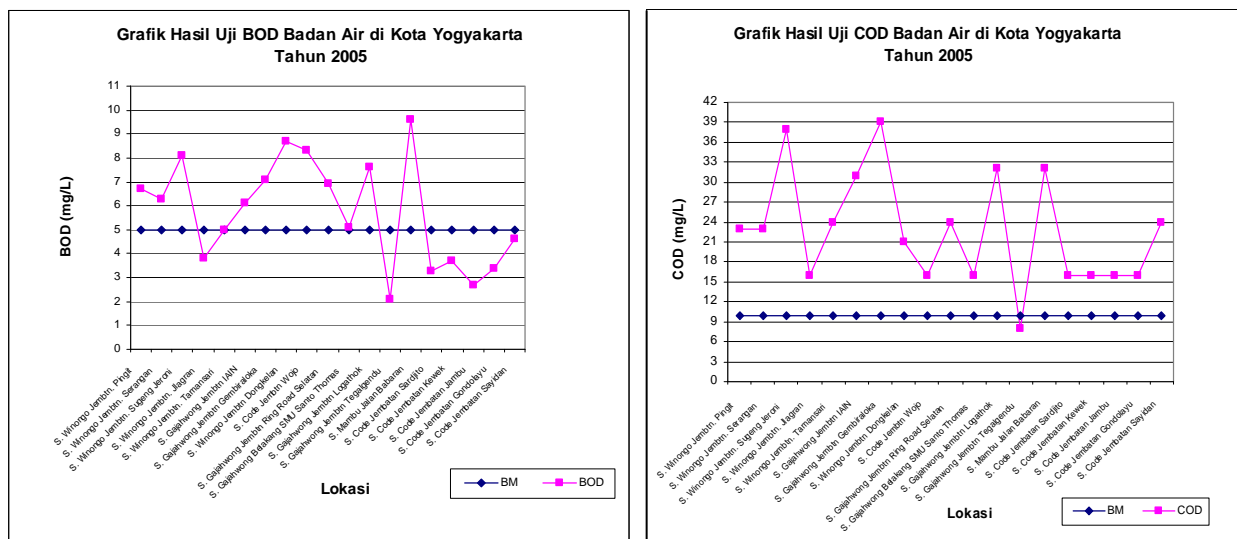
No	Subdistrict	Type of Land Use (Ha)							Total
		Housing	Services	Business	Industry	Agricult.	Empty	Other	
1	Mantriweron	200	9	12	0.5	5	0.1	33	261
2	Kraton	104	11	8	-	-	-	15	140
3	Mergangsan	156	15	19	2	6	0.2	31	231
4	Umbulharjo	509	52	35	17	80	16	105	812
5	Kotagede	222	9	16	10	18	1	30	307
6	Gondokusuman	228	69	58	6	0	0.4	36	399
7	Danurejan	50	16	30	0.3	-	-	12	110
8	Pakualaman	35	11	6	0.3	-	0.3	10	63
9	Gondomanan	47	29	21	2	-	-	11	112
10	Ngampilan	62	3	4	-	-	0.5	11	82
11	Wirobrajan	136	7	14	0.6	0.6	-	16	179
12	Gedongtengen	67	4	14	-	-	-	11	96
13	Jetis	106	18	22	3	-	0.5	19	170
14	Tegalrejo	184	18	8	1	29	0.7	40	291
	<b>TOTAL</b>	<b>2,100</b>	<b>274</b>	<b>273</b>	<b>52</b>	<b>138</b>	<b>20</b>	<b>388</b>	<b>3,250</b>

Source: Yogyakarta City Land Office, based on land use status.

32. **Surface water quality.** The results of surface water testing in several rivers in Kota Yogyakarta, i.e., Winongo River (6 points), Gajahwong River (6 points), Code River (6 points), and Mambu River (1 point) in 2005 showed a varied and fluctuating result for each parameter. For example, the parameter for dissolved residue for all sampling locations shows a result below the minimum required quality standard. Similarly for Ammonia (NH<sub>3</sub>-N), Iron (Fe), Fluoride (F), Chloride, Manganese (Mn), and Nitrate for all locations show values below the environmental quality standard. Meanwhile, detergent, BOD, COD, dissolved oxygen (DO), and nitrate in several locations exceeded the quality standard.

33. High detergent concentration in five sampling points (Winongo River of Jalagran Bridge, Winongo River of Dongkelan Bridge, Code River of Kewek Bridge, Code River of Jambu Bridge, Gajahwong River of Tegalendu Bridge) is caused by many MCK (communal bathing, washing, and flushing facility) which produce domestic waste in the form of floor drain from bathing and washing in the five dense populated areas. The high discharge of domestic waste also causes nitrate concentration in two locations (Winongo River of Dongkelan Bridge and Gajah Wong River of Ring Road Bridge) to exceed the quality standard.

34. Meanwhile for the parameters BOD, COD, and DO, generally in all sampling locations they exceed the allowable threshold value of the quality standards. Since the three parameters represent chemical pollution indicators for surface water, it is considered that in all the rivers (surface water) sampled almost all show surface water pollution, from low to high levels.



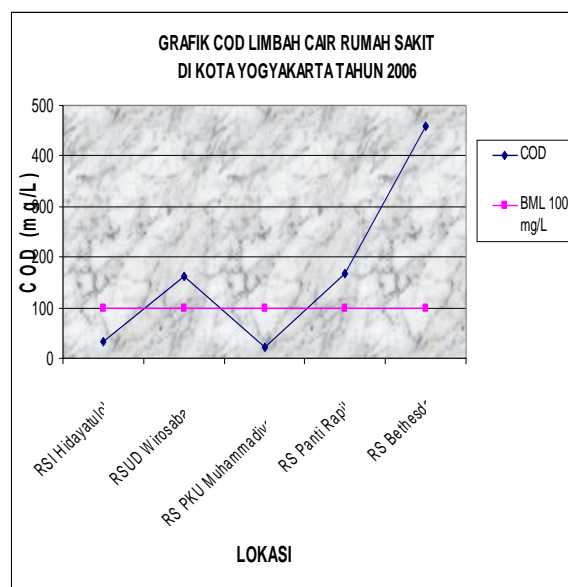
35. In general, groundwater/well quality monitored in 12 locations in Kota Yogyakarta in 2005 show a relatively good condition, except for several parameters such as nitrate, which is quite high in several locations such in Pasar Demangan. The high iron and manganese concentration is presumably related to the location of wells or groundwater near to old rice farms, which usually contain high iron concentration groundwater. Other parameters such as sodium, chloride, pH, TDS, nitrite, sulphate, all are below the threshold value allowed for water supply.

36. In 2006 there was carried out testing of groundwater and wells by measuring several key parameters of groundwater and wells such as aluminum, cadmium, mercury (Hg), sulphate, nitrate, etc, and organoleptic parameters such as odor, taste, color, etc. Almost all tests carried out showed results below the disturbing threshold value, both directly and indirectly, except for Hg (mercury), which was identified at an alarming level (in wells and groundwater, it is not allowed any Hg). From the measuring at four points (of five tested points) the concentration of Hg was in the range of 0.0003-0.0008 mg/L. It is not identified the source of the mercury contamination. However, in general this element is rarely identified in wells except if it is directly exposed (such as due to oil drilling at certain depths/ above 2,000 m) or due to infiltration from rivers or discharge of liquid waste into wells.

37. **Wastewater.** In 2005, the performance of liquid waste treatment was monitored from 6 hospitals and 1 health laboratory. From the monitoring it was shown that only 1 hospital (Happy

Land) adequately treats liquid waste, resulting in no parameters which exceed the quality standard. Meanwhile for the other 5 hospitals and health laboratory, it showed that 1-3 parameters exceeded the quality standard, generally for BOD, COD, TSS, PO<sub>4</sub> and ammonia. However, they do not exceed the range too high. This condition can be corrected by improving the performance of WWTPs and liquid waste treatment systems of the hospitals. Another thing to be taken into account, disposal of medical waste not only imposes a physical-chemical hazard, but it also harmful for its infectious and nosokomial characteristic, therefore it may spread diseases through water media.

38. In 2006 monitoring, the performance of liquid waste treatment was monitored from 15 medium and large hotels, 6 malls and shops, 2 industries and 3 large restaurants. From the monitoring it was shown that almost all locations identified inadequately treat liquid waste for almost all parameters tested, namely BOD, COD, detergent, and TSS, except for pH. This shows that the tourism sector becomes one of the main contributors for PAD (locally driven revenue) for Kota Yogyakarta, which generates side effects in the form of pollution from discharge of domestic liquid waste. If this liquid waste is directly discharged into surface water without adequate treatment, it is understood that high concentrations of BOD, COD, TSS and ammonia in rivers in Kota Yogyakarta, among others come from hotels, malls, industries, and restaurants.



### 3.2 Ecological Resources

39. **Terrestrial ecosystem.** Kota Yogyakarta as a Metropolitan has a very high degree of urbanization and physical development. Very limited ecological resources can be expected around the city. Sub-components within the city boundaries are likely to be located in areas of low ecological sensitivity. Outside of city area, such as at the locations of the WWTP (IPAL Sewon) and FDS (FDS Piyungan), a more rural environment is found. At some abandon land and at some public park, hence the wild vegetation contains more than 100 species, consisted of liana and herbs, small plant type and big plant type (trees).

40. Along the main roads of Kota Yogyakarta, type of flora founded was generally consisted of shading and reforestation plants and some of them were ornamental plants. Such as Angsana (*Pterocarpus indicus*), Mahoni (*Swietenia mahogany*) and some species of Cemara (such as: *Thuja orientalis*, *Cupressus sempervirens*, *Casuarina equisetifolia*). In general this plants are suites with its tropic ecosystem. Some of these big and shady plants were heritage from colonial era and should maintain and paid attention such as Tamarind Trees (*Tamarindus indicus*) and Beringin Trees (*Ficus benjamina*), Kihujan (*Samanea saman*) around Keraton and along the street I Dewa Nyoman Oka westside.

41. In location of along the riverbanks (Kali Code, Kali Opak dan Kali Gajah Wong), the floral type consisted of plant that is usually riparian or cultivated like kaso (*Sacharum spontaneum*), tebu (*Sacharum officinarum*), banana (*Musa paradisiaca*), mango (*Mangifera foetida*, *Mangifera indica*), Jarak kosta (*Ricinus communi*), Mengkudu (*Morinda citrifolia*), Alang-alang (*Imperata*

*cilyndrica*) etc. In location of house-yard, result of observation covers all good plant types exploited by resident. In general, plants and trees observed exploited by resident as shading trees, ornamental plant (most popular and a very expensive *Caladium* and famous *Anthurium* growing well here), fruits and medical plant were found as well.

42. Due the degree of urbanization in Yogyakarta City, very limited ecological resources have been identified: Sub-components within the city boundaries are likely to be located in areas of low ecological sensitivity.

43. **Aquatic biology.** Due to rampant water pollution, a reduced biodiversity in rivers can be expected. At point of sampling at Kali Code riverbank 5 genera plankton, covers 1 zooplankton genus and four genera phytoplankton were detected. Condition of surface water body tends to have the character of outotrof. At a second point of sampling two genera zooplankton and one genus phytoplankton were detected. This condition tends to have the character of heterotroph.

44. **Wildlife.** The Project activity areas have been developed, with limited natural wildlife remaining within these areas.

45. **Forest.** The Project activity areas have been developed, with no or little natural forests remaining within these areas.

46. **Rare or endangered species.** No data on rare or endangered species were available. However, it can be assumed that rare or endangered species found in the city are transient and potentially part of an illegal trade with protected species.

47. **Protected area.** There are no known protected areas at or nearby project activity areas.

### 3.3 Economic Development

48. From 2004 to 2005, the economy of Kota Yogyakarta increased in real terms by about 4.9%, which was slightly lower than the growth recorded in the previous year (5.1%). Increasing economic growth occurred in financial, rental and service, trade and services, with annual growth rates of 7.5%, 6.2% and 2.5%, respectively. In 2005, mining and quarrying and agriculture decreased by 34.8% and 11.8%, respectively. Decreasing agricultural land and the limited land available for the sector contributed to this decline. Also in 2004 and 2003, these sectors recorded negative growth rates.

**Table S12-9: Economic Growth in 2000 Constant Prices, 2003-2005 (% p.a.)**

Sector	2003	2004	2005
Agriculture	-5.64	-13.96	-11.79
Mining/Quarry	-24.13	-9.95	-34.77
Processing Industries	4.49	1.56	2.38
Electricity, Gas, and Water Supply	6.94	4.56	5.30
Building	7.88	11.20	7.14
Trade	6.08	4.93	6.24
Transportation and Communication	8.14	13.93	5.20
Finance, Rental & business services	2.90	2.71	7.50
Services	1.67	0.90	2.46
<b>All Sectors</b>	<b>4.76</b>	<b>5.05</b>	<b>4.88</b>

Source: BPS Kota Yogyakarta

### 3.4 Socio-Cultural Resources

49. **Population.** Based on registration in 2006, total population of Kota Yogyakarta in 2006 was 523,191 persons, consisting of 268,780 males and 254,411 females. In that year, the composition of the population based on gender was 51.37% male and 48.63 % female.

50. The male population is greater if compared with the female population. It is shown by sex ratio greater than 100, namely 105.63%. If seen for period 2001 to 2006, population growth of Kota Yogyakarta is always positive, though it is relatively small increment. For 2005 and 2006 population growth of Kota Yogyakarta consecutively was 0.97% and 0.80%.

51. In 2006, Kecamatan Gondokusuman represented the most populated subdistrict in Kota Yogyakarta, namely 75,803 persons, or 14.5% of the total population, while on the second rank was Kecamatan Umbulharjo of 74,347 persons (14.2% of the total). The least populated subdistrict was Kecamatan Pakualaman with a population 15,118 persons, or less than 3% of the total population of Kota Yogyakarta.

52. The subdistrict with the highest population density is Kecamatan Ngampilan (29,074 person/km<sup>2</sup>). This subdistrict covers an area of 0.82 km<sup>2</sup> and is inhabited by 23,841 persons. The subdistrict with the lowest population density is Kecamatan Umbulharjo (9,156 persons/km<sup>2</sup>). Although it is the second most populated subdistrict, it covers a large area (8.12 km<sup>2</sup>), so that its population density is low. Conversely, Kecamatan Ngampilan has a relatively large population but a small area, resulting in a high population density.

53. The uneven population distribution needs to be considered since it relates to an imbalanced carrying capacity between the kabupaten and city. For that reason, a more even distribution is required, from densely populated areas to less densely populated ones.

54. Historically, Kota Yogyakarta has had the highest population density in the province of Yogyakarta. In 2006, the population density in Kota Yogyakarta reached 16,098/km<sup>2</sup>.

55. **Public health.** The public awareness level for clean and healthy life style is quite high, which is shown by the high community participation in implementing cleansing programs in the neighborhoods such as self-waste sorting, and the established health cadres at neighborhood level. However, the health problem in Kota Yogyakarta still requires serious efforts, among others the high prevalence of communicable diseases such as DBD (dengue fever), lung tuberculosis, and other infectious diseases and increasing degenerative diseases.

- High prevalence of DBD, which is still above the national level;
- Increasing lung tuberculosis patients/prevalence, though it is still below national and provincial standards/targets;
- Increasing number of infants with poor nutrition status, which is still above the national standard;
- Mortality caused by stroke represents the highest number of top 10 of mortality causes.

56. From almost all the communicable diseases observed, Incident Reported (IR) rates are below the standard, except for DBD, which is far above the standard. However, for lung tuberculosis it tends to increase, though it remains below the national IR. This happens due to the active participation of the government and private hospitals, and cases of treatment.

**Table S12-10: Reported Incidence of Communicable Diseases Observed  
Kota Yogyakarta in 1998-2004**

No	Incidence (per 1000)	YEAR						
		1998	1999	2000	2001	2002	2003	2004
1	Tuberculosis	0.54	0.33	0.41	0.41	0.29	1.6	1.7
2	PD3 I :							
	Diphthery	0	0	0	0	0	0	0
	Measles	0.42	0.34	1.20	1.54	1.32	0.87	0.34
	Pertusis	0	0	0	0	0	0	0
	Tetanus	0	0	0	0	0	0	0
	Polio	0	0	0	0	0	0	0
3	DIARRHEA	18.03	17.82	24.68	26.89	15.54	14.98	24.1
4	ARI (%)	1.34	1.91	1.95	2.51	0.13	1.11	0.7
5	DBD	3.41	0.61	1.13	1.20	0.74	0.99	1.3

Source: LB1 LBRS Dinas Kesehatan Kota Yogyakarta

57. The health status in Kota Yogyakarta can be seen from indicators among others, infant mortality per 1,000 surviving births, under five children mortality per 1,000 surviving births, maternal death per 100,000 surviving births, average life expectancy and nutrition status.

**Table S12-11 : Public Health Status of Kota Yogyakarta in 2005**

No	Public Health Status	Kota Yogyakarta	DIY	National
1	Infant mortality per 1,000 KH	3.57	15.53	40
2	Under five children mortality per 1,000 KH	0.14	45	58
3	Maternal death per 100,000 KH	164.41	110	150

Source: Data W2K.Ka.RS/Pusk KH = surviving birth

58. One of the indicators to achieve expected health status is nutrition status. It shows an increase in 1999 to 2001 and decrease of 0.24 in 2002. KEK pregnant mother indicator use LILA < 23.5 cm data from *puskemas*. One of the impacts of KEK pregnant mother and pregnant mother anemia is Under Weight Infant (BBLR); BBLR Kota Yogyakarta is 3.4%, while the national standard is < 5 %.

59. The number of maternal death in 2005 was nine persons. This figure is higher compared with that in 2004 (five persons). Meanwhile, in 2005 infant mortality was recorded for one person, whereas in 2004 seven such cases were recorded. The number of poor nutrition in 2005 was 570 persons and in 2004 was 582 persons or decrease of 2.06%, therefore this figure represents one of the successes of Kota Yogyakarta in minimizing poor nutrition among children younger than five years.

60. Life expectancy in Kota Yogyakarta in 2005 for males was 66.38 years, while for females it was 70.25 years. Mortality index for infants is 3.57 per 1,000 surviving births, mortality index for under five children is 0.14 per 1,000 surviving births, and maternal death is 141 per 100,000 surviving births. Good nutrition index in 2005 reached 83.29%. Prevalence index for lung tuberculosis is 222 per 100,000 population, index for measles is 313 visits, and index for diarrhea is 10.38%, index for acute respiratory infection (ARI) is 25,801 visits and index for dengue fever is 20 per 100,000 population.

**Table S12-12: Nutrition Status of Under-Five Children and Pregnant Mothers, 2001-2005**

No	Nutrition Status	Standard (%)	2001	2002	2003	2004	2005
1	Poor	< 1	1.43	1.44	0.92	1.16	1.2
2	Less	19	11.27	10.80	12.00	10.88	9
3	Good	80	84.33	83.89	83.10	84.92	83.29
4	Better	0	2.97	3.87	3.98	3.03	6.51
5	Pregnant mothers	< 10	21.46	25.04	21.98	22.38	22.28
6	Pregnant mothers (anemia)	< 15	17.80	10.42	12.61	17.09	42.8

Source: Seksi Kesga Kota Yogyakarta.

#### **4. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

61. Based on the environmental screening of project components and interventions using ADB Environmental Assessment Guidelines (2003, the sub-component activities are assessed based on the individual Rapid Environmental Assessment (REA). Checklists and a screening matrix for sanitation projects is shown in **Annex 3**. This chapter only discusses environmental impacts of physical subprojects included in the SPAR of 30 June 2009 (community-based sanitation and piped sewerage only).

##### **4.1 Baseline (Without Project Option)**

62. The no action option would mean that the non-existing or inefficiently operated sanitation systems will continue to cause environmental damage and public health risks.

##### **4.2 Environmental Impacts and Mitigation Related to Project Location**

63. Most sub-components are located within the highly urbanized city boundaries and linked to existing urban infrastructure. These are generally areas of low ecological sensitivity due the high degree of disturbance, thus potential adverse impacts would be minor and likely linked to the construction phase. Project locations further outside the urban centres may experience moderate to significant impacts on community livelihood (e.g. farming) and other environmental services (e.g. water supply from groundwater). The need for relocation of local communities has not been identified at this stage. A Resettlement Framework in line with ADB standards has been drawn up, in the unlikely event that resettlement issues would arise.

##### **4.3 Environmental Impacts and Mitigation Related to Project Design**

64. It is assumed that the intended designs of the proposed sub-components will improve current sanitation systems. Existing systems are only partially available, or they are lacking components and are not fully functional. A potential source of negative environmental impacts are sub-standard DED, e.g. for overly complex designs that are susceptible to operational and maintenance problems. A lack of environmental specifications for contractors in bidding documents and environmental clauses for construction contracts may lead to insufficient provisions of environmental mitigation measures during the construction process. It will be a mandatory requirement to make EMAP tables part of the tender documents with costing required by bidders for EMAP/sub-component implementation.

#### 4.4 Environmental Impacts and Mitigation Related to Construction

65. **Physical impacts.** A large number of proposed sub-components involve the construction or repair/up-grade of existing sewer lines with a great deal of commonality in the construction methods. Replacing and installing pipes and extending the network into new areas for example, will involve the same basic trenching techniques as used when replacing or building new sewers. Generally, physical environmental impacts from these subcomponents will be slight to negligible. Similarly, construction and rehabilitation of pumping stations will involve the same types of small building work and installation of pumps and pipes. Construction of the MPW wastewater/sludge treatment/tank systems and MCK Plus units will be in new or existing housing estates, with limited excavation work required. Thus, physical impacts will only be small and temporary during construction.

66. Trenches to remove existing structures or create voids for new sewer pipes will probably be dug by a small backhoe digger, with extracted soil being placed in mounds nearby. New pipes (probably pre-cast) will be brought to site on trucks, and offloaded and placed into trenches by hand, or using a small rig for heavier pipes. Once pipes are in place and joined, soil will be replaced by shovel or digger, and the surface will be compacted by vibrating machine. Excess soil will be taken in trucks for off-site disposal. Prior to excavation works, the contractor shall obtain approval from local authorities for sites that will be used for disposal of excess spoils; such sites shall be stabilized and located at least 100 meters from surface water bodies. The physical environment may be disturbed by the construction of trenches (during detailed design, the use of trenchless technologies will be considered wherever possible). Though the individual excavation may be limited, the proposed sub-components will continue over years. As construction will focus on short lengths at a time, effects will be localised and short in duration (1-2 weeks at most at each site). The replacement of material into the trench and compaction of soil afterwards also mean that the physical disturbance will be temporary.

67. **Water pollution.** Rainwater will collect in exposed trenches, so construction shall be planned to avoid excavation and trenching during the monsoon season (when working conditions are difficult anyway). Construction of canals across steep side slopes can cause slope instability, land-slipping and landslides. The same is the case for the construction of access roads, if any, along steep side slopes, especially if cross-sewer structures are not provided. This leads to sedimentation of canals, water pollution and deposits of silt downstream from the work sites. These impacts are expected to be slight and of temporary and limited nature. Surface run-off over construction storage sites could lead to leakage of diesel, petroleum and lubricants into soil and groundwater resources.

68. Mitigation measures include (i) adequate supervision of construction operations, (ii) the use of silt traps when and where appropriate, (iii) careful deposition of spoil arising from excavation works, ensuring that it is not cast directly over drain embankments, (iv) providing designated areas with for vehicle fuelling and fuel storage with bunds and simple oil-water separators (if fuelling and maintenance of vehicles is carried out at site), and (v) careful coordination with water utilities, to avoid damage to existing piped infrastructure during construction. To the extent possible, spoil shall be used as fill. In the event, additional fill materials are needed, borrow sites have to be chosen at sufficient distance from waterways and environmentally sensitive areas.

69. **Air quality and noise.** Trucks will be required for the construction so there are temporary air quality and noise impacts anticipated in form of dust and other matters at construction sites and along access roads. However, in congested urban settings, additional

construction traffic and the temporary traffic closure at construction sites may cause additional traffic congestions and related air and noise pollution. As early as possible traffic authorities will be consulted for necessary rerouting of traffic during construction phase. The following additional precautions should be adopted to avoid effects on traffic: (i) planning transportation routes so that heavy vehicles do not enter the main city area, as much as possible; (ii) scheduling the transportation of spoils to avoid peak traffic periods and other important times; (iii) do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) public roads are not blocked; (v) excavated soils/mud is not deposited on public roads; and (vi) speed limits are imposed. These additional impacts can be expected to be slight and of temporary nature.

70. A moderate impact specific to the work on the sewers is the effect on air quality from the noxious smell of faecal material in existing sewers (receiving domestic effluent/overflow from septic tanks), which is also a significant hazard to human health. To provide a safe environment for both residents and workers this material shall be pumped out into tankers before the work begins as part of the mitigation measures. The removed material would then provide an opportunity to improve the physical environment by enhancing the quality of agricultural soil if it were used as a fertilizer. This must, however, only be done with strict precautions to prevent transmission of pathogens or parasites to cattle or people. This can be achieved by allowing the material to dry thoroughly in sunlight for several weeks, or by spraying wet material onto fallow fields, from which animals and people are excluded (also for several weeks) whilst the slurry percolates into the ground.

71. The handling and disposal of screenings, if not properly managed, may have adverse environmental and occupational impacts. Proposed mitigation measures are: (i) provision of inert, sturdy, and corrosion-proof containers on each pumping station as temporary storage of screenings; (ii) provision of covers for the containers to prevent access by insects and vermins; (iii) scheduling for the timely collection of screenings from the sites by city-authorized waste disposal contractor ; and (iv) provision of trainings and appropriate personal protective equipment (such as gloves, boots, aprons, face masks, goggles, etc.). A plan to address abnormal conditions such as uncollected screenings over long period of time will include provision of a storage area that is: (i) lined with impermeable materials such as HDPE, (ii) bunded to prevent leaching to the surrounding environment; (iii) designed with leachate canal to return the accumulated liquid wastes to the system; (iv) covered to prevent soaking during rainy season, dust generation during dry season, and infestation by insects and vermin; and (v) secured to prevent access by unauthorized personnel.

72. Dust pollution during construction can be minimized by spraying water on construction sites and vehicles during dry weather periods, and by ensuring that trucks shipping loose construction materials are covered with tarpaulin by the contractor, in order to minimize dust emission. This shall be carried out in densely populated residential areas. Construction noise shall be limited to permitted hours and shall cease at night and on public holidays, as much as possible. To minimize traffic congestions, local authorities shall establish traffic diversion plans and assisted by traffic police directing traffic during construction activities.

73. **Ecological resources.** There are no ecological resources of note in the area, and that the urban areas contain few plants, and only those animals such as birds, small mammals and insects that are common in inhabited areas and able to live in proximity to man. Construction of the network improvements should therefore have no significant ecological impacts.

74. **Economic development.** There is a great deal of small business activity in the city, particularly in the main streets where the work on the main water pipes and sewers may occur. Mounds of soil and open trenches will impede access to shops, which could lose customers as a result. These slight to moderate impacts shall be mitigated by maintaining access to shops during trench construction by leaving spaces between earth mounds and providing small wood bridges across trenches. Transportation will be disrupted where trenches are dug in roadways, as roads may need to be closed temporarily, and where they remain open the width available for traffic will be restricted by the trench and displaced soil. As roads in the centre of the town are quite congested already, actions to reduce further disturbance shall be taken, including:

- careful planning of the work to ensure that roads are closed only when necessary, and that suitable diversions are provided,
- increasing the size of the workforce in these areas to complete the work quickly, and
- ensuring that earth removed from trenches is placed off the road wherever possible, to limit the width restriction.

75. **Social and cultural resources.** Access to locations of social and cultural importance (clinics, schools, mosques, etc) will be temporarily impeded by work on water and sewerage networks in the vicinity, so here again spaces between the earth mounds and pedestrian walkways across trenches shall be provided. Where facilities like hospitals require vehicular access, more substantial structures will be needed. The construction work will not affect population or community numbers, locations or composition, but individual inhabitants could be affected by noise and dust (slight impacts) when work is conducted near their houses, and by the inconvenience of interrupted access to their homes. This shall be reduced by a combination of measures suggested above, including:

- increasing numbers of workers in these areas to complete work quickly,
- providing temporary bridges to maintain access where required,
- covering exposed soil during wind to prevent dust, and
- informing affected communities about the work in advance, and where possible, scheduling the work to comply with community preferences.

76. Covering of sewers in the neighborhoods will mean that some residents lose structures they have built to provide access to houses, and again these will not be replaced as the new sewer pipes will be covered. Mitigation will require the same measures as applied when slabs and steps are removed from shops, which involves:

- informing owners in advance of the need to remove structures, the reasons for removal and the program for the work, and
- providing temporary access boards and steps during the construction work.

77. **Employment opportunities.** The construction works offers the potential to positively contribute to the improved welfare of the local population. During the **construction** phase, job opportunities mainly in form of semi-skilled and unskilled labor demand will be created. Preference in recruitment shall be given to local communities or people in affected neighbourhoods.

#### 4.5 Environmental Impacts and Mitigation Related to Operational Stage

78. **Physical impacts.** In maintaining the sewer lines, the IA shall ensure that removed material is not piled on the adjacent street as at present, and instead is taken to the treatment ponds by trucks. If pipeline leaks are repaired this should not cause major physical impacts as areas affected will be small, the work will be short in duration, and the physical environment will

be reinstated as pipes will be re-buried. If leaks are repaired this will be done in the same way as the sewers were installed, by sealing off the affected sewer and pumping the contents into tankers, digging trenches to reveal the faulty section, and repairing or replacing the pipes.

79. **Water pollution.** The sewer pipes will not function without maintenance, because the topography does not allow large gradients, and sewer pipes may therefore become blocked with silt in time. Using the experience of many previous projects, inadequate O&M can be anticipated in operations. Poor O&M may also be responsible for a continuous water pollution and public health risk, restricted access to clean drinking water and proper sanitation facilities. The project's proposed sub-components will therefore provide better equipment for cleaning sewers. Regular use of this equipment, which needs to be kept in good working conditions, will ensure a reduced risk of water pollution. To ensure that the sanitation facilities are properly maintained, the Sector project will involve capacity building/ institutional development and project implementation support component designed to (i) strengthen institutional capacity in sanitation strategy development, management, operations and maintenance, and financial skills, (ii) strengthen institutional capacity in health and hygiene awareness raising and behavioral change programs, (iii) support the executing and implementing agencies, and participating communities, in the implementation of the various activities under the Project, and (iv) make the facilities built or improved from the investment more sustainable. The Project will provide consulting services packages to support these activities.

80. The Sewon WWTP will also need to maintain the treatment ponds by removing sewage sludge every four or five years. This is a simple process that does not require a comprehensive Sludge Management Plan. Ponds are allowed to dry out naturally and the solid sludge is removed by backhoe digger. The treatment and drying processes kill bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer.

81. **Ecological resources.** Although the improved and expanded sewerage system will improve the environment, there are unlikely to be significant ecological benefits as there are no natural habitats or rare or important species affected.

82. **Economic development.** If pipeline leaks are repaired in the vicinity of shops or other enterprises, impacts should not be significant as few businesses will be affected, and the repairs will be short in duration. Nevertheless, the local government should minimise disruption by similar measures as applied during the construction period, including:

- informing businesses and residents of the work in advance and providing resources to ensure that work is completed quickly,
- providing temporary bridges to maintain access and covering exposed soil with tarpaulins during windy weather to reduce dust, and
- planning work to reduce traffic disruption, and providing suitable diversions if roads need to be closed.

83. **Social and cultural resources.** Covered and buried sewers will remove the smell and appearance of excrement, and the waste shall be removed rapidly and effectively to treatment works located well away from the urban area. The environment of the city should therefore improve. Air and visual quality will improve, but the most significant benefit will be in the health of the people. Better sanitation combined with a better water supply and greater understanding of the risks of poor standards of hygiene, should ensure that the project delivers major improvements in public health.

84. There should be other benefits including: increased incomes as people spend less on healthcare and miss fewer working days; increased business productivity; and improved social capital in city if people spend more on educating their children and following social and cultural pursuits. To maintain these gains and particularly the health of the environment and the people, it will be very important for the local government and the citizens to keep the system in full working order, by clearing any blocked sewers, and by the local/provincial government maintaining the treatment works. To avoid any health risks the local government must also ensure that affected sewers are sealed before work begins and that the contained faecal material is pumped into tankers and taken to the treatment works for disposal.

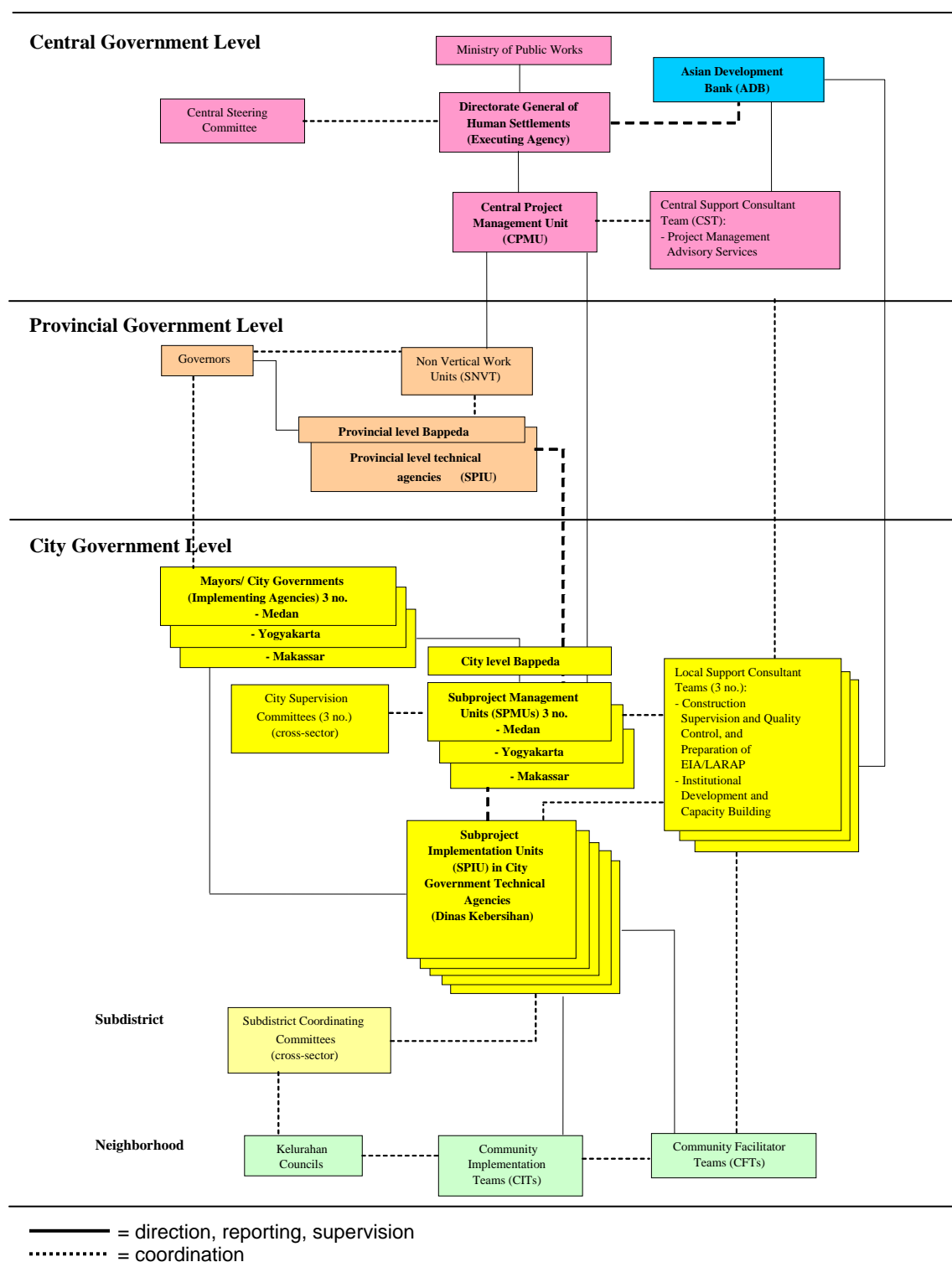
## **5. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN**

### **5.1 Institutional Requirements**

85. Sanitation management in Kota Yogyakarta will affect two neighbouring districts. In the urban sanitation management of the Greater Yogyakarta Agglomeration (GYA) there is cooperation for wastewater and solid waste management, which has been established in the form of Sekber Kartamantul (Sekretariat Bersama Kartamantul), a cooperative venture between three regional governments (Kota Yogyakarta, Kab. Bantul and Kab. Sleman). This regional institution coordinates the provision of public services that affect more than one of this regional governments, including: solid waste management, supporting facilities for water supply, sanitary landfills and domestic wastewater, road and transportation, and drainage.

86. Currently, the management of environmental issues in Kota Yogyakarta is still in the development stage. The government applies socialization and dissemination of information to the people, business enterprises and other activities. Program to prevent surface water pollution have been carried out. Cooperation between local government departments and between city level and provincial level technical agencies in managing and monitoring the environmental impacts is limited. Coordination in order to resolve problems is not well established.

**Figure 2: Project Organization Chart (All Participating Cities)**



87. Until recently, the sewerage system in Kota Yogyakarta was operated by a working unit (Satuan Kerja Perangkat Daerah or SKPD) in the environmental department (Dinas Lingkungan Hidup) of Kota Yogyakarta. In 2009, this responsibility was transferred to an SKPD in the city's public works department (Dinas Kimpraswil). The management of the sanitation sector always

links with public health, therefore in the field implementation it should be synchronized with the programs and activities of several working units (SPKD) which support the realization of clean, healthy, cool, and safe environment. At the planning stage it should refer to available legal plans such as the regional spatial plan and local mid-term plan, and involve or coordinate with SKPD related to planning such as Bappeda, Dinas Kimpraswil, Dinas Sosial, Dinas Kesehatan, and PDAM.

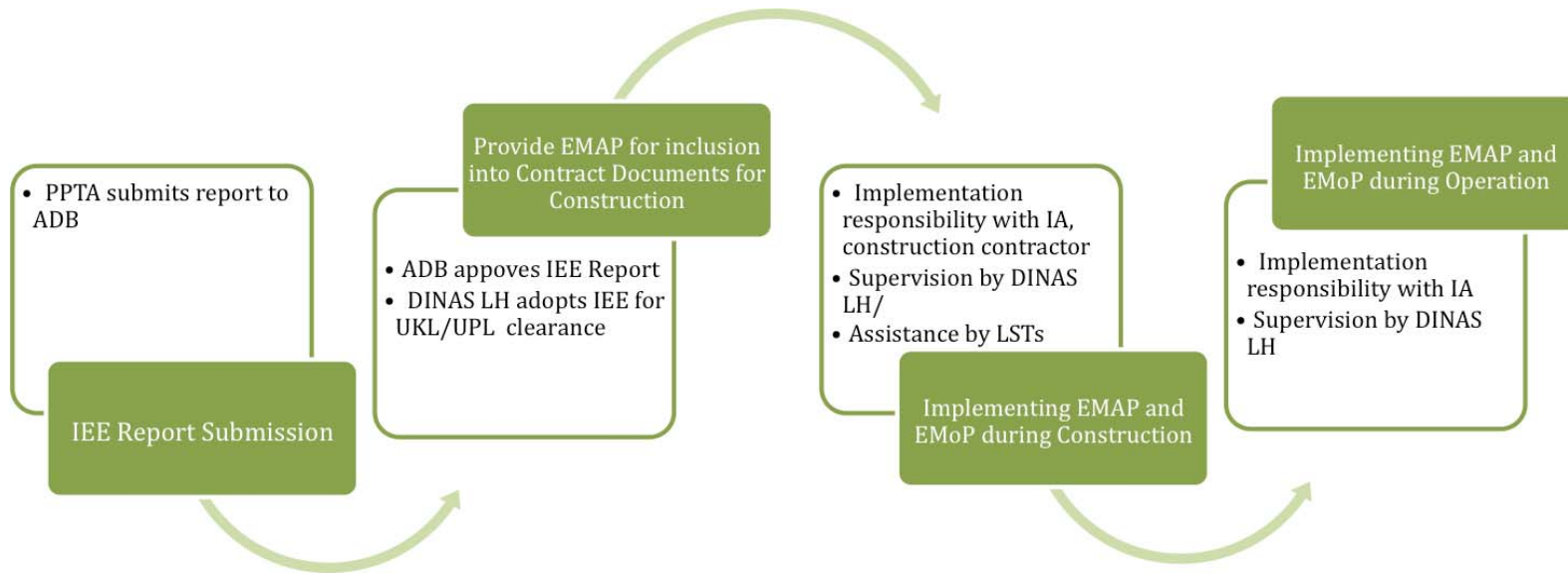
88. **Implementing agencies.** The implementing agency of subprojects financed from the city governments' own budgets (APBD-Kota) will be the governments of Kota Yogyakarta. The mayor will appoint a subproject management unit (SPMU) in Bappeda Kota to coordinate implementation with subproject implementation units (SPIU) in the respective city government technical agencies. Provincial government agencies appointed by the EA will be responsible for the procurement and implementation of subprojects financed from DGHS budgets (including ADB loan proceeds), as well as for subprojects financed from provincial government budgets (APBD-Provinsi). These are: Dinas PU, Dinas Kesehatan, Dinas Lingkungan Hidup and Dinas Kimpraswil. The governors of the provinces in which the participating cities are located will appoint a subproject management unit (SPMU) in Bappeda Provinsi to coordinate implementation with subproject implementation units (SPIU) in the respective technical agencies.

89. **Dinas Lingkungan Hidup (LH).** On city government level, Dinas LH (Environmental Bureau) will be consulted by the IA for submission and approval of required AMDAL documents or respectively UKL/UPL (simplified environmental management and monitoring plans). For this purpose, LH will form the required technical evaluation committees, including stakeholders from the city's agencies and communities to assess the environmental documents. When approved, the AMDAL or UKL/UPL submissions will also satisfy the Indonesian EIA compliance requirements. During the public consultation, *Dinas Lingkungan Hidup* Kota Yogyakarta declared strong commitment to provide assistance to other city government agencies. Dinas LH has AMDAL certified staff and is conducting environmental monitoring of sanitation systems in hospitals, shopping malls and industries on a quarterly basis, in other facilities less frequently.

90. Dinas LH realized that these activities were not equipped by providing an adequate supporting facilities for waste water treatment, so that waste from various activities directly thrown to city drainage or even direct to the river. It requires integrity and law enforcement, a frequently monitoring and amount of budget to conduct these procedures. The lack of adequate funding by the City Government for environmental management and monitoring activities is likely to impact on the effective implementation of ADB/GOI approved environmental management action plan (EMAP) and environmental monitoring program (EMoP) for sub-components under this project during the pre-construction, construction and operational stages. With insufficient funding, on-the-job training of LH staff in environmental monitoring activities is not effective.

91. In an earlier meeting with LH it was confirmed that the city government applies the Ministry of Environment Decree No. 11 of 2006 as thresholds for the AMDAL process in Kota Yogyakarta, the Decree No. 86 of 2002 for UKL/UPL applies as well. The city government will facilitate the synchronization of the environmental assessment process for new proposed sub-components under this PPTA. This provides opportunities to reduce duplication of EIA reporting to satisfy both ADB and national standards and potentially substantially reduces timeframes for environmental assessment processes. In loan negotiations with GOI, ADB shall require the cities to allocate sufficient funds for O&M in the overall project budget. Initial estimates for EMAP and EMoP costs are provided below for budgeting purposes.

**Figure 3: Flow Chart for Milestones in Environmental Assessment and Management Activities**



92. **Consultant Teams/ Central and Local Support Teams (CST/ LST).** These teams are proposed to support the implementing agency and affiliates (SPMU and SPIUs) with technical advice. It is proposed that at least one environmental specialist is included in the central and local support teams to compile and manage environmental capacity building efforts in the city and conduct environmental impact monitoring or provide impact mitigation advice to the SPIUs. It is proposed that the environmental consultants assist the IAs in updating the EMAP and EMoP by taking into account the additional information obtained during the detailed design (DED). Appropriate mitigation measures shall be added, as necessary, in the updated EMAP. The IAs shall also ensure that mitigation measures are included in the subcomponent design. These measures, i.e., updating of EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design shall be included in the IEE's EMAP and EMoP.

93. **Environmental monitoring.** Compliance monitoring will be conducted in accordance with the work plan in Table S12-17. Aspects to be monitored are as follows: (i) pre-construction: updating of EMAP and EMoP during detailed design phase and inclusion of environmental clauses in bid and contract documents; (ii) construction: environmental performance of contractors with regard to sludge disposal, control measures to pertaining to erosion, siltation, air quality, noise, sludge disposal and traffic management; and (iii) operation: O&M practices and environmental effects (soil, surface water and groundwater quality).

94. The IA will submit a quarterly monitoring report to Dinas LH. No later than 1 month before the completion of the construction work, the IA will collect material from all contractors and provide a construction completion report to the stakeholders. The environmental section of this report will indicate the timing, extent, and success of mitigation completed and the maintenance and monitoring needs during operations. A proposed monitoring report format is included in this IEE to serve as guideline for the IA in preparing environmental monitoring reports during project implementation.

95. The CST/LST shall support the IA in conducting environmental monitoring of construction activities and in compiling the quarterly reports during construction. A copy of the reports shall be submitted to ADB for review and comments and kept for project review purposes. During operations environmental mitigation will be monitored by the Dinas LH; a report will be prepared and submitted semi-annually. The Dinas LH shall conduct soil, surface and ground water monitoring on semi-annual basis at sampling sites to be determined.

## 5.2 Capacity Building in Environmental Management and Monitoring

96. Technical monitoring/auditing training as well as training in environmental data processing and reporting is advised for Dinas LH staff as capacity building measures. These training efforts should be extended to aid civil society capacity building, enabling local NGOs to become actively involved and qualified to conduct own environmental audits.

97. It is proposed that one or two senior staff of the environmental sections of Dinas LH and the IA staff be involved in the implementation of the EMAP and EMoP will be sent to training courses on environmental impact mitigation and monitoring to Jakarta or overseas ("train the trainers"). Trained and qualified staff shall then develop more city-specific training programs. These training programs can be tailor-made in consultation with Dinas LH to suit the needs of the agency and projects on the ground. These capacity building efforts shall be in addition to other community empowerment and IA technical staff training programs under this PPTA.

98. The capacity building efforts will only be effective if the City Government would provide sufficient operational funding for EMAP and EMoP and supervision by Dinas LH during the pre-construction, construction and operational phases of this project's sub-components. The City will provide sufficient funds for EMAP and EMoP, supervision by Dinas LH and respective capacity building programs. Indicative budget estimates for EMAP and EMoP are given under 5.3.

### 5.3 Budget Estimate for Implementation of EMAP and EMoP

99. The below budget is based on average national costs of equipment and services.

**Table S12-7. Estimated One-Time (Nonrecurring) Mitigation Costs – Kota Yogyakarta**

<b>Mitigation Measures</b>	<b>Unit Cost (Rp million)</b>	<b>Total Estimated Cost (Rp million)</b>
<b>Siltation Control</b> Silt retaining structures along slopes and canals, reinstatement of spoil disposal/ cut sites (if required), mainly for larger canals and structures	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission
<b>De-sludging of Existing Drains and Sewers</b> Cleaning and Sludge pumping in drains and sewers prior to repair of existing drain and sewer lines, proper disposal of removed sludge	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission
<b>Prevention of Water Contamination</b> Construction of fuel and lubricant storage area with concrete floors/bunds and oil/water separator at vehicle park	To be priced by contractor as part of tender submission	To be priced by contractor as part of tender submission

100. For budget estimation purposes of environmental mitigation costs, approximately 1-2 % of total contract value shall be allowed for mitigation measure implementation for construction. This amount will be included in the project cost estimates.

101. The following estimates are presented for recurring environmental costs (mainly labor) incurred during the construction period:

**Table S12-8: Estimated Recurring Environmental Costs – Kota Yogyakarta**

Item	Unit Cost/Year (Rp. million)	Total IDR (Rp. million)
<b>During Construction mainly monthly Compliance Monitoring is advised</b>	5	30
Costs include travel to the sites, preparation and submission of records and monitoring reports, follow up meeting with contractors, etc.		
Sampling of ambient environmental parameters will only provided in case of major environmental pollution/violations of EMAP		
<b>Quarterly Environmental Monitoring and Compliance Checks</b> by Dinas LH and other city government agencies (includes per diem, honorarium, quarterly monitoring report review and approval by agencies)	50	300
The participation of these agencies in physical monitoring will build capacity and improves the quality of the environmental monitoring review and approval process.		
Environmental Capacity Building for Technical Staff of Dinas LH and IA for Operations (one year course) for two persons, conducted during late construction phase	250	250
<b>Total Costs During Construction Period</b>		<b>580</b>

102. The following estimates are presented for recurring environmental costs over a 20-year operating period:

**Table S12-9: Recurring Costs over 20-year Operating Period (per Subproject)**

Description	Per Year (Rp. million)	Number of Years	Total Cost (Rp. million)
Ambient soil, surface and ground water quality monitoring twice a year, including laboratory and reporting:			
Manpower: Four person months/year @ Rp 5 million/month	20	20	400
Laboratory: 6-10 parameters per sample @ maximum Rp. 250,000/parameter tested			
Environmental Parameters to be tested:			
Soil: PAH, VOC, Lead, Arsenic, Heavy metals (2)	15	20	300
Surface/Groundwater:			
BOD, COD, DO, TSS, Lead, Arsenic, Heavy metals, Total coliform/E.coli	25	20	500
<b>Total Operating Period (20 years)</b>			<b>1,200</b>

## 6. PUBLIC CONSULTATION AND DISCLOSURE

103. Public Consultation in Yogyakarta was held on 27-28 September 2007 in informal discussion among some environmental NGOs and City Working Group. A discussion with Dinas Lingkungan Hidup was done separately. Key aspects of EIA and IEE were socialized to the participants (See **Annex 2** for list of attendance from meeting). On this occasion, participants and the NGOs highlighted the following aspects.

### 104. Law Enforcement:

- In public point of view (represented by NGO), execution of AMDAL in Yogyakarta City is not effective, especially related to environmental monitoring plan for activities, which had completed and ratified their AMDAL study.
- AMDAL preparation for most all activities only for formality. AMDAL still considered as one of phase in process of licensing which must be fulfilled by investors or entrepreneurs, not as a tool for Environmental Feasibility Study which results of its analysis normatively has the power of law in assessing the feasibility of the project(s) related to environmental aspect.
- Yogyakarta City which experiences rapid development of malls, hotels, shopping centers and real estates is not following by law enforcement in environmental aspect. Dinas LH realized that these activities were not equipped by providing an adequate supporting facilities for waste water treatment, so that waste from various activities directly thrown to city drainage or even direct to the river. It requires integrity and law enforcement, a frequently monitoring and amount of budget to conduct these procedures.

### 105. IPAL Sewon (Sewon WWTP):

- IPAL Sewon is one of Province Government success project. It located in Kabupaten Bantul. As the asset of Province Government, implication of importance and contamination problem arise around Sewon is more a regional problem and become provincial responsibility.
- In Year 2005 the resident lived around IPAL had protested about odors and well water contamination from IPAL activity. The management by then gave counseling and socialization to response the protest referred to laboratory analysis result that they done it frequently. The result shows that effluent from IPAL was not exceed the standard, so that it would not harm or contaminate the water well.
- Existing performance of IPAL Sewon is not fully optimal; there is still idle capacity for waste disposal house connections to IPAL until 70 % more.

### 106. Communal IPAL:

- Development of some Communal WWTP (IPAL Komunal) in Yogyakarta is one of the City Government program getting positive attention from community and is one of government program which has a lot of support by NGO. Development of communal WWTP also was one of City Government sanitation program which had entangled and involved community from design process, operational to maintenance process.
- Some similar facilities like communal septic tank built in among the community came from NGO's initiative, as cooperation between local NGO with International NGO like BORDA, etc.

107. Surface Water Contamination:

- Environmental contamination in Yogyakarta City becomes one issue paid attention by community, NGO, and government of the city. All discussants agree that government should do some efforts in environmental management, especially in water pollution prevention at big rivers flowing in City Yogya (Kali Code, Kali Gajah Wong and Kali Opak) which must given high priority. Now water channels in town, especially residing in around shopping centre, market and tourism like Malioboro shows level of contamination from medium to high exceed the standard. The contamination easily seen from visual color and annoying odors to community surrounding.
- Government efforts to prevent contamination and preserve condition of river water quality in Yogyakarta City, should not implemented separately with spatial plan aspect. Among of these efforts are to review settlements allocation, order and regulations, especially for slum area along the riverside that gives big contribution of contamination through domestic waste disposal and direct garbage. This responsibility should be carry out by government by involving NGOs, private sectors and community.

**Table S12-15: Environmental and Social Issues Raised during Consultation and Proposed Action to address those Issues**

<b>Issue/Concern Raised by Public</b>	<b>Proposed Action to address Issue/Concern</b>
Ineffective execution of AMDAL	Integrity and law enforcement with frequent monitoring and amount of budget to conduct procedures.
Pollution in groundwater wells	Project will improve drainage and sewerage piping network, thus reducing leakage into groundwater, house connections to sewer system will do the same, installation of off-site/on-site treatment facilities will reduce seepage of highly polluted wastewater into groundwater
Public complaints about poor groundwater quality in vicinity of WWTP Sewon	Review of masterplan for wastewater services and full EIA/AMDAL prior to further expansion; verify groundwater quality
Surface water contamination	Project will review settlements allocation, order and regulations.

## 7. FINDINGS AND RECOMMENDATIONS

108. Based on the performed screening no significant environmental impacts are expected in the foreseeable future during the implementation of these sub-components. This is largely due to the potential environmental improvements and benefits resulting from this work in the long-run. This IEE itself becomes the completed environmental assessment for those sub-components mentioned here and no follow-up EIA will be needed.

109. However, as this IEE was prepared concurrently with the finalization of the SPAR, it is recommended it is recommended to up-date the EMAP and EMoP as more information on location, lay-out, technical and other aspects of the subcomponents becomes available during the detailed design phase.

## **8. CONCLUSIONS**

110. The report concludes that there is no need for further studies at this time. This IEE report becomes the completed environmental assessment for the sub-components covered in this report.

**Table S12-16: Environmental Management Action Plan (EMAP)**

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
1.Preconstruction Phase						
1.1 Up-Dating of EMAP and EMoP during Detailed Design for Sub-components	i. Updating of EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design  ii. Allocating and revise budgets estimates for EMAP and EMoP	IEE, Section V	Entire Project	During DED	IA (city level) Central/ Local Support Team (LST)	Ministry of Public Works, DG Human Settlement
1.2 Lack of Environmental Specifications for Contractor in Bid Documents, Environmental Clauses for Contracts	i. Prepare relevant environmental sections in the tender documents for bidders ii. Prepare a bid evaluations section for environment, according to ADB bid evaluation format iii. Prepare environmental contract clauses for contractors (cf. EMAP and EMoP)	-	Entire Project	Before construction starts	IA (city level) Central/ Local Support Team (LST)/	Ministry of Public Works, DG Human Settlement
2.Construction Phase						
Physical Environment						
2.1 Soil Erosion and Siltation/ Sedimentation of drains/sewers	i. Adequate supervision of construction operations, ii. Use of silt traps iii. Careful deposition of spoil arising from excavation works, ensuring that it is not cast directly over canal embankments. To the extent possible, spoil shall be used as fill, either where required for the scheme or to construct level surfaces, as desired by farmers. In all cases it must be compacted and treated either using bio-engineering techniques, or by using dry stone walls or stone pitching. In the event, fill materials are needed, borrow sites have to be chosen at sufficient distance from waterways and environmentally sensitive areas. iv. Stabilisation of temporary and permanent works such as cuts in steep slopes (if required) for canal alignments	Contract terms and conditions  IEE, Section IV	Throughout the project corridors, all access roads, and spoil disposal or borrow sites	During the construction period	Construction Contractor /IA (city level)	Central/Local Support Team (LST)/ Dinas LH

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	or canal embankments by slope stabilisation methods if design cannot avoid such works, construction roads need to be properly built with cross drainage structures.					
2.2 Air Quality, Noise, Traffic Congestion	i. Dust pollution addressed by spraying water on construction sites and vehicles during dry weather periods. This shall be carried out in densely populated residential areas. ii. Construction noise shall be limited to permissible hours and shall cease at night and on public holidays, as much as possible. iii. Establish traffic diversion plans assisted by traffic police directing traffic during construction activities.	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads, and construction camps and vehicle parks	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH
2.3 Proper de-sludging of drains and sewers prior to repair	i. Pumping of sludge and proper drying and disposal of dried sludge, potential use for agriculture or a FDS for sludge; ii. Prevent leakages of sewerage and contact contamination with humans in residential, commercial and industrial areas by removal of sludge and contaminated materials.	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas Kebersihan/ Dinas Pertanian
<b>Socio-cultural Environment</b>						
2.4 Rise in Employment Opportunities	i. With job openings for semi-skilled or unskilled labour, priority shall be given on recruiting workers from local communities ii. Requirement for local labour recruitment in the contract of the contractors.	Contract terms and conditions IEE, Section IV	City/ Kecamatan (Sub-district)	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas Tenaga Kerja
2.5 Access impediments to public buildings and locations of cultural and social importance and	i. Increase number of workers in these areas to complete work quickly ii. Providing temporary bridges to maintain access when required. iii. Covering exposed soil during wind to prevent dust	Contract terms and conditions IEE, VI	Throughout the project corridors, all access roads,	During the construction period	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH

Environmental Impact/Issue	Mitigation Measures	References in Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
businesses	iv. Informing affected communities about work in advance and scheduling the work to comply with community preferences v. Informing business owners in advance vi. Providing temporary access to businesses during construction.					
<b>3. Operational Phase</b>						
3.1 Sludge management	i. Regular removal of sludge from WWTP ponds every few years, sewer lines and drains.	IEE, section IV	Kecamatan Sub-districts	During the operational period	PDAM Tirta Nadi	Dinas LH
3.2 Poor Operations and Maintenance (O&M)	i. The project will address this issue by specific training and clearly placing more responsibility on excellence in O&M to protect the sustainability of the investments.	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH
3.3a Ecological Resources	i. Planting of native trees along new access and operation roads as well as along newly laid pipes.	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH
3.3b Long-term Cumulative Impacts on Soil, Surface and Groundwater Quality	ii. Improved sanitation and waste management in the city and regionally	IEE, section IV	Throughout the project area	During the operational period	IA	Dinas LH/ BAPEDALDA Province
3.3c Access impediments to public buildings and locations of cultural and social importance and businesses during repair works	i. Increase number of workers in these areas to complete work quickly ii. Providing temporary bridges to maintain access when required. iii. Covering exposed soil during wind to prevent dust iv. Informing affected communities about work in advance and scheduling the work to comply with community preferences v. Informing business owners in advance vi. Providing temporary access to businesses during construction.	Contract terms and conditions  IEE, VI	Throughout the project corridors, all access roads,	During the repair work phase	Construction Contractor /IA (city level)	Local Support Team (LST)/ Dinas LH

**Table S12-17: Environmental Monitoring Program (EMoP)**

EMAP Reference No. and Item	Monitoring Details	Timing	Executing Unit	Reporting Responsibility
<b>1. Pre-construction Period</b>				
1.1 Up-Dating of EMAP and EMoP during Detailed Design for Sub-components	Compliance check for updated EMAP and EMoP during detailed design phase and incorporation of mitigation measures in the project design	In time for inclusion as part of bid documentation and environmental clauses in contracts	IA (city level) Central/ Local Support Team (LST)/	(CPMU) of the EA
1.2 Environmental Specifications for Contractor and Environmental Clauses in Contracts and Loan Covenant	Compliance with provision of key environmental inputs for inclusion in bid preparation documents and contractor contracts.	In time for inclusion as part of bid documentation and environmental clauses in contracts	IA	(CPMU) of the EA
1.3 Mitigation Plans and Timetables	Compliance with provision of documents for environmental mitigation and monitoring measures and timetables are translated into Indonesian language for submission (as UKL/UPL) and distribution to contractors.	For use by construction contractors/ for approval by Dinas LH	IA	(CPMU) of the EA / Dinas LH
<b>2. Construction Phase</b>				
2.1. Erosion and Siltation	Compliance inspection and file report (tabular format) on whether erosion control measures are in place and functioning as specified	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.2 Surface Water Quality	Compliance inspection at equipment/material storage sites, visual inspection for signs of leakages in soil and water-oil separator, general cleanliness	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.3 Air Quality (Dust), Noise, Traffic Congestion	Compliance inspection at construction sites, visual inspection for signs of dust pollution during dry weather periods  Compliance inspection at construction sites of noise pollution restrictions outside permissible hours/ ambient noise measurements upon resident complaints	Inspect sites monthly  Inspect sites quarterly	IA supported by LST  Dinas LH	IA submits report to Dinas LH and copy to stakeholders
2.4 De-sludging of sewer lines	Compliance inspection of adequate sludge removal and disposal adequate in line with recommended methods, no hazard to residential, commercial and industrial areas	Inspect sites weekly  Inspect sites quarterly	IA supported by LST  Dinas LH/Dinas Kebersihan	IA submits report to Dinas LH and copy to stakeholders
2.5. Rise in Employment	Compliance inspection of the total number	Monthly, starting with	IA supported by LST	IA submits report to

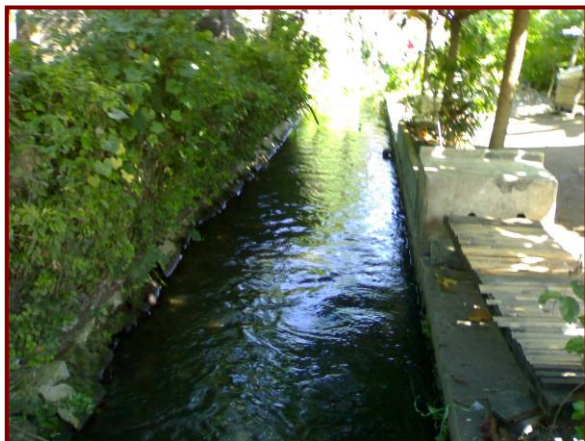
EMAP Reference No. and Item	Monitoring Details	Timing	Executing Unit	Reporting Responsibility
Opportunities/ Work Safety	of local workers, the workers' qualifications, workers' place of origin and total cases of work-related accidents	recruiting construction workers and during the construction period	Dinas Tenaga Kerja	Dinas LH and copy to stakeholders
<b>3. Operational Phase</b>				
3.1 Sludge Removal and Disposal	Compliance inspection of WWTP ponds, sewer lines and drains to be de-sludged at adequate frequencies	Inspect sites monthly or as adequate Inspect sites quarterly	PDAM Tirta Nadi Dinas Kebersihan Dinas LH	IA submits report to Dinas LH and copy to stakeholders
3.2 Poor O&M	Compliance inspection on number of maintained trainings and capacity building and improved O&M practices	Inspect sites quarterly	IA Dinas LH	IA submits report to Dinas LH and copy to stakeholders
3.3 Cumulative / Long-term Impacts	Ambient soil, surface and groundwater quality will be monitored at: WWTP and main sewer lines Environmental Parameters to be tested: Soil: PAH, VOC, Lead, Arsenic, Heavy metals (2) Surface/Groundwater: BOD, COD, DO, TSS, Lead, Arsenic, Heavy metals, Total coliform/E.coli	Semi-annually	Dinas LH/ BAPEDALDA Province	Dinas LH/ BAPEDALDA to stakeholders

## References

- 1) Environmental Assessment Guidelines of the Asian Development Bank (2003)
- 2) Guide and Reference Book on Environmental Assessment and Environmental Safeguard Requirements (Version 1, October 2005):
- 3) Environmental Policy of the Asian Development Bank (2002)
- 4) Disclose the Findings of The IEE, and Summary IEE in the According with the requirement under the ADB Environmental Policy (2002), and Disaster and Emergency Assistance Policy (2004).
- 5) Ministerial Decree of Environment number 17. About Plan of Effort Activity Which is obliged to AMDAL, 2001.
- 6) Ministerial Decree of PU number 58/KPTS/1995. Guide of Managery AMDAL PU, 1995.
- 7) Regulation of Government number 22 about Arrangement and number 23 about Irrigation, 1982 and number 27, about AMDAL, 1999.

# **IEE Annex**

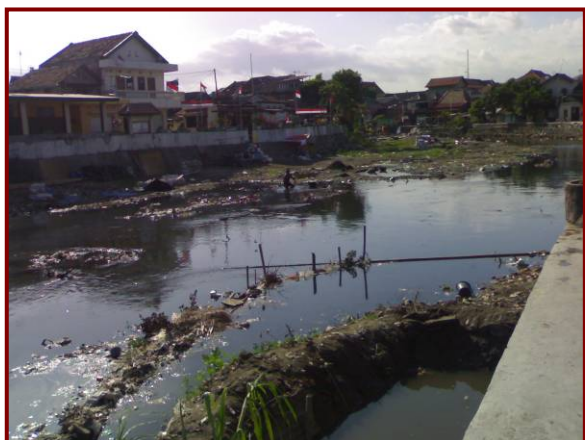
## **Annex 1: Projects Locations – Photographic Record**



Drainage from Communal WWTP (IPAL) at Kecamatan Gondokusuman



Domestic Waste water sampling on Communal WWTP (IPAL) at Kecamatan Gondokusuman



Kali Code (Code River) as “final disposal site” of domestic and industry waste water



Kali Code (Code River) also functioning as a big solid waste “final disposal site”

## **Annex 2: Public Consultation Notes – Attendance of Meeting**

### **Public Consultation for Environmental Assessment – Yogyakarta September 27 to September 28, 2007**

Public Consultation in Yogyakarta was held in informal discussion among some environmental NGOs and City Working Group. A discussion with Dinas Lingkungan Hidup was done separately. Substance about EIA and IEE socialized to the participants. On this occasion, participants and the NGOs highlighted the following aspects:

#### **Law Enforcement:**

- In public point of view (represented by NGO), execution of AMDAL in Kota Yogyakarta is not effective, especially related to environmental monitoring plan for activities which had completed and ratified their AMDAL study.
- AMDAL preparation for most all activities only for formality merely. AMDAL still be considered as one of phase in process of licensing which must be fulfilled by investors or entrepreneurs, not as a tool for Environmental Feasibility Study which results of its analysis normatively has the power of law in assessing the feasibility of the project(s) related to environmental aspect.
- The Growing Yogyakarta which might be seen from the rapid development of malls, hotels, shopping centers and real estates in Kota Yogyakarta is not following by law enforcement in environmental aspect, for instance these development of malls, hotels, and others were not equipped by providing an adequate supporting facilities for waste water treatment, so that waste from various activities directly thrown to city drainage or even direct to the river. It requires integrity and law enforcement and a frequently monitoring to avoid this condition take place anymore.

#### **IPAL Sewon (Sewon WWTP):**

- IPAL Sewon is one of Province Government success project. It located in Kabupaten Bantul. As the asset of Province Government, implication of importance and contamination problem arise around Sewon is more a regional problem and become provincial responsibility.
- In Year 2005 the resident lived around IPAL had protested about odors and well water contamination from IPAL activity. The management by then gave counseling and socialization to response the protest referred to laboratory analysis result that they done it frequently. The result shows that effluent from IPAL was not exceed the standard, so that it would not harm or contaminate the water well.
- Existing performance of IPAL Sewon is not fully optimal; there is still idle capacity for waste disposal house connections to IPAL until 70 % more.

#### **Communal IPAL:**

- Development of some Communal WWTP (IPAL Komunal) in Yogyakarta is one of the City Government program getting positive attention from community and is one of government program which has a lot of support by NGO. Development of communal

WWTP also was one of City Government sanitation program which had entangled and involved community from design process, operational to maintenance process.

- Some similar facilities like communal septic tank built in among the community came from NGO's initiative, as cooperation between local NGO with International NGO like BORDA, etc.

#### Surface Water Contamination:

- Environmental contamination in Kota Yogyakarta becomes one issue paid attention by community, NGO, and government of the city. All discussants agree that government should do some efforts in environmental management, especially in water pollution prevention at big rivers flowing in Kota Yogya (Kali Code, Kali Gajah Wong and Kali Opak) which must given high priority. Now water channels in town, especially residing in around shopping centre, market and tourism like Malioboro shows level of contamination from medium to high exceed the standard. The contamination easily seen from visual color and annoying odors to community surrounding.
- Government efforts to prevent contamination and preserve condition of river water quality in Kota Yogyakarta, should not implemented separately with spatial plan aspect. Among of these efforts are to review settlements allocation, order and regulations, especially for slum area along the riverside that gives big contribution of contamination through domestic waste disposal and direct garbage. This responsibility should be carry out by government by involving NGOs, private sectors and community.

### Annex 3: Rapid Environmental Assessment (REA) Checklist

#### SEWAGE TREATMENT

#### Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- ❑ Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

**Country/Project Title:** ADB TA No. 4763-INO Metropolitan Sanitation Management and Health/ **Yogyakarta**

**Sector Division:** SEA Department/ Infrastructure Division

SCREENING QUESTIONS	Yes	No	REMARKS
<b>B. PROJECT SITING</b>			
IS THE PROJECT AREA...			
▪ DENSELY POPULATED?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	There are rivers passing through the city where sanitation facilities are to be built
• CULTURAL HERITAGE SITE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• WETLAND	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• MANGROVE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• ESTUARINE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BUFFER ZONE OF PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BAY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

SCREENING QUESTIONS	Yes	No	
			Sewage Treatment, page 2
<b>A. POTENTIAL ENVIRONMENTAL IMPACTS</b>			
WILL THE PROJECT CAUSE...			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lining and construction of stormwater drains and new sewer lines may cause temporary access blockage
▪ <i>dislocation or involuntary resettlement of people</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The project is aiming to improve sanitation and public health, it can not be ruled out that new systems fail due to poor design/construction or O&M
▪ overflows and flooding of neighboring properties with raw sewage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current stormwater ditches serve as open sewer that overflow when flooding occurs
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ noise and vibration due to blasting and other civil works?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Current WWTP with sufficient land reserve and buffer
▪ social conflicts between construction workers from other areas and community workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ road blocking and temporary flooding due to land excavation during the rainy season?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Provided major works is carried out during drier season
▪ noise and dust from construction activities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ traffic disturbances due to construction material transport and wastes?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ temporary silt runoff due to construction?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Only due to system failure or poor O&M of new systems: Sludge treatment facilities for MPW housing, on-site WWTP for hospital wastewater
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ contamination of surface and ground waters due to sludge disposal on land?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

<ul style="list-style-type: none"> <li>health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in sewage flow and exposure to pathogens in sewage and sludge?</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Possible for lining works on drainage works which doubles as open sewer system
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------	--------------------------	--------------------------------------------------------------------------------

## Annex 4: Proposed Monitoring Report Format

### SUGGESTED FORMAT OF EMAP PERFORMANCE AND ENVIRONMENTAL EFFECTS MONITORING REPORTS FOR PRE-CONSTRUCTION, CONSTRUCTION AND OPERATION PHASES

<b>EMAP Monitoring Report</b>					
<b>1. Introduction and Project Overview</b>					
<i>Reporting period:</i>					
<i>Last report date:</i>					
<i>Key sub-project activities since last report:</i>					
<i>Report prepared by:</i>					
<b>2. Environmental Performance Monitoring</b>					
<b>a. Summary of Compliance with EMAP Requirements (Environmental Performance)</b>					
<i>EMAP Requirement</i>	<i>Compliance Attained (Yes, No, Partial)</i>	<i>Comment on Reasons for Non-Compliance</i>	<i>Issues for Further Action</i>		
1.					
2.					
3.					
<b>b. Issues for Further Action</b>					
<i>Issue</i>	<i>Cause</i>	<i>Required Action</i>	<i>Responsibility</i>	<i>Timing</i>	<i>Resolution</i>
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					
<b>3. Environmental Effects Monitoring</b>					
<b>a. Environmental Inspection and Monitoring Results</b>					
<i>Monitoring Parameter</i>	<i>Comparison to Relevant Standard /</i>	<i>Comment on Incidences of</i>	<i>Issues for Further Action</i>		

1.					
2.					
3.					

**b. Issues for Further Action**

<i>Issue</i>	<i>Cause</i>	<i>Required Action</i>	<i>Responsibility</i>	<i>Timing</i>	<i>Resolution</i>
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

**4. Appendices**

- a. Correspondence
- b. Monitoring Results
- c. Etc.