Initial Environmental Examination

June 2013

Indonesia: Metropolitan Sanitation Management Investment Project

Palembang City Off-Site Wastewater Collection System and Treatment

Prepared by Directorate General of Human Settlements, under the Ministry of Public Works of the Republic of Indonesia for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 31 May 2013)

Currency unit	–	Indonesian rupiah (IDR)
IDR1.00	=	$0.0001013171
$1.00	=	IDR9,870

ABBREVIATIONS

ADB	–	Asian Development Bank
AMDAL	–	Analisis Mengenai Dampak Lingkungan Hidup
ANDAL	–	Analisis Dampak Lingkungan (environmental impact analysis)
BAPPEDA	–	Badan Perencanaan Pembangunan Daerah
BLH	–	Badan Lingkungan Hidup
BMKG	–	Badan Meteorologi, Klimatologi, dan Geofisika
BOD	–	biochemical oxygen demand
CEMP	–	Contractor's Environmental Management Plan
CPMU	–	Central Project Management Unit
CSECC	–	City Sewerage Environmental Complaints Committee
cumd	–	cubic meters per day
cums	–	cubic meters per second
dB(A)	–	A-weighted sound scale
EIA	–	environmental impact analysis
EMP	–	environmental management plan
FGD	–	focus group discussion
GOI	–	Government of Indonesia
IEE	–	initial environmental examination
IndII	–	Indonesia Infrastructure Initiative
IPAL	–	Instalasi Pengolahan Air Limbah (WWTP)
IR	–	Involuntary resettlement
IRR	–	Implementing rules and regulations
km	–	kilometer
km^2	–	square kilometers
LGU	–	local government unit
lpcd	–	liters per capita per day
lps	–	liters per second
LPMU	–	Local Project Management Unit
mamsl	–	meters above mean sea level
NGO	–	non-government organization
PDAM	–	Peruhasaan Daerah Air Minum
PISC	–	Project Implementation Support Consultant
PPE	–	personal protective equipment
PPTA	–	project preparation technical assistance
RRP	–	report and recommendation of the president (ADB)
TA	–	technical assistance
UPTD	–	Unit Perlaksan Teknis Daerah
UKL	–	Upaya Pengelolaan Lingkungan (environmental management plan)
UPL	–	Upaya Pemantauan Lingkungan (environmental monitoring plan)

ug/Ncm	–	microgram per normal cubic meter
WWTP	–	wastewater treatment plant

NOTE

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed **Palembang City's Off-site Wastewater Collection System and Treatment**. It is one of the five subprojects to be funded by the Asian Development Bank (ADB) under the Metropolitan Sanitation Management and Investment Project (MSMIP) of the Directorate General of Human Settlements (DGHS) of the Ministry of Public Works, Republic of Indonesia. Palembang City is in South Sumatra Province, Republic of Indonesia. The proposed sewerage system subproject is expected to improve access on sanitation services in Palembang City. Relative to the significance of environmental impacts and risks, this subproject is deemed Environmental Category B based on ADB's environmental categorization and the type of assessment warranted only the preparation of an Initial Environmental Examination (IEE) report. This IEE was carried out under ADB's TA 7993-INO and in accordance with *ADB's Safeguards Policy (2009)* and Government of Indonesia (GOI) environment law, Environmental Protection and Management Law of 2009. For compliance with GOI requirements on environmental assessment, a separate Analisa Mengenai Dampak Lingkungan (AMDAL) report will be prepared by the detailed design consultants during the detailed design phase.

2. *Subproject Description*. Palembang's proposed sewerage system under MSMIP shall cover the areas north of the Musi River in the sub-districts of Ilir Timur I, Ilir Timur II, Bukit Kecil, and Kelurahan Sei Selayur of Kecamatan Laidoni. This is known in Palembang's Wastewater Investment Master Plan as the "Ilir Wastewater Scheme Stage I". This is centered on one large sewerage catchment area with the primary aim of intercepting wastewater discharges to the Musi River from 95,000 people by 2018 with19,000 domestic service connections. The proposed Palembang City's sewerage network will have 19.24 km of sewer pipelines with diameters ranging from 300 mm to 1,650 mm and a tertiary sewer network covering 692 hectares. The Indonesia Infrastructure Initiative (IndII) will fund the proposed WWTP and sewer network. The system also includes sewer 151 manholes and 2 sewage pumping stations.

3. Wastewater from the proposed Palembang City's sewer network system will drain to a 23-MLD Wastewater Treatment Plant (WWTP) located at Kelurahan Sei Selayur near the Musi River. WWTP's effluent discharge point is the Musi River. The WWTP will be a Facultative Aerated Pond (FAP) system using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds with a biochemical oxygen demand (BOD) load of 5.3 tons per day (tpd) and will be designed to achieve effluent quality with a maximum BOD of 50 mg/l and total suspended solids (TSS) of 100 mg/l. Other components are: administration office, guard house, small laboratory for wastewater tests, and backup power supply.

4. *Environmental and Socioeconomic Conditions*. The sites of the proposed Palembang City's subproject are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed WWTP site at Sei Selayur is presently an idle piece of land, it is basically located in an industrial area bounded by the Musi River. Its northern border is an unpaved access road that connects to a paved road. The west is bounded by a road (Jalan Dr. Insinyur Sutami) which goes straight to the Musi River. Beyond this western boundary is an industrial facility (a fertilizer plant). Hence, the proposed Palembang City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. For socioeconomic indicators, Palembang City's total population in 2010 was 1,455,284 people. Its industrial sector is engaged in chemicals, oil, and gas. Some 2,031,700 tons of fertilizer

were produced in 2010. Its agricultural sector produced 24,773 tons of rice and 1,485 tons of cassava in 2010.

5. *Impacts and EMP*. Screening for environmental impacts of the proposed Palembang City's subproject is made through a review of the parameters associated with sewerage projects against the components of the proposed sewage collection network and Sei Selayur WWTP. An important consideration in analyzing the environmental impacts of the proposed subproject is the fact that its components are infrastructures for environmental improvement and for reducing the risk to public health from untreated sewage.

6. Adverse environmental impacts during construction of the proposed Palembang City's subproject are temporary, less than significant, and can easily be mitigated. There will be no massive construction activities that can damage the environment. All open trenches shall be adequately shored and braced to provide a safe working environment. The contractor has a range of options to support the trench during pipe laying operations. Excavated soil is backfilled to the trench after pipelaying and surplus soil hauled to suitable disposal sites. Construction activities for the proposed WWTP at Kelurahan Sei Selayur shall be confined in a site to be secured by the city government. Typical construction issues are manageable with the implementation of a contractor's environmental management plan (CEMP) for the following: (i) erosion and sediment runoff, (ii) nuisance to the public, (iii) noise and dust, (iv) vehicular traffic, (v) construction wastes, (vi) oil and fuel spillages, (vii) construction camps, (viii) occupational health and safety, (ix) public safety and convenience, (x) proper closure of construction sites, and (xi) potential damage to any archaeological and cultural assets. During detailed design and pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues.

7. Environmental problems due to operation of the proposed WWTP at Kelurahan Sei Selayur can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. The implementing unit of the proposed WWTP shall ensure that its plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents. Public health risk can be addressed by keeping the public away from the facility. A written health and safety manual shall be prepared for the Sei Selayur WWTP operation.

8. An Environmental Management Plan of the proposed Palembang City's sewerage system is developed to effectively manage the environmental issues. The plan includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional setup discusses the requirements and responsibilities during pre-construction, construction, and operation phases. The plan includes tabulated information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures and monitoring.

9. *Addressing Climate-Change Impacts*. Climate change adaptation considerations shall be included in the design of the proposed Sei Selayur WWTP since it is on a low-lying ground and in close proximity to the Musi River. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to infrastructures. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Palembang City and increase the likelihood that such investments will fail to deliver the benefits for which they were intended. Flooding could affect the structural integrity of the proposed Sei Selayur WWTP. Flooding can also

prevent the WWTP from operating by reducing the head available across the plant. It may also submerge facility components that are supposed to be dry for proper operation. These situations may result to the release of untreated sewage into the environment and increasing the risk to public health. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Palembang City's Sei Selayur WWTP during the design phase to ensure that occurrence of flooding is properly evaluated. Results of the study shall be used for designing the proposed WWTP and the preparation of engineering specifications to ensure that it is less vulnerable to extreme flood events.

10. Climate change mitigation considerations will also be included in the design of the proposed Palembang Sei Selayur WWTP. The membrane covered anaerobic ponds shall be connected to a flare by pipework to avoid releasing the generated methane from the ponds. However, during detailed design, potential use of the generated methane shall be evaluated with due considerations to financial and economic factors.

11. *Institutional Setup and Capacity Building*. The institutional setup from the top starts with the Ministry of Public Works as the executing agency of MSMIP with a Central Project Management Unit (CPMU) to be created under its Directorate of Development, Sanitation, Environment and Housing (PPLP), while the key implementing unit at the subproject level is the Palembang City's Local Project Management Unit (LPMU). This setup at the subproject level is different from the other 4 MSMIP subprojects.

12. The CPMU shall appoint a staff, as Environment Officer for MSMIP, to oversee the implementation and monitoring of environmental safeguards requirements. Palembang City's LPMU is the key implementation unit in the field responsible for construction contracts' supervision of the Palembang City subproject. An Environmental Officer will be designated in the LPMU to effectively manage the environmental aspects of the Palembang City's subproject and ensure implementation and monitoring of the EMP during construction. Close coordination between the contractors and the Environment Officer of the LPMU is needed to ensure good planning for mitigation measures and ensure the timely implementation.

13. A capacity building for Palembang City's Sei Selayur WWTP operators is proposed. It is one of the proactive ways to prevent the WWTP from discharging poor quality effluents by ensuring proper operation. The capacity building shall be divided into 2 parts. The first part shall be a hands-on training in a similarly operating WWTP in Indonesia, while the second part shall be the actual operation of the new WWTP with inputs from a WWTP advisor for a 3-month period intermittently, an important input for the WWTP start-up phase.

14. *Consultation and Participation*. Within the context of "meaningful consultation" per ADB's SPS, the city government of Palembang initiated a process of consultation during project preparation and intends to continue it during detailed design and construction phases. The city government conducted an initial public consultation and information disclosure last 02 October 2012 with various stakeholders' representative, and concerned individuals. Details of the proposed subproject components were presented to the stakeholders and their views were requested. The initial public consultation was conducted in the Indonesian language. Issues that stakeholders raised include impacts to the public during construction of the sewer lines, odor generation of the WWTP, potential for recycling of the WWTP effluent, and the need for further information campaign. Stakeholders expressed support to the proposed subproject. The process of public consultation with various stakeholders shall continue during the detailed design stage. Public information

activities were also conducted earlier during the preparation of Palembang Wastewater Investment Master Plan in 2010-2011.

15. *Grievance Redress Mechanism*. Implementation of the proposed sewerage subproject will be fully compliant to ADB's safeguards requirement on grievance redress mechanism. The city government of Palembang disclosed the proposed mechanism during the initial public consultation last 02 October 2012. It will again be presented to stakeholders during detailed design when more subproject details are available and in area meetings during the construction phase. Complaints about the environmental performance of the subproject during the construction phase can best be handled by various levels including the formation of an ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for the expeditious resolution of the complaints, while complaints during the operation phase can be brought to the attention of Palembang's Badan Lingkungan Hidup (BLH), the local environment agency. The CSECC shall be chaired by Palembang City's LPMU head. Members shall include: (i) contractor's highest official at the site such as the Construction Manager or Construction Superintendent, (ii) village (Kelurahan) Chief or his representative, and (iii) a women organization's representative. Creation of the ad-hoc CSECC and its operation shall be included in appropriate sections of the civil works contract.

16. *Conclusion and Recommendation*. Based on the screening for potential environmental impacts and risks of the proposed Palembang City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Palembang City subproject can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment study. A full EIA is not warranted and the subproject's environmental classification as Category B is deemed appropriate. The IEE shall therefore be finalized as the final environmental assessment document of the proposed Palembang City's sewerage system subproject.

17. Implementation of the proposed Palembang City's subproject is hereby recommended with emphasis on the following: (i) EMP of Palembang City's sewerage system subproject shall be included in the design process; (ii) IEE Report/EMP shall be forwarded to the design consultant for consideration in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract; (v) Contract provisions on creation and operation of the CSECC shall be included in construction contracts; (vi) Training of the WWTP operators on operation and maintenance of the WWTP shall be completed before actual operation; (vii) a WWTP advisor (consultant) shall be provided intermittently during the initial 3 months of operation to assist the operators in the start-up phase and also to correct any undesirable operating practices; (viii) Monitoring of health and safety requirements shall be given more importance during construction and operation to reduce risks to the public and to personnel; and (ix) Palembang City government and its LPMU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

I. INTRODUCTION

1. Palembang City is the capital of South Sumatra Province, Indonesia and one of the selected subprojects under the Metropolitan Sanitation Management and Investment Project (MSMIP) for the Republic of Indonesia (ADB TA 7993-INO) funded by the Asian Development Bank (ADB). Objective of the Project Preparatory Technical Assistance (PPTA) study is to assist the government of Indonesia (GOI) in preparing for funding consideration by ADB a project for urban sanitation management. It is intended to improve the livability and competitiveness of millions of city-dwellers in large Indonesian cities through interventions in sanitation management such as the provision of a sewerage system. It will improve access to sanitation services in selected urban areas.

2. Preparation of this Initial Environmental Examination (IEE) is part of the activities of ADB TA 7993-INO. It provides ADB with an assessment of the environmental concerns to be considered regarding the subproject location, planning and design, construction, and operations and maintenance.

3. Preparation of the IEE involved field visits to the proposed subproject area; review of available information, discussions with local government officials, local government agencies, and members of the community within the subproject area.

4. The IEE has been carried out in accordance with *ADB's 2009 Safeguard Policy Statement* (SPS) and the requirements describe in its Appendix 1 (Safeguards Requirement 1: Environment) and the laws of the Republic of Indonesia as embodied in Environmental Protection and Management Law of 2009. For compliance with GOI requirements on environmental assessment, a separate Analisa Mengenai Dampak Lingkungan (AMDAL) report will be prepared by the detailed design consultants during the detailed design phase.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

5. The policy, legal, and administrative frameworks relevant to the environmental assessment of infrastructure projects in the Republic of Indonesia have been established by the following laws and regulations: (i) Environmental Management Law of 1997 (Law No. 23/1997), (ii) Environmental Protection and Management Law of 2009, and (iii) Environmental Permit Regulation (Government Regulation No.27/2012).

6. The Environmental Management Law (Law No. 23/1997) required the conduct of environmental assessment of infrastructure projects. This law strengthened the enforcement of the Indonesian environmental assessment system (AMDAL). Government Regulation No.27/1999 was issued, requiring actions to implement the environmental assessment system. Formal guidance on the preparation of environmental assessment was issued by Decree of the Minister of Environment No. 2 of 2000.

7. To further improve the AMDAL system, the Environment Minister of State issued in 2006 Regulation No.11 which clarifies the guidelines of categorizing projects and the type of environmental assessment documents to be submitted by project proponents. Under the AMDAL system, proposed projects must be screened for coverage and compliance. Proposed projects are categorized into: (i) projects requiring Environmental Management Plan (Upaya Pengelolaan Lingkungan, UKL) and Environmental Monitoring Plan (Upaya

Pemantauan Lingkungan, UPL); (ii) projects requiring an EIA report which include an Environmental Impact Analysis (Analisis Dampak Lingkungan, ANDAL), UKL and UPL; and (iii) projects that do not require AMDAL or UKL/UPL. Regulation No.11of 2006 provides an extensive list of screening and sector-specific criteria to this effect.

8. In 2009, the Environmental Protection and Management Law of 2009 replaced the Environmental Management Law of 1997 (Law No. 23/1997). Recently, the Environmental Permit Regulation of 2012 was issued citing the need to implement certain provisions of the Environmental Protection and Management Law of 2009. This new regulation requires all project owners to apply for an environmental permit to the appropriate government authority (minister of environment, governor or mayor) before project implementation. It prescribed the process for environmental permitting and reaffirms GOI's AMDAL processes and requirements. Presently, the local environment agencies, Badan Lingkungan Hidup (BLH), of the subproject cities are still waiting for the issuance of the implementing guidelines for the Environmental Permit Regulation of 2012.

9. Under AMDAL regulation, a proposed WWTP for domestic wastewater that will require an area of more than 3 hectares or will serve a population of more than 100,000 shall be required to prepare an AMDAL report. The Palembang City subproject will require an area of 5.7 hectares for its WWTP, more than the 3-hectare criterion. It will therefore be required to prepare an AMDAL. Preparation of the AMDAL will be done by the detailed design consultants during the detailed design phase as agreed by ADB and GOI. This will be funded by the Indonesia Infrastructure Initiative (IndII). Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

10. Application for Environmental Permit and AMDAL shall be done at the same time as provided for by Environmental Permit Regulation (No.27/2012). The regulation requires that application for environmental permit shall be accompanied by environmental assessment documents (ANDAL and UKL/UPL), business legal documents, and business profile document. Information on the process for environmental permit and AMDAL processing and timelines is presented in Appendix 1.

11. A permit to discharge will also be required for the proposed WWTP under the city's regulation for WWTPs. Information on the process for discharge permit is presented in Appendix 2. This permit shall be applied for during the initial months of WWTP operation since actual data on effluent quality are required to be submitted with the application.

12. *International Conventions*. Some international conventions are part of the environmental framework since the Republic of Indonesia is a party to some international conventions, treaties and agreements on the principles and actions necessary for sustainable development and environmental protection. It has ratified on 1994 both the *Convention on Biological Diversity* and the *United Nations Framework Convention on Climate Change*. These international conventions explicitly reference the application of environmental assessment to address the effects of human activities. The Convention on Biological Diversity, in particular, promotes the use of appropriate procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse effects on biological diversity.

13. *Sewerage Laws and Regulations*. The framework on wastewater management system development in Indonesia is provided by Public Works Regulation No.16/PRT/M/2008 on National Strategy and Policy in Domestic Wastewater Management. Law No.4/1992 on Housing and Settlements mandates that sewerage systems shall be provided. It requires

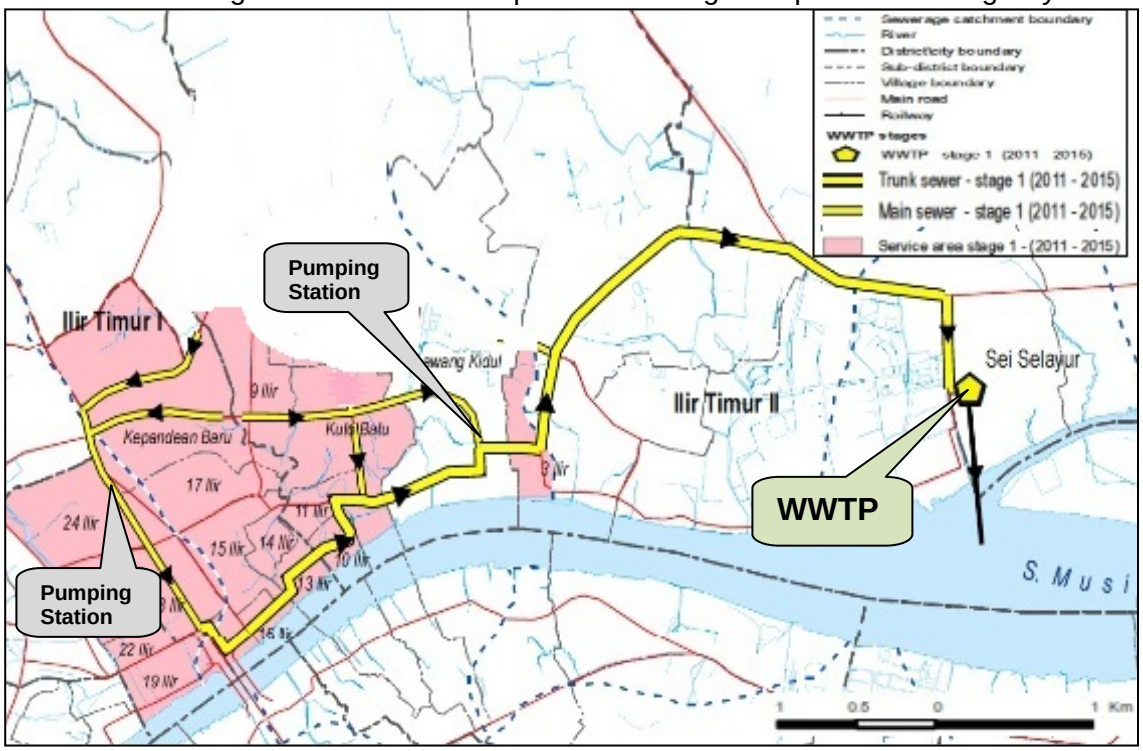
public utilities for wastewater systems to be operated professionally to provide adequate public services. Law No.7/2004 on Water Resources also cites the need for sanitation infrastructures for the protection and preservation of water resources. Effluent standard for wastewater treatment plants are regulated under the Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality which allows effluent discharge with maximum biochemical oxygen demand (BOD) of 100 mg/l and total suspended solids (TSS) of 100 mg/l. However, the proposed WWTP will be designed to meet maximum effluent values of 50 mg/l and 100 mg/l. This will be compliant with the provincial standards of BOD 50 mg/l and TSS 100 mg/l.

III. DESCRIPTION OF THE PROJECT

A. Location

14. Palembang's proposed sewerage system under MSMIP shall cover the areas north of the Musi River in the sub-districts of Ilir Timur I, Ilir Timur II, Bukit Kecil, and Kelurahan Sei Selayur of Kecamatan Laidoni. This is known in Palembang's Wastewater Investment Master Plan as the "Ilir Wastewater Scheme Stage I" (Figure 3.1). This is centered on one large sewerage catchment area with the primary aim of intercepting wastewater discharges to the Musi River from 95,000 people by 2018 with19,000 domestic service connections.

Figure 3.1: Location Map of Palembang's Proposed Sewerage System



Source: PPTA Consultants

B. Components and Cost Estimate

15. The proposed sewerage network will have 19.24 km of sewer pipelines with diameters ranging from 300 mm to 1,650 mm (Table 3.1) and a tertiary sewer network covering 692 hectares. IndII will fund the proposed sewer network and WWTP. The system also includes sewer 151 manholes and 2 sewage pumping stations.

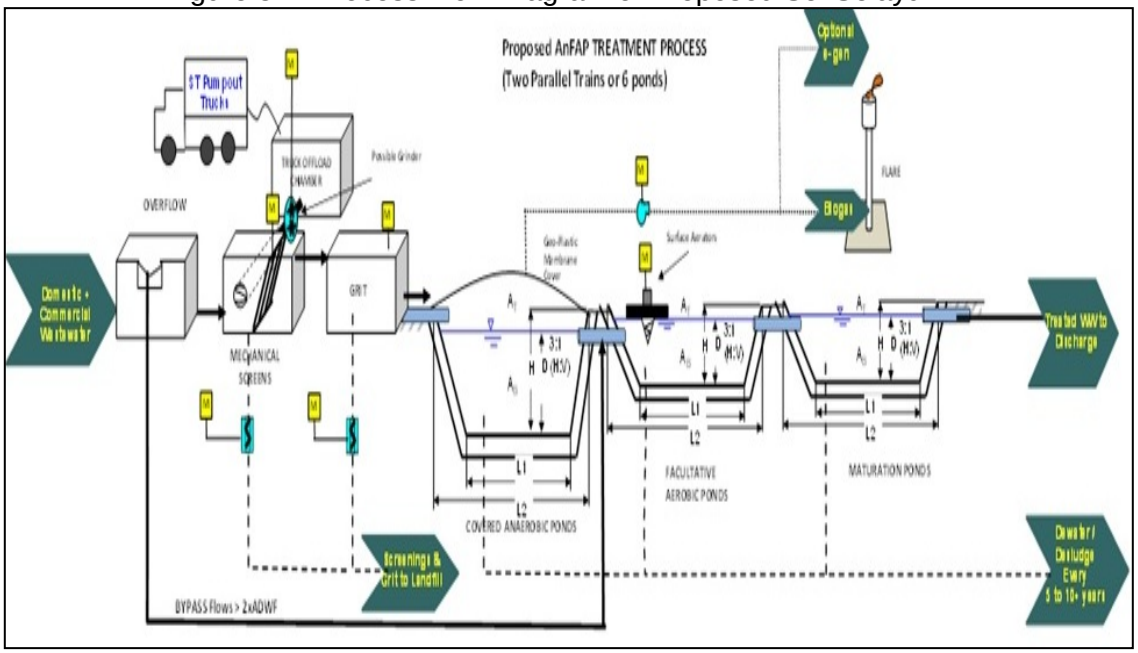
Table 3.1: Proposed Palembang's Sewerage Network

Sewer Pipe Diameters (in millimeter)	Sewer Pipeline Length (in kilometer)
1650	4.60

1550	4.77
1200	1.62
850	0.18
750	1.21
550	3.08
450	3.41
300	1.76
Total…	19.24

16. Wastewater from the sewer network system will drain to a 23-MLD Wastewater Treatment Plant (WWTP) located at Kelurahan Sei Selayur near the Musi River. WWTP's effluent discharge point is the Musi River. A wastewater treatment plant is locally known in Bahasa as "Instalasi Pengolahan Air Limbah (IPAL)". The WWTP will be a lagoon system as indicated in the process flow diagram (Figure 3.2) with a biochemical oxygen demand (BOD) load of 5.3 tons per day (tpd).

Figure 3.2: Process Flow Diagram of Proposed Sei Selayur WWTP



Source: PPTA Consultants

17. The proposed WWTP shall be a Facultative Aerated Pond (FAP) system in series using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds. There will be 2 parallel trains (total of 6 ponds). The anaerobic pond shall be covered with a polymer (such as "Hypalon") to capture odor and biogas for flaring. Pretreatment system includes a screen chamber and grit chamber. The WWTP will be provided with a septage receiving structure for future use. Initially, there will be no sludge drying beds since pond desludging will only be needed every 10 years. Other components are: administration office, guard house, small laboratory for wastewater tests, and backup power supply.

18. The FAP system is a biological waste treatment system using stabilization ponds with mechanical aerators to put more oxygen (air) into the wastewater. With higher oxygen transfer the ponds can have smaller hydraulic retention time resulting to smaller requirement for volumes and land area. Top of ponds have aerobic conditions, while the bottom is anaerobic. Both aerobic and anaerobic processes occur within the pond. The top layer of the pond receives oxygen from aerators, while the lower layer is deprived of oxygen and becomes anoxic or anaerobic. Settleable solids accumulate and digested at the bottom of the pond. Aerobic and anaerobic organisms work together to achieve good BOD reductions.

19. The proposed WWTP will be designed to achieve effluent quality with a maximum BOD of 50 mg/l and total suspended solids (TSS) of 100 mg/l. This BOD value is more stringent than the national effluent regulations that (Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality) allows a discharge quality with a maximum BOD of 100 mg/l. There are no fecal coliform standards for effluents. The provincial effluent standard of maximum 50 mg/l BOD applies (South Sumatra Governor Decree No.18 of 2005).

20. *Another WWTP Process*. Instead of using the FAP system for the proposed WWTP, the PPTA consultants also examined the proposal of a previous study to use an oxidation ditch system. An oxidation ditch system is a type of activated sludge wastewater treatment system that uses a ring-shaped or oval-shaped channel equipped with mechanical aeration devices either a brush or rotary type. It is operated as a continuous aerobic biological treatment facility. Primary settling tanks are not required. Screened and degritted wastewater that enters the ditch is aerated and circulated normally at about 0.25 to 0.35 m/s. Oxidation ditch operate in an extended aeration mode with long hydraulic and solids retention times. After biological treatment in the oxidation ditch, a clarifier is used to settle out the biomass and to recycle a portion to the influent stream. Process train consists of pre-treatment, oxidation ditch reactor, clarifier, sludge thickener, anaerobic digester, and disinfection.

21. The PPTA consultants are not recommending the oxidation ditch system since it has higher capital and operating costs compared to the FAP system. It is also more complex to operate than the FAP system. Since the focus of the Stage I sewerage system is to deliver a WWTP with low capital and operating costs and less system complexity, the FAP system is preferred for the WWTP.

22. Total Palembang's subproject cost is estimated at US$51.92 millions based on 2012 prices. The proposed WWTP is estimated to have an operating cost of US$192,000 per year based on 2012 prices.

C. Construction

23. Palembang's Sei Selayur WWTP construction shall require: (i) site clearing and marking of alignments, (ii) stockpiling of construction materials, (iii) backfilling, (iv) construction of new structures, (v) construction of embankments, (vi) construction of ponds and buildings, (vii) concreting for required tanks, (viii) installation of piping systems, (ix) installation of electro-mechanical equipment (x) cleaning and closure of construction sites.

24. Sewer pipelines of the proposed Palembang's sewerage system shall be laid in trenches along the designated streets of the city. Trenches shall be excavated to the alignment and elevations as indicated on the construction drawings with any deviations to be approved by the supervising engineer representing the city. All open trenches shall be adequately shored

and braced to provide a safe working environment. Depending upon the severity of the condition, the contractor may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, a trench shield or box to support the trench during pipe laying operations.

25. All pipe, fittings, and accessories shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, slings, or other suitable tools or equipment in such a manner as to prevent damage to the sewer main materials and any protective coatings. Pipe and fittings shall be embedded in the trench with the invert conforming to the required elevations, slopes, and alignment, and with the pipe bottom uniformly and continuously supported by a firm bedding and foundation. All pipe joints shall be assembled in accordance with the recommendations of the manufacturer. The laid pipelines shall be backfilled with suitable earth materials prescribed in the construction contracts and shall be compacted to the required standards. Compaction will be done to ensure that the pavement sub-grade will not settle and adversely affect the pavement.

26. *Pipeline Leakage Tests*. Before acceptance of the owner of the installed sewer pipeline, leakage tests will be conducted by the supervising engineer representing the city to provide assurance that the pipeline is free from significant leaks. The tests may include low pressure air exfiltration or water exfiltration. Exfiltrations of sewer pipeline between manholes will be measured and shall not exceed the allowable standards for exfiltrations.

27. *Restoration and Clean-up*. After the sewer pipeline trench are backfilled and the pipeline accepted by the owner, the contractor will restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod, or other disturbed surfaces or structures to a condition equal to that which existed before the construction work began. The provisions for these restoration activities are usually included in standard construction contracts for sewer pipeline installations. Prior to demobilization, the contractor will remove all surplus pipeline materials, tools and temporary structures resulting from the work. The contractor will also remove and dispose all debris, excess earth from excavations, and construction solid wastes. Standard construction contracts for sewer pipeline installations also contain these provisions.

D. Implementation and Operation

28. Detailed engineering design of the Palembang subproject will start on first quarter of 2013. Construction is scheduled to start on fourth quarter of 2014 and expected to be completed on the second quarter of 2018. Palembang‘s new sewerage system is expected to be operational by third quarter of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

29. A brief description of the existing environmental and socioeconomic conditions of the Palembang City subproject influence area is presented in the following subsections:

A. Physical Resources

30. Palembang City is the capital of South Sumatra province and the fourth largest city in Indonesia. It is located between 2°52' to 3°5' south latitude and from 104°37' to 104°52' east latitude, with average height 8 meters from the sea level. Since year 2007, Palembang City is divided administratively into 16 Sub-district and 107 wards and according to Governmental Regulation number 23/1988. It has an area of 400.61 km square. The northern, eastern, and western boundary of Palembang is Banyuasin Regency, while the southern is Muara Enim Regency and Ogan Ilir.

31. *Topography*. Palembang City's terrain is generally flat and is characterized by the Sungai Musi River transecting the city from west to east. Elevations range from about 4 m above mean sea level (amsl) close to the river to about 12 m amsl in the northern and north western parts (Sukarami to Ilir Barat) where the terrain tends be more undulating in nature then the flat, marshy areas typical of the western part of the urban area. As can be expected from such terrain, ground slopes are flat to mild, typically less than 1° (less than 1 in 100) in most parts, and increasing to 2° - 10° (1 in 30 to 1 in 6) in the hilly areas.

32. The significance of this topography to wastewater management is that sewerage systems are likely to need pump stations. However, sewerage areas will necessarily be constrained by drainage catchments. The natural ground gradient would be adequate to enable some gravity pipelines for tertiary and secondary sewer pipes over relatively short distances across the flatter areas. In the hilly areas further upstream gravity mains could be used to collect wastewater and convey it to a primary carrier closer to the river. The low lying areas which are prone to inundation suggest that in many parts of the city disposal of septic effluent poses a health hazard to the community and should be connected to a sewerage system. Because of the almost flat topography of the area, construction techniques to ensure appropriate gradients on the sewer pipelines need to be incorporated into the design. This in itself has implications as far as the conventional pump gravity system is concerned. Obtaining the right gradients and velocities is critical to ensure that there are minimal operational difficulties at a later date. Pumping the bulk of the effluent will incur higher power charges of keeping velocities optimal with the network and is also important to reduce the blockages (source: Wastewater Investment Master Plan Package II Palembang, Bandar Lampung and Batam Activity W004 Palembang Vol. 1, 2011)

33. *Geology and Soils*. The underlying geology of the city is dominantly clay, sandy clay, silt and alluvial deposits. Along the river and nearby areas, especially in the eastern part of the city, Kaldoni and Seberang Ulu kecamatans, the alluvial deposits dominate. The clayey soils tend to be found more in the north east and northern area. Clayey sands are also abundant in the Ogan area. This indicates that soils are well draining close to the river, but because of the high water table, onsite disposal of wastewater may cause aquifer contamination. This in turn would make the groundwater unsuitable for water supply without treatment (disinfection at the minimum). In the northern areas the higher clay content would lessen the efficiency of on-site disposal systems but this could be offset by the lower housing density.

34. Indonesia has 6 earthquake zones: earthquake zone 1-2 for minor earthquake, earthquake zone 3-4 for moderate earthquake, and earthquake zone 5-6 for severe earthquake. Palembang City is in earthquake zone 2, minor earthquake zone. (Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003). The value of peak acceleration of bedrock should be calculated in the structural design of buildings to ensure safety.

35. *Groundwater Resources*. The water table in the alluvial deposits near the river is shallow, 1 m to 2 m during the dry season and rising to within 1,5 to 0,5 m in the wet season. Further away from river the depths to the nearest aquifers range from more than 5 m in the dry season to about 5-2 m in the wet season. However, in the marshy areas the water table is at surface level. The implication for wastewater planning is that onsite disposal systems design and location must take into consideration the depth of the water table. In terms of sewerage planning, the laying of pipes in depths greater than 1 m would be in saturated ground conditions and this must be allowed for both in design and costing. Buoyancy considerations may also be required in the design of larger structures such as pump stations and treatment plants.

36. Groundwater quality is poor and requires treatment for drinking water use. It is high in iron as evidenced by its yellow color. It has high E.coli concentrations. This may be due to penetrations into the shallow aquifers by discharges from septic tanks and other wastes.

37. *Surface Water Resources*. Being on the flood plain, Palembang has an abundance of water. The Musi River has a number of tributaries, the main ones being the Keramasan, Ogan and Komering rivers on the right bank, all of which originate in the Bukit Barisan Mountains to the south of Palembang and enter the Musi River within the city area. On the left or northern bank there are numerous smaller streams that discharge into the Musi River. The Musi River is affected by tidal fluctuations to upstream of the town and so water levels rise and fall during the day. Although there are levee banks around the city, inundation still occurs relatively frequently, especially in the marshy areas in eastern parts such as Kaldoni and Seberang Ulu II. By extension the reaches of the tributary streams are also affected by tidal variations.

38. There are a total of 19 drainage catchments within Palembang with catchments varying in size from 2 ha to over 7,000 ha. Most of the channels are small and shallow; width ranging from 2-12 m and depth 1 m to 3 m. Many of them flow through marshy areas or rice paddies which are still present within the city limits. By nature, the drains generally dry up in the hot season and overflow during the wet season. Many of them flow backwards for parts of the day as they are affected by backwater from the Sungai Musi.

39. Water quality data has been measured intermittently for at least 6 years in the four main rivers of Palembang. Unfortunately the data collected to date is too scant and discrete for it to be used to identify trends or even the impact of pollution discharges from a city as large as Palembang. An indicative assessment of water quality based on the data in hand is summarized in Table 4.1 for biochemical oxygen demand (BOD). Data on BOD, COD, DO, total phosphorus, ammonia, and fecal coli are presented in Table 4.2 and Table 4.3.

40. The small streams and drainage channels on the left bank of Musi River have poorer water quality than that of the rivers. Many of the channels suffer from siltation and stagnation and even eutrophication. In the inner city area many of sections of the canals are blocked by solid waste and the water is septic due to lack of flushing. These waterways have much smaller carrying capacity.

Table 4.1: Water Quality of Palembang Rivers

Point/Stream Location *	June 2005			October 2005		
	Flow (m^3/s)	BOD (mg/L)	BOD (ton/d)	Flow (m^3/s)	BOD (mg/L)	BOD (ton/d)
Musi River						
1 u/s – Pulo Kerto	728	0,75	47	871	1,10	83
2 Karang Anyar – PDAM	673	3,06	178	740	2,03	130
7 Ampera Bridge	3.120	1,68	453	3.762	0,64	208
10 d/s-Pulo Banjar	3.572	1,15	355	5.018	1,05	455
11 d/s-Selat Borang	707	1,66	101	911	1,07	84
12 d/s-Pulo Burung	3.790	2,06	675	4.845	0,80	335
Keramasan River						
3 u/s of City	50	1,71	7	21	1,15	2
4 Musi confluence	143	2,40	30	80	0,67	5
Ogan River						
5 u/s of city	1.260	1,15	125	1.672	1,05	152
6 Musi confluence	1.444	1,69	211	2.257	1,30	254
Komering River						
8 u/s of city	146	1,42	18	187	1,50	24
9 Musi confluence	219	1,02	19	320	0,69	19

Note : u/s refers to upstream; d/s refers to downstream
Source : Wastewater Investment Master Plan Package II Palembang, Palembang Vol. 1, 2011

Table 4.2: Water Quality of Musi River Upstream of Ampera Bridge in June 2005

Parameters	Standard	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
BOD, mg/l	2	0.75	3.06	1.71	2.4	1.15	1.69
COD, mg/l	10	2.99	3.96	5.98	8.96	5.98	3.98
DO, mg/l	6	4.9	4.7	1.9	4	4.9	4.8
Total Phosphorus, mg/l	0.2	0.59	0.68	0.34	0.63	0.84	0.84
Ammonium,mg/l	0.5	0.06	0.22	0.08	0.07	0.26	0.06
Fecal Coli, n/100ml	100	1700	7700	1000	8800	1400	3100

Note: Standard based on National Government Regulation No. 82 of 2001 for Water Quality Management and Control of Water Pollution (River Classification for Beneficial Uses) Class I
Source: Wastewater Investment Master Plan Package II Palembang, Vol. 1, 2011

Table 4.3: Water Quality of Musi River Downstream of Ampera Bridge in June 2005

Parameters	Standard	Point 7	Point 8	Point 9	Point 10	Point 11	Point 12
BOD, mg/l	2	1.68	1.42	1.02	1.15	1.66	2.04

COD, mg/l	10	7.97	3.98	2.99	2.99	3.98	4.98
DO, mg/l	6	4.3	2.6	3	4.7	4	3.2
Total Phosphorus, mg/l	0.2	0.73	0.83	0.84	0.84	0.13	0.74
Ammonium,mg/l	0.5	0.14	0.16	0.1	0.14	0.04	0.09
Fecal Coli, n/100ml	100	3000	1500	2000	1300	1200	600

Note: Standard based on National Government Regulation No. 82 of 2001 for Water Quality Management and Control of Water Pollution (River Classification for Beneficial Uses) Class I
Source: Wastewater Investment Master Plan Package II Palembang,Vol. 1, 2011.

41. *Climate*. Palembang City has dry season and rainy season. The dry season (June to September) is influenced by the Australia Continental Air Masses. The rainy season (December to March) is influenced by Asia Continental and Pacific Ocean Air Mass. The air contains a great deal of moisture and causes rain to fall in Indonesia. The transitional periods between the two seasons are April to May and October to November. The variation in temperature is influenced by the altitude. In 2010, the average temperature ranged from 26.6^{o}C to 28.50^{o}C. The highest temperature was recorded in May that accounted for 35.70^{o}C, while the lowest temperature that accounted for 21^{o}C was recorded in December (*Palembang in Figure 2011).*

42. Rainfall in the area is influence by climate, orography, and cycling of air flow. Therefore, the volume of rainfall varied greatly by month and place of observation station. The average rainfall in 2010 ranged from 91.1 mm^3 (July) to 541.7 mm^3 (March). The average humidity January-December 2010 is 85-88%. The lowest humidity is in October, 54% and the highest humidity is in June and July 100% (*Source: Meteorology and Geophysics Institution, Climatology Station of Palembang (Palembang in Figure, 2011).* In 2010, air pressure in Palembang is in the range of 1,007.40 mb in December and 1,010.50 mb in January. Wind speed is 2-3 knot and average of percentage of sun shines is 52%. The lowest percentage of sun shines is 40% in January and the highest percentage of sun shines is 58% in December (*Source: Meteorology and Geophysics Institution, Climatology Station of Palembang (Palembang in Figure, 2011).*

43. Relative to climate change, information on climate change projections specific for Palembang City is not yet available. GOI's Climatology Meteorology and Geophysics Agency, the Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) is still preparing its climate change projections.

44. *Air Quality and Noise*. In 2010, Palembang Environmental Office conducted air quality monitoring at 16 point in city area four times a year. The analyzed parameters were SO_2, CO_2, NO_2, particulate matter (PM 10), temperature, humidity and noise. Monitoring results showed that Palembang air quality is within limits of Government Regulation No. 17 Year 2005 (Emissions Standards and Ambient Air Quality Standards) except for noise. Concentrations of NO_2 range 12.95 -367.175 µg/NM^3/1 hour; concentrations of SO_2 range 113.7-656.7 µg/NM^3/1 hour; concentrations of CO_2,range 1.172-14.280 µg/NM^3/1 hour. Noise ranges 44.3 – 75.6 dB. The highest noise is located at corner of Jl. R. Sukamto that generated from motorcycle traffic in this area (Source: Regional Environmental Status 2011, Palembang Environmental Office).

45. An emissions inventory has not been conducted in Palembang. Although there is no specific mention of the odor emitted from the open drains in any of the reports discussing air quality, moving around the streets in the evenings and at night, it is quite obvious that the drains are open sewers and that anaerobic activity is present in the sediments. The sources of this pollution are septic tanks and direct discharges into the canals. For the city to become an international venue eliminating the odors associated with discharge of wastewater into the drains is of paramount importance.

B. Ecological Resources

46. The proposed 5.7-ha WWTP site at Sei Selayur is presently an idle piece of land occupied by some settlers near the unpaved access road that connects to a paved road (Jalan Dr. Insinyur Sutami). It is aligned towards the northwest from the Musi River and generally a flat area. Vegetation consists of grasses, shrubs, and few planted trees. There is a small rice field plot near the unpaved access road. The north is bounded by vacant government land with informal settlers near the unpaved access road. The east is also bounded by a vacant land. Beyond the northeast boundary is a rubber factory. The west is bounded by a road (Jalan Dr. Insinyur Sutami) which goes straight to the Musi River. Beyond this western boundary is an industrial facility (fertilizer plant). The southern part is bounded by industrial facilities and the Musi River. On a broader scale, the proposed WWTP site is not within undisturbed landscape and is basically located in an industrial area bounded by the Musi River.

47. Since the Sei Selayur WWTP site is devoid of forested areas, it is not a habitat for large wild animals, rare or endangered species. Farm and domesticated animals are therefore the large faunal species such as goats, house cats, and dogs. Photographs of the site are presented Appendix 3.

Figure 4.1: Satellite Photo of Proposed Sei Selayur WWTP Site

Photo source: Google Earth. 2012.

C. Economic Development

48. *City Income and Expenditures*. Regional dues and regional taxes are the contributor for regional income. Which have very important role to support the regional development. Regional Expenditure Budget of Palembang City in 2008 is Rp. 1,177,276,456,058.91 increase 3.18 % to Rp. 1,214,751,448,376.70 in 2009 (Source : Palembang in Figures 2009).

49. *Land Use*. Unlike cities in Java, cities in Sumatra in general, but Palembang in particular has a wide open space feel about it. Allotment sizes are large and spaced out. There are only a few high rise buildings. Urban development, such as housing and industries, account for about 76 % of the total area within the city limits. The undeveloped area can be classified as 15 % agricultural land, 5 % forests and 4 % marshlands.

50. The built-up areas tend to be concentrated in the central part of the city on either side of the Ampera Bridge and along the river banks. In the north, the main developed area extends from Ilir Timur to Ilir Barat II and on the south side in Seberang Ulu 1 between the main highway and the Ogan River. There does not appear to be any planned growth direction, expansion of the build up area is by natural sprawl. This makes infrastructure planning much more difficult.

51. The central business district is spread around the Jalan Sudirman axis mostly in Kecamatan Ilir Timur I and eastern part of Bukit Kecil and a new commercial district is developing around Gubernur Hasan Bastari Street in Kecamatan Seberang Ulu I. Industrial areas are concentrated along the banks of the Musi River in the eastern part of the city in Ilir Timur II and Plaju kecamatans and along the right bank of the river in Kertapati kecamatan.

52. *Commerce and Trade*. Palembang has four industry groups: Metal Industry, Machine, Chemical and Multi various; Industry of Agricultural Produce and Fishery; Industrial Result of Forest and Plantation; and also Crafting Industry. PT Pusri a chemical industry that produces fertilizer plays a very important both nationally and internationally. PT Pusri fertilizer production in 2010 amounted to 2,031,700 tons which during the period January to December 2010, is the largest production compare to other production.

53. There are two small scale business units of metal product manufacturing and services industry in Ilir Timur II. There are six medium scale business units of manufacturing of forest and estates. There are two units for each sub-district in Seberang Ulu I and Sukarami; and one unit for each sub-district in Kertapati and Ilir Timur II. The large scale of Manufacturing of Forest and Estates has 15 business units are located in Gandus (7 units); Kertapati and Ilir Timur II (3 units for each sub-district); Plaju and Sukarami (1 units for each sub-district). Number of small scale, medium scale and large scale industries for another type of industry: small scale of food and clothing manufacturing 21 units; small scale of chemical and structural material manufacturing 7 units; medium scale of fabricated metal product, machine and various industries 43 units; medium scale of agricultural and fishery manufacturing 9 units; large scale of fabricated metal product, machine and various industries 25 units; large scale of agricultural and fishery manufacturing 5 units.

54. *Agriculture*. The production of Paddy in 2010 was 24,773 ton or decrease 2,322 ton (8.60%) compared to production of Paddy in 2009. The harvest area of cassava in 2010 was

6,336 Ha or decreased 526 Ha (7.67 %). The production of cassava in 2010 was 1,485 ton or decreased 15,751 ton (91.38%) compared to production of cassava in 2009. The harvested area of cassava in 2010 was 198 Ha or increased 86 Ha (76.79%). The production of maize in 2010 was 140 ton or decreased 609.91 ton (81.33%) compared to production of maize in 2009.

55. *Tourism*. The development of tourism is aimed to increase the tourism role and economic activity. Therefore, the local government of Palembang is encouraging the development of tourism to expand job opportunities, increase people's welfare and regional income as well. In 2010, the number of hotel and accommodations in Palembang reaches 121 units, room 3,922 units and beds 4,086 units.

56. *Existing Water Supply System*. Water supply in Palembang is the responsibility of the Palembang Local Water Company (PDAM Tirta Musi) which was established more than 60 years ago. The PDAM has three river intakes and five water treatment plants: There are two intakes on the Musi River – at Karang Anyar and 1 Ilir; and one on the Ogan River at 15 Ulu to the south of the city. The 1 Ilir intake supplies three treatment plants at 3 Ilir, Bukit Kecil and Lebung Gajah and the other two intakes supply treatment plants of the same name. All river intakes of PDAM are far away upstream of the proposed WWTP site. The current total water production capacity of the PDAM is 235,000 cumd. The service area coverage in 2009 was reportedly about 80 % of the population, but with only 133,600 registered connections, this appears inconsistent with the existing population estimate of 1.4 million people, unless some of the customers are housing estates. The profile of the customer base is: 89 % residential (118,500 customers), 10 % commercial (13,500 customers) and 1 % social (1,600 customers). There appears to be no industrial category of customers.

57. *Transportation and Communication*. Palembang city can be accessed by car, train, sea and river transport, and air. Sea transport is available to Bangka, Batam, and to area along the Musi River. Air travel is available for Jakarta, Batam, Bangka, Medan, and Jambi. The total land of Palembang roads in 2010 reached 974,671 meters. About 33.36 km of the roads was under state responsibilities, about 97. 27 km under provincial responsibility, and the rest was 797,031 km under Palembang city responsibility. The proportion of asphalted road length was 81,99 % and 8,94 % of was gravel and 9, 07 % of other types. The trend of total length of roads classified by type road is presented on table below. Outgoing air passengers in 2010 was 1,063,788, while incoming was 1,046,787 passengers.

58. Data from the Office of Telecommunication Services Palembang area in 2008, the number of telephone subscribers in Palembang reached 486,486 subscribers or has reached 91.14 per cent of the central capacity. From these data also showed that 95.90 percent of the total residential customers, businesses amounted to 3.92 percent, while the social customer amounted to only 0.18 percent. While the three existing GSM cellular operator, PT Satelindo, PT Telkomsel (Grapari) and PT Excelcomindo Pratama, have also increased its coverage area includes most of Palembang city and the surrounding areas. As for the CDMA, only one operator that has been operating well, Telkom Flexi.

59. *Power Supply*. During 2010 the PLN consumers were dominant by the households, on the other hand the smallest numbers of customers were dominated by the industries. In 2010, household's consumers were about 91.34% from the 309,068 consumer's, business 6.66% meanwhile social customer, government, institution and industry each 1.35%, 0.58%, and 0.07%.

D. Socio and Cultural Resources

60. *Population*. Palembang's population in the mid year 2010 by result of population census was 1,455,284 with a male population of 726,328 and female 726,512.The growth of labor force that exceeded the growth of employment opportunities will lower working opportunity rate. However, the number of working population does not always reflect the number of employment opportunities due to mismatch in the labor market. Based on data of Labor Affair Service of Palembang, from 27,390 people job seekers on 2010 only 3,303 people were absorbed by labor market or 12.06 %.

61. Public Health and Sanitation. The proportion of households with access to adequate sanitation facilities has consistently improved from 30.9 % in 1992 to 69.3 % in 2006. The tentative Millennium Development Goals target for 2015 meanwhile is 65.5 %. Thus the target of reducing the proportion of the population without access to basic sanitation facilities by half in 2015 has already exceeded the targets set for 2006.

62. There are no off-site sewerage systems in Palembang. An indicative breakdown of sanitation practices based on recent data shows that 69 % of households have septic tanks, 4 % have pit latrines, 15 % practice open defecation on land and 12 % defecate directly in waterways. Reportedly, only about 30 % of the septic tanks are considered to be of sound construction and working properly and 60 % were found to be unsound. This means that overall, only about 20 % (30 % of 69 %) of households have adequate waste treatment systems on their premises. The survey data on on-site sanitation practices and condition of septic tanks in each sub-district are summarized in Table 4.4.

Table 4.4: Existing Sanitation Practices

No.	Sub-district	Septic Tanks (%)		No Septic Tank or Direct Discharge to Drains (%)	Total Ineffectively Treated Wastewater Discharged to Drains (%)
		Properly Functioning	Poorly Functioning		
1	Ilir Barat I	23	58	19	77
2	Ilir Barat II	19	48	32	81
3	Ilir Timur I	38	55	7	63
4	Ilir Timur II	11	42	47	89
5	Seberang Ulu I	18	54	28	82
6	Seberang Ulu II	19	42	39	81
7	Bukit Kecil	38	62	0	62
8	Kemuning	24	61	16	76
9	Kertapati	13	51	36	87
10	Plaju	21	64	15	79
11	Gandus	4	50	46	96
12	Sukarami	13	53	33	87
13	Kalidoni	26	43	31	74
14	Sako	40	57	3	60
15	Sematang Borang	15	64	21	85
16	Alang Alang	0	87	13	100

No.	Sub-district	Septic Tanks (%)		No Septic Tank or Direct Discharge to Drains (%)	Total Ineffectively Treated Wastewater Discharged to Drains (%)
		Properly Functioning	Poorly Functioning		
	Lebar				
Average for City		20	54	26	80

Source: Wastewater Investment Master Plan Package II Palembang, Vol. 1, 2011

63. In the business district, the highest proportion of the sound septic tanks can be found in Sako, which is one of the growth corridors with high levels of new building construction, and the inner districts of Bukit Kecil and Ilir Timur. A possible explanation for the latter is that these areas include the central business districts where rejuvenation of properties is common and tighter control on building construction is being implemented. Some of the larger commercial premises such as hotels have small package treatment plants that provide secondary level treatment of wastewater before discharging into the environment – usually the nearby stream or drainage channel.

64. For Community-based sanitation, since 2006 there have been a number of community-based and driven sanitation schemes installed in Palembang. There are 3 locations of SANIMAS Programs, namely Village Talang Aman, Kemuning district, Village Talang Putri, Plaju district, and Village Gandus, Gandus district. Seven has been constructed through support from the AusAID and World Bank funded SANIMAS scheme. Septic tank upgrades were also carried out under the NUSSP new upgrading scheme in two villages (3-4 Ulu and 9-10 Ulu). Afterwards, in 2007, Palembang City Government received another SANIMAS Program assistance in 4 (four) locations, namely: Village ¾ Ulu SU I District (2 locations), Village 15 Ulu, SU I District, and Village Siring Agung, Ilir Barat District.

65. Since 2008 four housing estate sewerage systems have been built servicing about 560 households. The systems typically comprise septic tanks and small bore sewers collecting and transferring both grey and black water from the houses to a communal absorption field with overflow to the nearby drains. The performance of these on-site systems is not monitored by any of the government agencies. A summary of piped neighborhood or estate systems is presented in

Table 4.5: Existing Sanitation Systems in Palembang

Location	Year Built	Built Facilities		Service Coverage (no)		Current Status
		Collection System	Treatment Process	Con-nections	Person	
Rusunawa Blok 21-Kel. 24 Ilir	2010	Direct	Septic tank with absorption field	112	560	Good, not yet Operational
Perum Taman Palembang Kencana	2009	Small bore sewer	Communal septic tank with absorption field	126	248	Good, Operational
Rusun Blok 22, Kel. 24 Ilir	2008	Small bore sewer	Septic tank with absorption field	28	140	Good, Operational
Griya Interbis Indah	2008	Small bore sewer	Septic tank with absorption field	43	214	Good, Operational

Location	Year Built	Built Facilities		Service Coverage (no)		Current Status
		Collection System	Treatment Process	Con-nections	Person	
Griya Palembang Indah	2006	Small bore sewer	Septic tank with absorption field	250	1250	Good, Operational

Source: Wastewater Investment Master Plan Package II Palembang,Vol. 1, 2011

66. For Low Income Households and Slum Area, over 20 % of low income households do not have a toilet in their house for use. Members of these households have to walk to public toilets, use neighbours' toilets or practice open defecation in rivers, drains or vacant ground. Low income households which do have toilets are less likely to have a septic tank with leach drains than other households and are more likely to have a pit system. Septic tanks are frequently poorly constructed and wastewater leaks into the surrounding environment. Many have never been emptied and dense housing and narrow access means septic tanks are difficult to construct as well empty them when full. The lack of sanitation and poor environmental sanitation conditions in these areas contribute to spread of pathogens, subsequently poor nutrition and malnutrition with potential long term effects to the mental and physical development of those children who suffer frequent illness such as diarrhea and worm infestations, and to reduced production and income through the loss of work days due to disease (Source: Wastewater Investment Master Plan Package II Palembang, Bandar Lampung and Batam Activity W004 Palembang Vol. 1, 2011).

67. In 2007 the slums area of Palembang city were 47 regions (occupied 72.780 inhabitants), the Ulu 7 is set to be the government's priority areas. Many houses in this area do not have adequate sanitary facilities, river water near the house used for the purpose of bathing, washing, cooking, drinking and as toilet. In 2007, health centers at 7 Ulu noted as 4203 cases of diarrhea and 655 cases of acute respiratory tract infections. This is indicative of the poor quality of the environment in the region which is also supported 7 Ulu test results of river water in the region surrounding 7 Ulu. There were some parameters of wastewater that exceeds the quality standard, ie BOD 89 mg / L (standard 30 mg / L), COD 250 mg / L (standard 80 mg / L) and ammonia-free 3:56 mg / L (standard of 0.1 mg / L) (Source: Regional Environmental Status 2011, Palembang Environmental Office).

68. For septic tank sludge management, Palembang has one septage treatment plant located at the Sukawinatan landfill facility near the airport. The plant is operational but because it is quite far, pump out trucks can only make 2-3 trips per day and so often discharge their loads illegally en route to the plant or in some isolated area. Reclaimed water from the plant is discharged to the nearby creek. The plant is being operated by the City Sanitation Office.

69. Diarrhea and fungal skin diseases, diseases associated with the provision of clean water, are included in the top 10 leading diseases in Palembang City for the years 2008 to 2010 (Table 4.6).

Table 4.6: Top Leading Diseases in Palembang City

No.	Type of Diseases	2008	2008	2009	2009	2010	2010
		No. of patients	Rank	No. of patients	Rank	No. of patients	Rank

1	Other infectious disease acute of upper respiratory tract	123.713	1	69.637	1	171.972	1
2	Disease of muscular system & connective tissue			45.115	2	56.230	2
3	Diarrhoea	45.309	3	44.248	3	29.077	6
4	Skin disease due o fungus	19.276	8	40.405	4		8
5	Gingvitis and peridontal disease	33.553	7	30.534	5	21.332	10
6	Disorders of teeth and other support networks	16.871	9	25.640	6	11.612	7
7	Pulp and periapical tissue disease	44.690	4	16.598	7	24.594	3
8	Hypertension	52.337	2	15.914	8	52.261	
9	Infectious intestinal other disease	15.920	10	15.868	9		
10	Disease oral cavity, salivary glands, jaws and other			14.813	10		
11	Other diseases of upper respiratory tract						
12	Asthma						
13	Skin disease die to infection	41.744	5			33.362	4
14	Allergic Skin Disease	37.778	6			29.298	5
15	Other eye diseases					16.820	9
Total		431.191		318.808		446.558	

Source: Health Department in Palembang City, 2007-2010, Palembang in Figures 2011

70. *Education*. Education Facilities such as school's building in Palembang City, for state and private school in academic year 2010/2011 consisted of 285 kindergarten, 558 elementary schools/Islamic Schools/ Islamic Junior High School, 130 Senior High Schools / Islamic Senior High School and 54 vocational high schools. The number for all level school was used by the amount of students of state and private schools that fluctuated for years. In 2010/2011, there were 15,510 kindergarten students; 180,864 elementary schools/ Islamic elementary School students; 63.251 Senior High Schools / Islamic Senior High School students; and 24.463 vocational high school students.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

71. A comprehensive screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed Palembang City sewerage subproject and the environment where the facilities will be located. A screening checklist was developed to help identify which topics do not require further attention.

72. The assessment is made on the following phases of the subproject: (i) pre-construction; (ii) construction; and (iii) operation and maintenance. Results of the environmental impacts screening are summarized in Table 5.1, while the discussions of each issue are presented in the succeeding sections. In Table 5.1, impact types and magnitudes are indicated for both impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. The screening table uses the symbols "+" for positive impacts and "**–** "for negative impacts. Symbols for impact magnitudes are "∆" for insignificant and "●" for significant. The symbol for an insignificant negative impact is "∆ **–"**, while a significant negative impact is "● **–**". The second column of the table indicates the type and magnitudes of the impacts without any mitigating measures being applied. Some impacts have already insignificant magnitudes even without mitigations and mitigating measures are therefore no longer required. The last column of the table indicates the expected impact magnitude after applying the mitigating measures. Hence, a significant negative impact (● **–**) will become insignificant (∆) after applying the mitigating measures. A summary of the environmental impacts and mitigation measures that should be carried out are detailed in the Environmental Management Plan (EMP) at the end of this section as Table 5.2.

73. Environmental impacts arising from decommissioning of the proposed Palembang City sewerage facilities were also reviewed but are no longer further discussed due to the following: (i) decommissioning of facilities is a remote possibility since these will serve growing urban areas and such facilities are critical for sustaining those areas, (ii) residual waste cleanup is not a major concern since the facilities are not industrial manufacturing plants with potential problems for toxic and hazardous wastes, and (iii) solid wastes from decommissioning is also not a major concern since the WWTP structures are mostly made of reinforced concrete and earth materials. Solid wastes from decommissioning will mostly be recyclable materials such as broken concrete materials, plastic pipes, reinforcing steel bars used in the structures, structural steel, roofing materials, electrical wires, earth materials, etc. A decommissioning plan is appropriately prepared after several years have elapsed after commissioning and by that time, more information regarding operations of the proposed Palembang City sewerage facilities are available.

Table 5.1: Summary of Environmental Impacts Screening for Palembang City Subproject

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● **–**	∆
Climate change mitigation (design aspect)	● **–**	∆
Conformance to spatial planning	na	na
Encroachment to environmentally sensitive areas	na	na
Impacts and risks to biodiversity conservation	na	na

Environmental Impacts and Risks	Without Mitigation	With Mitigation
Potential nuisance and problems to the public	● −	Δ
Potential damage to archaeological and cultural assets	● −	Δ
Loss of assets (IR concerns)	● −	Δ
CONSTRUCTION PHASE		
Modification of construction site topography	na	na
Removal of Trees	na	na
Displacement of Rare or Endangered Species	na	na
Potential damage to archaeological and cultural assets	● −	Δ
Soil erosion and sediments of construction sites	● −	Δ
Noise from construction equipment	● −	Δ
Local air pollution due to construction activities	● −	Δ
Oil and other hazardous materials releases	Δ −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Pollution due to discharge of poor quality effluents	● −	Δ
Noise and dust pollution from WWTP and pumping station	Δ −	Δ
WWTP sludge disposal	● −	Δ
WWTP's foul odor off-site migration	● −	Δ
Toxic waste generation	na	na
Pollution to groundwater	● −	Δ
Drowning risk in pond and tanks	● −	Δ
Health and safety risk in sewerage system operation	● −	Δ
Increase employment opportunities	● +	● +

Legend: n.a. = not applicable; Δ = insignificant; ● = significant;
+ = positive; - = negative

A. Design/Pre-Construction Phase Considerations

74. *Climate Change Vulnerability*. Climate change adaptation considerations shall be included in the design of Palembang City's proposed WWTP at Sei Selayur since it is in close proximity to the Musi River. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to the proposed WWTP. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Palembang City and increase the likelihood that such investments will fail to deliver the benefits for which they were intended. Flooding could affect the structural integrity of the proposed WWTP. Flooding can also prevent the WWTP from operating by reducing the head available across the plant. It may also submerge facility

components that are supposed to be dry for proper operation. These situations may result to the release of untreated sewage into the environment and increase the risk to public health.

75. To appropriately address this impact, a hydrology and flooding study shall be conducted for the site of Palembang City's proposed WWTP at Sei Selayur during the design phase to ensure that occurrence of flooding is properly evaluated. Results of the study shall be used for designing the proposed WWTP and the preparation of engineering specifications to ensure that it is less vulnerable to extreme flood events. Consultants who will prepare the study shall use the official climate change projections of GOI's Climatology Meteorology and Geophysics Agency, the Badan Meteorologi, Klimatologi, dan Geofisika (BMKG).

76. *Climate Change Mitigation*. Climate change mitigation considerations shall be included in the design of Palembang City's Sei Selayur WWTP to control greenhouse gas emissions. The membrane covered anaerobic ponds of the WWTP shall be connected by pipework to a flare and avoid releasing the generated methane from the ponds. However, during detailed design, potential use of the generated methane shall be evaluated with due considerations to the financial and economic factors.

77. *WWTP Site's Conformance to Spatial Plan*. There is no problem with spatial planning for the proposed WWTP. Palembang City's Badan Perenanaan Pembangunan Daurah (BAPPEDA) confirmed that the proposed Sei Selayur WWTP site conforms to Palembang City's Spatial Plan. BAPPEDA is the local government agency responsible for planning. It is tasked with the preparation and implementation of the city's development plans and policies.

78. *Encroachments to Environmentally Sensitive Areas*. There will be no encroachments to environmentally sensitive areas. The sewer network and the proposed Sei Selayur WWTP will be located in the urban areas of Palembang City. The proposed WWTP will be constructed in a site that has been transformed into its present landscape dominated by grasses, shrubs, and few planted trees. These sites are not within undisturbed landscapes. The proposed primary secondary sewer lines will pass through main city streets, while the tertiary sewer lines will be installed in the streets of built-up areas.

79. *Impacts and risks to biodiversity conservation*. The issue on impacts and risks to biodiversity conservation is not applicable to the Palembang City subproject since its components will not be located in an areas that have concerns on biodiversity conservation. The sewer network will be located in built-up areas. The areas surrounding the proposed Sei Selayur WWTP site are not undisturbed and over the years the ecological changes due to human activities in the area have resulted to its present residential and agricultural landscapes.

80. *Nuisance and Problems to the Public*. Potential nuisances and problems to the public during construction of the proposed Palembang City sewerage system can best be avoided if proactively addressed during detailed design and pre-construction phase. During detailed design, when the final sewer line alignments are available, consultation and information dissemination to potentially affected people shall be done. Tender documents for the proposed Palembang City sewerage system shall include provisions addressing potential nuisances and problems to the public during construction. These include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (v) public safety and convenience. These shall also be reflected in the bidding and construction contracts of the proposed sewerage system.

81. During detailed design, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated for their applicability (with consideration also to cost implications) to streets with heavy commercial activities.

82. Pipe jacking is a trenchless technique for installing underground pipelines by tunneling. Powerful hydraulic jacks are used to push the pipes through the ground behind a shield at the same time as excavation is taking place within the shield. Microtunneling is also a trenchless pipeline installation technology that uses a remotely controlled small tunnel boring machine combined with pipe jacking technique to directly install pipelines underground, such as sewer lines, in a single pass. This has been a proven sewer line installation method for various soil conditions.

83. *Potential Damage to Archaeological and Cultural Assets*. At present, there are no information of any archaeological and cultural assets that may be affected by excavations works of the proposed sewer lines and the proposed Sei Selayur WWTP. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Balai Arkeologi Palembang (Palembang Archaeological Research Office) if archaeological and cultural assets are discovered.

84. *Loss of Assets*. Inventory of losses for the proposed Palembang City's subproject was made during the planning phase and shall be updated during detailed design phase as soon as the final pipeline alignments and final locations of facilities are available. A plan for compensation and other assistance (separate from this IEE) corresponding to the losses of the affected people was prepared under the PPTA. All payments to affected parties shall be made before the start of construction activities. There will be no people to be physically displaced or resettled.

B. Construction Phase Environmental Impacts

85. *Site Preparation*. Construction of the proposed Palembang City's sewerage system will not involve significant modification of the construction site topography. The proposed WWTP site at Sei Selayur will only be backfilled by 0.5 meter high. Sewer lines installation will not involve changing the topography of the surrounding area. This issue is therefore considered not significant. Removal of trees will not be an issue due to the following: (i) site for proposed WWTP is an agricultural area dominated by grasses, shrubs, and few planted trees and (i) sewer lines will be installed along the right-of-way of existing roads. The issue on displacement of rare or endangered species is not applicable since there are no known rare or endangered species within the proposed site of the site of the proposed WWTP at Sei Selayur.

86. *Potential Damage to Archaeological and Cultural Assets*. During construction, excavation activities of the proposed sewer lines and the proposed WWTP at Sei Selayur have the potential to damage archaeological and cultural assets that lay undiscovered below the ground. Although at present there is no information of any archaeological and cultural assets that may be affected by excavations works, this potential impact requires precautionary measures.

87. Mitigation. An effective approach to avoid potential damage to any archaeological and cultural assets during the construction phase is the inclusion of provisions in construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Balai Arkeologi Palembang (Palembang Archaeological Research Office) if archaeological and cultural assets are discovered.

88. *Soil Erosion and Sediment of Construction Sites*. During rainy periods, exposed soil at the construction sites for sewer lines can easily be washed away by runoff and carried to the natural drainage system. Construction of embankments for the Sei Selayur WWTP is a potential source of sediments and can easily release soil materials to the surrounding areas if not provided with sediment control. During rainy periods, soil materials from embankment sections that are not yet stabilized can easily be carried by runoff to the natural drainage system .

89. Mitigation. Control of surface runoff from the Sei Selayur WWTP construction site is necessary in preventing erosion. The contractor shall be required to use structural erosion prevention and sediment control practices which will divert the storm water flows away from the exposed areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters. These may include the following: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass bale barriers, (iv) sediment traps, and (v) temporary sediment basins. Whenever possible, total exposed area shall be minimized.

During construction of embankments for the ponds of the Sei Selayur WWTP, the following shall be required in order to control erosion: (i) construction of all permanent erosion control features as soon as practical, such as riprap, and (ii) provision of erosion control blankets for sections not yet stabilized.

90. *Construction Noise*. Trucks and construction equipment, which can generate noise of 80 dB(A) from a distance of 30 meters are the potential sources of noise during construction of the Sei Selayur WWTP and sewer lines. The issue is mostly applicable in the trench excavation activities for the sewer line installation since the lines will pass through built-up areas with establishments and houses.

Mitigation. Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. In areas near houses or noise-sensitive sites, noisy equipment shall not be operated during nighttime to early morning (19:00H – 06:00H). Noise levels due to construction activities should not exceed 55 dB(A) near schools and residential areas as mandated by GOI's Decree of Environment Ministry No.48/1996. Temporary noise barriers shall be used in areas determine by LPMU's supervising engineer. Workers using noisy equipment shall be provided with ear plugs.

91. *Local Air Pollution Due to Construction Activities*. During dry periods, dust generation can be expected from activities associated with the construction of the Sei Selayur WWTP and the sewer lines such as trenching, earthworks, and soil preparation. Intermittent episodes of localized air pollution from smoke belching equipment may also occur. Other potential sources of air pollution are large stockpiles of construction materials such as soil and aggregates. Without any mitigating measures, dust generation could be problematic during dry periods. This issue is important for the proposed sewer lines installation by trenching along the roads since the sites will be excavated.

92. Mitigation. The contractor should be required to perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts. He will also be

required to use equipment that are properly maintained and are not smoke belchers. Covers for stockpiles of soil and aggregates that will be left idle for a long time shall be required. Covers will prevent dust generation due to wind action. Trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover.

93. *Oil and other hazardous materials releases*. Presence of oil products and other hazardous materials are expected in Palembang Cit's sewerage construction. These include fuel, oil, grease, paints, and solvents. These materials are associated with operation of the construction heavy equipment and vehicles and various construction activities. Some of these materials may accidentally be released to the environment. However, the issue is considered less significant since expected quantities will be relatively small for sewerage construction.

94. However, as part of good construction practice, the contractors will be required to implement an awareness program for all workers regarding the prevention and management of spills and proper disposal of used containers. Fuel and oil shall be stored in a designated secured area provided with an impermeable liner to prevent the accidental spills from seeping into the ground.

95. *Vehicular Traffic Congestion and Public Access*. Installation of sewer lines may cause traffic congestion in heavily traveled roads and narrow streets. It may hinder public access. Sewer lines installation in narrow streets may cause the temporary total closure of the road and will lead to traffic congestion in the area.

96. While sewer line construction in wide streets, such as Jalan Mayor Zen, could easily be managed with regards to traffic congestion and pedestrians access to the area, the same could not be said of streets with heavy commercial activities, such as the Jalan Sudirman. Transport of backfill materials for the proposed WWTP site may also cause traffic congestion along Jalan Dr. Insinyur Sutami if not properly managed.

97. Mitigation. Contractors shall be required to: (i) prepare a traffic plan and (ii) closely coordinate with local authorities for the closure of roads or rerouting of vehicular traffic, and (iii) ensure access in areas with excavations by provision of secured walkways, provision of access between mounds, steel plates for vehicle passage, expedite works in front of shops, and provide signs to direct the pedestrians to access areas. Timing of construction activities in any sites should consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc.

98. As discussed in the pre-construction section, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated during detailed design for their applicability (with consideration also to cost implications) to streets with heavy commercial activities.

99. *Hazards to public due to construction activities*. Hazards to the public associated with construction activities for the proposed Palembang Cit's sewerage system are expected since sewer lines shall be constructed in roads. Hazardous driving conditions maybe created in sewer line installation by trenching since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and excavations would pose some hazards to the driving public. There is also risk of people falling down in open trenches since trenches are normally left uncovered until pipeline testing is completed. There is always a potential for hazardous situations since sewer line

installation by trenching will require wide trenches in order to accommodate the large sewer pipes.

100. Mitigation. The contractor shall be required to implement a road safety plan incorporated in his proposed construction methodology. Safety measures shall be implemented including: (i) warning signs to alert people of hazards around the construction sites, (ii) barricades, and (iii) night lamps for open trenches. Provision of these measures shall be included in the construction contract specifications.

101. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during construction of the Palembang City's sewerage system. Improperly managed silt runoff and sanitary wastes from these camps may reach nearby areas. Poor sanitation and lack of proper solid waste management at the worker's camp will provide the conditions for vermin and other disease vectors to easily multiply and infect the workers. This may lead to the transmission of diseases from the workers camp to other areas. These conditions will increase public health risk. Areas near the site of the proposed WWTP are potential areas for workers camp.

102. Mitigation. The construction contractor shall be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants. The contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps.

103. *Occupational Health and Safety at Work Sites*. Construction hazards are expected in the implementation of the proposed Sei Selayur WWTP, pumping stations, and sewer lines. Hazards may exist in all construction sites in many different forms such as sharp edges, falling objects, flying sparks, chemicals, noise and various potentially dangerous situations. Good practices in construction occupational health and safety requires that employers protect their employees from workplace hazards that can cause injury.

104. Mitigation. Contractors shall be required to address the issue on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan, (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with clean eating areas, and (v) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards.

105. The construction site health and safety management plan (CSHSMP) will provide guidance to the contractors' staff on how good work practices can be carried out on every activity in the construction site to prevent accidents to the workers and the general public. This shall include, among others, emergency procedures and the required resources, clear description of responsibilities and management, specific requirements of occupational health and safety policies and regulations, training requirements, and site safety rules.

106. However, establishing and maintaining a safe and healthful work environment requires responsibilities from both the contractors and their workers. In general, contractors are responsible for: (i) performing a "hazard assessment" of the workplace to identify and control physical and health hazards, (ii) identifying and providing appropriate PPE for employees, (iii) training employees in the use and care of the PPE, (iv) maintaining PPE, including replacing worn or damaged PPE, (v) periodically reviewing, updating and

evaluating the effectiveness of the PPE program. Workers should: (i) properly wear PPE (ii) attend training sessions on PPE, (iii) care for, clean and maintain PPE, and (iv) inform a supervisor of the need to repair or replace a PPE.

107. *Increase Employment Opportunities at Work Sites*. Considerable number of workers will be required for the various construction activities of the proposed Palembang City's sewerage system. The impact would be beneficial and significant since employment opportunities in the area will increase for a few years during the construction period.

108. Enhancement. Whenever possible, the contractor shall be required to use the available local labor for these construction activities. The recruitment of workers shall be coordinated with the local officials and Palembang City's LPMU.

109. *Improper Closure of Construction Sites*. Construction activities of the proposed Palembang City's sewerage system are expected to generate construction solid wastes during construction and after completion of work. This may include used wood materials, steel works cuttings, paint and solvents containers, used oil from equipment, unused aggregates, etc. If not remove from the sites after completion of the construction activities, these solid wastes will cause aesthetic problems and some will be potential sources of contaminants for surface runoffs. Due to the large pipe diameters, considerable amount of surplus excavated soil will be generated by the sewer line construction.

110. Mitigation. After completion of work activities, the contractor shall be required to remove the construction wastes from the sites before finally leaving them. The entire sites must be free of any construction solid wastes. Implement the required surface restoration. All surplus excavated soil shall be disposed away from the built-up areas to sites approved by the Palembang City's LPMU. Design of disposal sites shall also be approved by the supervising engineer. It will be the contractor's responsibility to identify suitable sites for disposal of the surplus excavated soil. To ensure the timely removal of the surplus materials associated with the installation of the sewer lines, disposal of surplus excavated soil materials shall be keep abreast with the progress of the construction activities.

C. Operation Phase Environmental Impacts

111. *Discharge of Poor Quality Effluents*. The proposed Palembang City's Sei Selayur WWTP may produce low quality effluents due to operational problems. This situation may happen if the proposed WWTP is: (i) not operated according to its design parameters and (ii) in emergency situations such as lack of power supply for an extended period of time. These situations will lead to poor operational performance and will produce low quality effluents not complying with effluent regulations.

112. Mitigation. The Sei Selayur WWTP shall be operated according to its design parameters in order to produce effluent quality satisfying the national and provincial effluent quality standards. The relevant maximum standards for main parameters are: 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil. The implementing unit of the proposed WWTP shall ensure that its plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents.

113. The requirement for properly trained operators cannot be overemphasized since the proposed Sei Selayur WWTP is not a sophisticated system that relies on continuous online performance monitoring instruments. The newly hired WWTP operators shall undergo a one month hands-on training in an existing WWTP facility. In addition, a WWTP advisor shall be provided intermittently during the initial 3 months of operation. The WWTP advisor shall provide advisory services for a full-week and every other week within the 3-month period. This type of advisory services is very important since the WWTP will be in the start-up phase and also to correct any undesirable operating practices of the newly hired operators.

114. Operating manuals shall be provided to help ensure that the plant is operated as design. Operating manuals shall also guide the operators in handling emergency situations. WWTP design shall consider the reliability of power supply to the mechanical equipment. This is an important aspect of the proposed WWTP since its aerobic process will be dependent on the continuous supply of power to the mechanical equipment.

115. Another prevention measure is to prevent the discharge of industrial wastes into the sewer lines. Industrial waste will affect adversely affect the biological processes in the Sei Selayur WWTP and could lead to poor effluent quality. This can be done by implementing a local regulation preventing the discharge of industrial wastes into the sewer lines.

116. *Noise and Dust Pollution of WWTP and Pumping Station*. Noise of the proposed Sei Selayur WWTP will not be an issue during operation since there will be no sources of significant mechanical noise within the site. In addition, potential sources of noise, such as pumps, blowers and mounted aerators are inherently provided with enclosures that provide noise attenuation. There will be no operational activities that will cause dust generation. Additional mitigating measures are therefore not necessary for noise and dust pollution.

117. *Disposal of Sludge from WWTP*. Operation of the Sei Selayur WWTP will generate sludge from the treatment processes. The sludge has to be removed regularly to maintain good operational performance. The sludge cannot simply be disposed without proper treatment since it may cause land pollution. However, the frequency of desludging for the Sei Selayur WWTP could be once every 10 years since an allowance is provided in the design concept to allow sludge accumulation for better digestion and avoid frequent desludging.

118. Mitigation. Initially, a sludge dewatering system is not necessary for the first 10 years of operation with the built-in allowance for sludge accumulation. When desludging will finally be done, sludge from the proposed Sei Selayur WWTP shall be directed to a sludge dewatering system such as a drying bed or a mechanical dewatering machine. Dewatered sludge shall be hauled and applied to farm lands. However, during detailed design, a biosolids program for the WWTP shall be developed by adopting appropriate standards from other countries since Indonesia does not have biosolids management standards for WWTPs.

119. *WWTP's Foul Odor Off-site Migration*. Operation of the Sei Selayur WWTP has the potential for generating foul odor that may be carried off-site. Hence, there is a need to prevent the foul odor from escaping the process units and migrating off-site. Potential sources of odor under normal operating conditions are the WWTP anaerobic ponds and the lack of air input to the aerobic units under extended power failures.

120. Mitigation. Mitigations shall include the following: (i) anaerobic ponds shall be covered with a polymer (such as "Hypalon") to capture odor and biogas for flaring (to

minimize the escape of methane gas), (ii) close monitoring of the aerobic units to ensure the conditions are not anaerobic (without enough oxygen), (iii) landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and (iv) conduct of WWTP's annual odor audit to identify operational measures that can prevent odor problems.

121. The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management. The lack of power supply will cause the lack of air input to the aerobic units. If the situation persists for an extended period of time, the resulting anaerobic (without enough oxygen) condition will generate foul odor. During detailed design, it is therefore necessary to carefully evaluate the need for providing emergency electrical power supply to the proposed WWTP.

122. *Toxic waste generation*. Operation of the proposed Palembang City's Sei Selayur WWTP will not generate any toxic wastes under normal operating conditions. The operation is simply the use of physical and biological processes for treating domestic wastewater.

123. *Pollution to Groundwater*. Wastewater of the proposed Palembang City's Sei Selayur WWTP may seep into the ground from process units, such tanks and ponds if these facilities are not impermeable.

124. Mitigation. Concrete tanks process units shall be design and constructed as impermeable containers. Wastewater treatment ponds of the Sei Selayur WWTP shall be design and constructed with impermeable plastic liners.

125. *Drowning Risk in WWTP Tanks and Ponds*. The potential for drowning always exists when large tanks and ponds are filled with liquid. Persons and animals falling in the tanks and ponds of the Sei Selayur WWTP can drown easily since these are deep facilities.

126. Mitigation. To reduce the risk of drowning in the tanks and ponds, the Sei Selayur WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location along the berms, (ii) posted with warning signs indicating that the tanks and ponds are deep and that dangers exist, (iii) provided with at least a five-foot-high fence to keep people and animals away, and (iv) provide security personnel to guard the facility.

127. *Health and Safety Risks in Sewerage System Operation*. Operation of the proposed Palembang City's sewerage system has an associated health risk to the workers and the public since sewage is an infectious material. It can cause disease if ingested or if it comes in contact with broken skin. Accidents involving sewage spills at the proposed Sei Selayur WWTP can seriously threaten the health and safety of the personnel.

128. Workers' safety at proposed Sei Selayur WWTP relative to the generation of biogas should not be taken lightly. The anaerobic process unit in the WWTP, the anaerobic ponds, will generate biogas. Methane in biogas forms explosive mixtures with air. Flammable gases, such as methane, have a lower explosive limit (LEL) and an upper explosive limit (UEL). The LEL is the lowest concentration (in percentage of total volume) of a gas in a mixture with air capable of producing a flash of fire in the presence of an ignition source such as arc or flame, while the UEL is the highest concentration. Methane has an explosive range of 5% to 15%. Explosive mixture of methane gas may accumulate in confined spaces.

129. Another potential risky situation will be the use of chlorine gas as disinfectant of the final effluents. Accidents may occur with chlorine gas handling. Provisions are included for the future use of chlorine gas as disinfectant of the final effluents.

130. Mitigation. Facility hazards identification shall be conducted during the initial operation phase of the sewerage system and updated as necessary. Due to the possibility of methane gas accumulation in confined spaces, hazards identification associated with methane shall be given more attention. A written facility health and safety manual shall be prepared to address the prevention, reduction and control of occupational injury and illness of Palembang City's sewerage system operation. The manual shall among others: (i) clearly identify conditions that may cause acute workers health and safety problems, (ii) specific requirements that all workers should comply, (iii) include management of spills, and (iv) specify training requirements for health and safety. All workers should have the authority to stop any work if they observe any unsafe conditions that present imminent danger, particularly injury. Utmost care should be taken to avoid sewage spills. Workers shall be trained on health and safety aspects of handling sewage spills. The public should be kept away from the proposed Sei Selayur WWTP. A five-foot-high fence shall be provided to keep people away from the WWTP.

131. For methane management, the WWTP shall be provided with a portable digital gas analyzer capable of detecting methane and carbon dioxide. This instrument shall provide sampling and analysis of gas composition in percent by volume of methane, carbon dioxide, oxygen, percent LEL of methane, and temperature. Standard gas safety devices, such as flame arresters and pressure relief valves shall be installed at appropriate locations to be determined during detailed design.

132. To reduce the risk of accidental exposure to chlorine gas, a separate chlorine gas building shall be provided. Use of sodium hypochlorite (NaOCl), the liquid form of chlorine, shall be evaluated during detailed design for its applicability instead of chlorine gas with consideration on its availability in Indonesia. NaOCl is inherently a safer disinfectant.

133. *Increase Employment Opportunities*. Operation and maintenance of the proposed Palembang City's sewerage system will definitely require a number of workers. The impact would be beneficial since there will be additional employment opportunities in the area.

134. Enhancement. Operating unit of the Palembang City's sewerage system is expected to implement a manpower development program of its workforce. This will help ensure in providing good service to the public and the proper maintenance of its assets.

135. *Cumulative Effects*. Cumulative effects generally refer to impacts that are additive or interactive in nature and result from multiple activities over time. In the case of the Palembang City subproject, the cumulative effect would be on the organic and nutrient loads to Musi River, the WWTP's discharge point. The cumulative positive effect of the proposed Palembang sewerage system is the reduction of the total organic and nutrient loads to the river since it will capture a significant portion of the domestic wastewater that presently find its way to the river. This effect highlights the role of the proposed sewerage system as an environmental improvement infrastructure. However, the WWTP effluents is not expected to have a significant dilution effect on Musi River's water quality since the WWTP's discharge of 23 MLD is only about 8.8% of the river flow.

136. After impacts screening, Table 5.2 lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

Table 5.2: Environmental Impacts and Risks for Inclusion in EMP of Palembang's Subproject

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● −	Δ
Climate change mitigation (design aspect)	● −	Δ
Potential nuisance and problems to the public	● −	Δ
Potential damage to archaeological and cultural assets	● −	Δ
Loss of assets (IR concerns)	● −	Δ
CONSTRUCTION PHASE		
Potential damage to archaeological and cultural assets	● −	Δ
Soil erosion and sediments of construction sites	● −	Δ
Noise from construction equipment	● −	Δ
Local air pollution due to construction activities	● −	Δ
Oil and other hazardous materials releases	Δ −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Pollution due to discharge of poor quality effluents	● −	Δ
Noise and dust pollution from WWTP and pumping station	Δ −	Δ
WWTP sludge disposal	● −	Δ
WWTP's foul odor off-site migration	● −	Δ
Pollution to groundwater	● −	Δ
Drowning risk in pond and tanks	● −	Δ
Health and safety risk in sewerage system operation	● −	Δ
Increase employment opportunities	● +	● +

Legend: Δ = insignificant; ● = significant; + = positive; - = negative

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

137. Ensuring subproject success requires meaningful stakeholders' consultation and participation. Activities for information disclosure, public consultation, and public participation are part of the overall planning, design process, and construction of the proposed Palembang City sewerage system subproject.

138. During preparation of the Palembang City Wastewater Investment Master Plan in 2011, information regarding the proposed sewerage subproject was disclosed to the public during the conduct of a willingness to pay survey for sanitation services. Subproject

information was also disclosed in focus group discussions (FGDs) conducted as part of the activities for the master plan.

139. *Public Consultation*. Last 02 October 2012, Palembang City's BAPPEDA conducted an initial public consultation and formally discussed the proposed sewerage subproject with the stakeholders and requested their views. A total of 20 stakeholders and representatives participated.

140. These are the stakeholders from those areas living near the WWTP, community leaders, and officials of various government offices. Stakeholders expressed support to the proposed sewerage system. Summary of the consultation outcomes is presented in Table 6.1, while the documentations are presented at the appendices.

141. Representative of Badan Perenanaan Pembangunan Daurah (BAPPEDA) explained that the purpose of the public consultation is to seek advice and opinions from the participants about the city's sanitation development project plan under MSMIP. BAPPEDA gave a "powerpoint" presentation of the proposed sewerage subproject. It was explained that the proposed sewerage subproject will be implemented in stages. In the initial stage, Stage I, the collected wastewater will be treated in a WWTP at Sei Selayur in a 5.7-hectare site. The proposed operator of the sewerage system will be the existing water utility company, Palembang City's Peruhasaan Daerah Air Minum (PDAM).

142. After the "powerpoint" presentation, the participants were encouraged to ask question and raise their concerns. The discussions included issues on impacts to the public during construction of the sewer lines odor generation of the WWTP, and potential for recycling of the WWTP effluent.

143. BAPPEDA requested the PPTA consultants to assist them in explaining the technical aspects of the proposed sewerage system. It was explained to the participants that impacts to the public during construction of the sewer lines will be managed and the contractors will be required to implement clean construction, that is, excavated soil and construction wastes will not be allowed to just scatter at the sites.

144. Potential odor generation of the WWTP was also discussed and the participants were assured that WWTP will not generate odor that could affect the public. As reference, it was cited that in Bangkok and Kuala Lumpur, WWTPs are located in areas surrounded by houses and there are no odor problems. Some participants showed interest in recycling of the WWTP effluent. It was explained that effluent recycling can only be feasible at large-scale levels such as communal use and industrial.

145. Participants asked some clarification on how wastewater will be collected from houses businesses. It was explained that domestic wastewater will be collected by pipes laid at certain slope and equipped with supporting structure such as manholes, drop manholes, flushing structure, etc. This domestic wastewater will drain to the proposed WWTP at Sei Selayur in a 5.7-hectare site.

146. Chiefs of IlirTimur I District and Kalidoni District expressed their support for the proposed sewerage system, but also encouraged BAPPEDA to conduct more public information campaign and consultation since the people are concerned with potential impacts of the sewer system. BAPPEDA announced that another public information campaign and consultation will be organized with the related agencies in 2013.

Table 6.1: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
NGO WALHI	Why the initial sewerage area is the business district? Is the criteria population density?	The initial selected site is the business center in order to recover some costs since the operation and maintenance of a WWTP will require huge costs. The selected site is populous and septic tank is not suitable due to limited land
health sector	What about the odor generated by the WWTP?	Odor is not a problem during operation of the WWTP. In some cities, such as Bangkok and Kuala Lumpur, WWTPs are located in areas surrounded by houses and there are no odor problems.
Govt sector	What about the impacts of sewer line construction to the residents of the surrounding areas?	During pipeline construction, the method will be clean construction to prevent disruption to the environment and the local residents and their daily activities.
Govt sector	How will wastewater from houses, industries be collected?	Domestic wastewater will be collected via pipes laid at certain slope and equipped with supporting structures such as manhole, drop manhole, flushing structure, etc.
health sector	Can the treated water be used as recycled water?	Effluent from the WWTP can be recycled, but only suitable for communal scale. For city scale, it can be used to water city parks or sold to industries for cooling water.
Kalidoni District	There should be more public information campaign and consultation since the people are concerned with potential impacts of the sewer system	Another public information campaign and consultation will be organized with the related agencies in 2013. A regional regulation for the sewer system is being drafted with regard to the management.
Ilir Timur I District	More public information campaign and consultation	Another public information campaign and consultation will be organized with the related agencies in 2013

147. *Future Disclosure and Consultations*. Public consultation and participation activities will again be conducted in the future. The Palembang City's Local Project Management Unit (LPMU) will conduct public consultations and information disclosure during detailed design. Discussions during these consultations are expected to be more focused and detailed since design information will be available such as exact locations and alignments of sewer lines. Views of the stakeholders will be considered in the overall design process. Stakeholders'

consultations shall be continued throughout the construction phase on an area by area basis to sort out any potential problems. These shall be done by the LPMU and contractors prior to actual construction activities. In these construction consultations, specific concerns of the people such as the disturbance associated with the excavations in their area shall be discussed in detail. Records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues shall be kept.

VII. GRIEVANCE REDRESS MECHANISM

148. Local grievance redress mechanism (GRM) is important in the planning and implementation of the proposed Palembang City sewerage subproject since any complaints and concerns of the affected people must be address promptly at no costs to the complainant and without retribution. There will be 2 GRMs. The first one shall address the grievances associated directly with the construction activities, while the second one shall address the grievances on land acquisition, compensation and resettlement. Both GRMs were presented to stakeholders' representatives during the initial public consultation meeting last 02 October 2012.The GRM for the construction activities shall be explained fully to the various areas where construction activities are expected. This is appropriately done during public consultations in the detailed design phase when actual alignments will made for the proposed works. During the operational life of Palembang City Sie Selayur WWTP, complaints about its environmental performance can also be brought to the attention of the local environment agency, the Badan Lingkungan Hidup (BLH).

A. Construction Activities Grievances

149. The GRM for the construction activities shall again be disclosed to the public in consultation meetings during the design phase of the subproject and before the start of construction activities. The proposed Palembang City's Local Project Management Unit (LPMU) and the contractors shall inform the local officials and representatives, such as district and village, about the GRM. There will be three levels of GRM. The first level GRM shall handle the first instance of a complaint. If not resolve, then the complainant shall go to the next levels.

150. *First Level GRM*. A fast resolution to most grievances during construction can easily be handled by the contractors' representatives at the construction site and whenever necessary together with the construction supervision consultants. At this first level, the grievance should be resolved within 2 days maximum. If the complaint is not resolved at this level, the complainant may elevate his grievances to the second level GRM which is the temporary City Sewerage Environmental Complaints Committee (CSECC).

151. *Second Level GRM*. In every Kelurahan, where a construction activity shall be implemented, an ad-hoc CSECC shall be created and shall be chaired by Palembang City's Chief of the LPMU. Members shall include the following: (i) contractor's highest official at the site such as the Construction Manager or Construction Superintendent, (ii) village (Kelurahan) Chief or his representative, and (iii) a women organization's representative. Creation of the CSECC and its operation, including the procedures for filing of complaints, shall be included in appropriate sections of the civil works contracts with the contractors. This mechanism shall be disclosed in public consultations during detailed design and in public meetings during the construction phase.

152. Fast resolution of complaints during construction is important since activities are sometimes continuous and several changes may occur within a week. For the quick filing of complaints, the CSECC shall prepare a form to be used for the filing of complaints. The use of form will also facilitate the filing of complaints by persons who cannot write through the assistance of another person.

153. The steps to be followed in filing complaints and the procedures for handling are the following: (i) complainant shall provide the background information and file the complaint verbally or in writing to the CSECC. The CSECC secretary shall assist the complainant in filling-up the complaint form; (ii) within 2 working days, the City's LPMU Chief, contractor's representative, and complainant shall discuss if the complaint can be resolved without calling for a CSECC meeting; (iii) if the complaint cannot be resolved by the City's LPMU Chief and contractor's representative, a CSECC meeting shall be called with the complainant to resolve the complaint within 5 working days.

154. *Third Level GRM*. If the complaint cannot be resolved at the CSECC, the complainant shall go to the courts and file the necessary charges.

Table 7.1: GRM Processing of Complaints

GRM Level	Maximum number of days to decide on complaint	Persons to handle the complaint
First level	2 days	contractors' representatives at the construction site
Second level	2 days	City's LPMU Chief, contractor's representative
	5 days	temporary City Sewerage Environmental Complaints Committee (CSECC)
Third level	---	courts

B. Resettlement Activities Grievances

155. A separate report on Land Acquisition and Resettlement Plan (LARP) was prepared for the Palembang City's subproject. The said report contains a GRM addressing land acquisition and other concerns on involuntary resettlement.

C. Complaints to Palembang City's Badan Lingkungan Hidup

156. Complaints about environmental performance of projects issued an Environmental Permit can also be brought to the attention of the Badan Lingkungan Hidup, the local agency responsible for enforcing the AMDAL system. It is also involved in monitoring the water quality of rivers.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

157. This section addresses the need for mitigation and management measures for the Palembang City subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional setup is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

A. Environmental Mitigation

158. Table 8.1 presents the information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures. Details of mitigating measures are already discussed in Section V where the need for mitigation of each impact was determined in the screening process.

159. During the pre-construction phase, the cost of preparing tender documents with provisions for the required environmental measures are part of the design consultant's contract, while the cost to Palembang City's Local Project Management Unit (LPMU) is the cost of meetings for stakeholders' consultations which are minimal costs to the LPMU. During construction, all cost of environmental mitigation measures shall be borne by the contractor and are considered part of their contracts as specified in the technical specifications. During the operation phase, all cost of mitigation measures are part of the operation and maintenance costs of Palembang City sewerage system, while some were already included in the construction of particular items.

160. For budgetary purposes of the overall MSMIP cost, the EMP costs shall not be taken as separate environmental costs since they are already part of specific items such as the design consultant's contract, contractors' contracts, and Palembang City's operation and maintenance costs. Capacity building cost is part of overall MSMIP capacity building program which shall address the capacity building needs of all subprojects under MSMIP.

161. **Budget for Environmental Mitigation Measures of Construction**. The construction contract documents shall contain a provision allocating part of the construction cost for the implementation of the environmental mitigating measures during construction. For budgetary purposes, this is estimated at 1% of the total direct cost of the WWTP and the sewer lines. For the Palembang City subproject, the estimated amount is US$ 0.30million.

162. To ensure that funds will be allocated during implementation of the Palembang City subproject, the tender documents during the bidding process shall include a lump sum bid item in the bill of quantities to be titled "Environmental Mitigation Measures". It shall be clarified in the specification documents that the environmental mitigating measures identified in the construction EMP are to be charged to this item. This will allow the construction supervision engineer of the Palembang City subproject to require the contractor to quickly address the environmental issues during construction.

Table 8.1: Environmental Mitigation Plan of Palembang City Subproject

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
PRE-CONSTRUCTION PHASE					
Ensure climate-proofing of WWTP	Climate change vulnerability of WWTP	Conduct of hydrology and flooding study for the proposed WWTP site to ensure that occurrence of flooding is properly evaluated; study to be used for WWTP design and engineering specifications to ensure that it is less vulnerable to extreme flood events considering climate changes	WWTP site	Part of detailed design cost	Design Consultants/ Palembang City's LPMU and CPMU
Addressing greenhouse gas emission in design	Escape of WWTP's greenhouse gas	membrane covered anaerobic ponds shall be connected by pipework to a flare for burning to avoid releasing the generated methane from the ponds	WWTP	Part of detailed design cost	Design Consultants/ Palembang City's LPMU and CPMU
Social and community concerns	Potential nuisance and problems to the public from Palembang City's sewerage system implementation	Consultation with the affected communities regarding the expected impacts and proposed mitigation measures of the project; Tender documents shall include provisions addressing the potential nuisances and problems to the public during construction phase During detailed design, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated for their applicability (with consideration also to cost implications) to streets with heavy commercial activities	Sewer line routes, WWTP site	Part of detailed design cost	Design Consultants/ Palembang City's LPMU and CPMU
Excavation requirements	Potential damage to archaeological and cultural assets	Tender documents shall include a provision that will require construction activities to be stopped immediately upon discovery of any archaeological and cultural relics; Palembang City government and the Balai Arkeologi Palembang (Palembang Archaeological Research Office) will be informed promptly	Sewer line trenches, civil works excavations	Part of detailed design cost	Design Consultants/ Palembang City's LPMU and CPMU
IR concerns	Loss of assets	Compensation and other assistance for loss of assets and land acquisition; Consultation and information dissemination to affected people.	Pipelines routes, WWTP site	Part of detailed design cost; separate land acquisition costs	Design Consultants/ Palembang City government / LPMU and CPMU
CONSTRUCTION PHASE					
Sewer lines installation, WWTP construction, and other civil works	Potential damage to archaeological and cultural assets	Contractors shall stopped immediately the activities upon discovery of any archaeological and cultural relics; Palembang City government and the Balai Arkeologi Palembang (Palembang Archaeological Research Office) will be informed promptly	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
Sewer lines installation, WWTP construction, and other civil works	Soil erosion and sediments of construction sites	Total exposed area shall be minimized; divert storm water flows away from the exposed areas and sediment controls using small interceptor dikes, pipe slope drains, grass bale barriers, sediment traps, and temporary sediment basins; isolation barrier for raw water intake construction of embankments for the ponds, requires: (i) construction of all permanent erosion control features as soon as practical, such as riprap, and (ii) provision of erosion control blankets for sections not yet stabilized	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Nuisance from noise of construction equipment	not to operate noisy equipment during nighttime (19:00 – 06:00); sound suppression for equipment; ear plugs for workers; noise levels not to exceed 55 dB(A) near schools and residential areas as mandated by GOI's regulation; use of temporary noise barriers	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Air pollution due to construction activities	Water spraying for dust control; construction materials with potential for significant dust generation shall be covered; not smoke belchers equipment; Trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Vehicular traffic congestion and hindrance to public access	Close coordination with local authorities in road closure and traffic rerouting; contractor's traffic plan; provision of planks, provision of access between mounds, steel plates for vehicle passage, expedite works in front of shops, and provide signs to direct the pedestrians to access areas; timing of construction activities in any sites should consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc. Use of construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Hazard to public due to construction activities	Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open trenches in sewer lines installation	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
				contract	
Sewer lines installation, WWTP construction, and other civil works	Pollution and health risks due to workers camp	Proper camp sanitation; installation of sanitary facilities; solid waste management; surface runoffs control	Workers camp	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Occupational health and safety at work sites	Implement construction site health and safety management plan, provision of equipped first aid station at all times, workers provided with potable water, adequate sanitation facilities, clean eating areas, and personal protective equipment (PPE) to minimize exposure to a variety of hazards	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers recruitment to be coordinated with local officials and LPMU	Sewer line routes, WWTP site	No cost	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
Rehabilitation and closure of construction sites	Improper closure of construction sites	Removal of all construction wastes and implement surface restoration; proper disposal of surplus soil to suitable sites away from built-up areas	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.30 million as environmental mitigations allocation of construction contract	Contractor / CPMU, Palembang City's LPMU, Supervision Consultants
OPERATION PHASE					
Sewerage system operation	Discharge of WWTP poor quality effluents	WWTP operated according to its design parameters; ensure plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents; provision of WWTP operating manuals; WWTP shall have reliable power supply to the mechanical equipment; local regulation to prevent discharge of industrial wastes into the sewer lines	Sewer line, WWTP	Part of operation & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH
WWTP operation	Noise of WWTP	Ensure that potential sources of noise, such as pumps, blowers and mounted aerators are inherently provided with enclosures that provide noise attenuation	WWTP	Part of operation & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH
WWTP operation	Disposal of sludge from WWTP	No sludge dewatering for initial 10 years; WWTP sludge be sent to sludge drying bed or mechanical dewatering system; dewatered sludge to be hauled and applied to farm lands; during detailed design, a biosolids program for the WWTP shall be developed by adopting appropriate standards from other	WWTP	Part of capital, operation & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		countries since Indonesia does not have biosolids management standards for WWTPs			
WWTP operation	WWTP foul odor offsite migration	Odor control and management include: (i) membrane covered anaerobic ponds connected by pipework to a flare for burning , (ii) close monitoring of the aerobic units to ensure conditions are not anaerobic, (iii) landscaping with trees and shrubs around the facility be positioned as wind breaks, and (iv) conduct of WWTP's annual odor audit to identify operational measures that can prevent odor problem	WWTP	Part of capital & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH
WWTP operation	Pollution to groundwater	Concrete tanks process units shall be design and constructed as impermeable containers; WWTP treatment ponds shall be design and constructed with impermeable plastic liners	WWTP	Part of capital & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH
WWTP operation	Drowning risk in WWP tanks and ponds	WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location along the berms, (ii) posted with warning signs indicating that tanks and ponds are deep and that dangers exist, (iii) provided with at least a five-foot-high fence to keep people and animals away, and (iv) provided with security personnel to guard the facility	WWTP	Part of capital, operation & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH
Sewerage system operation	Health and safety risks in sewerage system operation	Conduct facility hazards identification during initial operation phase; written facility health and safety manual to address the prevention, reduction and control of occupational injury and illness; all workers authorized to stop any work if they observe any unsafe conditions that present imminent danger, particularly injury; workers to be trained on health and safety aspects of handling sewage spills; five-foot-high fence to be provided to keep people away from the WWTP; standard gas safety devices, such as flame arresters and pressure relief valves be installed at appropriate locations to be determined during detailed design; operators to be provided with portable digital gas analyzer capable of detecting methane and carbon dioxide; separate chlorine gas building; during detailed design evaluate the use of sodium hypochlorite instead of chlorine gas as disinfectant	Sewer line routes, WWTP site	Part of capital, operation & maintenance costs	Sewerage system operator (PDAM)/ Palembang City's BLH

163. Although details of the required mitigating measures are already discussed in the screening for impacts, the following items are discussed further to highlight their importance: (i) tender documents and construction contracts, (ii) contractor's environmental management plan, (iii) sewerage system operations manual, and (iv) unanticipated environmental impacts.

164. *Tender Documents and Construction Contracts*. Palembang City subproject's EMP shall form part of the bidding and contract documents. Environmentally responsible procurement advocates the inclusion in construction contract documents the provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submittal of a Contractor's EMP (CEMP). Tender documents and construction contracts shall therefore include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience, (viii) occupational health and safety, (ix) proper closure of construction sites, and (x) potential damage to any archaeological and cultural assets.

165. *Contractor's EMP*. During construction, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the Palembang City subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by CPMU and LPMU and other monitoring parties. Inclusion in construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow Palembang City's LPMU construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, LPMU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

166. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the CPMU and Palembang City's LPMU. This requirement shall be included in the construction contracts. It shall provide details on specific items related to the environmental aspects during construction. It shall include specifications on requirements for dust control, erosion and sediment control, avoidance of casual standing water, management of solid wastes, workers' camp sanitation, pollution from oil, grease, fuel spills, and other materials due to the operation of construction machineries, safety and traffic management, avoidance of inconveniences to the public, air and noise pollution control. It shall also include guidance on the proper design of the construction zone, careful management of stockpiles, vegetation, topsoil, and vehicles and machinery.

167. *Sewerage System Operations Manuals*. Palembang's PDAM shall ensure that operations manuals are available prior to operating the sewer network and the WWTP. These manuals shall provide the standard operating procedures of the proposed sewerage system. It shall also include, among others, on how to address the issues on environmental and health and safety of workers and the public.

168. *Unanticipated Environmental Impacts*. Where unanticipated environmental impacts become apparent during project implementation, CPMU and Palembang City's LPMU shall prepare a supplementary environmental assessment and EMP to assess the potential impacts and outline mitigation measures and resources to address those impacts.

B. Environmental Monitoring

169. Table 8.2 presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv) frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring.

170. The LPMU Environment Officer shall provide the CPMU with its monthly environmental monitoring reports. The CPMU shall consolidate all monthly environmental monitoring reports of all subprojects and prepare a monthly and quarterly environmental monitoring report. Using the quarterly reports, the CPMU shall prepare the semi-annual environmental safeguards progress report of MSMIP which shall be submitted to ADB and detailing the status of mitigating measures implementation. The suggested outline of the monitoring reports is presented in Appendix 8. Roles of the CPMU and Palembang City's LPMU are outlined in the succeeding section for institutional arrangement.

171. *Environmental Monitoring Cost*. Monitoring cost for pre-construction is minimal cost to CPMU since this is simply verification by the CPMU on whether the EMP is included in tender and contract documents. Construction monitoring cost is minimal cost to Palembang City's LPMU since it will be their personnel who will do checking/ inspections of the construction activities and its part of their operational costs. Monitoring cost of construction supervision consultants are also minimal costs since this is checking/ inspections cost and part of their contracts. The cost to Palembang City's LPMU for the GRM is also minimal cost since these are only meetings for resolving the complaints and it is included in the contractor's contract. During the operation phase, effluent monitoring costs is part of Palembang City's PDAM operational cost using its own small laboratory. Cost for monitoring of other activities such as sludge disposal, generation of odor, safety and health issues are minimal costs to PDAM since these are checking/ inspections activities only.

Table 8.2: Environmental Monitoring Plan of Palembang City Subproject

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
PRE-CONSTRUCTION						
WWTP design and engineering specifications based on hydrology and flooding study	WWTP site	Verify study and engineering specifications	once	Design consultants	CPMU/ Palembang City's LPMU	Part of project management in detailed design (minimal cost)
methane capture system and flare are included in WWTP design and specifications	WWTP	Verify engineering specifications	Twice – draft and final tender documents	Design consultants	CPMU/ Palembang City's LPMU	Part of project management in detailed design (minimal cost)
Consultation meetings; Specific provisions in tender documents on nuisance & problems to public	Sewer line routes, WWTP site surroundings,	Verify draft and final tender documents	After completion of meetings; Twice – draft and final tender documents	Palembang City's LPMU/ Design consultants	CPMU/ Palembang City's LPMU	Part of project management in detailed design (minimal cost)
Specific provision in tender documents on archeological/ cultural relics	Sewer line trenches, civil works excavations	Verify draft and final tender documents	Twice – draft and final tender documents	Design consultants	CPMU/ Palembang City's LPMU	Part of project management in detailed design (minimal cost)
Consultation meetings; payments to affected people	Pipelines routes, WWTP site	Verify meetings documentation; Verify plans	After completion of meetings; upon	Palembang City's LPMU/ Design	CPMU/ Palembang City's LPMU	Part of project management in detailed design

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
		and IR payments	completion of payments	consultants		(minimal cost)
CONSTRUCTION PHASE						
Presence of archeological/ cultural relics in excavations	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Total area to be exposed; runoff flowing into disturbed sites	Sewer line routes, WWTP site	Visual inspection of sites; plans verification	Daily during rainy periods	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
noise levels not to exceed 55 dB(A) near schools and residential areas; noisy equipment not operated between 19:00 – 06:00hrs;ear plugs for workers	Sewer line routes, WWTP site	Use of sound levels meter; visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Dust, cover of stockpiles, smoke belching	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Road closure and traffic rerouting; traffic plan; temporary access facilities	Sewer line routes, WWTP site	traffic plans verification; visual inspection of sites	weekly	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Road safety plan; warning signs, barricades, and night lamps	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Sanitary toilets, garbage bins, runoff controls in camps	Workers camp	Visual inspection of sites	Once before start of construction and once monthly	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
Health and safety plan; first aid station; PPE, sanitation facilities	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Number of local labor employed	Sewer line routes, WWTP site	Verification of contractor's records	Once a month	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Construction wastes; surplus soil not removed	Sewer line routes, WWTP site	Visual inspection of sites	Once before final stage of demobilization; weekly for surplus soil	contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
OPERATION PHASE						
Effluent quality not to exceed 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil (consistent with Provincial Effluent Standards or GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003)	Sewer line, WWTP	effluent sampling and laboratory tests	twice monthly	Sewerage System Operator (PDAM)	Palembang City's BLH	Part of WWTP Operating Unit's operation cost/ (USD2,000 /year)
Presence of noise attenuation enclosures for pumps, blowers and mounted aerators	WWTP	Visual inspection of sites	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost to Palembang City's BLH since this is an annual visual inspection
Sludge volume; biosolids strategy for the WWTP initiated	WWTP	Visual inspection of sites; verify strategy for biosolids	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost to Palembang City's BLH since this is an annual visual inspection
flare and odor control units operational; no odor of aerobic units; annual odor audit conducted	WWTP	Visual inspection of sites; verify records of annual odor audit	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost to Palembang City's BLH since this is an annual visual inspection
Integrity of concrete and impermeable plastic liners	WWTP	Visual inspection of WWTP	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost to Palembang City's BLH since this is an annual visual inspection
safety station, warning signs, and	WWTP	Visual inspection of	Once a year	Sewerage System	Palembang City's BLH	Minimal cost to Palembang

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
fence		WWTP		Operator (PDAM)		City's BLH since this is an annual visual inspection
Health safety plan; workers training	Sewer line routes, WWTP site	Visual inspection of WWTP; verify workers training records	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost to Palembang City's BLH since this is an annual visual inspection

172. *Project Performance Monitoring*. Project performance monitoring presents the desired outcomes as measurable events by providing parameters or aspects that can be monitored and verified (Table 8.3). Tendering process advocating environmentally responsible procurement is a desired outcome during the pre-construction phase. This can easily be verified by checking if EMP requirements are incorporated in construction contracts. Construction phase desired outcomes include effective management of environmental impacts and reduce risk to public. For the operation phase, the WWTP discharges shall meet GOI's standards for BOD, suspended solids, oil and fats.

Table 8.3: Project Performance Monitoring of Palembang City Subproject

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design of Palembang City's sewerage system	Verify detailed design documents	Two reviews: (i) draft detailed design documents and (ii) prior to approval of final documents	Design consultants/ Palembang City's LPMU	CPMU	Part of project manageme nt in detailed design (minimal cost)
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts of Palembang City's sewerage system	Verify construction contract documents	Prior to finalization of construction contract documents of Palembang City's sewerage system	Design consultants/ Palembang City's LPMU	CPMU	Part of project manageme nt in tendering (minimal cost)
CONSTRUCTION PHASE						
Effective management of environmental impacts during construction	Number of public complaints on construction activities	Verification of contractor's records; Palembang City's LPMU's coordination with local officials	Once a month	Contractor	Construction supervision consultants, CPMU/ Palembang City's LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
Reduce risk to workers and the public during	Number of accidents	Verification of contractor's	Once a month	Contractor	Construction supervision	Part of consultant's

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
construction	involving construction activities	records; Palembang City's LPMU's coordination with local officials			consultants, CPMU/ Palembang City's LPMU	construction supervision contract; minimal cost to CPMU/ Palembang City's LPMU
OPERATION PHASE						
WWTP effluents meets Provincial Effluent Standards and GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003	Effluent quality not to exceed 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil	effluent sampling and laboratory tests	twice monthly	Sewerage System Operator (PDAM)	Palembang City's BLH	Part of WWTP Operating Unit's operation cost (USD2,000 /year)
Palembang City's sewerage system operation acceptable to the public	Public Complaints on sewerage system operation	Verification of operation records	Once a year	Sewerage System Operator (PDAM)	Palembang City's BLH	Minimal cost

C. Implementation Arrangement

173. This subsection presents the: (i) institutional setup, (ii) implementation schedule, (iii) GOI permits, and (iv) capacity building.

18. *Institutional Setup*. The institutional setup from the top starts with the Ministry of Public Works as the executing agency of MSMIP with a Central Project Management Unit (CPMU) to be created under its Directorate of Development, Sanitation, Environment and Housing (PPLP), while the key implementing unit at the subproject level is the Palembang City's Local Project Management Unit (LPMU). This setup at the subproject level is different from the other 4 MSMIP subprojects.

174. The CPMU shall appoint a staff, as Environment Officer for MSMIP, to oversee the implementation and monitoring of environmental safeguards requirements. With assistance from the National Environmental Advisor of the Project Implementation Support Consultants (PISC) team, the CPMU shall be responsible for the following activities related to environmental safeguards: (i) confirm that the IEEs are updated in accordance with ADB's SPS based on detailed designs and submit to ADB for review and approval prior to contract award; (ii) confirm that the required AMDAL, a GOI requirement, has been prepared during detailed design and approved by the respective environment agency, the Badan Lingkungan Hidup (BLH); (iii) confirm that the EMP is included in the bidding documents and civil works contracts; (iv) ensure Contractor's EMPs (CEMPs) are prepared by contractors prior to actual construction; (v) establish a system to monitor environmental safeguards of the subprojects including monitoring the indicators set out in the monitoring plan of the EMP; (vi) supervise the implementation of environmental mitigating measures required for the construction activities; (vii) review, monitor and evaluate the effectiveness of the implemented CEMPs, and recommend necessary corrective actions; (viii) prepare monthly and quarterly environmental monitoring reports and submit semi-annual environmental monitoring report to ADB; (ix) ensure timely disclosure of final IEE and EMP in locations and

form accessible to the public, and (x) address, record, and report on any grievances brought about through the Grievance Redress Mechanism in a timely manner.

175. Palembang City's LPMU is the key implementation unit responsible for construction contracts' supervision of the Palembang City subproject. An Environmental Officer will be designated in the LPMU to effectively manage the environmental aspects of the Palembang City subproject. The Environment Officer of Palembang City's LPMU has an important role in ensuring that the required environmental mitigation measures are implemented in a timely manner by actively participating in construction supervision. LPMU also has an important role in addressing grievances during the construction period as its chief shall be the chairperson of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for Palembang City.

176. PISC and the Capacity Development Technical Assistance (CDTA) Consultants shall be engaged to assist the CPMU and LPMU. The National Environmental Advisor (part of PISC) will: (i) review the revised IEEs prepared during detailed design stage, (ii) assist CPMU in ensuring that EMPs are included in the bidding documents and civil works contracts; (iii) assist the CPMU and LPMU in monitoring of EMP implementation, (iv) training of CPMU and LPMU staff in environmental safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports. An important capacity building component is the hands-on training and advisory services for Palembang City's WWTP operators. During the initial years of operation, the sewerage system will be operated by the Wastewater Division of Palembang's Peruhasaan Daerah Air Minum (PDAM).

177. At the bottom of this institutional setup are the construction contractors for the Palembang City sewerage system which are responsible for implementing the required environmental mitigation measures as defined by their respective approved CEMP. Close coordination between the contractors and the Environment Officer of Palembang City's LPMU is needed to ensure good planning for mitigation measures and ensure the timely implementation. The contractors are also directly involved in addressing grievances during the construction period since their activities will cause disturbances to the public. Oftentimes, complaints can easily be resolved between the contractors and the complainants. The contractor's highest official at the site such as the Construction Manager or Construction Superintendent, shall be a member of Palembang City's CSECC.

178. During the operation phase, environmental impacts will be associated with the operation and maintenance of the sewer networks and WWTPs. There is a need for Palembang's PDAM to appoint a staff as Pollution Control Officer/ Environment Officer to attend to the environmental concerns of the sewerage system failures and coordination with the environment agency, the BLH. One of the main concerns is the possibility of poor WWTP performance leading to odor problems and poor effluent quality.

179. External environmental monitoring will be done by BLH as required by its mandate. BLH is tasked to prepare and implement regional policies and rules to promote environment protection and conservation. It reports to the Mayor through the Regional Secretary. Its function is to: (a) formulate and recommend policies on environmental management and (b) prepare and carry out work plans and programs on environmental management and monitoring and AMDAL (EIA system). It is responsible for enforcing the AMDAL system. It is also involved in monitoring the water quality of rivers in Palembang City.

180. Table 8.4 presents information on where the environmental aspects are addressed in the institutional setup and the associated requirements for environmental consultants and training consultants.

Table 8.4: Environmental Aspects Institutional Setup

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Construction Phase			
Ministry of Public Works' Directorate General for Human Settlements (Cipta Kayra)	Executing Agency for the MSMIP; provides technical supervision and responsibility over the investment		
Central Project Management Unit (CPMU) will be created under the Directorate of Development, Sanitation, Environment and Housing (PPLP)	responsible for MSMIP implementation in project cities; coordinates with ADB and other external agencies	CPMU Environment Officer (to be designated); responsible for overall environmental supervision of subprojects; coordinates with LPMU Environment Officer to ensure environmental requirements are address effectively; responsible for semi-annual environmental monitoring reports preparation	Project Implementation Support Consultants (PISC) and the Capacity Development Technical Assistance (CDTA); The National Environmental Advisor (part of PISC) will: (i) review the revised IEEs prepared during detailed design stage, (ii) assist CPMU in ensuring that EMPs are included in the bidding documents and civil works contracts; (iii) assist the CPMU, and LPMU in monitoring of EMP implementation, (iv) training of CPMU and LPMU staff in environmental

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
			safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports. WWTP Training Consultant (part of CBC) shall facilitate hands-on training of all WWTP operators
Palembang City's Local Project Management Unit (LPMU).	key implementation unit in the field; Provides construction contracts' supervision; closely monitors construction progress; coordinates with Palembang's PDAM for its early participation in the sewerage project before turnover during the operation phase	LPMU Environment Officer; responsible for overall environmental supervision of construction activities; ensures that the Contractor's EMP is properly implemented and monitored; prepares monthly environmental monitoring reports; provides input to the CPMU Environment Officer in the preparation of the semi-annual environmental monitoring reports preparation; coordinates with Palembang City's environment agency, Badan Lingkungan Hidup (BLH); assists the CSECC in addressing environmental complaints; LPMU chief sits as the Chairperson	Advisory services to be provided by the National Environmental Advisor (part of PISC)

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
		of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC)	
Construction contractors of the proposed Palembang City's sewerage system	Implement construction activities; implement the Contractors' EMP	Contractor's Environment Officer (to be designated); responsible for implementation of the Contractor's EMP; coordinates with Palembang City's LPMU Environment Officer and BLH; assist the Palembang City's CSECC in addressing environmental complaints; contractor's highest official at the site such as the Construction Manager or Construction Superintendent sits as a member of the CSECC	
Operation Phase			
Wastewater Division of Palembang's PDAM	Operates Palembang City's sewerage system	Palembang PDAM's Pollution Control Officer (to function also as the Environment Officer); responsible for all environmental matters of the sewerage system including EMP implementation and self-monitoring; coordinates with the city's environment agency (Badan Lingkungan Hidup); The Pollution Control Officer shall ideally be the WWTP Supervisor;	WWTP Advisor (consultant) guides Palembang City's WWTP operators during the initial 3-month period

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
		ensures WWTP compliance to effluent regulations; attend to permits requirements for continued WWTP operation; supervise the proper operation and maintenance of pollution control devices; prepares reports required by BLH including notification if the WWTP is not functioning well due to technical problems; recommend to management any improvements or required additional equipment for better WWTP compliance to GOI standards	

181. *Implementation Schedule*. As presented in the project description, construction of the Palembang City's sewerage system subproject is scheduled to start on the fourth quarter of 2014 and expected to be completed on the second quarter of 2018. CPMU and Palembang City government shall ensure that construction contract provisions related to the contractor's EMP shall be included in the tendering stage in 2013.

182. *GOI Permits*. Under GOI's Environmental Permit Regulation (No.27/2012), Palembang City government shall apply for an Environmental Permit and AMDAL approval from the BLH, the local environment agency. Information on the process for environmental permit and AMDAL processing and timelines is presented in Appendix 1. According to BLH, there will be no problems with the AMDAL processing of this sewerage subproject since it is a priority infrastructure of the city. The BLH is part of the city government's units.

183. *MSMIP Capacity Building*. MSMIP implementation will be supported by consulting services for: (i) project management advisory services, including detailed engineering designs, preparation of contract documents, support to Palembang City's LPMU on construction supervision and quality control; and (ii) institutional development and capacity building. During pre-construction and construction period, it shall be necessary to provide an Environmental Advisor to the CPMU. This shall be the National Environment Specialist of the PISC supporting the CPMU.

184. *Capacity Building for WWTP Operators*. One of the proactive ways to prevent the Palembang City's Sei Selayur WWTP from discharging poor quality effluents is to ensure that the WWTP operators are properly trained. While acknowledging the fact that capacity

building is a long-term process and is much more than training only, MSMIP shall start with the initial hands-on training of the WWTP operators during pre-operation phase and continue during the initial few months of the operation phase. This part of capacity building shall be divided into 2 parts. Estimated cost of the initial capacity building is presented below. This capacity building for WWTP operators is also reflected in the overall capacity building plan for MSMIP.

185. The first part shall be a hands-on training in a similarly operating WWTP in Indonesia. There are presently operating WWTPs in Indonesia that use aerated and facultative lagoons. Operators hired for the new Palembang City's Sei Selayur WWTP shall undergo a one month hands-on training on operating and maintaining a WWTP, together with the new operators of the other MSMIP subprojects. This training shall be facilitated by a local WWTP training consultant. It is necessary to engage the services of a local consultant since this type of training is intensive and requires good communication between the newly hired operators and the training consultant.

186. The second part shall be the actual operation of the new Palembang City's Sei Selayur WWTP with inputs from a WWTP advisor for a 3-month period intermittently. The WWTP advisor shall provide advisory services for a full-week and every other week within the 3-month period. This type of advisory services is very important since the WWTP will be in the start-up phase and also to correct any undesirable operating practices of the newly hired operators. Again, similar to the first part hands-on training, it is necessary to engage the services of a local consultant for effective communication.

Table 8.5: Cost of Capacity Building for Palembang City's Sei Selayur WWTP Operators

Capacity Building Activity	Duration	Total Cost (US$)
1st Part:[a]		
Training of 2 newly-hired WWTP operators	1 month	7,600
2nd Part:[b]		
WWTP Advisor services	6 weeks (in 3-month spread)	14,000
	Total Cost…	**21,600**[c]

Notes:
[a] 1st Part will be a hands-on training of all newly-hired WWTP operators in an existing WWTP. This will be a combined training with the operators of the other MSMIP subprojects.
[b] For the 2nd Part, a WWTP Advisor will be present every other week in the WWTP to guide the operators.
[c] Total Cost for this subproject only.

IX. CONCLUSION AND RECOMMENDATIONS

187. Palembang City is one of those cities aspiring to become an international city. Realization of this vision is hampered by lack of some infrastructures complying to international standards. Aside from this vision, the city government also wants to improve the overall sanitation situation and the water quality of the Musi River which at present receives domestic wastewater from the built-up areas. Similar to many cities in Indonesia, Palembang City does not have a sewerage system that collects domestic wastewater from its central business district and other built-up areas. Hence, the proposed sewerage system subproject will be one of the major boosts to make Palembang achieve its vision and provide better access to sanitation facilities.

188. The environmental screening process has highlighted the environmental issues and concerns of the proposed Palembang City's sewerage system subproject. The screening has considered the fact that the proposed subproject sites are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed WWTP site at Sei Selayur is presently an idle piece of land, it is basically located in an industrial area bounded by the Musi River. Its northern border is an unpaved access road that connects to a paved road. The west is bounded by a road (Jalan Dr. Insinyur Sutami) which goes straight to the Musi River. Beyond this western boundary is an industrial facility (a fertilizer plant). Hence, the proposed Palembang City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. An important consideration in analyzing the environmental impacts of the proposed Palembang City's sewerage system is the fact that its components are infrastructures for environmental improvement and for reducing the risk to public health from untreated sewage.

189. Based on the screening for potential environmental impacts and risks of the proposed Palembang City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Palembang City subproject can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment study. A full EIA is not warranted and the subproject's environmental classification as Category B is deemed appropriate. The IEE shall therefore be finalized as the final environmental assessment document of the proposed Palembang City's sewerage system subproject.

190. Implementation of the proposed Palembang City's subproject is hereby recommended with emphasis on the following: (i) EMP of Palembang City's sewerage system subproject shall be included in the design process; (ii) IEE Report/EMP shall be forwarded to the design consultant for consideration in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract; (v) Contract provisions on creation and operation of the CSECC shall be included in construction contracts; (vi) Training of the WWTP operators on operation and maintenance of the WWTP shall be completed before actual operation; (vii) a WWTP advisor (consultant) shall be provided intermittently during the initial 3 months of operation to assist the operators in the start-up phase and also to correct any undesirable operating practices; (viii) Monitoring of health and safety requirements shall be given more importance during construction and operation to reduce risks to the public and to personnel; and (ix) Palembang City government and its LPMU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

APPENDICES

APPENDIX 1

Environmental Permit and AMDAL Processing

Environmental Permit Regulation (Government Regulation No.27/2012) requires all project owners to apply for an environmental permit to the appropriate government authority (minister of environment, governor or mayor) before project implementation. It prescribes the process for environmental permitting and reaffirms GOI's AMDAL processes and requirements. Presently, the local environment agencies, Badan Lingkungan Hidup (BLH), of the subproject cities are waiting for the issuance of the implementing guidelines for Environmental Permit Regulation of 2012.

Chapter IV of the regulation refers to environmental permit application and issuance. The GOI will use 130 working days (4.3 months) for processing from receipt of Environmental Permit application up to permit issuance, considering there are no revisions to the submitted documents. The steps and required processing time are presented below.

Steps	Required Time
Application for environmental permit shall be accompanied by the environmental assessment documents, business legal documents, and business profile document.	
After receiving the Environmental Permit application, the appropriate government authority (minister of environment, governor or mayor) should announce the Environmental Permit application through multimedia and announcement board where the businesses and activities shall be located	within 5 working days
The public is given time to give their advice, opinions, and responses to the announcement	maximum of 10 working days after the announcement
Project proponent shall submit a Terms of Reference (TOR) for the preparation of the environmental assessment documents. The EIA Appraisal Committee shall review the administrative completeness of the TOR	within 30 working days upon receipt
The project proponent prepares the environmental assessment documents based on the Terms of Reference which has been approved.	Variable; based on how fast the EIA can be prepared
Upon receipt of the environmental assessment documents, the EIA Appraisal Committee shall review the documents	within 75 working days
The approving government authority (minister of environment, governor or mayor) shall decide on the Environmental Eligibility of the project.	within 10 working day after receiving the recommendations from the EIA Appraisal Committee
Environmental Permit is issued at the same time with the issuance of Environmental Eligibility Decision. Environmental Permit list the environmental protection and management actions expected from the permit holder	

Environmental Permit holder shall submit the performance report on the terms and obligation set out in the Environmental Permit to the appropriate government authority (minister of environment, governor or mayor)	on a regular basis, every 6 months

AMDAL Processing

The basis for determining the type of environmental study required for the environmental permitting of a proposed WWTP is prescribed by Regulation No.11 of 2006 issued by the Environment Minister of State. Under this regulation, a proposed WWTP for domestic wastewater that will require an area of more than 3 hectares or will serve a population of more than 100,000 shall be required to prepare an AMDAL report.

The Palembang subproject will be required to prepare an AMDAL report since it will use a WWTP area of 5.7 hectares, much more than the 3-hectare criterion. The AMDAL report will be prepared by the consultants to be engaged by the Indonesia Infrastructure Initiative (IndII) during the detailed design phase of this subproject. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

APPENDIX 2

WWTP DISCHARGE PERMIT REQUIREMENTS OF PALEMBANG CITY

Operation of a wastewater treatment plant (WWTP) in Palembang City requires a discharge permit. Under Palembang City's Wastewater Discharge Management and Control Regulation No.26/ 2011, operation of a WWTP needs permission from the Mayor.

A WWTP owner shall make a written application to the Mayor for a discharge permit with the following requirements:

- Permanent flow measuring device for the WWTP
- Record of water quality analysis for a 3-month period done by a reference laboratory
- Statement to discharge the wastewater according to regulations
- Statement to pay compensation and/or restore the quality of water resources due to effluent discharge
- Site plan and proof of land ownership
- Layout and location
- Copy of ID of person in-charge of business, water bills
- Copy of business license in a specific location that can cause harm, loss and interference
- AMDAL documents

Processing of discharge permit is through Palembang's Badan Lingkungan Hidup (BLH). According to BLH, they can quickly process the application for permit. This permit shall be applied for during the initial months of WWTP operation since actual data on effluent quality are required to be submitted with the application.

APPENDIX 3

PHOTOGRAPHS OF SITES FOR PROPOSED PALEMBANG SEWERAGE SYSTEM

Photo No.1 – Proposed Palembang's WWTP site is an idle piece of land vegetated by grasses, shrubs, and few planted trees.

Photo No.2 – Proposed Palembang's WWTP site (left of photo) bordered on the north by an unpaved road; across the road is a government land occupied by some settlers.

Photo No.3 – Beyond northeast boundary of proposed Palembang's WWTP site is a rubber processing facility

Photo No.4 – Palembang's main road (J. Sudirman) where a main sewer line will be laid, indicating sufficient space for sewer line construction

APPENDIX 4

Minutes of the Initial Public Consultation and Information Disclosure held at Palembang City's BAPPEDA, 02 October 2012

Opening/ Presentations:

Opening and presentation by Chief of Bappeda, Bapak Sapri at around 9:40 AM. He expresses this thanks to the participants for their coming. The socialization aims to explain the planned wastewater and sewerage treatment plants. Palembang is only one city of 5 cities that will receive ADB assistance for WWTP development. There will be some stages. Stage I the waste will be processed in river Selayur/Sei Selayur, 5.7 ha. WWTP site is close to Pusri, at jl. Ir. Sutami. The operator is PDAM. Regulation on its management is being prepared. This public consultation will not be the last. The Mayor strongly support of this program.

Comments, Views, Issues and Concerns

1. M. Yunus Staf of Camat (Kecamatan Ilir Timur I)
   For WWTP site in Jl. Sutami. The survey has been made and basically the land is suitable. Population density in there is not too high.

   Chief of Bappeda
   There will be no unpleasant odor from WWTP. It has been proven with the WWTP of Sewon Bantul in Yogyakarta. This facility generates no unpleasant odor.
2. Bapak Norman Walhi
   a. What is the consideration taken for site selection? Population density?
   b. Why starts from this site? If the site has less population density accordingly the impact will be less severe

   Pak Sapri's response
   a. Discussion has been made with PDAM with regard to service charge to be charged. Thus, the selected site is that of business center to reap profits since the operation and maintenance of WWTP require huge costs. The selected site is populous. Septic tank is not suitable due to limited lands.
   b. WWTP site will be in downstream area to prevent contamination to the rivers within the city.
3. Bapak Zulkifli of Health Agency
   As for unpleasant odor from WWTP, will the treated water be used as recycled water.
4. Ibu Eni A. of PU Bina Marga and PSDA
   Support the program since it is consistent with river normalization program to reduce river pollution. How will wastewater from houses, industries be collected? And how is the impact of waste water pipeline construction to the residents at the surrounding project?

Ariani :

a. Domestic wastewater will be collected via pipes laid at certain slope and equipped with supporting structure such as manhole, drop manhole, flushing structure, etc. During pipe construction, the method will be clean construction to prevent disruption to environment and the local residents and their daily activities.
b. For the odor from WWTP, we do not worry about it, because if the WWTP operate properly the odor is not a problem. In some city WWTP is located in the city and still there are no problems about the odor like in Bangkok, Kuala Lumpur, even though it's surrounded by housings.
c. For regional/city WWTP the treated water will be recycled and can be used to water city parks or sold to industries for cooling water. In some large scale WWTP, this approach has been implemented. Moreover, some commercial WWTPs in Jakarta add membrane in their treatment system. The water is recycled for flushing.
d. In this meeting, we also propose grievance redress mechanism for environmental complaints during construction. This mechanism is still a proposal, we invite suggestions for some additional clause or some questions

5. Pak H. Djamaloedin MJ, land owner
    a. No problems related to land, which currently resides in the land is to maintain and have an agreement that they would move if the land is required by the owner. The village head also knew about this agreement. Just please consider existing humanitarian funds.
    b. Agreement or the Statement, reads: (i) at the time the land will be used, they move without asking for compensation, (ii) not to renovate the house, and or building a new home, (iii) must maintain the cleanliness of the environment, (iv) to keep security.

    .
6. Alan Gunary, Staf of Camat Kecamatan Kalidoni
    a. Socialization is necessary. The affected communities are concerned about the impacts.

    Pak Sapri's responce
    a. Another socialization will be organized with the related agencies in 2013. A regional regulation is being drafted with regard to the management.
    b. Ask to Pak Sahrul, where will the draft be submitted?

    Pak Sahrul

    It may be submitted to Legal [Bureau], but academic draft and socialization will be necessary.
7. Pak Yunus, Kecamatan Ilir Timur 2

Basically he supports the program. Seven kelurahan are ready to support. Areas 23-24 Ilir, for slump areas, are the local residents ready? Further socialization is necessary.

8. Participant of Cipta Karya,

   It is necessary to inform the local communities that the treated water can be used to wash motorcycles or to water the plants as in Surabaya.

   Ariani

   Surabaya is a good example for water saving, i.e. re-using washing and cooking water for plant watering and motorcycle washing after undergoing treatment. However, it is only suitable for communal scale. For city scale WWTP the water after treated can be used to water city parks or sold to industries for cooling water. Moreover, some commercial WWTPs in Jakarta add membrane in their treatment system. The water is recycled for flushing.

9. Bu Lili Roslelah, Ketua (head) of RT, 17 ilir

   The served areas are not so populous. However for areas 13-14-15 Illir are very crowded.

   Supriadi

   Similarly, road development, land acquisition avoid the first, the second cannot be avoided if the minimum effort using community land. If there is land the project affected communities are compensated in accordance with prevailing regulations. The principle of the ADB to provide assistance, the least affected his life the same as before the project.

10. Cipta karya

    How will the drainage system be? By gravity like in Yogyakarta or what?

    Ariani

    By gravity sewerage will be adopted as much as possible. At certain point, this method may not work. Pumps will be installed there. Accordingly, when reaching certain depth, the maximum depth of pipe excavation is 7 m, pumps must be used.

Meeting closed at 11:00 AM.

APPENDIX 5

List of Participants of Initial Public Consultation and Information Disclosure (Palembang Subproject, 02 October 2012)

Stakeholders/Participants:

1. LiliRoslelah, Community Leader of 17 Ilir
2. Allan Gunery, District Chieft of Kalidoni
3. M. Yunus, District Chieft of IlirTimur I
4. Drs. H. Djamaloedin, Land owner
5. Norman Cegame, NGO WALHI South Sumatera
6. H.M Sunara
7. H. Asmanullah, Land owner
8. H. Kurniati, PLP Public Work Province South Sumatera
9. Hj. Ida Antung, PLP Public Work Province South Sumatera
10. EniAmtatulusi, Public work Office BM & PSDA Palembang
11. Halawani, Public work Office CiptaKarya P
12. AkhmatRifai, Public work Office CiptaKarya P
13. ArmataDony, PDAM TirtaMusi
14. ArioMahirnaya
15. Ayu W., BPP
16. Sinther MP, BPP
17. WewenAntoni, BPP
18. Julliya ST, MSi, Health Office Palembang
19. Yaniar, Health Office Palembang
20. Sri Ngatmini, BKB PP Palembang

BAPPEDA Team of Palembang:

1. Sapri, Head of BAPPEDA
2. TutiAlawiyah
3. RetnoWidihastuti
4. Lia Dharma Sari
5. Yunita Z. Rosalia
6. Syahrul

MSMIP Consultants:

1. Ruel Janolino, Environment Specialist
2. Ariani Dwi Astuti, Environment Specialist
3. Angelito Corpuz, Social Safeguard/ Involuntary Resettlement Specialist
4. Supriadi, Social Safeguard/ Involuntary Resettlement Specialist
5. Carolyn Gamiao, Social Development/ Gender Specialist
6. Oktarinda, Gender Development Specialist
7. Santy Sriharyati, Social Development Specialist

APPENDIX 6

Attendance Sheet of Initial Public Consultation and Information Disclosure (Palembang Subproject, 02 October 2012)

DAFTAR HADIR

Hari : Selasa
Tanggal : 02 Oktober 2012
Waktu : 09.00 WIB
Tempat : Ruang Rapat Bappeda Kota Palembang
Acara : Konsultasi Publik tentang Pembangunan Instalasi Pengolahan Air Limbah di Kota Palembang

No	NAMA	INSTANSI	TANDA TANGAN
1	Eni Andaruti	DPU BM & PSDA Kota Plg	1
2	Norman Cegame	Walhi Sumsel	2
3	Lili Roslelah	Kakacabt / 17 Ilir	3
4	Arman Deng	PDAM Tirta Musi	4
5	Allan Gunesy	Kecamatan Kalidoni	5
6	M. Yunus	Kec. Ilir Timur I	6
7	Sri Ngatmini	BKB-PP Kota Plg	7
8	[illegible] ST. MG	Dinkes Kota	8
9	[illegible]	[illegible]	9
10	Drs. H. Djamaluddin [illegible]	[illegible]	10
11	Syahbirwil	Bag. Hukum	11
12	H. M. Sunarno	Kabag Kesra BK	12
13	H. Kurniati	PUP. Sum-Sel	13
14	Hj. Ida. Kartini Z.	— " —	14
15	H. Akuan Ilcan	K. Tarik 9	15
16	Akhmat Rifai	DPU CKP	16
17	H A Gawani	DPU CKP	17
18	Suprinadi	Konsultan MSMIP	18
19	Rubi Jaranillas	Cahbengga - ljp	19
20	Ariani Dwi Astuti	Konsultan MSMIP	20
21	Angelito N. Gorduiz	Lahmeyer - IDP	21
22	Santy Srihartati	Konsultan MSMIP	22
23	Carolyn Genalao	TA MSMIP	23
24	Tuti Hanaryati	Bappeda Kota Plg	24
25	Retno Wahyuhasturi	— " —	25
26	Lia Dharma Sari	— " —	26
27	Yuanita Z. Rosalin	— " —	27
28	Ayu. W	BPP	28
29	Ruther MP	BPP	29
30	Warsen Antoni	BPP	30
31	Ario Mahirnaya		31

APPENDIX 7

PHOTOGRAPHS OF INITIAL PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (PALEMBANG SUBPROJECT)

Photo No.5: Stakeholders' representatives listening to subproject presentation by BAPPEDA [02 October 2012].

Photo No.6: A village representative near the WWTP raised some points [02 October 2012].

Photo No.7: Stakeholders' representatives carefully reading the draft GRM [02 October 2012].

Photo No.8: An area representative along the sewer route raised some points [02 October 2012].

APPENDIX 8

SAMPLE CONTENTS OF ENVIRONMENTAL MONITORING REPORT

(Note: this format also satisfies the GOI requirements for environmental monitoring based on Decree of State Minister of Environment Reg.45/2005)

Executive Summary

- Summary of EMP Implementation
- Key issues, corrective actions, and any grievances
- recommendations

1.0 Background

- Profile of Proponent
- Location Information

2.0 Status of Activities

- Activities of Proponent
- Progress of Work (% physical completion)
- Changes of Surrounding Environment
- Status of Permits / Consents

3.0 Details of EMP Implementation Status /Evaluation

- Design/Location/Preconstruction Phase Monitoring
- Construction Phase Monitoring
- Operation Phase Monitoring
- Occupational Health Risks and Safety Plan for Workers
- Redress of Grievances (type of grievance, date, persons, etc.)
- Corrective Actions Taken
- Field Visits and Consultations (sites visited, dates, persons met)
- Training (Nature of training, number of participants, date, location, etc.)

4.0 Conclusion

- Important results from the implementation of environmental management and monitoring
- Recommendations to improve environmental management and monitoring

Appendices

Consents / permits
Monitoring data (water quality, air quality, etc.)
Photographs
Maps