

Initial Environmental Examination

June 2013

Indonesia: Metropolitan Sanitation Management Investment Project

Jambi 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
KLH	–	Kantor Lingkungan Hidup
BOD	–	biochemical oxygen demand
CEMP	–	Contractor's Environmental Management Plan
CPMU	–	Central Project Management Unit
CSECC	–	City Sewerage Environmental Complaints Committee
cum d	–	cubic meters per day
cum s	–	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
MLD	–	million liters per day
NGO	–	non-government organization
PISC	–	Project Implementation Support Consultant
PPE	–	personal protective equipment
PPIU	–	Provincial Project Implementation Unit
PPTA	–	project preparation technical assistance
RRP	–	report and recommendation of the president (ADB)
TA	–	technical assistance
UPTD	–	Unit Pelaksana Teknis Daerah

NOTE

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

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed **Jambi 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. Jambi City is in Jambi Province, Republic of Indonesia. The proposed sewerage system subproject is expected to improve access on sanitation services in Jambi 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. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

2. *Subproject Description.* Jambi's proposed sewerage system under MSMIP shall cover the sub-districts of Jambi Timur and Pasar Jambi, part of the priority areas of Zone 1 in Jambi's Wastewater Infrastructure Master Plan. The proposed sewerage system will serve 85,000 people through 17,600 domestic service connections by 2018. The proposed sewerage network will have 124.2 km of sewer pipelines with diameters ranging from 100 mm to 1,000 mm. ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the 115.6 km of tertiary sewer network (with pipe diameters of less than 300 mm) will not be funded under MSMIP. Sewer pipelines with diameters 300 mm and above will have 60 manholes, while those below 300 mm will have 52 manholes. The system also includes a sewage pumping station.

3. Wastewater from the sewer network system will drain to a 15-MLD Wastewater Treatment Plant (WWTP) located at Kasang, East Jambi Sub-district near the Kasang village and Kasang Jaya village and just beside the Selincah Creek, the WWTP's effluent discharge point. The proposed Kasang WWTP shall be a Facultative Aerated Pond (FAP) system using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds. It will have a biochemical oxygen demand (BOD) load of 4.0 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 Jambi subproject are essentially urban areas. The sewer lines will be installed along urban roads. The proposed WWTP site at Kasang, an agricultural piece of land, is generally located in an urban area. Beyond the southern border is an urban road (Jalan Yos Soedarso), while beyond the western borders is another urban road (Jalan Raden Fatah). Selincah Creek, the WWTP discharge point, is actually draining a large vegetated area towards the proposed WWTP site. The proposed Jambi City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. For socioeconomic indicators, Jambi city's total population in 2011 was 540,258 people with a density of 2,630 persons per km². Rubber processing facilities dominate its large and medium industries. In 2011, its

agricultural sector produced 5,645 tons of rice, 316 tons of maize, and more than 3,000 tons of other agricultural products.

5. *Impacts and EMP.* Screening for environmental impacts of the proposed Jambi sewerage system is made through a review of the parameters associated with sewerage projects against the components of the proposed sewage collection network and Kasang 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 Jambi sewerage system, 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 Kasang 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 Kasang WWTP can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. The implementing unit of the proposed Kasang 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 Kasang WWTP's operation.

8. An Environmental Management Plan for the Jambi sewerage subproject 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 set-up 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 Kasang WWTP since it is on a low-lying ground and just beside the Selincih Creek. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to Kasang WWTP's structures. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Jambi 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 increasing the risk to public health. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed Kasang 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 Jambi's proposed WWTP at Kasang. 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 implementing agencies at the subproject level are two units working together, the Satuan Kerja (SATKER) for Jambi Province as the Provincial Project Implementation Unit (PPIU) and the Jambi City's Local Project Management Unit (LPMU).

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

13. A capacity building for Jambi City's Kasang 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, Jambi City's government 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 consultations and information disclosure last 21 September 2012 and 18 March 2013 with various stakeholders' representatives, and concerned individuals. The second initial public consultation was conducted due to the change of location for the proposed WWTP. Details of the proposed subproject components were presented to the stakeholders and their views were requested. Both initial public consultations were conducted in the Indonesian language. Issues that stakeholders raised include potential disturbances during construction, WWTP odor during operation, WWTP discharges effects on creek and groundwater, and WWTP effects on flooding. Stakeholders expressed support to the proposed subproject. The process of

public consultation with various stakeholders shall continue during detailed design and construction phases. Public information activities were also conducted earlier during the preparation of Jambi's Wastewater Master Plan in 2011.

15. *Grievance Redress Mechanism.* Implementation of the proposed Jambi sewerage subproject will be fully compliant to ADB's safeguards requirement on grievance redress mechanism. Jambi City's government disclosed the proposed mechanism during the initial public consultation last 21 September 2012. It will again be presented to stakeholders during detailed design when more subproject details are available and in 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 Jambi's Badan Lingkungan Hidup (BLH), the local environment agency. The CSECC shall be chaired by Jambi 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 Jambi City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Jambi 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 Jambi City's sewerage system subproject.

17. Implementation of the proposed Jambi City's subproject is hereby recommended with emphasis on the following: (i) EMP of Jambi 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) Jambi City government, its LPMU, and the PPIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

I. INTRODUCTION

1. Jambi City is in Jambi 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. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

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.11 of 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 Jambi subproject will require an area of 6 hectares, 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 GOI.

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 (AMDAL 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 Jambi WWTP under the city's regulation for WWTPs. Information on the process for discharge permit is presented in Appendix 2.

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

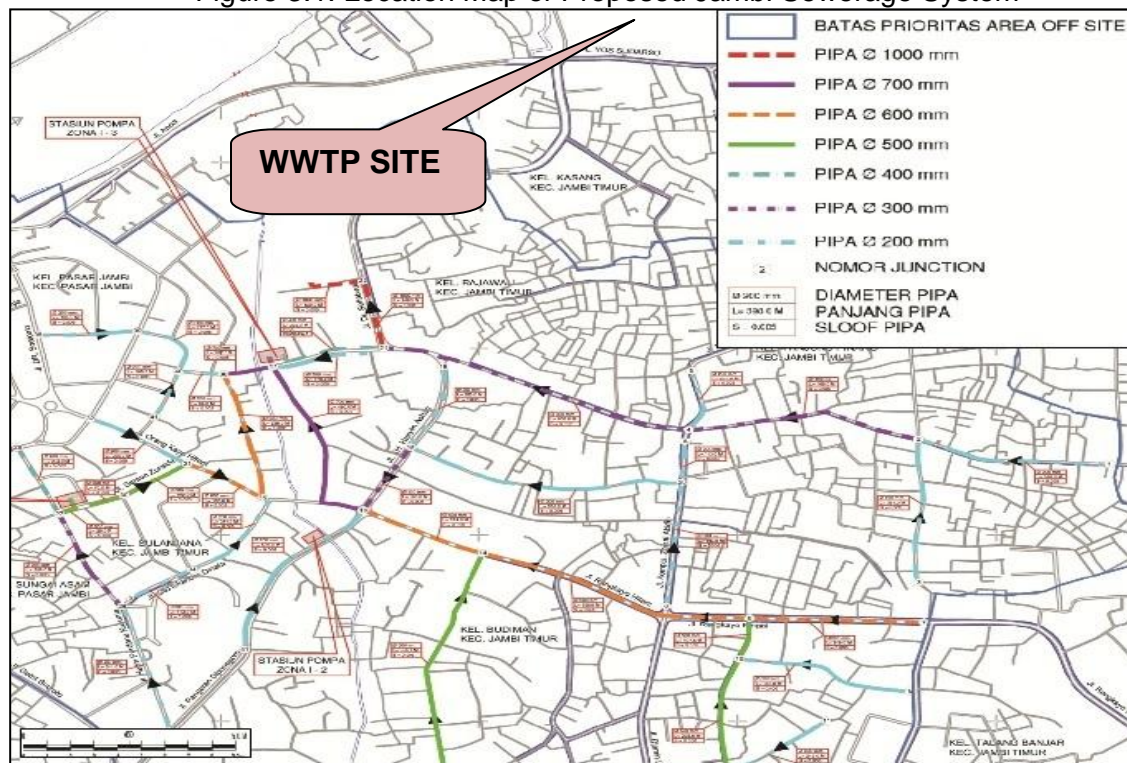
infrastructures for the protection and preservation of water resources. Effluent standard for wastewater treatment plants are regulated under the Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality which allows effluent discharge with maximum biochemical oxygen demand (BOD) of 100 mg/l and total suspended solids (TSS) of 100 mg/l. However, the proposed WWTP will be designed to meet maximum effluent values of BOD 50 mg/l and TSS 100 mg/l.

III. DESCRIPTION OF THE PROJECT

A. Location

14. Jambi's proposed sewerage system under MSMIP shall cover the sub-districts of Jambi Timur and Pasar Jambi, part of the priority areas of Zone 1 in Jambi's Wastewater Infrastructure Master Plan. The proposed sewerage system will serve 85,000 people through 17,600 domestic service connections by 2018.

Figure 3.1: Location Map of Proposed Jambi Sewerage System



Source: PPTA Consultants

B. Components and Cost Estimate

15. The proposed sewerage network will have 124.2 km of sewer pipelines with diameters ranging from 100 mm to 1,000 mm (Table 3.1). ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the 115.6 km of tertiary sewer network (with pipe diameters of less than 300 mm) will not be funded under MSMIP. Sewer pipelines with diameters 300 mm and above will have 60 manholes, while those below 300 mm will have 52 manholes. The system also includes a sewage pumping station (flow capacity of 100 liters/second).

Table 3.1: Proposed Jambi Sewerage Network (to be funded by ADB)

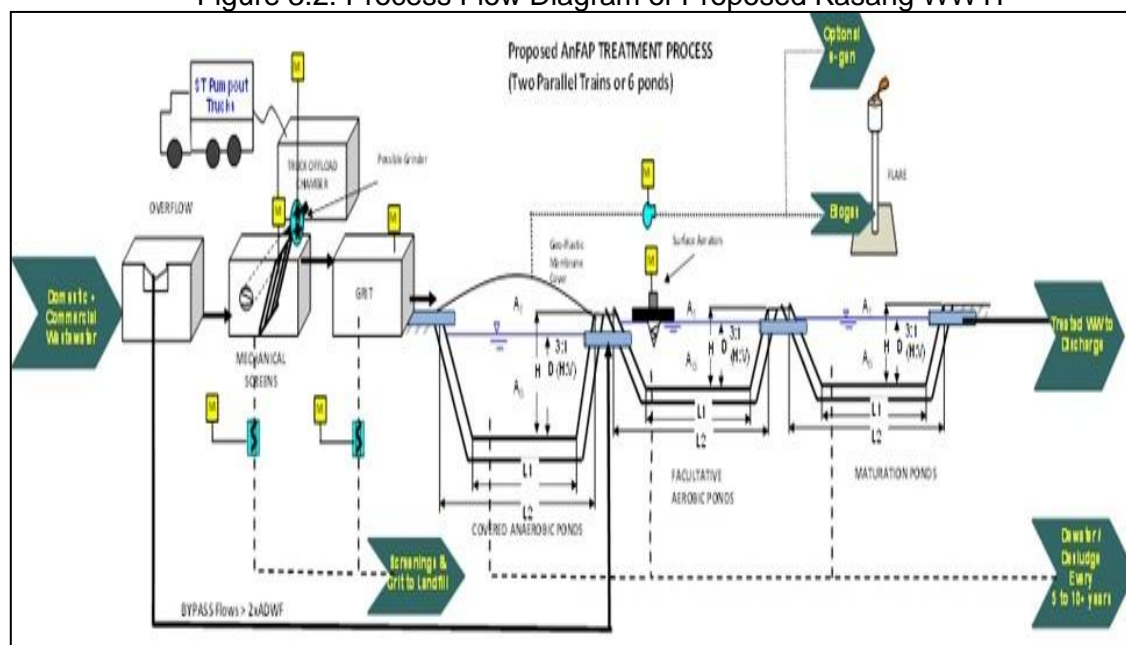
Sewer Pipe Diameters (in millimeter)	Sewer Pipeline Length (in kilometer)

1000	2.248
700	0.592
600	1.682
500	1.631
400	0.427
300	2.067
Total...	8.647

Source: PPTA Consultants

16. Wastewater from the sewer network system will drain to a 15-MLD Wastewater Treatment Plant (WWTP) located at Kasang, East Jambi Sub-district near the Kasang village and Kasang Jaya village and just beside the Selincah Creek, the WWTP's effluent discharge point. 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 4.0 tons per day (tpd).

Figure 3.2: Process Flow Diagram of Proposed Kasang 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.

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 national effluent regulation applies since Jambi Province has no effluent standard for BOD.

19. Total Jambi subproject's cost is estimated at US\$38.74 millions based on 2012 prices. The proposed WWTP is estimated to have an operating cost of US\$133,105 per year based on 2012 prices.

C. Construction

20. Jambi WWTP construction shall require: (i) site clearing and marking of alignments, (ii) stockpiling of construction materials, (iii) construction of new structures, (iv) construction of embankments, (v) construction of ponds and buildings, (vi) concreting for required tanks, (vii) installation of piping systems, (viii) installation of electro-mechanical equipment (ix) cleaning and closure of construction sites. The WWTP site will be backfilled with clean fill materials and there will be no site excavations for the ponds.

21. Sewer pipelines of the proposed Jambi 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.

22. 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.

23. *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 ex-filtrations.

24. *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

25. Detailed engineering design of the Jambi 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 Jambi's new sewerage system is expected to be operational by third quarter of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

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

A. Physical Resources

27. Jambi City is located in the middle of Sumatra Island between 01°30'2.98" to 01°7'1.07" south latitude and 103°40'1.67" to 103°40'0.23" east longitude. The city is in Muaro Jambi Regency. Based on Government Regulation No. 6 of 1986, Jambi City has an area of ± 205.38 km², consists of 8 districts, with the administrative center in the district of Kota Baru, namely: District of Kota Baru (77.78 km², 37.87%), District of Jambi Selatan (34.07 km², 16.59%), District of Jelutung (7.92 km², 3.86 %), District of Pasar Jambi (4.02 km², 1.96 %), District of Telanaipura (30.39 km², 14.80 %), District of Danau Teluk (15.70 km², 7.44 %), District of Pelayangan (15.29 km², 15.29 %), and District of East Jambi (20.21 km², 9.84 %).

28. *Topography.* Jambi City's topography consists of: (i) mostly flat, 0-2% slope, 11,326 ha, (ii) wavy, 2-15% slope, 8,081 ha, and a slightly steep, 15-40% slope, 41.0 ha. It has an altitude range of 10 to 60 m above sea level. Altitude of its districts are: Pasar Jambi, Pelayangan, and Lake Teluk an altitude of 0 to 10 meters above sea level, while Telanaipura, Jambi Selatan, Jambi Timur, and Kotabaru mostly located at an altitude of 10 to 40 meters above sea level

29. *Geology and Soils.* Soil types in Jambi are Gleisol Hidrik, Podsolik Gleik, Alluvial and Podsolik. From all the type of soil, podsolik is type of soil which dominant widely at 10,082 hectares, but another type of soil, alluvial, gleisol hidrik and podsolik gleik each area of 9,600 hectares, 796 hectares, and 60 hectares. Podsolik soil are scattered in Telanaipura sub-district, Kota Baru, Jelutung, and Jambi Selatan and generally alluvial soil found in plains area such as Lake Teluk and Pelayangan.

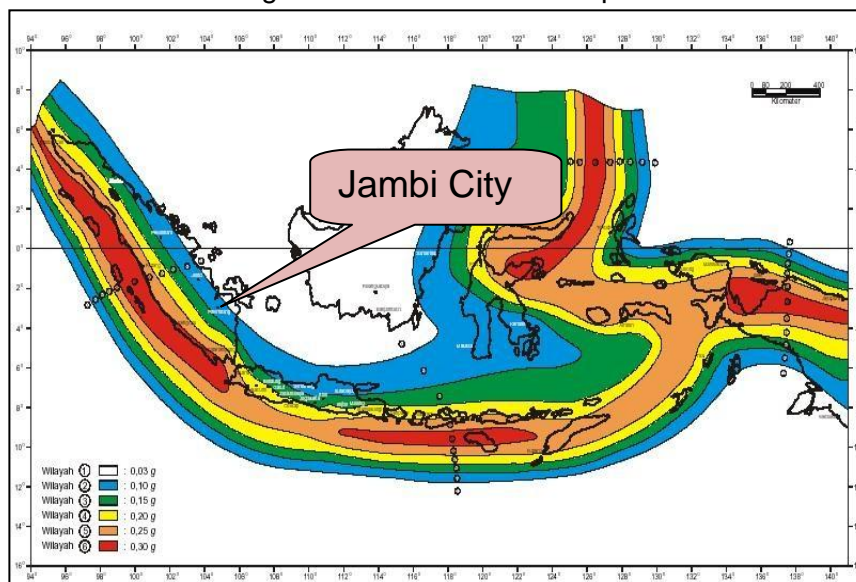
30. The texture of the soil in the city of Jambi can be differentiated into types of fine, medium and coarse. Land with a smooth texture occupies an area of approximately 3,579 hectares or 17.43% of the whole area, being an area of 15,381 hectares texture or covering 74.89% and coarse texture covering an area of 488 hectares or 2.38% of the area of the whole city of Jambi

31. 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. Jambi is in earthquake zone 2, minor earthquake zone. (Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003). The map of earthquake zone and peak acceleration of bedrock can be seen in Figure 4.1. The value of peak acceleration of bedrock should be calculated in the structural design of buildings to ensure safety.

32. *Water Resources.* Area with high potential ground water is in South of Jambi. Aquifer system can be seen in depth between 170 to 200 m below ground level, with final coefficient (K0 between $7,1 \times 10^{-2}$ m/day with coefficient T (T) between 12.1-36,2 m²/day. Ground water quantity showed by ground water level (GWL) between 0 – 14 mbmt. Deep well from this aquifer system can produce 0.1 - 0.3 l/s/ m with optimum discharge from 11,7 to 41,2 l/s. Groundwater quality generally is good and comply with drinking water requirements.

33. Regional ground water potential was occupying the valley between hills or foothills located between the Jambi city to the hills to the west. Aquifer system is found at depths of 150-170 MBT with values of k between $4,2 \times 10^{-2} - 4,6 \times 10^{-2}$ m/ day and T between 6,9 – 7,1 m²/day, GWL depth of 0,5 to 12,2 mbmt, Q_s average about 0,1 l/s/m and QOP average between 5,9 – 6,9 l/s, ground water quality generally comply with the requirements of drinking water.

Figure 4.1: Indonesia Earthquake Zones



Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003

34. With regards to rivers and lakes, Batanghari River flows along approximately 500 km, from the Bukit Barisan mountain in the province of West Sumatra and pass Jambi into the Strait Berhala. According to Master Plan PDAM Tirta Mayang, area of DAS Batanghari is 37.500 km² that covering part of West Sumatera Province, Bengkulu and Jambi. The main rivers that flow in the city of Jambi which are tributary streams of River Batanghari are: Kenali Kecil River, Kenali Besar River, Asam River, Lubuk Oman River, Selincih River, Maram River, and Tembuku (Table 4.1).

Table 4.1: Rivers in Jambi City

No	River	Lenth (km)	Width (m)	Depth (m)
1.	Batang Hari	17.56	495	-
2.	Kenali Besar	12.19	3	0.7
3.	Maram	14.37	4	1
4.	Selincih	14.25	3	0.6
5.	Kambang	43.09	-	-
6.	Putri	20.78	-	-
7.	Lubuk Oman	99.28	-	-
8.	Tembuku	59.21	-	-

Source: PPM – DAS Research Institute of Jambi University. 2011

35. The discharge point of the proposed WWTP site is Selincah Creek. This stream has a flowrate of 10m³/second and drains an agricultural area. Water quality of this stream indicates that it has higher values for total coliform and ammonia as against the Class IV Government Regulation No. 82/2001 for water quality management of rivers (Table 4.2).

Table 4.2: Water Quality of Selincah Creek

No.	Parameter	Unit	Bridge Jalan Raden Fataha ^a	Standard ^b
1.	BOD	mg/L	10	12
2.	COD	mg/L	14	100
3.	Phosphate	mg/L	0.8	5
4.	DO	mg/L	1.4	0
5.	Ammonia	mg/L	2.1	2
6.	Oil and Grease	mg/L	115	57.5
7.	Total Coliform	Amount/100 mL	12000	2000

Notes:

^a Selincah Creek sampling point

^b National Government Regulation No 82 of 2001 for Water Quality Management and Control of Water Pollution class IV

Source : Environmental Office of Jambi City, 2012

36. Jambi has lakes with varying volume Table 4.3.

Table 4.3: Lakes in Jambi

No.	Lakes	Area (Ha)	Volume (m ³)
1.	Kiambang	23	690.000
2.	Teluk	63	2.205.000
3.	Teluk Kenali	47	1.692.000
4.	Sipin	94	3.760.000
Jumlah		227	8.347.000

Source: PPM – DAS Research Institute of Jambi University. 2011

37. *Climate*. Jambi City has a tropical climate with two different seasons. The rainy season occurs during October to March with average rainy days of 20 days/month, while the dry season occurs during April-September with an average rainfall of 16 days/month. Rainfall is 2296 mm/year (average 191.34 mm/month). The wind velocities in every month were spread evenly, ranged from 16 knots to 24 knots. Average humidity ranged from 77% to 85%. In 2011, the average of temperature in Jambi City ranged from 26.1°C to 27.5°C. The maximum temperature was 34.8°C in May, and the minimum temperature was 21.0°C in December. The city is not in the tropical storm risk zone.

38. Relative to climate change, information on climate change projections specific for Jambi 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.

39. *Air Quality and Noise.* In January to March 2012, concentration of Suspended Particulate Matter (SPM) at Jambi ranged between 73.28 to 78.77 ug/m³. Rain water pH ranged between 4.59 to 5.50. Jambi Environmental Office measured of SO₂, NH₃, NO₂, and O₃ (Table 4.4 and 4.5).

40. Noise standards applicable in Jambi is GOI's Decree of Environment Ministry No.48/1996 which provides maximum noise limits of 55 dB(A) near schools and residential areas, 65 dB(A) for commercial and office areas, and 60 dB(A) for government facilities.

Table 4.4: Air Quality at Office Areas and Roads

No	Parameter	Unit	Measurement Time	Location	
				Office	Transportation
1.	SO ₂	ug/Nm ³	15 days	3,534	2,895
2.	NH ₃	ug/Nm ³	15 days	3,916	3,189
3.	NO ₂	ug/Nm ³	15 days	83,468	46,814
4.	O ₃	ug/Nm ³	15 days	8,918	19,812

Table 4.5: Air Quality at Residential Areas and Industry

No	Parameter	Unit	Measurement Time	Location	
				Residential	Industry /Hospital
1.	SO ₂	ug/Nm ³	15 days	3,534	0,448
2.	NH ₃	ug/Nm ³	15 days	22,811	18,331
3.	NO ₂	ug/Nm ³	15 days	67,095	69,133
4.	O ₃	ug/Nm ³	15 days	16,903	18,981

B. Ecological Resources

41. Jambi is a city and the proposed WWTP site is within the city in a generally urban area at Kasang, East Jambi Sub-district near the Kasang village and Kasang Jaya village. This proposed 6-ha WWTP site is presently an agricultural area planted with a water-based vegetable known locally as "kangkung". The site is aligned towards the northeast. Selincah Creek bordered the site in the north. The west is also bounded by an elementary school, and vegetation. The east is bounded by land with vegetation. The southern part is bounded by "kangkung" plots, residential and commercial structures. This site has a much lower elevation compared to its surrounding areas in the east, west, and south.

Figure 4.2: Satellite Photo of Proposed WWTP Site



Photo source: Google Earth. 2012.

42. Beyond the southern border is an urban road (Jalan Yos Soedarso), while beyond the western borders is another urban road (Jalan Raden Fatah). Selincah Creek is actually draining a large vegetated area towards the proposed WWTP site and exits before eventually discharging into the Batang Hari River (Figure 4.2). It is therefore carrying runoffs from a vegetated area. This creek overflows into the proposed site during heavy rains. Consequently, this site is not within undisturbed landscape and can be viewed as a small agricultural patch of land in a basically urban landscape. Since the Kasang 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 fauna species such as goats, house cats, and dogs. Photographs of the proposed site are presented Appendix 3.

C. Economic Development

43. *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. The highest regional taxes incomes 62% is from street lighting, followed by restaurant 13%, hotel 11%. Regional expenditure budget of Jambi City in 2010 is Rp692,168,599,886 increase to Rp. 814,323,530,612 in 2011 and 883,399,425,045 in 2012 (Source : Jambi in Figures 2012).

44. *Land Use.* Land use in Jambi is dominated by 28.20% of gardens; 19.93% of the field and 19.38% of settlement. As shown in the figure below. In accordance with the strategic policy presented in Regional Spatial Plan (RTRW) of Jambi, development direction of Jambi city planned has 7 (seven) BWK. Jambi City's Badan Perencanaan Pembangunan Daerah (BAPPEDA) confirmed that the area of the proposed WWTP is classified as for WWTP.

Table 4.6: Jambi City Land Use

NO	URBAN AREA/BWK	LAND USE	AREA (HA)	DISTRICT
1	BWK A	Residential, educational, cultural, green open space, and conservation.	3.234	Danau Teluk, Pelayangan.
2	BWK B	Residential, office / administration (city), trade, the oil pump, spare urban development, landfill, and industry	3.307	Kota Baru, Jelutung.
3	BWK C 1	Provincial offices, housing, education, trade and services, hospitals, green open spaces and urban forest. office	2.883	Telanaipura.
4	BWK C2	Residential, commercial, oil pump area, conservation and urban development reserves.	5.401	Telanaipura, sebagian Kota Baru.
5	BWK D1	Green open spaces, conservation, industrial, warehousing, and swamps	1.669	Jambi Timur.
6	BWK D2	Industrial, warehousing, airports, jungle garden, green open spaces, urban development and reserves	2.207	Jambi Selatan, sebagian Jambi Timur.
7	BWK E	Settlement, trade, and services	18.837	Pasar Jambi, sebagian Telanaipura, Jelutung, Jambi Selatan, Jambi Timur.

Source: Office of Agriculture, Animal Husbandry, Fisheries and Forestry.2011

45. *Commerce and Trade*. Jambi city has the industry consisting of small industries, medium, and large industries.

Table 4.7: Medium and Large Industries

No.	Company	Type of Industry*)
1.	Hok Tong	Crum Rubber
2.	Batang hari Tembesi	Crum Rubber
3.	Jambi Waras	Crum Rubber
4.	Angkasa Raya	Crum Rubber
5.	Remco	Crum Rubber
6.	Indofood	Instant Mie
7.	Kurnia Tunggal	Palm Oil
8.	Kopi AAA	Coffee

Source: Office of Industry and Trade- Jambi City 2011, Jambi in Figures 2012

Table 4.8: Small Industries

No.	Company	Type of Industry*)
1.	Batik Craftsmen (19)	Batik
2.	Printing Fabric (26)	Printing Fabric
3.	Convection (8)	convection
4.	Bread & Kind (21)	Bread & Kind
5.	Syrup / Beverage (17)	Lemonade, Syrup, Etc.
6.	Tempe (10)	Tofu / tempe
7.	Soy sauce (6)	Soy sauce
8.	Bricks (6)	Brick
9.	Preserving Rotan (7)	Preservatives Rotan
10.	Vehicle Body Building	Car repair shop
11.	Furniture	Household Furnishings
12.	Wooden utensils	Wooden utensils

Source: Office of Industry and Trade- Jambi City 2011, Jambi in Figures 2012

46. Every industry will generate waste such as liquid waste, solid waste, air waste, toxic and hazardous materials. The following are loading of liquid waste in 2011.

Table 4.9: Pollution Load of Industrial Wastewater

N o.	Type of Industry	Loading of industrial wastewater (Ton/Year)			
		BOD	COD	TSS	Ammonia
1.	PT. Djambi Waras	15,76	31,03	34,51	2,82
2.	PT. Remco	13,69	26,51	27,81	0,92
3.	PT. Angkasa Raya	9,10	19,01	23,14	0,56
4.	PT. B H T	22,53	32,20	5,99	1,10
5.	PT. Hok Tong	17,44	33,97	19,94	0,83

Source: SLHD Jambi Environmental Office, 2011

47. *Agriculture*. The harvested area of paddy rice in Jambi City in 2011 was 1,183 hectares and production of paddy rice was 5,645 tons. Compared to 2010 was 1.676 Ha for harvested area and 3.720,33 tons of production, by means decreased by 29,42% on harvested area but increased 51,73% on production. The production of maize was 316.68 tons, cassava was 968.80 tons, sweet potatoes were 216.41 tons, peanut was 113.41 tons. Data on the production of fruits in Jambi City namely siam orange was 20 tons, avocado 153.10 tons, papaya 1,014.69 tons, banana 398.26 tons, mango 8.80 tons and rambutan 19.25 tons. The livestock in Jambi City are milk cow, buffalo, horse, goat, sheep, pig, duck and broiler. In 2011, the total stocks of these kinds are 1,012, 122.7, 35,127, 1,920, 47,039, 220,186 and 4,762,995 for each livestock, respectively. The fishery production of public waters in 2011 was 627.74 tons. Fresh water fish production in 2011 was 2,692.69 tons, decreased by 17.11% from 2010 which is 2,299.30 tons.

48. *Tourism*. Points of interest for tourism in Jami are mostly nature tourism, such as forest parks, and a zoo. In 2011, a total of 87,850 people have visited these sites. Available number of hotels and inns in 2011 was 74 with 3 four-star hotels and 4 three-star hotels.

49. *Existing Water Supply System.* Data in 2011 showed, PDAM Tirta Mayang Jambi serve the water demand of 60.5% of population in Jambi and number of consumers is 58265. Raw water sources of drinking water are from Batanghari River, as can be seen the table below.

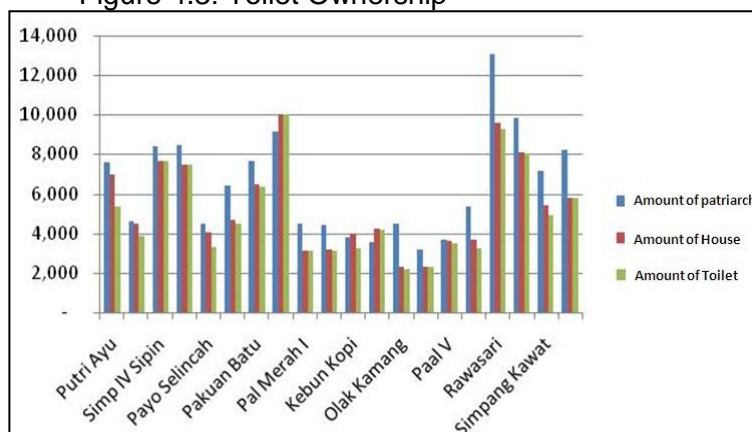
Table 4.10: Jambi Drinking Water Sources

No.	Water Treatment Plant	Designed Capacity (l/dt)	Production Capacity (l/dt)	Water resoures
1	Broni	600	470	R. Batang hari
2	Benteng	220	171	R. Batang hari
3	Pasir Panjang I	10	0	R. Batang hari
4	Pasir Panjang II	35	35	R Batang hari
5	Tanjung Johor	3	0	Non active
6	Well Drilling Perumnas Kota Baru	10	0	Non active
7	Aur Duri (PT Novco)	100	94	R. Batang hari
8	Perumnas Aur Duri	10	10	R. Batang hari
9	Well Drilling Villa Kenali	10	0	Non active
10	Well Drilling Mayang M	1	0	Non active
11	Well Drilling Paal Merah	5	0	Non active
Amount		1.004	780	

Source : Jambi in Figures 2012

50. *Sanitation Condition.* Based on result of Puskesmas Inspection in 2011 to the level of risk in household sanitation at Jambi, shown that 6% of the population do not have toilets. The largest population those do not have a toilet is the village Putri Ayu (23%), followed by village Payo Selincih and village Kebun Kopi (19%) and village Aur Duri (13%). Toilet ownership details can be seen on the figure below. The inspection of quality toilet shown 36,4 % have intermediate to high risk level. High risk means have a potency to contaminate the environment.

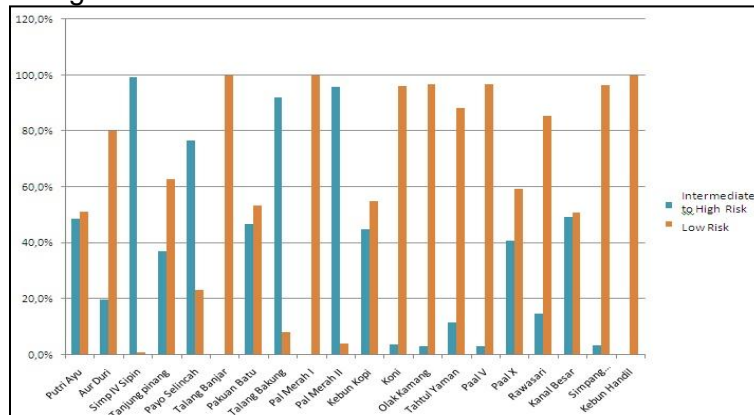
Figure 4.3: Toilet Ownership



Source: Puskesmas Inspection. 2011

51. Business center area is located in Pasar Jambi District. Generally, there are shopping activity, restaurant, traditional market and modern market. The system of wastewater management in the region also is individualized with septic tank or latrine and grey water discharged into drainage channels. For new residential areas, housing built by developers from 2005 through 2008, reached 3,310 units with a variety of types. Generally, wastewater treatment is individualized using septic tank and infiltration, in which only one compartment of the septic tank and not waterproof, while grey water (from the bathroom, kitchen and laundry) directly discharged into drainage channels. For Slum Area, slum areas are scattered in several village in Jambi. Generally, structure houses are stagy. Waste water treatment especially black water is using latrine without infiltration and grey water discharged in the surrounding area.

Figure 4.4: Toilet Potential to Contaminate Environment



Source: Puskesmas Inspection. 2011

52. Sludge Treatment Plant (STP) for septic tanks sludge is located in Talang Bakung, 14 Km from the city center, is currently utilizing the facility of 16%. The sludge suction equipment owned 2 units. In general, the condition of the building is still good, but necessary rehabilitation for increase STP performance such as construction rehabilitation of sludge drying bed, maneuvering the truck in imhoff tank, providing water supply and increasing in both sludge suction equipment such as truck and motorcycles. STP is managed by Jambi Sanitation and Cemetery Office, operating costs derived from suction retribution and government budget in accordance with Government Regulation No. 7 of 2003.

53. Contamination of shallow well by un-standard septic tank condition can be characterized by the presence of chemicals such as nitrites and nitrates and the presence of E.coli bacteria. The results of water quality monitoring wells at various places by Jambi City Environmental Office in 2010, can be concluded that the well has not indicated any contamination of septic tank. The management drainage in Jambi city is managed by the Office of Human Settlements Sub Jambi. The occurrence of puddle in Jambi can be relatively less. Spacious pool that occurred only about 449 hectares compared to the overall area of the city, so it can be said the city's drainage network is relatively good. Primary channel length Jambi city is 21,28 km and secondary channels is 8,96 km.

54. *Transportation and Communication.* Road is one of the most important infrastructures in supporting economic activities. Improvement in the quality of road will support the development process distribution of trade from any region to another. The total length in

Jambi City in 2011 is 506.670 km with 278.670 km is in well condition. Jambi has 2 ports. Kasang Port is used for passengers, while Angso Duo Port is used for both passengers and goods. During 2011, there are 521 ships entered and left at Jambi. The total number of loaded and unloaded cargoes on 2010 were 5,165 and 4,635 tons. Jambi City has domestic airport, the Sultan Thaha Syaifuddin Airport. The number of aircraft arrivals was 4.345 in 2011. The number of passenger departures and arrivals were 501.241 and 513.083. Compared to 2010, the number of aircraft arrivals and departures are increase by 6,55% and 6,42% from 2010. The number of passenger arrivals also increase by 8,86% and passenger departures increase by 7,83% than previous year

55. *Power Supply.* Until year 2010 development goals of electrics sector is to improve utilize to encourage more productive economic activities such as industrial activities, handicraft industry and other businesses. Jambi's electricity provider is PT PLN, the state power company. During 2010, the number of PLN customers in Jambi city is 160,900 with an installed power 176.904.700 VA and sold 640 787 366 KWh. Entire villages in Jambi been getting power supplies. Electricity utilization in Jambi, dominated by households (17030601 Kwh), followed by trade (391142357 Kwh), industry (133053219 Kwh), government (64926573 Kwh) and schools (34634616 Kwh). Percentage of electricity utilization can be seen in the figure below. Fuel is also one of the power sources. The average fuel sales at the fuel station is 7.440 kilo-liters (premium), 6.300 kilo-liters (pertamax), 48.300 kilo-liters (diesel). Total of fuel stations in Jambi are 19. Total fuel consumption for industrial sector are 187.846 kilo-liters (2011).

D. Socio and Cultural Resources

56. *Population.* Jambi city's total population by the end of 2011 is 540.258 inhabitants. The number of inhabitants in each sub-district and its population density can be seen in the table and figure below.

Table 4.11: 2011 Population of Jambi City

No	Sub-districts	Area (Km ²)	Total Population (Inhabitant)	Population Growth	Population Density (Inhabitant/Km ²)
1.	Kota Baru	77.78	142,237	0,25	1.829
2.	Jambi Selatan	34.07	122,675	0,1	3.601
3.	Jelutung	7.92	77,740	6,14	9.816
4.	Pasar Jambi	4.02	13,480	-7,42	3.353
5.	Telanaipura	30.39	77,931	0,16	2.564
6.	Danau Teluk	15.7	13,573	-2,2	864
7.	Pelayangan	15.29	12,508	-3,11	839
8.	Jambi Timur	20.21	79,798	-3,51	3.948
TOTAL		205.38	540,258	0.03	2,630

Source: Jambi Statistical Center Office, 2011 in Jambi in Figures 2012

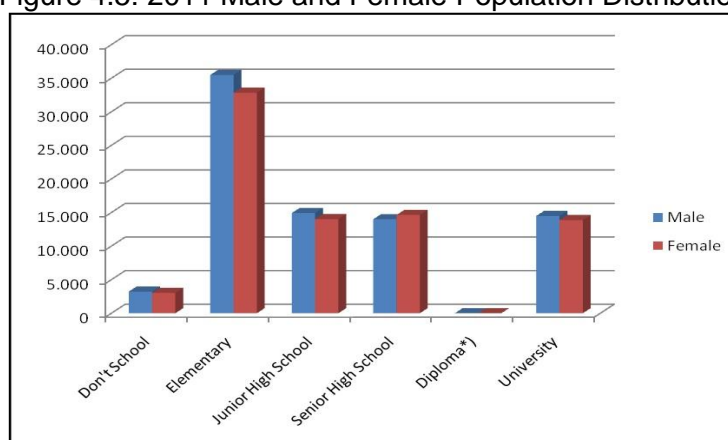
57. *Public Health.* Hospitals in Jambi City in 2011 are: Jambi Public Hospital, Bratanata (DKT) Hospital, Budhi Graha Hospital, Theresia Hospital, Asia Medika Hospital, MMC Hospital, Bhayangkara Hospital. The number of local government clinics are: Puskesmas, 20 units and Pustu clinic, 38 units. Diarrhea and gastroenteritis rank no. 7 in the ten leading diseases suffered by Jambi's residents in 2011.

Table 4.12: 2011 Ten Leading Diseases

No.	Disease	Total Patients
1.	Nasa Pharing Acut	110.556
2.	Hypertensi Essensial	30.137
3.	Pharingitis Acut	27.114
4.	Gastritis	24.474
5.	Dermatitis	20.806
6.	Muscle and connective tissue diseases	18.773
7.	Diare and Gastroenteritis	17.060
8.	Influenza	13.496
9.	Dental tissue disorders	10.332
10	Pulpitis	8.204
TOTAL		280.952

Source: Jambi Health Office (2011), *Jambi in Figures 2012*

Figure 4.5: 2011 Male and Female Population Distribution



Source: Jambi Statistical Center Office, 2011 in *Jambi in Figures 2012*

58. *Education.* Jambi City's educational sector includes elementary to university level, non-formal education in the form of various educational and training institutions in all sorts of knowledge needed for development. According to The Ministry of National Education of

Jambi City, the total number of state and private school in Jambi City in 2011/2012, are: kindergarten, 124 units, elementary, 252 units, junior high school, 89 units, senior high school, 89 units. For the tertiary education level, schools in Jambi City are: Jambi State University, Jambi National Islamic institute, Batanghari University, Secretary and Management Academy, Computer Management College, STIKOM Dinamika Bangsa Baiturrahim Nursing Academy, and Muhammadiyah College

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

59. A comprehensive screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed Jambi City's 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.

60. 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 "Δ" for insignificant and "●" for significant. The symbol for an insignificant negative impact is "Δ -", 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 (Δ) 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.

61. Environmental impacts arising from decommissioning of the proposed Jambi City's 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 Jambi City's sewerage facilities are available.

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

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● -	Δ
Climate change mitigation (design aspect)	● -	Δ
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

62. *Climate Change Vulnerability.* Climate change adaptation considerations shall be included in the design of Jambi City's proposed WWTP at Kasang since it is on a low-lying ground and just beside the Selincah Creek. 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 Jambi 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 Jambi City's Kasang 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.

63. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Jambi City's Kasang 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. 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).

64. *Climate Change Mitigation.* Climate change mitigation considerations shall be included in the design of Jambi City's proposed WWTP at Kasang to control greenhouse gas emissions. The membrane covered anaerobic ponds 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 financial and economic factors.

65. *WWTP Site's Conformance to Spatial Plan.* There is no problem with spatial planning for the proposed WWTP. Jambi City's BAPPEDA confirmed that the proposed WWTP site at Kasang conforms to Jambi 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.

66. *Encroachments to Environmentally Sensitive Areas.* There will be no encroachments to environmentally sensitive areas. The sewer network and the proposed Kasang WWTP will be located in the urban areas of Jambi City. The proposed WWTP will be constructed in a site that has been transformed into its present agricultural landscape over the years. 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 Jambi City's built-up areas.

67. *Impacts and risks to biodiversity conservation.* The issue on impacts and risks to biodiversity conservation is not applicable to the Jambi 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 Kasang WWTP site are not undisturbed and over the years the ecological changes due to human activities in the area have resulted to its present agricultural landscape.

68. *Nuisance and Problems to the Public.* Potential nuisances and problems to the public during construction of the proposed Jambi City's 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 Jambi City's 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.

69. 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.

70. 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. Micro-tunneling 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.

71. *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 Kasang 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 Pelestarian Peninggalan Purbakala Jambi (Jambi Archaeological Heritage Preservation) if archaeological and cultural assets are discovered.

72. *Loss of Assets.* Inventory of losses for the proposed Jambi 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

73. *Site Preparation.* Construction of the proposed Jambi City's sewerage system will not involve significant modification of the construction site topography. The proposed WWTP site at Kasang will only be backfilled by a 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 Kasang WWTP is an agricultural area 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 Kasang

74. *Potential Damage to Archaeological and Cultural Assets.* During construction, excavations activities of the proposed sewer lines and the proposed Kasang WWTP 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.

75. *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 Pelestarian Peninggalan Purbakala Jambi (Jambi Archaeological Heritage Preservation) if archaeological and cultural assets are discovered.

76. 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 WWTP is a potential source of sediments and can easily release soil materials to Selincah Creek and surrounding area 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 Selincah Creek.

77. Mitigation. Control of the surface runoff 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, 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.

78. 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 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 PPIU's supervising engineer. Workers using noisy equipment shall be provided with ear plugs.

79. Local Air Pollution Due to Construction Activities. During dry periods, dust generation can be expected from activities associated with the construction of the Kasang 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.

80. 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. This requirement is particularly important in the hauling of backfill materials for the proposed Kasang WWTP due to the significant number of hauling trips.

81. *Oil and other hazardous materials releases.* Presence of oil products and other hazardous materials are expected in 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.

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.

82. *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. While sewer line construction in wide streets, such as Jalan Setia Budi, could easily be managed with regards to traffic congestion and pedestrians access to the area, the same could not be said of narrow roads with heavy commercial activities, such as the market area in Jalan Rangkayo Hitam. Transport of backfill materials for the proposed WWTP site may also cause traffic congestion along Jalan Setia Budi if not properly managed.

83. *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, expedite works in front of shops, steel plates for vehicle passage, 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.

84. 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 such as the market area.

85. *Hazards to public due to construction activities.* Hazards to the public associated with construction activities for the proposed Jambi City'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.

86. 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.

87. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during construction of the Jambi 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.

88. 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.

89. *Occupational Health and Safety at Work Sites*. Construction hazards are expected in the implementation of the proposed WWTP, pumping station, 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.

90. 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.

91. The construction site 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.

92. 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.

93. *Increase Employment Opportunities at Work Sites.* Considerable number of workers will be required for the various construction activities of the proposed Jambi 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.

94. 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 Jambi City's LPMU.

95. *Improper Closure of Construction Sites.* Construction activities of the proposed Jambi 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.

96. 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 PPIU. 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

97. *Discharge of Poor Quality Effluents.* The proposed Jambi City's Kasang 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.

98. Mitigation. The WWTP shall be operated according to its design parameters in order to produce effluent quality satisfying the national effluent regulations (Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality) with maximum standard for main parameters: 100mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil. However, the WWTP will be designed to achieve effluent quality with a maximum BOD of 50 mg/l and TSS of 100 mg/l. 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.

99. The requirement for properly trained operators cannot be overemphasized since the proposed 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.

100. 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.

101. Another prevention measure is to prevent the discharge of industrial wastes into the sewer lines. Industrial waste will adversely affect the biological processes in the 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.

102. *Noise and Dust Pollution of WWTP and Pumping Station.* Noise of the proposed 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.

103. *Disposal of Sludge from WWTP.* Operation of the 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 Jambi's Kasang 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.

104. 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 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 Jambi's Kasang WWTP shall be developed by adopting appropriate standards from other countries since Indonesia does not have biosolids management standards for WWTPs.

105. *WWTP's Foul Odor Off-site Migration.* Operation of Jambi's Kasang 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 anaerobic ponds. Aerobic units may also produce bad odor due to lack of air input under extended power failures.

106. Mitigation. Mitigations shall include the following: (i) anaerobic pond 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.

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.

107. *Toxic waste generation.* Operation of the proposed Kasang 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.

108. *Pollution to Groundwater.* Wastewater of the proposed Kasang WWTP may seep into the ground from process units, such tanks and ponds if these facilities are not impermeable.

109. *Mitigation.* Concrete tanks process units shall be design and constructed as impermeable containers. Wastewater treatment ponds shall be design and constructed with impermeable plastic liners.

110. *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 WWTP can drown easily since these are deep facilities.

111. *Mitigation.* To reduce the risk of drowning in the tanks and ponds, the Kasang 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.

112. *Health and Safety Risks in Sewerage System Operation.* Operation of the proposed Jambi 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 WWTP can seriously threaten the health and safety of the personnel.

113. *Workers' safety at proposed WWTP relative to the generation of biogas should not be taken lightly.* The anaerobic process unit in the WWTP, the anaerobic pond, 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.

114. *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.

115. *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 Jambi 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 WWTP. A five-foot-high fence shall be provided to keep people away from the WWTP.

116. 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.

117. 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.

118. *Increase Employment Opportunities.* Operation and maintenance of the proposed Jambi 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.

119. Enhancement. Operating unit of the 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.

120. *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 Jambi City subproject, the cumulative effect would be on the organic and nutrient load to Selincah Creek, the WWTP's discharge point. The cumulative positive effect of the proposed Jambi sewerage system is the reduction of the total organic and nutrient loads to the stream since it will capture a significant portion of the domestic wastewater that presently find its way to the rivers. This effect highlights the role of the proposed sewerage system as an environmental improvement infrastructure.

121. In addition, the WWTP effluents to be discharged to Selincah Creek will have a dilution effect on the stream's water quality considering the additional flow of 15 MLD from the WWTP. .

122. 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 Jambi 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

123. 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 Jambi City's sewerage system subproject.

124. During preparation of the Jambi City's 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.

125. *Public Consultations.* There were two initial public consultations conducted for this subproject during the PPTA. The first was last 21 September 2012, while another one was conducted last 18 March 2013. Another public consultation was conducted due to Jambi City's government decision to change the location of the proposed WWTP to a nearby new site due to unsuccessful purchase of the previous site. Jambi City's government has purchased the new site. The new site for the WWTP is in the same general area as the previously identified site (Kasang Village). The new site is the nearby Kasang Jaya Village.

126. Last 21 September 2012, Jambi City's BAPPEDA conducted initial public consultation and formally discussed the proposed sewerage subproject with the stakeholders and requested their views. A total of 18 stakeholders and representatives participated. Documentations of the first public consultation are presented in Appendices 4 to 7.

127. 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.

128. Representative of Jambi City's Badan Perencanaan 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. The participants were informed that Jambi City government has plans to develop a wastewater treatment plant in Kasang village for the proposed sewerage system to avoid soil and groundwater contamination from the wastewater generated by households and businesses.

129. Representative of Dinas Kebersihan dan Pertamanan Kota Jambi (Sanitation Office of Jambi City) gave a "powerpoint" presentation of the proposed sewerage subproject. It was explained that the proposed sewerage subproject will be by gravity with wastewater from households and businesses flowing down to the WWTP in Kasang village.

130. After the "powerpoint" presentation, the participants were encouraged to ask question and raise their concerns. The discussions include the issues on an ongoing land acquisition of the site at Kasang village for the proposed WWTP. It also includes issues on sewerage construction and potential odor generation of the wastewater treatment plant.

131. Some participants asked how the price of land to be acquired will be addressed by Jambi City government. It was explained that the city government is following a process and the assessment of land price is being done by an independent appraisal team.

132. Participants asked how project implementation will handle disturbance to the public including traffic jams and impassable roads. It was explained that the city government will require the contractors to conduct its activities with due consideration to the public and minimize impacts including the implementation of traffic management.

133. A community leader from the site of the proposed WWTP asked about the generation of odor during operation of the WWTP. It was explained that the WWTP will use a technology that will avoid odor problems to the surrounding area. The participants were further informed that in some countries, WWTPs are in the centre of the city and have no odor problems since they are properly managed.

134. During closing, BAPPEDA informed the participants that even if the WWTP subproject is not implemented, Jambi City government will still buy the land at Kasang Village to be used for green open space requirements of the city.

Table 6.1: Summary of Consultation Outcomes - First Public Consultation

Group Represented	Issues/ Concerns Raised	Project's Response
Villagers, Jambi Timur District	how the price of land to be acquired will be determined?	Jambi City government is following a process and the assessment of land price is being done by an independent appraisal team
Kasang Village	How about if the owner of the land to be acquired live in another far village?	All owners of the land affected by the project will be compensated even if the owner is from another village
Kasang Village	Can people from the community work in the subproject during implementation?	local labor will be employed for construction activities, but for WWTP operators, it requires specific competence and skills
Kasang Village	What about odor problems during operation of wastewater treatment plant?	WWTP uses technology so that there are no odor pollution to the surrounding area. In some countries, WWTP is in the centre of the city. If WWTP is well managed, odor will not be a problem
Rajawali Village	Sewerage project will cause traffic jams and disturbances, especially for a busy small street	Construction activities will be managed in such a way that minimize impact to communities. Contractors will implement traffic management
Pasar District	What should be done further to proceed with this project?	Currently, regulation regarding waste water management is being prepared. A temporary unit which will be the Unit Perlaksanaan Teknis Daerah (UPTD) is being formed for WWTP management. The mayor, who is the head of Indonesia's association of mayor for urban sanitation is pushing for the implementation of this subproject
Rajawali Village	After this public consultation, when is the next meeting?	Public consultation is not only once, another meeting will be conducted. The decision to push with this project will be received within 3 weeks from higher authorities.

135. *Public Consultation due to change of WWTP Location.* After the draft IEE was prepared, Jambi City's government decided to change the location of the proposed WWTP to a nearby new site, the Kasang Jaya Village. Consequently, last 18 March 2013, Jambi

City's BAPPEDA conducted another public consultation in view of the selected new location of the proposed WWTP. Documentations of this public consultation are presented in Appendices 8 to 11.

136. Villagers living around the new site (Kasang Jaya Village) and nearby village (Kasang Village) participated in the meeting. Village and district representatives also participated. A total of 17 stakeholders and representatives participated. Summary of the consultation outcomes is presented in Table 6.2.

137. Representative of Jambi City's 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. The participants were informed that Jambi City government has a plan to develop a wastewater treatment plant in Kasang Jaya Village for the proposed sewerage system of the city. Representative of Jambi City's Sanitation Office and Jambi Province Public Works presented information regarding the proposed sewerage subproject.

138. Similar to the initial public consultation, villagers asked about the potential effects of the proposed WWTP such as odor, creek water and groundwater effects, and flooding. It was explained that the WWTP will use a technology that will avoid odor problems to the surrounding area. The participants were further informed that in some countries, WWTPs are in the centre of the city and have no odor problems since they are properly managed. The existing Yogyakarta WWTP was also cited as an example of no odor problems.

139. On creek water contamination, it was explained that the discharges from the proposed WWTP will comply with the government's standards for wastewater discharges to surface waters. It was also explained that groundwater will not be affected since the proposed WWTP will be impermeable. Jambi Province Public Works explained that flooding effects will be studied in detail during the detailed design phase of the proposed WWTP.

140. Villagers also raised the issue of construction disturbance. It was explained that construction activities will be conducted in such a way that impacts will be minimized. The city government will also recommend to the contractors the employment of villagers for the labor requirement of the construction activities.

Table 6.2: Summary of Consultation Outcomes - March 2013 Public Consultation

Group Represented	Issues/ Concerns Raised	Project's Response
Kasang Jaya Village	What is the technology to be used for the proposed WWTP	WWTP will use an aerated lagoon technology, a wastewater treatment system that is widely used in Indonesia
Kasang Jaya Village	Will the WWTP wastewater affect the surrounding area?	WWTP will not pollute the environment since it will comply with the government's standards for wastewater discharges to surface waters

Kasang Jaya Village	Will the WWTP wastewater affect the groundwater of the surrounding area?	Groundwater will not be affected since the proposed WWTP will be impermeable
Kasang Jaya Village	What about odor problems during operation of wastewater treatment plant?	The aerated lagoon technology will not create odor problems and odor will be similar to smell of paddy field. In some countries, WWTP is in the centre of the city. If WWTP is well managed, odor will not be a problem. An existing example is the Yogyakarta WWTP
Kasang Jaya Village	What about construction disturbance?	Construction activities will be conducted in such a way that impacts will be minimized. The city government will also recommend to the contractors the employment of villagers for the labor requirement of the construction activities
Kasang Village	What will be done in order for the WWTP not to affect the flooding of the surrounding areas?	Flooding effects of the WWTP will be studied in detail during the detailed design phase of the proposed WWTP

141. *Future Disclosure and Consultations.* Public consultation and participation activities will again be conducted in the future. The Provincial Project Implementation Unit (PPIU) and Jambi City's Local Project Management Unit (LPMU) shall 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 PPIU, 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

142. Local grievance redress mechanism (GRM) is important in the planning and implementation of the proposed Jambi City's sewerage subprojects 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 meetings last 21 September 2012 and 18 March 2013. 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 Jambi City's sewerage system, complaints about its environmental performance can also be brought to the attention of the local environment agency, the Jambi Badan Lingkungan Hidup (BLH).

A. Construction Activities Grievances

143. 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 Jambi 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.

144. *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).

145. *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 City's Chief of the LPMU which could be Unit Perlaksan Teknis Daerah (UPTD) or other equivalent. 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.

146. 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.

147. 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.

148. *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

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

C. Complaints to Jambi City's Badan Lingkungan Hidup

150. Complaints about environmental performance of projects issued an Environmental Permit can also be brought to the attention of Jambi City's 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

151. This section addresses the need for mitigation and management measures for Jambi City's subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up 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

152. 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.

153. 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 Jambi 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 Jambi City's sewerage system, while some were already included in the construction of particular items.

154. 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 Jambi 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.

155. **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 Jambi City's subproject, the estimated amount is US\$ 0.21million.

156. To ensure that funds will be allocated during subproject implementation, 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 to require the contractor to quickly address the environmental issues during construction.

Table 8.1: Environmental Mitigation Plan of Jambi City's 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/ PPIU 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/ PPIU and CPMU
Social and community concerns	Potential nuisance and problems to the public from Jami 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 sit	Part of detailed design cost	Design Consultants, PPIU, and LPMU / 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; Jambi City government and the Balai Pelestarian Peninggalan Purbakala Jambi (Jambi Archaeological Heritage Preservation) will be informed promptly	Sewer line trenches, civil works excavations	Part of detailed design cost	Design Consultants/ PPIU 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/ Jambi City government / PPIU 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; Jambi City government and the Balai Pelestarian Peninggalan Purbakala Jambi (Jambi	Sewer line routes, WWTP site	Incorporated in construction contract; part of US\$ 019 million as environmental mitigations allocation of	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		Archaeological Heritage Preservation) will be informed promptly		construction contract	
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\$ 019 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other	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	Sewer line routes, WWTP site	Incorporated in construction contract; part of US\$ 0.21 million as environmental	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
civil works		lamps for open trenches in sewer lines installation		mitigations allocation of construction 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Occupational health and safety at work sites	Implement construction 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, 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, PPIU, 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\$ 0.21 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, 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	Jambi City' Unit Pelaksana Teknis Daerah (UPTD)/ Jambi 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	Jambi City' Unit Pelaksana Teknis Daerah (UPTD)/ Jambi 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	WWTP	Part of capital, operation & maintenance costs	Jambi City' Unit Pelaksana Teknis Daerah (UPTD) / Jambi City's BLH

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		program for the WWTP shall be developed by adopting appropriate standards from other 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)/ Jambi 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)/ Jambi 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)/ Jambi 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)/ Jambi City's BLH

157. 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.

158. *Tender Documents and Construction Contracts.* Jambi City's 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.

159. *Contractor's EMP.* During construction of the proposed Jambi City sewerage system, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the Jambi City's subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by CPMU, Jambi Province's PPIU, and Jambi City's 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 Jambi Province's PPIU 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, PPIU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

160. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the CPMU and Jambi Province's PPIU. 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.

161. *Sewerage System Operations Manuals.* Jambi City's UPTD 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.

162. *Unanticipated Environmental Impacts.* Where unanticipated environmental impacts become apparent during project implementation, CPMU and Jambi Province's PPIU 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

163. 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.

164. The Jambi Province's PPIU 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 the PPIU are outlined in the succeeding section for institutional arrangement.

165. *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 Jambi Province's PPIU 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 Jambi 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 Jambi City's UPTD 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 since these are checking/ inspections activities only.

Table 8.2: Environmental Monitoring Plan of Jambi City's Subproject

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	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/ PPIU	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/ PPIU	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	Jambi City's LPMU/ Design consultants	CPMU/ PPIU	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/ PPIU	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	Jambi City's LPMU/ Design	CPMU/ PPIU	Part of project management in detailed design

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Dust, cover of stockpiles, smoke belching	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Road safety plan; warning signs, barricades, and night lamps	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Number of local labor employed	Sewer line routes, WWTP site	Verification of contractor's records	Once a month	contractor	Construction supervision consultants, CPMU/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
						CPMU/ PPIU
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/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
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 GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003)	Sewer line, WWTP	effluent sampling and laboratory tests	twice monthly	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to BLH since this is an annual visual inspection
Integrity of concrete and impermeable plastic liners	WWTP	Visual inspection of WWTP	Once a year	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to BLH since this is an annual visual inspection
safety station, warning signs, and fence	WWTP	Visual inspection of WWTP	Once a year	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to 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	Jambi City' Unit Perlaksan Teknis Daerah (UPTD)	Jambi City's BLH	Minimal cost to BLH since this is an annual visual inspection

166. *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 Jambi City's Subproject

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitoring Frequency	Implementation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design of Jambi 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/ PPIU	CPMU	Part of project management in detailed design (minimal cost)
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts of Jambi City's sewerage system	Verify construction contract documents	Prior to finalization of construction contract documents of Jambi City's sewerage system	Design consultants/ PPIU	CPMU	Part of project management 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; PPIU/ LPMU's coordination with local officials	Once a month	Contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Reduce risk to workers and the public during construction	Number of accidents involving construction activities	Verification of contractor's records; PPIU/ LPMU's coordination with local officials	Once a month	Contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
OPERATION PHASE						
WWTP effluents meets 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 Operating Unit	Jambi City's BLH	Part of WWTP Operating Unit's operation cost (USD2,000 /year)
Jambi City's sewerage system operation acceptable to the public	Public Complaints on sewerage system operation	Verification of operation records	Once a year	Sewerage System Operating Unit	Jambi City's BLH	Minimal cost

C. Implementation Arrangement

167. This subsection presents the: (i) institutional set-up, (ii) implementation schedule, (iii) GOI permits, and (iv) capacity building.

168. *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 implementing agencies at the subproject level are two units working together, the Satuan Kerja (SATKER) for Jambi Province as the Provincial Project Implementation Unit (PPIU) and the Jambi City Local Project Management Unit (LPMU).

169. 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.

170. The SATKER for Jambi Province, as the PPIU, is the key implementation unit responsible for construction contracts' supervision of the Jambi City subproject, while Jambi City's LPMU coordinates the needed local inputs and resources. Environmental Officers will be designated in the PPIU and LPMU to effectively manage the environmental aspects of the Jambi City subproject. The Environment Officer of the PPIU has an important role in ensuring that the required environmental mitigation measures are implemented in a timely manner by actively participating in construction supervision. The Jambi City's LPMU has an important role in addressing grievances during the construction period. Its chief sits as the chairperson of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for Jambi City. LPMU's Environment Officer shall assist the CSECC.

171. PISC and the Capacity Building Consultants (CBC) shall be engaged to assist the CPMU, PPIU, and LPMU. 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, PPIU, and LPMU in monitoring of EMP implementation, (iv) training of CPMU, PPIU, and LPMU staff in environmental safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports.

172. An important capacity building component is the hands-on training and advisory services for Jambi City's WWTP operators. During the initial years of operation, the sewerage systems will be operated by a temporary unit which will be the Unit Perlaksan Teknis Daerah (UPTD) or another unit to be determined later. The UPTD is considered a practical approach for the interim period since it can easily be formed through a Mayor's

decision, while other units such as the Badan Layanan Umum Daerah (BLUD) will take some time to form due to the legal and other requirements.

173. At the bottom of this institutional set-up are the construction contractors for the Jambi 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 PPIU 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 Jambi City's CSECC.

174. 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 the UPTD 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.

175. 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 Jambi City.

176. 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 Set-up

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	responsible for MSMIP implementation in project cities;	CPMU Environment Officer (to be designated);	Project Implementation Support Consultants (PISC)

Directorate of Development, Sanitation, Environment and Housing (PPLP)	coordinates with ADB and other external agencies	<p>responsible for overall environmental supervision of subprojects;</p> <p>coordinates with PPIU and LPMU Environment Officers to ensure environmental requirements are address effectively;</p> <p>responsible for semi-annual environmental monitoring reports preparation</p>	<p>and the Capacity Building Consultants (CBC);</p> <p>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, PPIU, and LPMU in monitoring of EMP implementation, (iv) training of CPMU, PPIU, and LPMU staff in environmental safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports.</p> <p>WWTP Training Consultant (part of CBC) shall facilitate hands-on training of all WWTP operators</p>
SATKER for Jambi Province as the Provincial Project Implementation Unit (PPIU)	<p>key implementation unit in the field;</p> <p>Provides construction contracts' supervision; closely monitors construction progress</p>	PPIU 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;	Advisory services to be provided by the National Environmental Advisor (part of PISC)

		provides input to the CPMU Environment Officer in the preparation of the semi-annual environmental monitoring reports preparation	
Jambi City's Local Project Management Unit (LPMU).	Monitors implementation of the project in the city and coordinates the needed local inputs and resources;	LPMU Environment Officer; coordinates with the city's environment agency, Badan Lingkungan Hidup (BLH); assists the PPIU in monitoring the implementation of the Contractor's EMP ; assists the CSECC in addressing environmental complaints; LPMU chief sits as the Chairperson of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC)	Advisory services to be provided by the National Environmental Advisor (part of PISC)
Construction contractors of the proposed Jambi 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 the PPIU and LPMU Environment Officers and BLH; assist the Jambi 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			
Jambi City's Unit Perlaksan Teknis Daerah (UPTD) or another service delivery unit	Operates Jambi City's sewerage system	Jambi City's Pollution Control Officer (to function also as the Environment Officer); responsible for all environmental matters of the sewerage system	WWTP Advisor (consultant) guides Jambi City's WWTP operators during the initial 3-month period

		<p>including EMP implementation and self-monitoring; coordinates with the city's environment agency (Badan Lingkungan Hidup);</p> <p>The Pollution Control Officer shall ideally be the WWTP Supervisor; 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</p>	
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177. *Implementation Schedule.* As presented in the project description, construction of the Jambi City 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 Jambi City government shall ensure that construction contract provisions related to the contractor's EMP shall be included in the tendering stage in 2013.

178. *GOI Permits.* Under GOI's Environmental Permit Regulation (No.27/2012), Jambi 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.

179. *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 PPIUs 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.

180. *Capacity Building for WWTP Operators.* One of the proactive ways to prevent the proposed Jambi City's Kasang 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.

181. 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 Jambi City's Kasang 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.

182. The second part shall be the actual operation of the new Jambi City's Kasang 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 Jambi City's Kasang 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

183. Similar to many cities in Indonesia, Jambi City does not have a sewerage system that collects domestic wastewater from its central business district and other built-up areas. This situation has resulted to the continuing pollution of the urban streams. The lack of a sewerage infrastructure affects the realization of Jambi City's vision of becoming a major complement area towards the growth of Sumatra by 2015. Hence, the proposed sewerage system subproject will be one of the major boosts to make Jambi an aesthetically clean and orderly city and provide better access to sanitation facilities.

184. The environmental screening process has highlighted the environmental issues and concerns of the proposed Jambi 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. The proposed WWTP site at Kasang is presently an agricultural area planted with a water-based vegetable known locally as "kangkung" and generally located in an urban area. Beyond its southern and eastern border is an urban road (Jalan Yos Sudarso), while beyond its western border is another urban road (Jalan Raden Fatah). This site is not within undisturbed landscape and can be viewed as an agricultural piece of land in a basically urban landscape. Hence, the proposed Jambi 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 Jambi 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.

185. Based on the screening for potential environmental impacts and risks of the proposed Jambi City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Jambi 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 Jambi City's sewerage system subproject.

186. Implementation of the proposed Jambi City's subproject is hereby recommended with emphasis on the following: (i) EMP of Jambi 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) Jambi City government, its LPMU, and the PPIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

APPENDICES

- Appendix 1 Environmental Permit and AMDAL Processing
- Appendix 2 WWTP Discharge Permit Requirements
- Appendix 3 Photographs of Proposed Sites
- Appendix 4 Minutes of First Initial Public Consultation Meeting
- Appendix 5 List of Participants of First Initial Public Consultation Meeting
- Appendix 6 Attendance Sheet of First Initial Public Consultation Meeting
- Appendix 7 Photographs of First Initial Public Consultation Meeting
- Appendix 8 Minutes of Second Initial Public Consultation Meeting
- Appendix 9 List of Participants of Second Initial Public Consultation Meeting
- Appendix 10 Attendance Sheet of Second Initial Public Consultation Meeting
- Appendix 11 Photographs of Second Initial Public Consultation Meeting
- Appendix 12 Sample Contents of Environmental Monitoring Report
- Appendix 13 REA Checklist - Jambi Subproject

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
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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 Jambi subproject will be required to prepare an AMDAL report since it will use a WWTP area of 6 hectares, much more than the 3-hectare criterion. The AMDAL report will be prepared by the consultants to be engaged by GOI during the detailed design phase of this subproject. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

WWTP DISCHARGE PERMIT REQUIREMENTS OF JAMBI CITY

Operation of a wastewater treatment plant (WWTP) in Jambi City requires a discharge permit. Under a proposed 2012 Jambi City's Requirements and Procedures for Wastewater Discharge Permit, 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:

- Copy of ID of person in-charge of business
- Copy of Permit Surat Izin Tempat Usaha (SITU) / Surat izin usaha perdagangan (SIUP) (premises license/permit trading) or other permit relating to the business and / or activity
- Copy of AMDAL/UKL-UPL / Statement of Commitment Management and Monitoring
- Surat Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup (SPPL)/ Environmental permit/
- Copy of business license in a specific location that can cause harm, loss and interference or other similar document in accordance with applicable regulations
- statement willing to bear the cost of mitigation and environmental restoration as a result of wastewater pollution
- Design WWTP and discharge channel
- Conduct a study on the impact of wastewater discharge on fish breeding, animals, and plants, soil and ground water quality and public health
- Conduct pollution prevention, waste minimization, water and energy efficiency and resource should be done by the person in charge of the business and / or activities related to waste management

Processing of discharge permit is through the Office of Integrated Services One door. According to regulation, maximum processing time of the application is 7 working days after receiving the complete application for permit.

APPENDIX 3

PHOTOGRAHS OF SITES FOR PROPOSED JAMBI SEWERAGE SYSTEM



Photo No.1 – Proposed site of Jambi's WWTP presently occupied by shrubs, grasses, and kangkung (view from southern boundary)



Photo No.2 – Selincih Creek flowing out of the proposed WWTP site (view towards the northeast)



Photo No.3 – Beyond the southern boundary of the proposed WWTP site is a road with residential and commercial areas



Photo No.4 – One of the streets in Jambi City where a trunk sewer will be installed, indicating sufficient space for sewer construction

APPENDIX 4**Minutes of the Initial Public Consultation and Information Disclosure held at Jambi City's BAPPEDA, 21 September 2012****Opening/ Presentations:**

The public consultation started at 9:10 A.M with Mr. Fahmi, Kepala BAPPEDA/ Chief of The Regional Development Planning Agency (BAPPEDA) Kota Jambi welcoming and thanking the participants for being able to attend the public consultation meeting. He also explained the purpose of public consultation today that to seek advice and opinions from the participants about the city Sanitation Development project plan, Metropolitan Sanitation Management Investment Program (MSMIP). Now, in Jambi both household and business area has its own septic tank, septic tank when it's full it should be vacuumed and the sludge brought to the Night Soil Treatment Plant (IPLT). Jambi have plans to develop a Wastewater Treatment Plant (WWTP) in Kasang village. Waste water treated is generated from households and businesses and it is no longer carried by truck but flows directly from the houses through the pipe. Thus, contamination of soil and groundwater can be avoided.

Presentation on Metropolitan Sanitation Management Investment Program (MSMIP) Kota Jambi by Mr. Sudirman, Dinas Kebersihan dan Pertamanan Kota Jambi/Sanitation Office Kota Jambi. He explained that currently, Jambi launched towards the modern city, with the plan to build landfill site and WWTP. WWTP development plans in Kasang already done socialization, but the waste pipeline plan has not been carried out socialization, as it waits Detailed Engineering Design (DED). 25 000 house connections (SR) planned to be constructed, and for the first phase will be constructed 5000 house connections (SR). In 2012 Pemda Jambi has provided funds for land acquisition. Location in Kasang WWTP has been stated in the Master Plan for wastewater. Kasang WWTP is served 5-prone areas of sanitation, except the area across the river Batanghari. Sewage system of is gravity, and there is also a pump for the region, which are located lower. The benefits of this project are to reduce the risk of soil and groundwater pollution and to improve public health.

Comments, Views, Issues and Concerns

1. Mr. M. Saleh Richi, SSTP, District Chief of Jambi Timur
 - a. Land in Kasang WWTP covers two villages, namely Kasang Village and Rajawali Village. We have collected evidence of ownership. Principally there is no problem with the project, except the price of land. There are few constraints on land acquisition, the land on the entrance location owned Chinese, not yet approved by the owner
 - b. Please explain, in the field, the bigger land is part of the Kasang Village, but on the map, the part of the Rajawali Village. But the most community that is informed about this project is from Kasang village

Mr. Sudirman's answer:

- a. For land acquisition, evidences of land ownership have collected.
- b. Estimating land prices refer to the NJOP (Tax Object Sales Value) in land and building tax (PBB) and the market price or AJB (Sale Certificate). To assess the price of land there is an independent appraisal team, Consultant Appraisal Service Public (PJPP)

- c. For the land at the entrance to the location if there are still problems, the village chief was asked to approach the owner
2. Mr. Rahmad Sugiharto, ST, Village Chief of Kasang
- a. Since this program informed, has been conducted socialization, land inventory, and collection of evidence of ownership of land. All files has been submitted to Dinas Kebersihan, there is a problem that some of land owners living outside the village Kasang
 - b. Questions from the community are when the land is measured, what is the cost, and when it will be released? Because they will prepare to switch their business elsewhere
 - c. During the project implementation and operation of the WWTP, can the community be involved as a worker?

Mr. Sudirman's answer:

- a. It does not matter if land owners living outside the Kasang Village, the compensation will be given according to ownership. Regarding the pipeline that almost passed through 0.25 Jambi city areas, for socialization have not done yet. There should be a separate forum. The next public consultation will be carried out when there is a decision of the ADB.
 - b. Communities will be evicted both land and business is going to be a project concern and will be considered an effort to positive economics.
 - c. For construction activities will be employed local labor, as well as field workers WWTP. But for WWTP operators requires specific competence and skills
3. Mr. Evridal Aqso, Kabid Bina Program Dinas Pekerjaan Umum
- a. Public Works Department supports this project plan.
 - b. Technically coordination in this project is necessary to improve DED
 - c. This activity is related to the community, so we need intensive socialization in order to avoid problems in the future. In construction activity, the project will impact on the roads impassable pipeline, how technical implementation, so as not to disrupt the activities of the community? If needed street improvements, where is the fund come from

Mr. Sudirman's answer:

- a. Piping-Laid depends on the road situation and conditions, can be constructed on the sides of the road, or in the middle of the road
 - b. Construction phase will be managed in such a way, that minimize the impact to the community
 - c. It will be answered by the ADB consultants
4. Mr. Suherman, Villager of Kelurahan Rajawali
- a. Principally, the community support this program
 - b. There are a problem, The land on the entrance location owned Chinese, is not yet approved by the owner
5. Mr. Ridwan Saleh, Land owner in Kasang Village
- a. We already know about these activities and strongly support the program because the goal is to improve the welfare and public health
 - b. Hopefully these activities can be enjoyed by the public
6. Mr. Sugiyanto, the community leader Of RT 03 Kasang Village

- a. As representatif of the Village Kasang RT 03 is very supportive of this project
- b. How about the land acquisition for the resident of RT 03 that located in the Village of Eagles?
- c. How about the price of land?

Mr. Sudirman's answer:

- a. For the land at the entrance to the location if there are still problems, the village officials/leader was asked to approach the owner
- b. Thankful for the help, so the community is very supportive, nothing is refused
- c. All owner of the land affected by the project will be acquititioned and be compensated, even if the owner ID from another village
- d. Estimating land prices refer to the NJOP (Tax Object Sales Value) in land and building tax (PBB) and the market price or AJB (Sale Certificate). To assess the price of land there is an independent appraisal team, Consultant Appraisal Service Public

7. Mr. Andi Amanullah, Consultant of Master Plan

- a. For the construction of WWTP, 7 hectares land area needed, the picture is sketch that is why looks as grid because only sketch it
- b. Planning Phase I in 5 years for the main pipes, the position of the pipe will be installed in the road.
- c. For the size of pipe 1 m will be placed at the below of the other facilities (PDAM pipes, telephone cables, etc.). There is also a waste water pipe was installed in the middle of the road, the depth of the pipe will be up to 7 m
- d. Since the planning pipeline position is on the road, land acquisition only in WWTP.

Mr. Sudirman's answer:

- a. Drawings of the plan will be revised
- b. Socialization for the residents who will be passed the pipeline will be held separately

Ms. Ariani, Consultant MSMIP

- a. Jambi is in the short list city that will be funding from ADB for urban sanitation project
- b. Waste water will be treated at the WWTP is generated from the kitchen, bathroom and septic tank, so all waste water from the home.
- c. Pipe construction is going to give effect to the environmental surroundings the project, but contractor will manage this activity so that the impact can be minimized
- d. In this meeting, we also propose grievance redress mechanism for environmental complaints during construction. This mechanism is still a proposal, we invite if there are needed some additional clause or some questions

Mr. Ruel, Consultant MSMIP

- a. ADB loan will finance those sewer lines with diameters 300mm and above, while lower sizes will be funded by the government. DED and AMDAL (EIA) will be funded by Indll.

8. Mr. Feriadi, District Chief of Pasar
- Already know about the project but had lost information
 - There is a statement from the owner of the land to help/support this project
 - Hope this project can be done
 - What should we done further to proceed this project?

Mr. Sudirman's answer :

- The mayor is the head of Indonesia association of mayor for sanitation urban (APOKSI), so he is pushing for the implementation of this project.
- Currently regulations regarding waste water management including management WWTP also being prepared.
- About the WWTP management, a temporary unit which will be the Unit Perlaksan Teknis Daerah (UPTD), but for long-term there will be a separate agency like PDPAL

9. Mr. Supriadi, Consultant MSMIP
- According to the regulations there is obligation to provide WWTP. Public consultation is still to be continued.
 - Materials in booklets distributed is still a draft, please give input
 - What about the farmers whose land would be acquisitioned? Also about the ownership of the land?

Mr. Sudirman's answer :

- Most of the land is leased to farmers, WWTP location is muddy.
- Currently also being prepared regulations for developers. The population to be served a wastewater treatment system was 3000 households or a quarter of residents Jambi.

10. Mr. Sugiyanto, community leader of RT 03 Kasang Village
- The land for the WWTP to be acquisitioned, 80% are self-owned, the rest are tenants
 - Is the whole land will be acquisitioned? If the remaining land is 2 m, can it be acquisitioned the whole land?

Mr. Supardi, Kabid BLH

- For this project, how about the AMDAL?

Mr. Sudirman's answer:

- If the remaining land is narrow, will be paid by the project
- DED and EIA will be prepared well and the funds will be provided by Indll

11. Mr. Feriadi, District Chief of Pasar
- Who will operate the WWTP? District official do not have the human resource skills and capacities.
 - Who will train the operator?

Mr. Sudirman's answer :

- WWTP will be managed by UPDT/BLU/PDPAL.
- Capacity building such as training will be financed by the project

Mr. Fahmi, Kepala BAPPEDA Kota Jambi

- Local Government Jambi really hope this project can be implemented, we will fulfill the requirements, preparation of budgets and the regulations.
- When the decision of this project? So that we well prepare. We are currently preparing the budget for 2012/2013. otherwise we will find other funding sources

12. Mr. Helmi, Land owner in Rajawali Village
- Sewerage project will cause traffic jams and disturbing, especially for a busy small street.

Mr. Sudirman's answer :

- Traffic site management will be applied to minimize the impact to the people surrounding the project

13. Mr. Muksin Rafadhal, villager of Rajawali Village

- What about compensation?
- When the implementation of the payment of compensation will be held?

Mr. Sudirman's answer :

- The compensation refer to the NJOP (Tax Object Sales Value) in land and building tax (PBB) and the market price or AJB (Sale Certificate). To assess the price of land there is an independent appraisal team, Consultant Appraisal Service Public
About compensation being made on the basis of appraisals NJOP (Tax Object Sales Value) and the market price using AJB (Sale Deed). Assessment will be conducted by the Jasa Konsulan Penilai Public (KJPP)
- Payment will be done in October 2012

14. Mr. Hermanto, community leader of RT 06 Kasang Village

- What about the odor pollution from operational of wastewater treatment plant

Mr. Sudirman's answer :

- WWTP uses technology so that there are no odor pollution to the surrounding area

Ariani's answer :

- In some countries, WWTP is in the centre of the city. If WWTP is well managed, odor is not a problem

Pak Supriadi's answer:

- no negative impact on social and economic

15. Mr. Ridwansyah, Land owner in Rajawali Village

- Need to conclude this public consultations and the next meeting plan

Mr. Sudirman's answer :

- Public Consultation today provide feedback and inputs to ADB
- Local Government will soon take land measurements
- Public consultation is not only once time, but there is planning to conduct another meeting
- Public support the project at Jambi. The decision about this project will be received within 3 weeks.
- Next week there will be a workshop in Yogyakarta will also discuss about wastewater system

16. Mr. Fahmi, Kepala BAPPEDA Kota Jambi

- The land acquisition will be proceed in October 2012
- Even though the project is not implemented the Jambi local government will acquisition the land at the Kasang Village for green open space.

Meeting closed at 11:15 AM.

APPENDIX 5**List of Participants of Initial Public Consultation and Information Disclosure
(Jambi Subproject, September 21th 2012)****Stakeholders/Participants:**

1. Hermanto, Community Leader of RT 06, Kasang Village
2. Sugiyanto, Community Leader of RT 03, Kasang Village
3. M. Syawal, Community Leader LPM, Kasang Village
4. Rahmad Sugiharto., SSTP, Village's Leader of Kasang Village
5. Ridwansyah, Land owner in Rajawali Village
6. Muksin Bafadhal, Villager in Rajawali Village
7. Suherman, Villager in Rajawali Village
8. Helmi, Land owner in Rajawali Village
9. Merry, Land owner in Rajawali Villager
10. Kaniwati, Village official of Rajawali Village
11. M. Saleh R., District Chief of Jambi Timur
12. Feriadi, District Chief of Pasar
13. Siska Iryani, Staff of PLP, Public Work Province Jambi
14. Wahyu Ningsih, Staff of PLP, Public Work Province JAMbi
15. Andi Amirullah, Master Plan Consultant
16. Supardi, Head of PPL Division, Environmental Office
17. Esti Susilawati S., Section Head of PPL Division, Environmental Office
18. Evridal Asri, Head of Bina Program Division, Public Work Office

Sanitary Office :

1. Sudirman, Sanitary Office

BAPPEDA Team of Jambi:

1. Fahmi, Chief of The Regional Development Planning Agency
2. Taufik S.



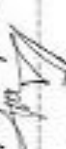





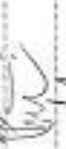



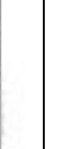


MSMIP Consultants:

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

APPENDIX 6

**Attendance Sheet of Initial Public Consultation and Information Disclosure
(Jambi Subproject, 21 September 2012)**

ABSENSI RAPAT					
HARI	TANGGAL	TEMPAT	KEGIATAN		
: Jumat	: 21 September 2012	: Ruang Rapat "Tampuk Manggis" Bappeda Kota Jambi			
		: Konsultasi Publik Pembangunan Sistem Pemisahan Air			
		: Limbah Dan Instalasi Pengolahan Air Limbah (IPAL)			

NO	NAMA	INSTANSI	JABATAN	NO. TELP	TANDA TANGAN
1	Hermanto	No verification	Ketua RT 06 kg	0812.788.2834	
2	SUGENTORO	None	Ketua RT 03 kg	0852.1138942	
3	M. Syawal	None	Ket L 9 M. Sang	0815.31320428	
4	RAHMAD. BUGHARU, SSP	None	Jurah Kasong	082176215880	
5	Siska Wati	Sekolah pkn. smk	Staf Pk	08177002200	
6	Wahyu Ningsih	"	"	0852.682864	
7	Ridwan Satri	"	P. L. Sang	085312757141	
8	Kanawati	RAJAWALI	PT. KEURAHAN RAJAWALI	089382811965	
9	Mikson Saputra	"	Warga	085769183838	
10	SAHMERAN	RAJAWALI, RT 21	WARGA P	082180404141	
11	LIFJANI	RAJAWALI	P. Umar	085266305959	
12	HIPPY	RAJAWALI	P. LAMAH	081994540506	
13	M. Gada Rubasgop	None	Camel Jauh Tur	08167448201	
14	Evandul Asri	Dinas per. ket. jag	Kabid tsm. program	082176603570	
15	FERDADI	Kec. Paron	Seumak	0852.66539954	

ABSENSI RAPAT

HARI

: Jumat

TANGGAL

: 21 September 2012





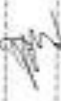





TEMPAT

: Ruang Rapat "Tampuk Manggis" Bappeda Kota Jambi

KEGIATAN

: Konsultasi Publik Pembangunan Sistem Pembuangan Air

: Lihat Dan Instalasi Pengolahan Air Limbah (IPAL)

NO	NAMA	INSTANSI	JABATAN	NO. TLP	TANDA TANGAN
16	Indi Anwarulhaq	Konsultan		085255444647	
17	Suparso	BLH Kota Jm	Kabid PM	081366323992	
18	Esti Sutawati S	BLH Kota Jambi	Kabid PM	0811745672	
19	Fetm	Bappeda	Kepala	0811740025	
20	Taufik Umar	Bappeda	Ketua		
21	SUDIRMAN	DEPP	Kary Kecehidan		
22	SUPRIADI	Konsultan ADS	Kecamat	081381464803	
23	RUEL JASULINO	CAHABIR-IPD	DAN. IV.		
24	ANGELITO N GAGUE	Konsultan ADS	Social Scientist		
25	Ariana Dwi Astika	Konsultan ADS	Env. Specialist	0816 135 1947	
26					
27					
28					
29					
30					

APPENDIX 7

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



Photo No.5: Jambi's BAPPEDA explaining some points regarding the proposed subproject [21 Sep 2012]



Photo No.6: A stakeholder representative near the WWTP raising some points [21 Sep 2012]



Photo No.7: A stakeholders' representative raising some points [21 Sep 2012]



Photo No.8: PPTA Consultant assisting BAPPEDA in explaining some points regarding the impacts of the proposed WWTP [21 Sep 2012]

APPENDIX 8

Minutes of the Second Initial Public Consultation and Information Disclosure held at Jambi City's BAPPEDA, 18 March 2013

Opening/ Presentations:

The public consultation started at 9:15 A.M with Mr. Fahmi, Kepala BAPPEDA/ Chief of The Regional Development Planning Agency (BAPPEDA) Kota Jambi welcoming and thanking the participants for being able to attend the public consultation meeting. He also explained the purpose of public consultation today that to seek advice and opinions from the participants about the city's sanitation development project plan, the Metropolitan Sanitation Management Investment Program (MSMIP). This public consultation today is the second public consultation due to the changes of the proposed WWTP site for some reasons. He highlighted several things as follows:

1. Jambi plans to build a system of sewer pipeline and IPAL to manage wastewater in Jambi City.
2. The treatment system will be built using aerated lagoon system, a treatment process system that is widely used in Indonesia
3. The effluent of from the wastewater treatment facility will not pollute the environment, because before being discharged it will comply with the water quality standards determined by the government.
4. Wastewater management system with sewer pipeline will provide great benefits for society, especially related to public health.

Presentation on Metropolitan Sanitation Management Investment Program (MSMIP) Kota Jambi by Mr. Muklis, Head of Dinas Kebersihan dan Pertamanan Kota Jambi/Sanitation Office Kota Jambi. He explained that currently, Jambi launched towards the modern city, with the plan to build landfill site and WWTP.

He highlighted several things as follows:

1. One of the important municipal facilities, because the development of Jambi City into a large city is a system of waste management. If these basic facilities are not owned and built, it will be a major problem in the future.
2. The construction of sewerage system will be funded by the central government that is sourced from ADB. We are the beneficiaries, so expect involvement of the community to support this program.
3. In the construction of wastewater treatment as much as possible the impact of the development will be minimized.

Mr. Indra Gunawan, Public Work Province Jambi,

He explained that :

1. Jambi has been selected one of the five cities that will have a system of integrated wastewater management. Many cities are interested, about 65 towns but only 5 can be funded by central government with funding from ADB. Therefore, we must be thankful for this grace.
2. Implementation will begin this year with the DED, and will continue not just this year alone. Hopefully 2014 can be realized.
3. This project is for the benefit of all people. We can see presently in the Rajawali area, river water is dirty due to waste disposal, the water eventually flows into the Batang Hari river that is a source of municipal drinking water.

4. In the wastewater management system of the wastewater from toilets, sinks, laundry and kitchen. It will need cooperation from the community, especially when connecting pipes to houses.
5. Jambi left behind compared to other countries. So we expect that the construction of a centralized wastewater treatment system can be implemented, especially at this time of environmental pollution has been happening everywhere. Impact on public health is also important because the wastewater is source of germs. For healthy life we need a clean environment.
6. We ask the attendees to also inform the other members of the community.

Mr. Sudirman, Sanitary Office:

1. Wastewater treatment system that will be built to serve 20,000 SR and 7 villages or about 20% of the population in the city of Jambi.
2. To prevent the objections of the project, socialization is needed

Comments, Views, Issues and Concerns

17. Mr. Zainal Abidin, Villager of RT 06, Kasang Jaya Village
 - c. Give thanks that Jambi get this opportunity to have integrated wastewater treatment.
 - d. This project related to wastewater include feces as ordinary people, he thinks that wastewater is smelly and hazardous. He wants to know about the treatment process, is it opened or closed system.
 - e. Surrounding the WWTP location there are paddy field, lagoon, well. Is the wastewater treatment system will affect to its surrounding?
 - f. What is the economy impact of this project
 - g. Disturbance from the sewerage project especially when constructing pipeline.
18. Mr. Ali Azabili, Villager of RT 07, Kasang Village
 - d. This area is ebb and tide area so flood frequently happens. If that happened, is the wastewater will flood and enter their house?
 - e. Why the BAPPEDA did not involve the parliament (DPR)? He got confuse to be asked to attend this meeting, because he already parliament (DPR) as his representative.

Mr. Sudirman's answer:

- d. He has visited the Yogyakarta WWTP, and he found that there are no odor surroundings WWTP.
- e. WWTP location is equipped by fence there are no infiltration to paddy fields
- f. During constructions on the piping-coverage area, excavation disturbance will be minimized, the pipe is buried under the ground
- g. Later, community will be involved in the development. This project will need a large labor not only in the construction phase but also in operation phase and will be suggested to involve surrounding community. But for work that requires competence with certain criteria. It is possible that local government would suggest involving local community during construction
- h. ADB has strict international standards regarding the odor from the WWTP and construction of piping and WWTP
- i. Regarding the flooding we have had the Jambi flood control

- j. Public consultation today is for the community, in the future parliament (DPRD) will also be involved. Publications in general will be carried out including the socialization of tariff.

Mr. Indra Gunawan's answer:

- a. Regarding the flood actually no longer exists.
- b. Coordination with Public Works SDA (Jambi Flood Control) will be carried out in some rivers will be built floodgates so that water will not flow into this area
- c. At the time of the preparation of DED, flood issue will be a concern, under the bridge will be constructed watergates so that the WWTP location and surroundings to be safe

19. Mr. Ali Azabili, Villager of RT 07, Kasang Village

- d. Are the efforts to manufacture watergates in the river or channel can handle the flood? Because the water will find another way through the cliffs and not just a river.

Mr. Indra Gunawan's answer:

- a. Flood control will be considered in the preparation of DED. Survey will be implemented, and will be required information from people who live around the WWTP.
- b. This project has also been known to the governor.
- c. The impact on the community will be reviewed again based on information from the public. Therefore, please give as much detail on issues.
- d. We see the benefits of this WWTP construction, there will be no contamination of the river water because processing system is impermeable

Mr. Muklis's answer:

- a. With the rapid development of the city, it is time to manage wastewater. Moreover, the government has launched the Sanitation Development Acceleration Program. In Environmental Law stated that the local government responsible for setting up wastewater management system, if not done, there will be penalties. Therefore we should be grateful because Jambi is selected for the project.
- b. On the issue of flooding, it will be assessed by the consultant that will prepare the DED.
- c. Additionally WWTP location is expected to be simultaneously a green open space city
- d. House of Representatives (parliament)/DPRD will later know as well. Development of a centralized wastewater treatment system for the benefit of the people and for the future.

20. Mr. Zainal Abidin, Villager of RT 06, Kasang Jaya Village

- c. How about noise pollution from WWTP during operation phase?
- d. What is the impact of wastewater on the wells. Because it looks like even this time the well water was contaminated seepage water from the river.

Mr. Muklis's answer:

- a. There will be no noise pollution from the WWTP

21. Mr. Indra :

Community will be asked to participate in the installation of the pipeline. And with piping systems, water wells will be more safe and secure

22. Mr. Supardi, Head of PPL Division, Environmental Office
Wastewater to be discharged into the river will comply with the quality standards/ standards that have been set by the government, so no need to worry
23. Mr. Sudirman :
 - d. EIA has been budgeted this year, environmental aspects will be reviewed again and there will be further public consultation.
 - e. For employment, for example there are 40 local labor in WWTP Yogyakarta.
 - f. Please support from the community for the implementation of this project because of its benefits in the long term for the city of Jambi.
24. Ms. Ariani, Consultant MSMIP
 - a. Jambi is in the short list of cities that will be funded by ADB for urban sanitation project
 - b. Wastewater will be treated at the WWTP is generated from the kitchen, bathroom and septic tank, so all wastewater from the home.
 - c. For this ADB funded MSMIP, WWTP with pipe diameter higher than 300 mm would require environmental assessment. Pipeline construction is going to affect the environmental surroundings the project, but contractor will manage this activity so that the impact can be minimized
 - d. Don't worry about the unpleasant odor. If properly operated, a WWTP will not generate any odor. The odor will be similar to smell of paddy field. With proper and good management these facilities produce no odor. Like WWTP at Yogyakarta, Solo there are no odor from WWTP site. People live in the surrounding of WWTP. Today, many WWTPs are built in city centers and residential zones as found in Bangkok and Malaysia.
 - e. The quality of river will not be disrupted. The water discharged to river will be first treated until it comply with government effluent standards. River will become cleaner since there is no untreated water entering the river.
 - f. In this meeting, we also propose grievance redress mechanism for environmental complaints during construction. This approach was to prevent and minimize social and environmental impacts. This mechanism is still a proposal, we invite participants to comment if there are needed some additional clause or some questions
25. Mr. Zainal Abidin, Villager of RT 06, Kasang Jaya Village
Previously, community worried that the surrounding of WWTP area become dirty and smelly after having the explanation they understand and support this project.
26. Mr. Muklis's closing speech :
Jambi City currently is highly developed and being the center of attention so please support of the whole community in order to have an integrated wastewater facility, especially at this time will be assisted by the Central Government and the ADB.

Meeting closed at 11:20 AM.

APPENDIX 9**List of Participants of Second Initial Public Consultation and Information Disclosure
(Jambi Subproject, 18 March 2013)****Stakeholders/Participants:**

1. Siswandi, Villager of RT 07, Kasang Village (surrounding IPAL)
2. M Arphan, Villager of RT 07, Kasang Village (surrounding IPAL)
3. Ali Azabili, Villager of RT 07, Kasang Village (surrounding IPAL)
4. Detri., Villager of RT 06, Kasang Jaya Village (surrounding IPAL)
5. Rahmad S, Village Chief of Kasang
6. Zainal Abidin, Villager of RT 06, Kasang Jaya Village (surrounding IPAL)
7. Depi Puspita Sari, Villager of RT 06, Kasang Jaya Village (surrounding IPAL)
8. M. Buchori, Villager of RT 06, Kasang Jaya Village (surrounding IPAL)
9. Syafril, Village Chief of Kasang Jaya
10. Rizky Fattulah Villager of RT 06, Kasang Village (surrounding IPAL)
11. Tarmizi, Head of UPTD IPLT, Sanitary Office
12. M. Saleh R., District Chief of Jambi Timur
13. Iskandar, Village official of Jambi Timur
14. Andi Amirullah, Master Plan Consultant
15. Supardi, Head of PPL Division, Environmental Office
16. Esti Susilawati S., Section Head of PPL Division, Environmental Office
17. M Ichsan, Environmental Office

Sanitary Office :

1. Muklis, Chief of Sanitary Office
2. Sudirman, Sanitary Office

BAPPEDA Team of Jambi:

1. Fahmi, Chief of The Regional Development Planning Agency
2. Edvan Ryan Alfriono, Section Head of Mapping, The Regional Development Planning Agency
3. Rahadian Indradi, Section Head of Spatial, The Regional Development Planning Agency

Public Work Jambi Province:

1. Indra Gunawan

MSMIP Consultant:

1. Ariani Dwi Astuti, Environmental Specialist

APPENDIX 10

**Attendance Sheet of Second Initial Public Consultation and Information Disclosure
(Jambi Subproject, 18 March 2013)**

DAFTAR HADIR PESERTA			
PUBLIC MEETING PROGRAM FOR WASTEWATER MANAGEMENT MANAGEMENT UNDER THE MSMIP			
Hari/Tanggal		: Senin, 18 Maret 2013	
Waktu		: 08.30 WIB s/d 12.30 WIB	
Acara/Agenda		: 1. Public Meeting	
		: 2. Lain-lain yang dianggap perlu	
Tempat		: Ruang Kebun Bungo Bappeda Kota Jambi	
No.	Nama	Jabatan/ALAMAT	Tanda Tangan
1	SISWANDA	RT 07 KSC.	1.
2	M. ARPAN	RT. 07. KSC	2.
3	ALI AZABILI	RT. 07. KASANG	3.
4	DETRI.	RT. 06 Ks Jaya	4.
5	RAHMAD.S	Jurali Kasang	5.
6	ZAKIR ABIDIN	WARGA RT. 06 Ks Jaya	6.
7	DEPI PUSPITA SARI	WARGA RT. 06 Ks. JAYA	7.
8	M. GULHORI	" "	8.
9	TARTIRI.	KUPTA IPT	9.
10	Mukhlis.	KADKPP Kota jbi	10.
11	SUDIRMAN	KEMAD KASABHAN	11.
12	M. Ichman	BLH Kota Jambi	12.
13	EDVAN RYAN ALFRINO	KASI PEMETAAN / DISTARIAN	13.
14	RAHMAN M DRADA	KASI TR, SDA & LK BAPEDA	14.
15	Esti Sutawati S	BLH Kota Jambi	15.
16	SYAFIL SE	Lurah Kasang Jaya	16.
17	Supriat	BLH Kota jbi	17.
18	INDRA GUNAWAT	SATWA PLP DRUPROV. Jambn	18.
19	Andi Annullah	Konsultan	19.
20	RIZKY FATULHAT	RT. 06 Ks.	20.
21	Ishak	Ks. Jambi Timur	21.
22	M. Ash Ash	Camat Jmbi Timur	22.
23	Ariani Dwi Astri	Konsultan MSMIP	23.
24			24. _____
25			25. _____

Irfan SUDIRMAN

APPENDIX 11

Photographs of Second Initial Public Consultation and Information Disclosure (Jambi Subproject)



Photo No.9: Mr. Muklis, Chief of Jambi's Sanitary Office, explaining some points regarding the area of the proposed subproject [18 March 2013]



Photo No.10: Mr. Ali Azabili (green batik), villager Kasang representative, raising some points [18 March 2013]



Photo No.11: Mr. Zainal Abidin, (white batik), villager Kasang Jaya representative, raising some points [18 March 2013]



Photo No.12: Participants of Second Public Consultation reading the proposed GRM [18 March 2013]

APPENDIX 12**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

APPENDIX 13

JAMBI CITY SUBPROJECT - RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:

INO: Metropolitan Sanitation Management Investment Project

Sector Division:

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA...			
▪ DENSELY POPULATED?	√		Subproject shall serve the CBD and other high density areas of the city
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	√		Subproject area is a city
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			
• CULTURAL HERITAGE SITE		√	none
• PROTECTED AREA		√	none
• WETLAND		√	none
• MANGROVE		√	none
• ESTUARINE		√	none
• BUFFER ZONE OF PROTECTED AREA		√	none
• SPECIAL AREA FOR PROTECTING BIODIVERSITY		√	none
• BAY		√	none
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE...			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	none

Screening Questions	Yes	No	Remarks
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	√		Contractors will be required to implement specific site management plans to address the impacts; shall be reflected in the Contractors EMP
▪ dislocation or involuntary resettlement of people?		√	none
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	none
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	√		adequate training of WWTP operators to ensure proper operation and maintenance and avoid release of untreated sewage
▪ overflows and flooding of neighboring properties with raw sewage?	√		Could happen in block sewer lines or increase infiltration and inflows leading to surcharged-pipe conditions; asset management program to minimize overflows from system failures and contingency plans for overflow situations
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		√	WWTP will be designed and constructed to have adequate sludge handling and disposal system; implement local regulation to restrict discharge of industrial wastes
▪ noise and vibration due to blasting and other civil works?	√		Contractors will be required to implement specific site management plans to address the noise and vibration; use of temporary noise barriers; shall be reflected in the Contractors EMP
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	√		Implement facility health and safety program to address prevention, reduction, and control of occupational injury and illness; workers training on health and safety aspects of operating WWTP; provide workers with personal protective equipment
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	√		Implement local ordinance to restrict discharge of hazardous materials to sewers; implement emergency response program for situations with hazardous materials
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	√		Effective facility design layout to minimize potential nuisances; enclosures for noisy equipment
▪ road blocking and temporary flooding due to land excavation during the rainy season?	√		Contractors will be required to implement specific site management plans to address traffic and avoid temporary flooding; shall be reflected in the Contractors EMP
▪ noise and dust from construction activities?	√		Contractors will be required to implement specific site management plans to reduce noise and dust generation; water spraying for dust control; shall be reflected in the Contractors EMP
▪ traffic disturbances due to construction material transport and wastes?	√		Contractors will be required to implement traffic management plan; optimal transport schedule to avoid traffic congestion
▪ temporary silt runoff due to construction?	√		Contractors will be required to implement specific site management plans to control and reduce construction silt runoff; shall be reflected in the Contractors EMP
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		asset management program to minimize overflows from system failures and contingency plans for overflow situations

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water? 	√		adequate training of WWTP operators to ensure proper operation and maintenance and avoid release of untreated sewage and inadequate sludge disposal
<ul style="list-style-type: none"> contamination of surface and ground waters due to sludge disposal on land? 		√	WWTP design: stabilized sludge will be dewatered prior to disposal
<ul style="list-style-type: none"> health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge? 	√		Conduct facility hazards identification and implement hazards management; workers training on health and safety aspects of operating WWTP
<ul style="list-style-type: none"> large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)? 		√	Construction activities are not massive works and will not required large number of workers at any time to cause large population increase; adequate facilities for construction camps
<ul style="list-style-type: none"> social conflicts between construction workers from other areas and community workers? 	√		Implement social orientation program for workers, including rules on dealing with surrounding communities; penalties for violators of rules
<ul style="list-style-type: none"> risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation? 	√		take the initiative to educate and inform the public on specific hazards associated with hazardous materials; provide warning signs; implement safety and health program and assess the effectiveness through periodic audits
<ul style="list-style-type: none"> community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? 	√		provision of fence to secure the facility and implementation of safety plan during construction and operation

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
<ul style="list-style-type: none"> Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)? 	√		Site is in the earthquake risk zone of intensity VI based on the modified Mercalli Scale; no volcanic risk from holocene volcanoes; not in tropical storm risk zone; source UN OCHA; WWTP site is prone to flooding
<ul style="list-style-type: none"> Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost? 	√		More precipitation will increase the risk of increase infiltration and inflows to sewer lines leading to surcharged-pipe conditions; Extreme events such as unusually large flooding could surely damage the WWTP components since it is near a stream
<ul style="list-style-type: none"> Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)? 		√	none
<ul style="list-style-type: none"> Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)? 		√	This is a sewerage subproject which is designed to serve areas that have high densities already

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change
Arid/Semi-arid and desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.
River valleys/deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.
Small islands	Small islands generally have land areas of less than 10,000km ² in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.