Initial Environmental Examination

June 2013

Indonesia: Metropolitan Sanitation Management Investment Project

Cimahi 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
cumd	–	cubic meters per day
cums	–	cubic meters per second
dB(A)	–	A-weighted sound scale
EIA	–	environmental impact analysis
EMP	–	environmental management plan
FGD	–	focus group discussion
GOI	–	Government of Indonesia
IEE	–	initial environmental examination
IndII	–	Indonesia Infrastructure Initiative
IPAL	–	Instalasi Pengolahan Air Limbah
IR	–	Involuntary resettlement
IRR	–	Implementing rules and regulations
km	–	kilometer
km^2	–	square kilometers
LGU	–	local government unit
lpcd	–	liters per capita per day
lps	–	liters per second
LPMU	–	Local Project Management Unit
mamsl	–	meters above mean sea level
NGO	–	non-government organization
PISC	–	Project Implementation Support Consultants
PPE	–	personal protective equipment
PPIU	–	Provincial Project Implementation Unit
PPTA	–	project preparation technical assistance
RRP	–	report and recommendation of the president (ADB)
SBR	–	Sequencing Batch Reactor
TA	–	technical assistance
UPTD	–	Unit Perlaksan Teknis Daerah
UKL	–	Upaya Pengelolaan Lingkungan (environmental management plan)
UPL	–	Upaya Pemantauan Lingkungan (environmental monitoring plan)

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

NOTE

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

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed **Cimahi City 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. Cimahi City is in West Java Province, Republic of Indonesia. The proposed sewerage system subproject is expected to improve access on sanitation services in Cimahi City. Relative to the significance of environmental impacts and risks, this subproject is deemed Environmental Category B based on ADB's environmental categorization and the type of assessment warranted only the preparation of an Initial Environmental Examination (IEE) report. This IEE was carried out under ADB's TA 7993-INO and in accordance with *ADB's Safeguards Policy (2009)* and Government of Indonesia (GOI) environment law, Environmental Protection and Management Law of 2009. For compliance with GOI requirements on environmental assessment, a separate Analisa Mengenai Dampak Lingkungan (AMDAL) report will be prepared by the detailed design consultants during the detailed design phase.

2. *Subproject Description*. Cimahi's proposed sewerage system under MSMIP shall cover the central business district (CBD) and around 40% population of Kelurahan Cimahi and Kelurahan Karangmekar as well as "The Edge" development in Baros. This is known in Cimahi's Wastewater Investment Master Plan as the "Stage I Leuwigajah Scheme". The proposed sewerage system will have a sewer network capacity for a population of 150,000, while the WWTP at Leuwigajah will initially serve a population of 53,240 through 9,873 service connections (domestic and commercial).

3. The proposed sewerage network will have 6.981 km of sewer pipelines with diameters ranging from 375 mm to 900 mm and a tertiary sewer network covering 26 hectares. ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the 26 hectares of tertiary sewer network (with pipe diameter of less than 300 mm) will not be funded by ADB. Sewer pipelines with diameters 300 mm and above will have 70 manholes, while those below 300 mm will have 1,950 manholes. The network will also include: (i) 5 units of drainage interception chambers, (ii) 2.244 km of drainage rehabilitation, and (iii) 500m of pipe crossings.

4. Wastewater from Cimahi's sewer network system will drain to a 11.1-MLD Wastewater Treatment Plant (WWTP) located at Kelurahan Leuwigajah and just beside the Cisangkan Stream. WWTP's effluent discharge point is the Cisangkan Stream. The WWTP will be a system based on the Sequencing Batch Reactor (SBR) with an estimated biochemical oxygen demand (BOD) load of 3.2 tons per day (tpd). The WWTP components are: screening chamber, degritting chamber, septage receiving structure (for future use), 2 SBR tanks, thickener, balance tank, chlorine contact tank, solid dewatering and storage building.

5. The SBR is an aerobic biological waste treatment system using the same tank for biological treatment and secondary clarification. Multiple tanks are used since each tank is operated in a batch treatment mode. In a single reactor tank, SBR accomplishes equalization, aeration, and clarification in a timed sequence. This is in contrast to a conventional continuous flow process where multiple structures are required to obtain the same treatment objectives. A single cycle for each reactor tank consists of five discrete periods: fill, react, settle, decant, and idle. Hence, an SBR reactor tank can be viewed as a

fill-and-draw reactor performing flow equalization, biological treatment, and secondary clarification in the same tank.

6. *Environmental and Socioeconomic Conditions*. Ecologically, project implementation will not pose significant problems to the environment since the proposed subproject sites are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed 2-ha WWTP site at Leuwigajah is presently an agricultural piece of land, it is however, generally located in an urban area. Beyond its northern and eastern borders is a busy highway (Jalan Tol Padalarang-Cileunyi) and further beyond are built-up areas. Cisangkan Creek, the WWTP discharge point, is draining a large urban area towards the proposed WWTP site and passes through its southern boundary before going further to the southern boundary of Cimahi City. The proposed Cimahi City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. Socioeconomic indicators revealed that Cimahi City has a growing urban sector. Its 2010 total population was 541,177 with a population density of 13,462 inhabitants /km^2. Its population growth rate from 2000 to 2009 has reached 3.09 percent, higher than the West Java provincial average of 2.03 percent. Cimahi City's economy is dominated by the manufacturing sector.

7. *Impacts and EMP*. Screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed sewage collection network and 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.

8. Adverse environmental impacts during construction 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 Leuwigajah shall be confined in a site already acquired 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.

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

10. *Addressing Climate-Change Impacts*. Climate change adaptation considerations shall be included in the design of the proposed Leuwigajah WWTP since it is in close proximity to Cisangkan Stream. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to infrastructures. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Cimahi 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 site of Leuwigajah 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.

11. Relative to greenhouse gas emissions, the Leuwigajah WWTP will not be a significant source of methane generation since the SBR process is aerobic.

12. *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 West Java Province as the Provincial Project Implementation Unit (PPIU) and the Cimahi City's Local Project Management Unit (LPMU).

13. 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 Cimahi City subproject, while Cimahi 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 Cimahi 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.

14. A capacity building for the Leuwigajah 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.

15. *Consultation and Participation*. Within the context of "meaningful consultation" per ADB's SPS, the city government of Cimahi initiated a process of consultation during project preparation and intends to continue it during detailed design and construction phases. The city government conducted an initial public consultation and information disclosure last 24 September 2012 with various stakeholders' representative, and concerned individuals. Details of the proposed subproject components were presented to the stakeholders and their views were requested. The initial public consultation was conducted in the Indonesian language. Issues that stakeholders raised include potential disturbances during construction. Stakeholders expressed support to the proposed subproject. The process of public consultation with various stakeholders shall continue during the detailed design stage. Public information activities were also conducted earlier during the preparation of Cimahi's Wastewater Investment Master Plan in 2010-2011.

16. *Grievance Redress Mechanism*. Implementation of the proposed sewerage subproject will be fully compliant to ADB's safeguards requirement on grievance redress mechanism. The city government of Cimahi disclosed the proposed mechanism during the initial public consultation. It will again be presented to stakeholders during detailed design when more subproject details are available and in area meetings during the construction phase. Complaints about the environmental performance of the subproject during the construction phase can best be handled by various levels including the formation of an ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for the expeditious resolution of the complaints, while complaints during the operation phase can be brought to the attention of Cimahi City's Kantor Lingkungan Hidup (KLH), the local environment agency. The CSECC shall be chaired by Cimahi 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..

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

18. Implementation of the proposed Cimahi City's subproject is hereby recommended with emphasis on the following: (i) EMP of Cimahi 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 Leuwigajah 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) Cimahi 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. Cimahi City is in West Java 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. This 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. Similarly, a proposed sewer network for a population of more than 100,000 shall be required to prepare an AMDAL report. The Cimahi subproject will have a sewer network capacity for a population of 150,000, while its WWTP will initially serve a population of less than 100,000. The Cimahi subproject will therefore be required to prepare an AMDAL report due to the large capacity of its sewer network. Preparation of the AMDAL will be done by the detailed design consultants during the detailed design phase as agreed by ADB and GOI. This will be funded by the Indonesia Infrastructure Initiative. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

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

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

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

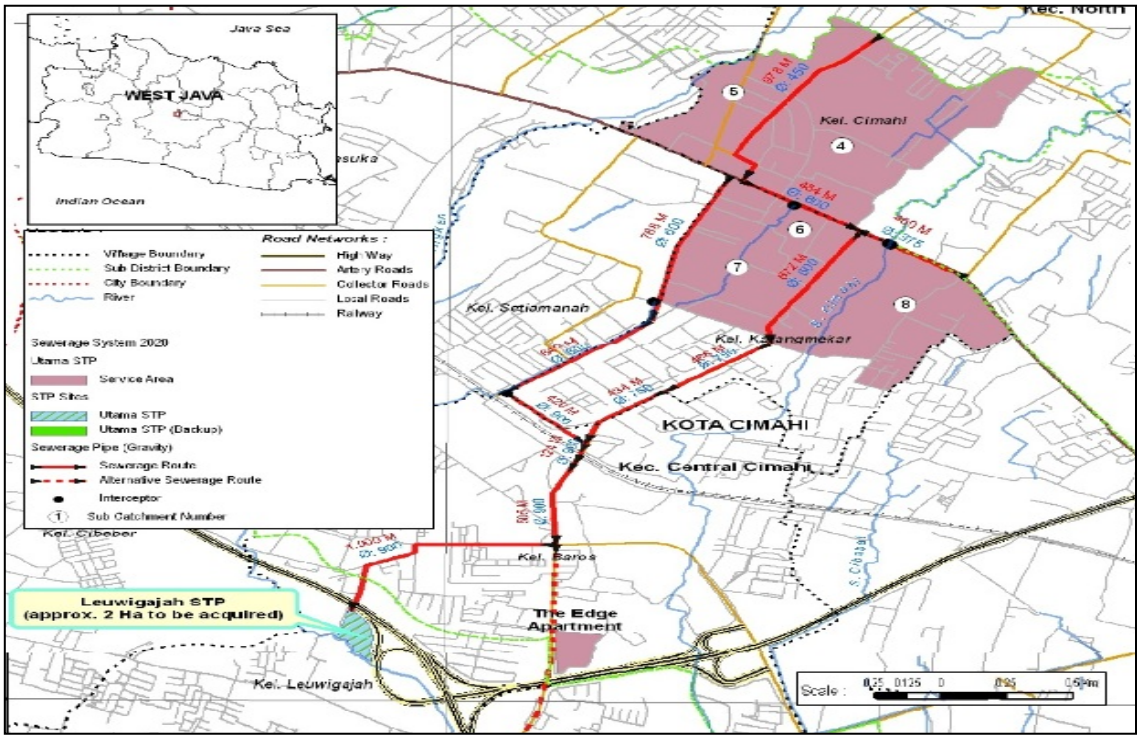
13. *Sewerage Laws and Regulations*. The framework on wastewater management system development in Indonesia is provided by Public Works Regulation No.16/PRT/M/2008 on National Strategy and Policy in Domestic Wastewater Management. Law No.4/1992 on Housing and Settlements mandates that sewerage systems shall be provided. It requires public utilities for wastewater systems to be operated professionally to provide adequate public services. Law No.7/2004 on Water Resources also cites the need for sanitation infrastructures for the protection and preservation of water resources. Effluent standard for wastewater treatment plants are regulated under the Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality which allows effluent discharge with maximum biochemical oxygen demand (BOD) of 100 mg/l and total suspended solids of 100 mg/l. However, the proposed WWTP will be designed to meet maximum effluent values of 50 mg/l and 100 mg/l of total suspended solids.

III. DESCRIPTION OF THE PROJECT

A. Location

14. Cimahi's proposed sewerage system under MSMIP shall cover the central business district (CBD) and around 40% population of Kelurahan Cimahi and Kelurahan Karangmekar as well as "The Edge" development in Baros. This is known in Cimahi's Wastewater Investment Master Plan as the "Stage I Leuwigajah Scheme" (Figure 3.1). The proposed sewerage system will have a sewer network capacity for a population of 150,000, while the WWTP at Leuwigajah will initially serve a population of 53,240 through 9,873 service connections (domestic and commercial).

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



Source: PPTA Consultants

B. Components and Cost Estimate

15. The proposed sewerage network will have 6.981 km of sewer pipelines with diameters ranging from 375 mm to 900 mm Table 3.1 and a tertiary sewer network covering 26 hectares. ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the 26 hectares of tertiary sewer network (with pipe diameter of less than 300 mm) will not be funded by ADB. Sewer pipelines with diameters 300 mm and above will have 70 manholes, while those below 300 mm will have 1,950 manholes. The network will also include: (i) 5 units of drainage interception chambers, (ii) 2.244 km of drainage rehabilitation, and (iii) 500m of pipe crossings.

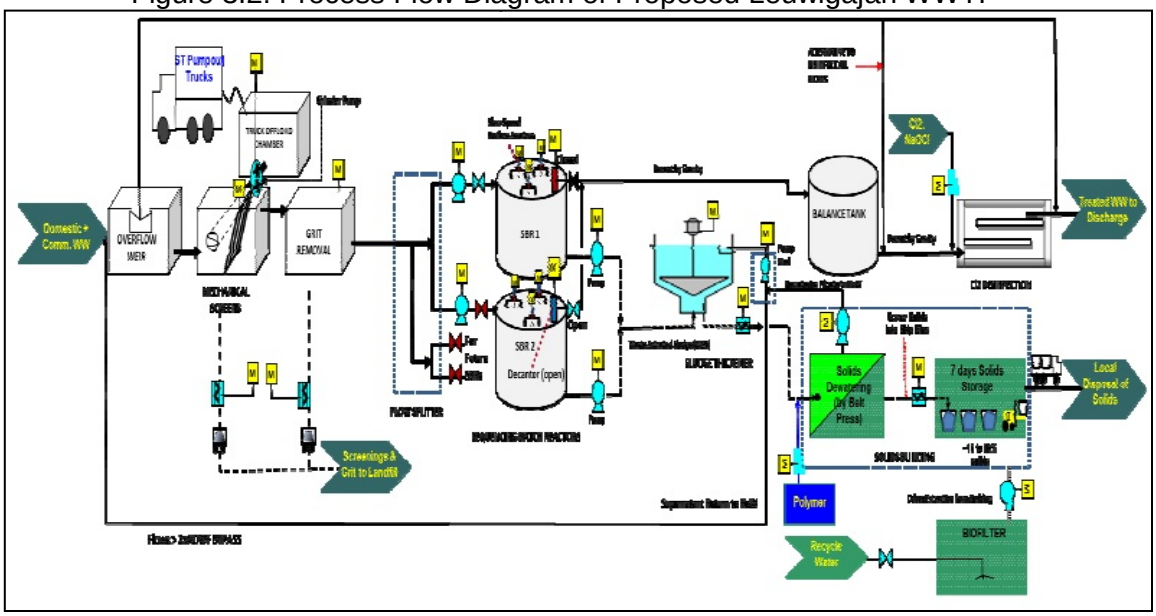
Table 3.1: Proposed Cimahi's Sewerage Network (to be funded by ADB)

Sewer Pipe Diameters (in millimeter)	Sewer Pipeline Length (in kilometer)
900	2.050
750	0.900
600	1.593
450	1.978
375	0.460
Total…	6.981

Source: PPTA Consultants

16. Wastewater from Cimahi's sewer network system will drain to a 11.1-MLD Wastewater Treatment Plant (WWTP) located at Kelurahan Leuwigajah and just beside the Cisangkan Stream. WWTP's effluent discharge point is the Cisangkan Stream. A wastewater treatment plant is locally known in Bahasa as "Instalasi Pengolahan Air Limbah (IPAL)". The WWTP will be a system based on the Sequencing Batch Reactor (SBR) with an estimated biochemical oxygen demand (BOD) load of 3.2 tons per day (tpd). The WWTP components and process train (Figure 3.2) are: screening chamber, degritting chamber, septage receiving structure (for future use), 2 SBR tanks, thickener, balance tank, chlorine contact tank, solid dewatering and storage building. Other components are: administration office, guard house, small laboratory for wastewater tests, and backup power supply.

Figure 3.2: Process Flow Diagram of Proposed Leuwigajah WWTP



Source: PPTA Consultants

17. The SBR is an aerobic biological waste treatment system using the same tank for biological treatment and secondary clarification. Multiple tanks are used since each tank is operated in a batch treatment mode. In a single reactor tank, SBR accomplishes equalization, aeration, and clarification in a timed sequence. This is in contrast to a conventional continuous flow process where multiple structures are required to obtain the

same treatment objectives. A single cycle for each reactor tank consists of five discrete periods: fill, react, settle, decant, and idle. Hence, an SBR reactor tank can be viewed as a fill-and-draw reactor performing flow equalization, biological treatment, and secondary clarification in the same tank.

18. During the fill phase, the reactor is filled with wastewater by distributing throughout the settled sludge through the influent distribution manifold and biodegration is initiated. The react phase follows with the termination of the influent flow. Aeration and mixing continue in the full reactor until complete biodegration is achieved. Next is the settle phase where aeration and mixing are turned off and perfect quiescent conditions allow the biomass to settle, leaving the treated supernatant above. The decant phase follows where the effluent is removed from just below the liquid surface by a decanter. The last phase is the idle/waste sludge phase, where the reactor waits to receive flow. Settled sludge is drawn and removed from the SBR reactor.

19. The proposed Leuwigajah 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 West Java Province has no effluent standard for BOD.

20. Total Cimahi subproject's cost is estimated at US$26.01 millions based on 2012 prices. The proposed Leuwigajah WWTP is estimated to have an operating cost of US$378,000 per year based on 2012 prices.

C. Construction

21. Cimahi's Leuwigajah WWTP construction shall require: (i) site clearing and marking of alignments, (ii) stockpiling of construction materials, (iii) construction of new structures, (iv) construction of buildings, (v) concreting for required tanks, (vi) installation of piping systems, (vii) installation of electro-mechanical equipment (viii) cleaning and closure of construction sites.

22. Sewer pipelines of the proposed Cimahi's sewerage system shall be laid in trenches along the designated streets of the city. Trenches shall be excavated to the alignment and elevations as indicated on the construction drawings with any deviations to be approved by the supervising engineer representing the city. All open trenches shall be adequately shored and braced to provide a safe working environment. Depending upon the severity of the condition, the contractor may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, a trench shield or box to support the trench during pipe laying operations.

23. 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.

24. Some 500m of pipe crossings in streams and railway line will use pipe jacking method. Pipe jacking is a 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. The method provides a structurally sound and watertight pipeline as the tunnel is excavated. A thrust wall is constructed to provide a reaction against which to jack. A thrust ring is used to transfer the loads to the pipe to ensure that the jacking forces are distributed around the circumference of the pipe being jacked.

25. *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.

26. *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

27. Detailed engineering design of the Cimahi sewerage 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. Cimahi‘s new sewerage system is expected to be operational by third quarter of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

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

A. Physical Resources

29. Cimahi City is located in West Java Province between 107°30'30'' and 107°34'30'' east longitudes and 6°50'00'' and 6°56'00'' south latitudes. The city has area of 40.25 km^2 and is bounded by Sub-district Bandung Barat on the north and west and Bandung City to the south and east. Administratively, Cimahi City comprises three sub districts and 15 kelurahan (villages).

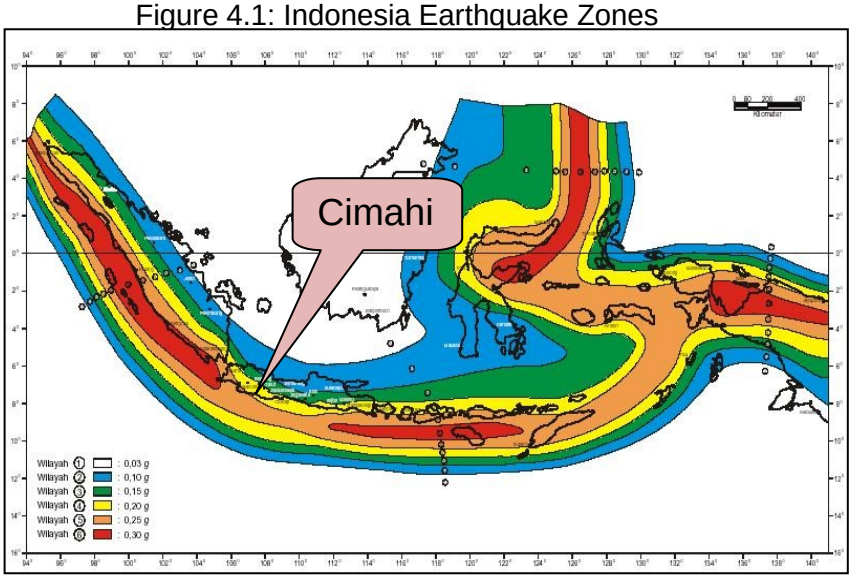
30. *Topography*. The elevation of Cimahi City is in the range from 1,050 m above mean sea level (MSL) in the north (Cipageran Village) to 690 m above MSL in the south (Melong Village). The northern part of Cimahi is in the foothills of the Tangkuban Perahu Mountains. The elevated areas are part of the North Bandung Conservation Area which is a designated water catchment where physical development is limited to 40 percent. As expected in such mountainous terrain, the city area is hilly with steep valleys. Around 82 % of the city area has flat to mild slopes of less than 8 % (or I in 12). Most of the area with less than 2 % slope (1 in 50) can be found in Cimahi Tengah and Sub district Cimahi Selatan. The steep slopes (> 45 percent) can be found in the south western parts of Cimahi and in parts of the northern Cipageran Village.

31. *Geology and Soils*. The geological structure in Cimahi City is dominated by Cibeureum Formation which is a volcanic from Tangkuban Perahu Mountain which mostly contains highly permeable porous tufa rocks. Based on the data of Cimahi City Environmental Office the soil permeability's are high (typically in excess of 10 m/day), which supports the observation that there is little surface overflow of effluent from septic tanks. The soil structure in Cimahi City consists of yellow podsols, brown -grey alluvia and bro
The vulnerability to erosion of each type of soil is: (1) Alluvial, not vulnerable to erosion; (2) Latosol, slightly vulnerable to erosion; and (3) Podsol, vulnerable to erosion.

32. 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. Cimahi is in earthquake zone 4, moderate 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.

33. *Water Resources*. Cimahi City is entirely within the watershed of the Citarum River which is one of the primary sources of water supply for Jakarta. There are five primary catchments within the city, namely: Cihaur, Cisangkan, Cimahi, Cimancong, and Cibeureum rivers. All of the rivers are typical mountain streams and have numerous sub-catchments and small tributaries. The catchments run typically from north to south. The Cihaur River originates in the mountains above Cimahi, but then flows out of the city boundaries and then crosses back in again in Kelurahan Leuwigajah. The Cibeureum River has its source in Bandung City and only passes through the eastern parts of Pasirkaliki, Cibeureum, and Melong kelurahan. The other three cross flow entirely through Cimahi.

Figure 4.1: Indonesia Earthquake Zones



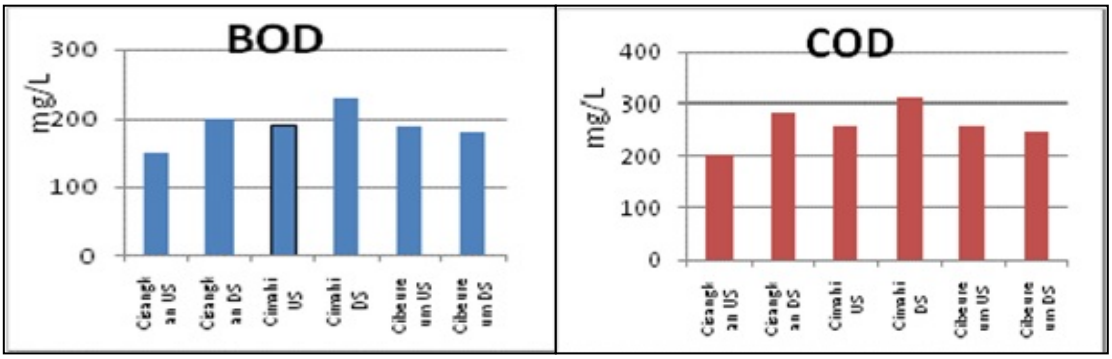
Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003

34. The Cisangkan River has an average width of 4-6 m and is lined with rocks for its 4.5 km pass through the city. Typical dry season flows are 170 L/s to 450 L/s. This stream has limited flow capacity. The Cimahi River is about 7 kilometers long and has an average width of 5-8 meters. In some parts, the width of the river is significantly narrowed, for instance in the area of Kampung Lembursawah, which is flooded during heavy rain. The river flows through the center of the city and the military area to the south. Typical dry season flows are 180 L/s to 360 L/s. The Cimancong River (sometimes referred to as the Cibabat River) is the largest of the streams in Cimahi with dry season flows in the range of 500 l/s to 1,200 L/s. The stream flows through the industrial area of Melong Village. The Cibeureum River through its reaches in Melong Village has an average width of 4-5 m but is narrowed as it flows between buildings and roads. It has a dry season flow of 540 L/s to 620 L/s. The rivers hydraulic capacity is also impeded by considerable sedimentation and garbage.

35. Surface water quality (Figures 4.2 and 4.3) does not comply with West Java Provincial standards at any of the monitored locations. Since each of these rivers drain into Citarum River, a major water source for Bandung and Jakarta, water quality is a critical concern and a key driver to improve wastewater management in Cimahi. The Cisangkan River appears to have the worst downstream water quality of the four rivers with 12 parameters exceeding the threshold water quality standard. It is interesting to note that heavy metals, such as copper, lead, and zinc also exceed allowable standards even at the upstream locations suggesting that it is a natural background level derived from the soils of the upper catchments. This would clearly have implications for water supply. For two of the rivers, Cisangkan and Cimahi, the effect of the town's discharges is clearly evident, with levels of BOD, COD and E.Coli increasing between upstream and downstream. For the Cibeureum, the opposite was the case with BOD and COD levels decreasing downstream. However, for DO and E.Coli the levels in Cibeureum had the same trend as for the other rivers, deteriorating from upstream to downstream. There are some differences with the data obtained from KLH. That secondary data claim some streams entering Cimahi are relatively clean with low levels of BOD < 5mg/L. The measured data shows that the pollution load in

the rivers entering Cimahi is typically around 150 mg/L. This is over 10 times the concentration required for the river to be designated Class 4 (12 mg/L), which is the lowest class of river.

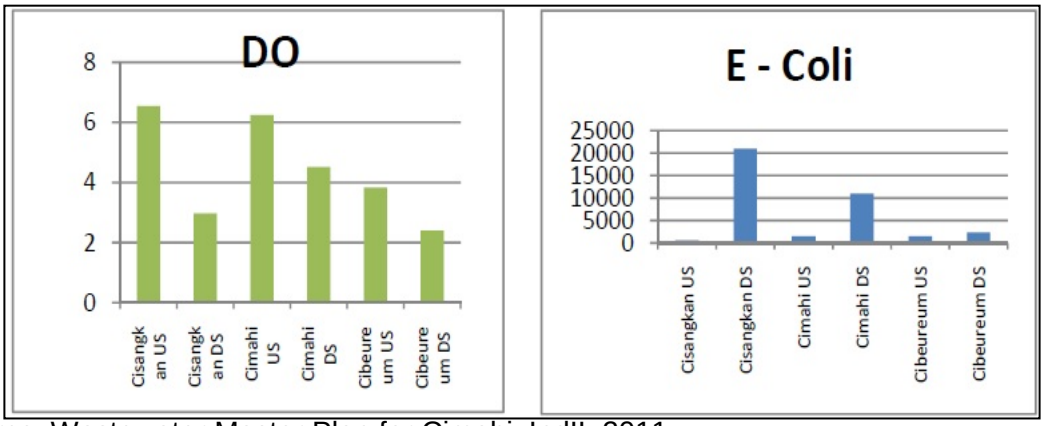
Figure 4.2: Cimahi Streams – Biochemical Oxygen Demand and Chemical Oxygen Demand



Source: Wastewater Master Plan for Cimahi. IndII. 2011.

For Cisangkan River, the discharge point of the proposed WWTP, water quality (Table 4.1) has exceeded water quality standards of Grade/Class IV Government Regulation No. 82/2001 for the allotment to irrigate agricultural or other uses that require water quality with usability. The BOD concentration was 150-200 mg / L and the concentration was 203-283 mg COD / L, indicating that domestic wastewaters are presently discharged into the river both at upstream and downstream. Amount of E. Coli and concentration of NH3-N in the downstream of Cisangkan River (20,000/100 mL) support this condition.

Figure 4.3: Cimahi Streams – Dissolve Oxygen and E. Coli



Source: Wastewater Master Plan for Cimahi. IndII. 2011.

Table 4.1: Cisangkan River Water Quality

No.	Parameter	Unit	Up Stream	Down Stream	Class IV Standard[a]
1.	BOD	mg/L	150	200	12
2.	COD	mg/L	203.73	283.21	100
3.	Phosphate	mg/L	0.18	0.18	5

No.	Parameter	Unit	Up Stream	Down Stream	Class IV Standard[a]
4.	DO	mg/L	6.55	2.92	-[b]
5.	NH_3-N	mg/L	0.08	3.5	-
6.	E Coli	number/100 mL	600	20000	2000

[a]National Government Regulation No 82 of 2001 for Water Quality Management and Control of Water Pollution
[b] There is no standard DO value for Class IV streams (water for irrigation). Cisangkan River is classified Class IV
Source: Environmental Quality Control PDAM Tirtawening Bandung, 2011

36. The water table in the alluvial deposits near the river is shallow, 1 m to 2 m during the dry season and rising to within 0,5 to 1,5 m in the wet season. Further away from river the depths to the nearest aquifers range from more than 5 m in the dry season to about 2-5 m in the wet season. However, in the marshy areas the water table is at surface level. Ground water quality was analyzed in 2006 at Cimahi City especially on residential at Viilage Cimahi, District Central Cimahi, there are 16 parameters that have been analyzed that is 3 physic parameters, 9 an organic chemistry parameters, 3 organic chemistry parameters, and total coliform as biological parameter. All parameters still comply with the quality standard based on decree of health minister No. 492 Year 2010.

37. *Climate*. Cimahi City has a monsoonal climate with a distinct dry season from June through to October and a wet season from November to May. The monthly rainfall varies from only 4 mm in September to 420 mm in March. There were 176 rain days in 2009 with about 20 rain days per month average during the wet season. There were only 11 days of rain over the three months from July to September. The primary effect of this rainfall pattern is that the combination of extensive intense rainfall periods and steep slopes creates significant surface runoff and so will have to be factored into the design of the sewerage system to minimize inflow of storm water. The high intensity and almost constant rainfall during the wet season highlights part of the reason why the septic tanks often do not work as intended. During the dry season river flows are very low thus affecting the water quality and the pollutant absorbing capacity of the streams. The average day time air temperatures are from 22 - 25 °C throughout the year and rela

38. Relative to climate change, information on climate change projections specific for Cimahi 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*. Air quality in Cimahi city is still quite good. Based on the analysis of air quality at the site on Pasar Lama and the residential area north of Pasar Lama Atas, Viilage Cimahi, District Central Cimahi in 2006, the analysis shows pollutant parameters still comply with the required quality standards based on government regulations No. 41 Year 1999. NOx values ranged between 53 – 72 µg/Nm^3. SO_2 values ranged between 3,2 – 5,9 µg/Nm^3. CO values ranged between 522 – 528 µg/Nm^3. H_2S values ranged between 52,2 – 77,6 µg/Nm^3. TSP values ranged between 52 – 57 µg/Nm^3. Pb values ranged between 0,06 – 0,19 µg/Nm^3. Noise level in this area is 55-66 dB. Sound source comes from the old market activity, sub-terminal and vehicle traffic in a relatively crowded Jalan Masturi. From the results of environmental monitoring of air quality in the factory area in the region Cimahi,

conducted by the BPLHD West Java Province, in 2008, for parameters NOx, SO_2 and TSP also comply with the required quality standards

B. Ecological Resources

40. The proposed 2-ha WWTP site at Leuwigajah is presently an agricultural area planted with bananas, bamboos and some trees. It is aligned towards the north. It is sloping from the north towards the west and south. The western part has the lowest elevation and subdivided into small ponds for vegetable and fishponds. The north and east are bordered by open spaces adjacent to a main highway (Jalan Tol Padalarang-Cileunyi). The west also is bordered by 1.5-meter paved walkway that is also traversed by motorcycles. Immediately next to the paved walkway is a fenced community graveyard. Beyond its northwest boundary is a golf course. The south is also bounded by the Cisangkan Creek. A satellite photograph of the site and its surrounding areas is presented in Figure 4.4.

41. While the proposed WWTP site is presently an agricultural piece of land, it is however, generally located in an urban area. Beyond the northern and eastern borders is a busy highway (Jalan Tol Padalarang-Cileunyi) and further beyond are built-up areas. Cisangkan Creek is draining a large urban area towards the proposed WWTP site and passes through its southern boundary before going further to the southern boundary of Cimahi City. Cisangkan Creek has the worst water quality conditions among the 4 streams draining the city and carries domestic wastewater and urban solid wastes. Immediately adjacent to the southern boundary of the proposed WWTP are residential areas of the Leuwigajah village. Just beside the Cisangkan Creek is a mosque. The site of the proposed WWTP is therefore not within an undisturbed land and can be viewed as a small agricultural patch of land in a basically urban landscape.

Figure 4.4: Satellite Photo of Proposed Leuwigajah WWTP Site

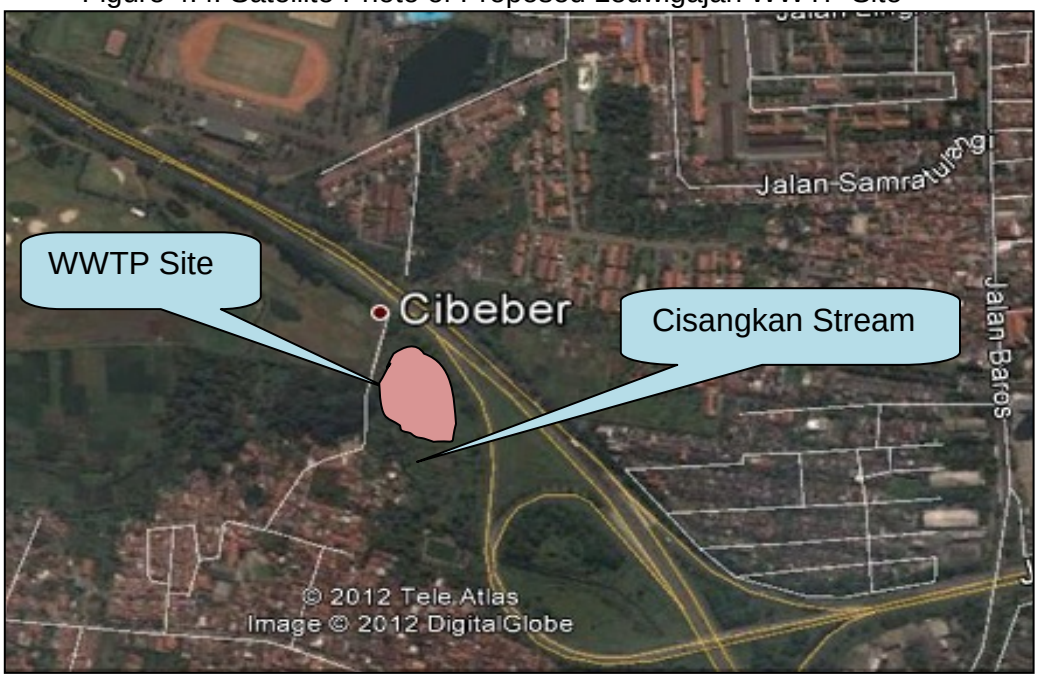


Photo source: Google Earth. 2012.

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

C. Economic Development

43. *City Income and Expenditures*. In the year 2010, Cimahi's income increased by 4 % from 2009, from 592 billion to 618 billion. The largest contribution was from Funds Transfer Allocation that reached 73 percent of total revenues. One thing that was encouraging, revenue was increased by 16 percent, from 75 billion to 87 billion (Source: Cimahi in Figure Year 2011).

44. *Land Use*. Each year an additional 0.6 percent land is built on or in other words converted from undeveloped land (agricultural land and empty land) to developed land. From the trend of increasing land use in Cimahi City during the period 2003-2007, it is clear that there was a significant increase (3.37 percent) in trade and service activities land use. In addition there were also positive efforts by the Government of Cimahi City to meet the social, education, health and religious service standards that can be seen from the significant increase in public facilities construction.

45. Land availability has been an issue for the development of Cimahi City. Some Sub districts have built on almost 70 percent of their available land, for instance as in Cibeureum Village and Melong Village. As a consequence, the current trend is to build toward the north (North Cimahi Sub District) that still has available land. The north of Cimahi City is actually part of North Bandung, Water Conservation Area, thus the land cannot be developed to its fullest extent because a regulation of a maximum of 40 percent building coverage is imposed in this area. So, the land use trend in Cimahi City is: (i) Cimahi Utara (North), residential areas supported with facilities such as for education, religious and health, (ii) Cimahi Tengah (Central), trade and service area will be developed in Cimahi Village and along Raya Cibabat main road, and (iii) Cimahi Selatan (South), industrial and residential areas.

46. *Commerce and Trade*. The largest contribution in the economic development of Cimahi in 2010 was dominated by the manufacturing sector. This industry sector data sources obtained from an annual survey of industrial enterprises large / medium. The number of industrial enterprises in 2010 consisted of a total of 63 large industries and the medium industry is as much as 67 companies. Most large and medium industrial companies are located in Cimahi Selatan Sub district, that is 95 companies (73.08%). While the least was in Cimahi Utara Sub district, which is 15 companies (9.2%).

47. *Agriculture*. In 2010, area of paddy fields is 123 ha, yard area is 3,406 Ha or 87.92% of dry land; farm area is 340 ha (8,78%) and pond area is 15 ha or 0.39% of dry land. In 2010, paddy production has increased from 38,929 quintals to 42,675 quintals. Increasing rice productivity may be caused by an increase in farmers' knowledge in developing patterns of intensification, use of superior seeds that continue to be socialized (Cimahi in figure 2011). Cimahi also produces cassava, corn, sweet potatoes, fruits (bananas, rambutan) and vegetables. Types of livestock in Cimahi include beef cattle, buffalo, dairy cattle, horses, sheep and goats. Main livestock is sheep with 13,250 heads in 2010, while buffalo was only 90. Buras chickens were 37,260, 85,347 broiler chicken, and 7111 ducks.

48. *Tourism*. Cimahi city has heritage buildings that are quite interesting and one of the objects and tourist attractions. Cimahi has the nickname as the "city of Army" because in this city there are many education center for army. Moreover, types of tourism in Cimahi are Cirendeu traditional kampong in Leuwigajah District, countryside which still looking after tradition and Ciseupan in Cibeber District with view of a real beautiful nature. There are 3 hotels in Cimahi city namely Tjimahi hotel, Chandra hotel, and Meridian hotel.

49. *Existing Water Supply System*. Cimahi depends on several sources for water supply such as groundwater, the PDAM piped network and purchasing from private water vendors. Groundwater is the primary source used by 90 % of the domestic population. PDAM Tirta Raharja, Kabupaten Bandung is the only government water supply service and has three supply areas, one of which is Cimahi. However, only 14 %t of Cimahi residents are PDAM consumers. Based on data in 2010, PDAM sold an average of 955,000 m^3/month water to different groups of consumers, such as household, commercial, industrial, institutional, apartments, and army facilities. In total, 79.2 percent of the water sold by the PDAM is for domestic house connections

50. *Transportation and Communication*. In 2010 length of the road in Cimahi is 118,956 meters consist of 3.25 percent national roads, 7.05 percent provincial roads, and the rest is city roads. From the entire length of road in Cimahi, asphalted road is 70-75 percents, while the rest were hardened roads and soil roads. And only 83.492 m (70.19 percents) is in good condition, along 21,299 m (17.90 percent) in the moderate condition, and 14,165 m (11.90 percent) in damaged condition. In 2010 there are data required to technical test of a vehicle in the department of transportation. The freight cars tested were 5940 vehicles or 72.9 percent of the total vehicles tested. The next largest percentage was in the bus transport vehicles by 25.47 percent.

51. Data from Cimahi in Figure 2010, the number of telephone subscribers in Cimahi reached 40,051 households. While the three existing GSM cellular operator, PT Satelindo, PT Telkomsel (Grapari) and PT Excelcomindo Pratama, have also increased its coverage area includes most of Cimahi city and the surrounding areas. As for the CDMA, only one operator that has been operating well, Telkom Flexi.

52. *Power Supply*. The power requirement for both industry and households in Cimahi City is mainly provided by the general state electricity company (PLN) and others from outside the PLN. Electricity being supplied by PLN per month is 91.2 millions KWh/VA. Total electricity being supplied by PLN in 2010 was 1,113,978.352 KWh/VA. (Cimahi in figure 2011). In year 2010, the number of PLN consumers was dominated by households with 128,966 households.

D. Socio and Cultural Resources

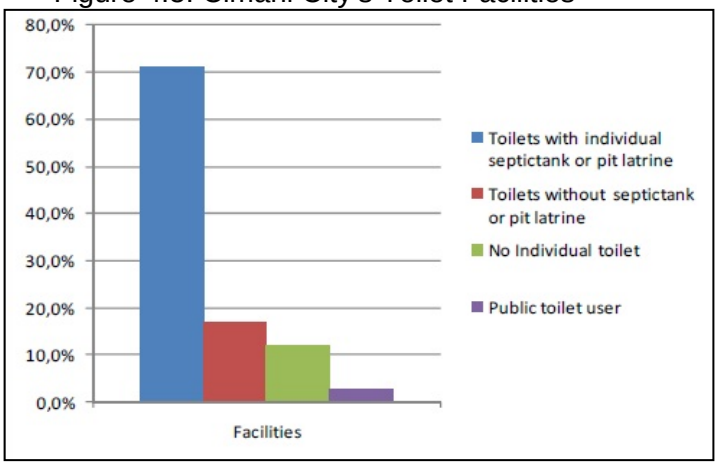
53. *Population*. Based on the data of the National Statistic Agency, the population in Cimahi in 2010 was 541,177 inhabitants and the population density is 13,462 inhabitants/Km2. In Cimahi, there is a sex ratio (male/female) of 1.026. Areas with high population density are Cibeureum Village and Melong Village. The high population density and large number of households in these two Villages are due to people preferring to live close to their places of employment in the industrial area of Cimahi Selatan Sub District. (Cimahi in figure 2011). The area with highest population growth in Cimahi City during 2000-2009 was Citeureup Village with a 7,01 percent growth rate. This growth was caused by development of new residential areas. Based on data from Master Plan of Cimahi City 2010 - 2030, up until

2007, there were 50 new residential areas developed with a total population of 137,622. In 2000-2010, the population density of Padasuka Village and Setiamanah Village increased rapidly from less than 150 people/ha in 2000 to more than 200 people/ha in 2009. Cimahi's population growth rate from 2000 to 2009 reached 3.09 percent, higher than the West Java provincial average of 2.03 percent.

54. Public Health and Sanitation. In total, 88 percent of all the houses own a family toilet, 71 percent of those are equipped with either a septic tank or a latrine and 17 percent are not equipped with septic tank Figure 4.4. Community members who do not own a family toilet use public facilities for showering, washing, and toilet needs. The lowest family latrine ownership is in Cibeureum Village, which is 46 percent. This is partly due to the limited availability of land but mainly because many of the residents in Cibeureum are transient workers from the industrial zone who tend to pay less attention to the quality of environment and their sanitation situation which consequently led to high levels of waterborne diseases recorded in these areas.

55. On community-based sanitation, efforts to improve on-site sanitation facilities in Cimahi have intensified in recent years. In 2009 - 2010, 30 public facilities equipped with biofilter septic tanks and seven units of communal septic tanks were constructed by DPLK Cimahi City using the local budget of the city. In addition an AG tank with 200 house connection capacity was built in Cimahi in 2004 using the local Provincial Budget. Despite these efforts, there are still many households that do not have either a septic tank or a latrine so the waste discharges directly to the drains or river. Inadequate wastewater management has resulted in a negative impact to the environment in Cimahi.

Figure 4.5: Cimahi City's Toilet Facilities



source: Cimahi City Health Office. 2009.

56. A survey in 2011 showed that 44.70 of respondents in five villages admited that they have been sick and Cimahi village has the largest percentage with 60.90. Diarrhea occurred in 2.64 % of the adult residents, 1.64 %of the children and 3.30 %children under the age of 5 years old (infants), the main reason for diarrhea according to 42.55 % respondents is that it's caused by food/drinks and the second reason was because the water was unclean. The diarrhea incidence increased in 2009 in most of the kelurahan of Cimahi City, especially in Cibeureum Village. Cibeureum Village and Utama are dominated by industrial areas with some densely populated slums that are populated with simple rented houses. In general

those, rented houses use public latrines or do not have any access to adequate sanitation facilities.

57. Cimahi City has public and private health care facilities. In 2010, there were 4 hospitals, 16 maternity/birthing clinics, 41 polyclinics, 12 public health care clinics (PUSKESMAS), 7 ancillary public health care clinics (PUSTU), 111 private doctor walk -in and specialist clinics, 135 private midwife/nurse -midwife clinics, 3 and 79 traditional medicine shops The city has 366 doctors, 35 percent of which are women. There are also a number of registered nurse (79), midwives (150), and trained birth attendants (48) and untrained, traditional birth attendants (30) (Source: Cimahi in Figure Year 2011).

58. *Education*. Improvement of human resources is the basic capital to drive development, which in turn can improve well-being in addition to natural resources. Number of Kindergarten is 98 units. Number of elementary school and Islamic elementary school are 130 units. Number of junior high school and Islamic junior high school are 43 units. Number of senior high school and Islamic senior high school are 21 units. Number of vocational school is 18 units (Cimahi in Figure Year 2011). In the academic year 2010/2011, the ratio of the number of students to number of teachers is as follows: for Kindergarten is 9.19; elementary school is 22.0; junior high school is 15.6; and Senior High School is 28.2.

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 Cimahi 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 "∆" for insignificant and "●" for significant. The symbol for an insignificant negative impact is "∆ **–"**, while a significant negative impact is "● **–**". The second column of the table indicates the type and magnitudes of the impacts without any mitigating measures being applied. Some impacts have already insignificant magnitudes even without mitigations and mitigating measures are therefore no longer required. The last column of the table indicates the expected impact magnitude after applying the mitigating measures. Hence, a significant negative impact (● **–**) will become insignificant (∆) after applying the mitigating measures. A summary of the environmental impacts and mitigation measures that should be carried out are detailed in the Environmental Management Plan (EMP) at the end of this section as Table 5.2.

61. Environmental impacts arising from decommissioning of the proposed Cimahi 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 Cimahi sewerage facilities are available.

Table 5.1: Summary of Environmental Impacts Screening for Cimahi Subproject

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

Environmental Impacts and Risks	Without Mitigation	With Mitigation
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	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 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 Cimahi's proposed WWTP at Leuwigajah it is in close proximity to Cisangkan Stream. 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 Cimahi City and increase the likelihood that such investments will fail to deliver the benefits for which they were intended. Flooding could affect the structural integrity of the proposed WWTP. Flooding can also prevent the WWTP from operating by reducing the head available across the plant. It may also submerge facility components that are supposed to be dry for proper operation. These situations may result to the release of untreated sewage into the environment and increase the risk to public health.

63. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Leuwigajah's 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*. Methane gas emission is not an issue for the Leuwigajah WWTP since the proposed SBR technology is an aerobic process.

65. *WWTP Site's Conformance to Spatial Plan*. There is no problem with spatial planning for the proposed WWTP. Cimahi's Badan Perenanaan Pembangunan Daurah (BAPPEDA) confirmed that the proposed WWTP site conforms to Cimahi'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 Leuwigajah WWTP will be located in the urban areas of Cimahi Ciy. 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 built-up areas.

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

68. *Nuisance and Problems to the Public*. Potential nuisances and problems to the public during construction of the proposed Cimahi 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 Cimahi 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 Leuwigajah WWTP. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Balai Arkeologi Bandung (Bandung Archaeological Research Office) if archaeological and cultural assets are discovered.

72. *Loss of Assets*. Inventory of losses for the proposed Cimahi 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 Cimahi City's sewerage system will not involve significant modification of the construction site topography. Only a small section, of the proposed WWTP site at Leuwigajah, will 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 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 Leuwigajah.

74. *Potential Damage to Archaeological and Cultural Assets*. During construction, excavations activities of the proposed sewer lines and the proposed Leuwigajah 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 Arkeologi Bandung (Bandung Archaeological Research Office) 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. Earthwork activities for the WWTP is a potential source of sediments and can easily release soil materials to Cisangkan Stream and surrounding area if not provided with sediment control. During rainy periods, soil materials from sections that are not yet stabilized can easily be carried by runoff to the Cisangkan Stream.

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.

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 Leuwigajah 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 Leuwigajah 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 Leuwigajah WWTP.

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 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 Jalan Ganda Wijaya where a mall is present.

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, 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.

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.

85. *Hazards to public due to construction activities*. Hazards to the public associated with construction activities for the proposed Cimahi'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 Cimahi 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, 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 Cimahi 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 Cimahi's LPMU.

95. *Improper Closure of Construction Sites*. Construction activities of the proposed Cimahi 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 Leuwigajah 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 standards for wastewater treatment plants regulated under the Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality. The proposed WWTP will be designed to meet maximum effluent values of 50 mg/l and 100 mg/l of suspended solids. 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 wastes will adversely affect the biological processes in the Leuwigajah 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*. 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, and blowers 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.

104. Mitigation. Sludge from the proposed WWTP shall be directed to belt press for dewatering. Dewatered sludge shall be hauled and applied to farm lands. However, during detailed design, a biosolids program for the Leuwigajah 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 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 sludge dewatering unit and the lack of air input to the aerobic units under extended power failures.

106. Mitigation. Mitigations shall include the following: (i) mechanical sludge dewatering through belt press will be done inside a building with an odor control unit, (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.

107. 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.

108. *Toxic waste generation*. Operation of the proposed Leuwigajah 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.

109. *Pollution to Groundwater*. Wastewater of the proposed Leuwigajah LWWTP may seep into the ground from process units, such as tanks, if these facilities are not made impermeable.

110. Mitigation. Concrete tanks process units shall be design and constructed as impermeable containers.

111. *Drowning Risk in WWTP Tanks*. The potential for drowning always exists when large tanks, such as clarifiers, are filled with liquid. Persons falling in the tanks of the WWTP can drown easily since these are deep facilities.

112. Mitigation. To reduce the risk of drowning in the tanks, Leuwigajah WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location, (ii) posted with warning signs indicating that the tanks 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.

113. *Health and Safety Risks in Sewerage System Operation*. Operation of the proposed Cimahi 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.

114. Mitigation. Facility hazards identification shall be conducted during the initial operation phase of the sewerage system and updated as necessary. A written facility health and safety manual shall be prepared to address the prevention, reduction and control of occupational injury and illness of Cimahis'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.

115. 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.

116. *Increase Employment Opportunities*. Operation and maintenance of the proposed Cimahi 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.

117. 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.

118. *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 Cimahi City subproject, the cumulative effect would be on the organic and nutrient load to Citarum River since Cisangkan Stream, the WWTP's discharge point, ultimately drains to this main river. The cumulative positive effect of the proposed Cimahi sewerage system is the reduction of the total organic and nutrient loads to the Citarum River since it will capture a significant portion of the domestic wastewater that presently find its way to the river. This effect highlights the role of the proposed sewerage system as an environmental improvement infrastructure.

119. In addition, the WWTP effluents to be discharged to Cisangkan River will have a dilution effect on the river's water quality considering the flow of 11.1 MLD added to the river. This positive effect is more pronounced during periods of less rainfall and lack of rainfall since Cisangkan River is quite polluted with a BOD range of 150 to 200mg/l.

120. 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 Cimahi's Subproject

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (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 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

121. 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 Cimahi City's sewerage system subproject.

122. During preparation of the Cimahi City Wastewater Investment Master Plan in 2011, information regarding the proposed sewerage subproject was disclosed to the public during the conduct of a willingness to pay survey for sanitation services. Subproject information was also disclosed in focus group discussions (FGDs) conducted as part of the activities for the master plan.

123. *Public Consultation*. Last 24 September 2012, Cimahi City's BAPPEDA conducted an initial public consultation and formally discussed the proposed sewerage subproject with the stakeholders and requested their views. A total of 18 stakeholders and representatives participated.

124. These are the stakeholders from those areas living near the proposed Leuwigajah 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.

125. The public consultation meeting was opened by a representative of the Cimahi City's Mayor, the Sekretaris Daerah of Cimahi City and urged the participants to support the proposed sewerage subproject. Representative of Cimahi City's Badan Perenanaan Pembangunan Daurah (BAPPEDA) explained that the city needs the proposed sewerage subproject due to the following: (i) the city is the largest source of E. coli bacteria for the Citarum River, (ii) large number of people has been affected by diarrhea, and (iii) the city has a big population.

126. BAPPEDA's representative gave a "powerpoint" presentation not only of the proposed Cimahi City sewerage subproject but also the entire long-term plan of Cimahi's Wastewater Investment Master Plan. After the "powerpoint" presentation, the participants were encouraged to ask questions and raise their concerns. The discussions include issues regarding the state of Cimahi City's sanitation, land acquisition for the proposed WWTP at Leuwigajah, the proposed construction of the sewerage system, and the need for more information campaign and consultation.

127. Participants claimed that majority of communities dispose their waste into the river and only few use septic tanks. In addition, a lot of septic tanks are leaking and perceived to have contaminated the groundwater. Relative to this issue, Cimahi City's BAPPEDA informed the participants that cases of diarrhea are increasing.

128. Participants asked that if the subproject has to acquire land, what is the follow-up action? It was explained that the public consultation meeting is just the first meeting. There will be another meeting. Land acquisition for 2,500 m^2 is planned for proposed WWTP site at Leuwigajah.

129. Participants also asked how the pipelaying works will be done, since they have seen in the excavations and pipelaying works done by the telephone company that left a lot of wastes and debris along the streets. It was explained that clean construction will be introduced to avoid leaving wastes at the sites. The contractors will not be allowed to leave the construction sites without properly closing them and haul the excess soil, wastes, and debris.

130. The need for more information campaign and consultation was highlighted by some participants. While there is information campaign and consultation on WWTP investment and development, public information campaign on sanitation should be intensified since majority of communities dispose their waste into the river and only few use septic tanks. Cimahi City's BAPPEDA acknowledged that despite intensive information campaign, not all people have same understanding. Support of village leaders will be necessary to map those who have yet to understand the program.

131. Finally, Cimahi City's BAPPEDA was reminded by participants from the government sector that acceptance of stakeholders will be necessary before a project is about to be executed, otherwise, there will be rejection by local communities. BAPPEDA explained that Cimahi City's government has a long experience regarding project implementation including those financed by other donors. The city government is also experienced in managing resettlement and was able to address such issue properly.

Table 6.1: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
Karang Mekar Village	How will the pipelaying works be done? Earthwork activities, such as the one done by the telephone company, left a lot of wastes and debris.	Clean construction will be introduced to avoid leaving wastes at the sites. This approach has been implemented in Bali.
Karang Mekar Village	The project needs to acquire land, what is the follow up action?	This meeting is just the first meeting. There will be another meeting. Land acquisition for 2,500 m^2 is planned for proposed WWTP site at Leuwigajah
Cimahi Village	Public information campaign on sanitation should be intensified since majority of communities dispose their waste into the river and only few use septic tanks.	The expression of support is well appreciated
Leuwigajah Village	There is a very small pond that has been used for fishing. Sometimes, its water is used for plant	Recreational activity and fishing will be relocated outside of the WWTP site

	watering. Will this pond remain in the site when the WWTP facility is developed?	
Government sector	For WWTP investment and development there is information campaign and consultation	Despite intensive information campaign, not all people have same understanding. Support of village leaders will be necessary to map those who have yet to understand the program.
Government sector	Experience shows that acceptance of stakeholders will be necessary before a project is about to be executed. Otherwise, there will be rejection by local communities.	Cimahi City government has long experience in regarding project implementation including those financed by other donors. The city government is also experienced in managing resettlement and has managed to address such issue.

132. *Future Disclosure and Consultations*. Public consultation and participation activities will again be conducted in the future for the proposed Cimahi City's sewerage project. The Provincial Project Implementation Unit (PPIU) and Cimahi City's Local Project Management Unit (LPMU) will conduct public consultations and information disclosure during detailed design. Discussions during these consultations are expected to be more focused and detailed since design information will be available such as exact locations and alignments of sewer lines. Views of the stakeholders will be considered in the overall design process. Stakeholders' consultations shall be continued throughout the construction phase on an area by area basis to sort out any potential problems. These shall be done by the 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

133. Local grievance redress mechanism (GRM) is important in the planning and implementation of the proposed Cimahi sewerage subproject since any complaints and concerns of the affected people must be address promptly at no costs to the complainant and without retribution. There will be 2 GRMs. The first one shall address the grievances associated directly with the construction activities, while the second one shall address the grievances on land acquisition, compensation and resettlement. Both GRMs were presented to stakeholders' representatives during the initial public consultation meeting last 24 September 2012. The GRM for the construction activities shall be explained fully to the various areas where construction activities are expected. This is appropriately done during public consultations in the detailed design phase when actual alignments will made for the proposed works. During the operational life of Cimahi's Leuwigajah WWTP, complaints about its environmental performance can also be brought to the attention of the local environment agency, the Kantor Lingkungan Hidup (KLH).

A. Construction Activities Grievances

134. 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 Cimahi 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.

135. *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).

136. *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.

137. 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.

138. 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.

139. *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

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

C. Complaints to Cimahi City's Kantor Lingkungan Hidup

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

VIII. ENVIRONMENTAL MANAGEMENT PLAN

142. This section addresses the need for mitigation and management measures for the Cimahi 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

143. 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.

144. 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 Cimahi'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 Cimahi's sewerage system, while some were already included in the construction of particular items.

145. 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 Cimahi 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.

146. **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 Cimahi subproject, the estimated amount is US$ 0.18million.

147. 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 Cimahi 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
Social and community concerns	Potential nuisance and problems to the public from Cimahi's sewerage system implementation	Consultation with the affected communities regarding the expected impacts and proposed mitigation measures of the project; Tender documents shall include provisions addressing the potential nuisances and problems to the public during construction phase During detailed design, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated for their applicability (with consideration also to cost implications) to streets with heavy commercial activities	Sewer line routes, WWTP site	Part of detailed design cost	Design Consultants, 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; Cimahi City government and the Balai Arkeologi Bandung (Bandung Archaeological Research Office) 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/ Cimahi 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; Cimahi City government and the Balai Arkeologi Bandung (Bandung Archaeological Research Office) will be informed promptly	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.18 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
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	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.18 million as environmental mitigations	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		barriers, sediment traps, and temporary sediment basins; isolation barrier for raw water intake		allocation of construction contract	
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$ 0.18 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$ 0.18 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$ 0.18 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Hazard to public due to construction activities	Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open trenches in sewer lines installation	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.18 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
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$ 0.18 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP	Occupational health and safety at work	Implement construction health and safety management plan, provision of equipped first aid	Sewer line routes, WWTP site	Incorporated in construction contract; part of	Contractor / CPMU, PPIU, Supervision

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
construction, and other civil works	sites	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		US$ 0.18 million as environmental mitigations allocation of construction contract	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$ 0.18 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)
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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)
WWTP operation	Disposal of sludge from WWTP	WWTP sludge be sent to belt press for dewatering; dewatered sludge to be hauled and applied to farm lands; during detailed design, a biosolids program for the WWTP shall be developed by adopting appropriate standards from other countries since Indonesia does not have biosolids management standards for WWTPs	WWTP	Part of capital, operation & maintenance costs	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)
WWTP operation	WWTP foul odor offsite migration	Odor control and management include: (i) odor control unit for sludge dewatering building, (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 problems	WWTP	Part of capital & maintenance costs	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
WWTP operation	Pollution to groundwater	Concrete tanks process units shall be design and constructed as impermeable containers;	WWTP	Part of capital & maintenance costs	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)
WWTP operation	Drowning risk in WWP tanks	WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location, (ii) posted with warning signs indicating that tanks 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)
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; 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)/ Cimahi's Kantor Lingkungan Hidup (KLH)

148. 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.

149. *Tender Documents and Construction Contracts*. Cimahi 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.

150. *Contractor's EMP*. During construction, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the Cimahi 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, West Java Province's PPIU, and Cimahi 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 West Java 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.

151. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the CPMU and West Java 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.

152. *Sewerage System Operations Manuals*. Cimahi 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.

153. *Unanticipated Environmental Impacts*. Where unanticipated environmental impacts become apparent during project implementation, CPMU and the West Java 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

154. 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.

155. The West Java 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.

156. *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 the West Java 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 Cimahi 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 Cimahi 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 Cimahi City's UPTD since these are checking/ inspections activities only.

Table 8.2: Environmental Monitoring Plan of Cimahi Subproject

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
PRE-CONSTRUCTION						
WWTP design and engineering specifications based on hydrology and flooding study	WWTP site	Verify study and engineering specifications	once	Design consultants	CPMU/ West Java's 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	LPMU/ Design consultants	CPMU/ West Java's 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/ West Java's 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 and IR payments	After completion of meetings; upon completion of payments	LPMU/ Design consultants	CPMU/ West Java's PPIU	Part of project management in detailed design (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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's PPIU
noise levels not to exceed 55 dB(A) near schools and residential areas;	Sewer line routes, WWTP site	Use of sound levels meter; visual inspection of	Daily	contractor	Construction supervision consultants, CPMU/ West	Part of consultant's construction supervision

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
noisy equipment not operated between 19:00 – 06:00hrs;ear plugs for workers		sites			Java's PPIU	contract; minimal cost to CPMU/ West Java's PPIU
Dust, cover of stockpiles, smoke belching	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's PPIU
Number of local labor employed	Sewer line routes, WWTP site	Verification of contractor's records	Once a month	contractor	Construction supervision consultants, CPMU/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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/ West Java's PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ West Java's 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	Sewer line, WWTP	effluent sampling and laboratory tests	twice monthly	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Part of WWTP UPTD's operation cost/ (USD2,000 /year)

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003)						
Presence of noise attenuation enclosures for pumps, blowers, etc	WWTP	Visual inspection of sites	Once a year	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH since this is an annual visual inspection
no odor of aerobic units; annual odor audit conducted	WWTP	Visual inspection of sites; verify records of annual odor audit	Once a year	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH since this is an annual visual inspection
Integrity of concrete tanks	WWTP	Visual inspection of WWTP	Once a year	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH since this is an annual visual inspection
safety station, warning signs, and fence	WWTP	Visual inspection of WWTP	Once a year	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost to Cimahi City's KLH since this is an annual visual inspection

157. *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 Cimahi Subproject

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Detailed design is environmentally	EMP requirements	Verify detailed design	Two reviews: (i) draft	Design consultants/	CPMU	Part of project

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
responsive	incorporated in detailed design of Cimahi's sewerage system	documents	detailed design documents and (ii) prior to approval of final documents	PPIU		manageme nt in detailed design (minimal cost)
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts of Cimahi's sewerage system	Verify construction contract documents	Prior to finalization of construction contract documents of Cimahi's sewerage system	Design consultants/ PPIU	CPMU	Part of project manageme nt in tendering (minimal cost)
CONSTRUCTION PHASE						
Effective management of environmental impacts during construction	Number of public complaints on construction activities	Verification of contractor's records; 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	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Part of WWTP UPTD's operation cost (USD2,000 /year)
Cimahi's sewerage system operation acceptable to the public	Public Complaints on sewerage system operation	Verification of operation records	Once a year	Cimahi's Unit Perlaksan Teknis Daerah (UPTD)	Cimahi City's KLH	Minimal cost

C. Implementation Arrangement

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

159. *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 West Java Province as the Provincial Project Implementation Unit (PPIU) and the Cimahi City Local Project Management Unit (LPMU).

160. 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 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 Kantor Lingkungan Hidup (KLH); (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.

161. The SATKER for West Java Province, as the PPIU, is the key implementation unit responsible for construction contracts' supervision of the Cimahi City subproject, while Cimahi 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 Cimahi 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 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 Cimahi City. LPMU's Environment Officer shall assist the CSECC.

162. 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

163. An important capacity building component is the hands-on training and advisory services for Cimahi 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.

164. At the bottom of this institutional set-up are the construction contractors for the Cimahi 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 Cimahi City's CSECC.

165. 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 KLH. One of the main concerns is the possibility of poor WWTP performance leading to odor problems and poor effluent quality.

166. External environmental monitoring will be done by Cimahi City's KLH as required by its mandate. Cimahi City's KLH 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 Cimahi City.

167. 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 Directorate of Development,	responsible for MSMIP implementation in project cities; coordinates with ADB and other	CPMU Environment Officer (to be designated); responsible for overall environmental	Project Implementation Support Consultants (PISC) and the Capacity Building

Sanitation, Environment and Housing (PPLP)	external agencies	supervision of subprojects; coordinates with PPIU and LPMU Environment Officers to ensure environmental requirements are address effectively; responsible for semi-annual environmental monitoring reports preparation	Consultants (CBC); 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. WWTP Training Consultant (part of CBC) shall facilitate hands-on training of all WWTP operators
SATKER for West Java Province as the Provincial Project Implementation Unit (PPIU)	key implementation unit in the field; Provides construction contracts' supervision; closely monitors construction progress	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; provides input to the CPMU Environment	Advisory services to be provided by the National Environmental Advisor (part of PISC)

		Officer in the preparation of the semi-annual environmental monitoring reports preparation	
Cimahi 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, Kantor Lingkungan Hidup (KLH); 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 Cimahi 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 KLH; assist the Cimahi 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			
Cimahi City's Unit Perlaksan Teknis Daerah (UPTD) or another service	Operates Cimahi City's sewerage system	Cimahi City's Pollution Control Officer (to function also as the Environment Officer);	WWTP Advisor (consultant) guides Cimahi City's WWTP operators

delivery unit		responsible for all environmental matters of the sewerage system including EMP implementation and self-monitoring; coordinates with the city's environment agency (Badan Lingkungan Hidup); The Pollution Control Officer shall ideally be the WWTP Supervisor; 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 KLH 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	during the initial 3-month period

168. *Implementation Schedule*. As presented in the project description, construction of the Cimahi 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 West Java PPIU shall ensure that construction contract provisions related to the contractor's EMP shall be included in the tendering stage in 2013.

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

170. *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.

171. *Capacity Building for WWTP Operators*. One of the proactive ways to prevent the Leuwigajah 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.

172. 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 SBR systems. Operators hired for the new Leuwigajah 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.

173. The second part shall be the actual operation of the new Leuwigajah 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 Leuwigajah 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

174. Presently, Cimahi City does not have a sewerage system that collects domestic wastewater from its central business district and other built-up areas. Most of the domestic wastewater finally found its way into the urban streams. The city government has a vision that Cimahi will be able to cut the pollution load entering the rivers that feed into the Citarum River. With improve river water quality, the City Mayor hopes that Cimahi City will recapture some of its rustic image to attract investment. This vision needs the support of a wastewater management infrastructure. Reliance on septic tanks as the only form of wastewater management will not be adequate. The proposed Cimahi sewerage system will therefore help the city achieve its vision and provide better access to sanitation facilities.

175. The environmental screening process has highlighted the environmental issues and concerns of the proposed Cimahi City's sewerage system subproject. The screening has considered the fact that the proposed subproject sites are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed 2-ha WWTP site at Leuwigajah is presently an agricultural piece of land, it is however, generally located in an urban area. Beyond its northern and eastern borders is a busy highway (Jalan Tol Padalarang-Cileunyi) and further beyond are built-up areas. Cisangkan Creek, the WWTP discharge point, is draining a large urban area towards the proposed WWTP site and passes through its southern boundary before going further to the southern boundary of Cimahi City. The proposed Cimahi 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 Cimahi 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.

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

177. Implementation of the proposed Cimahi City's subproject is hereby recommended with emphasis on the following: (i) EMP of Cimahi 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 Leuwigajah 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) Cimahi 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

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

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

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

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

AMDAL Processing

The basis for determining the type of environmental study required for the environmental permitting of a proposed sewer network is prescribed by Regulation No.11 of 2006 issued by the Environment Minister of State. Under this regulation, a proposed sewer network for a population of more than 100,000 shall be required to prepare an AMDAL report.

The Cimahi City's sewerage will be required to prepare an AMDAL report due to the large capacity of its sewer network. It will serve a population of more than 100,000 persons. The AMDAL report will be prepared by the consultants to be engaged by the Indonesia Infrastructure Initiative (IndII) during the detailed design phase of this subproject. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

APPENDIX 2

WWTP DISCHARGE PERMIT REQUIREMENTS OF CIMAHI CITY

Operation of a wastewater treatment plant (WWTP) in Cimahi City requires a discharge permit. Under Cimahi City's Wastewater Discharge Permit Regulation No.19/2003, 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 Location Permit, Surat Izin Tempat Usaha (SITU)
- Surat izin usaha perdagangan (SIUP) (premises license/permit trading)
- Building permit, Ijin Mendirikan Bangunan (IMB)
- Water Intake Permit, Surat Ijin Pengambilan Air (SIPA)
- Design WWTP and discharge channel and Calculation Note of WWTP Technical Design
- Copy of water quality analysis done by a reference laboratory at least in the last 3-month
- Statement to conduct wastewater treatment in accordance with the applicable
- Statement to pay compensation and/or restore the quality of water resources due to wastewater discharge and its activity
- Copy of Environmental Documents
- Copy of ID of person in-charge of business

Processing of discharge permit is through Cimahi's Kantor Lingkungan Hidup (KLH). According to regulation maximum processing time of the application is 12 working days after receiving the complete application for permit. This permit shall be applied for during the initial months of WWTP operation since actual data on effluent quality are required to be submitted with the application.

APPENDIX 3

PHOTOGRAPHS OF SITES FOR PROPOSED CIMAHI SEWERAGE SYSTEM

Photo No.1 – Further north of the proposed site for Cimahi's WWTP is the main highway (Jalan Tol Padalarang-Cileunyi); foreground is the western part of the site.

Photo No.2 – Eastern part of the site planted with bananas and some trees.

Photo No.3 – Adjacent to Cisangkan Creek at the southern boundary of the proposed WWTP site are houses and mosque of Leuwigajah village

Photo No.4 – One of the main roads (J. Ganda Wijaya) where main sewer will be installed; left side of photo is a big mall (C Mall)

APPENDIX 4

Minutes of the Initial Public Consultation and Information Disclosure held at Cimahi's BAPPEDA, 24 September 2012

Opening/ Presentations:

Opening by Mr Drs. H. Bambang Nuguroho, PLT *Sekretaris Daerah* Cimahi. He invites participation and support of the communities for this activity. Pak Herry, Head of Physical Division Bappeda said that Kota Cimahi has 600,000 inhabitants with 63% having on-site wastewater treatment systems. Cimahi is one of 5 cities selected to be participants of this donor sponsored project. The city was originally not included in long list. According to him, Cimahi needs WWTP facility due to the following facts:

- In 2010, PHBS just recorded 38%
- The largest contributor of E Coli was river Citarum
- 11% population of *Kelurahan* Cibereum of 30,000 persons suffered diarrhea. The incident was to rise by 4% in 2009 if compared with 2008
- Populous, small town, wretched city. WWTP facility is important.

At the present location there is a small fishpond. Investment in wastewater treatment is enormous. Participation of other parties is deemed necessary. The monthly charge will be further reviewed according to the affordability of local communities. The service charge will be set out into a regional regulation (*Perda*).

Comments, Views, Issues and Concerns:

1. Pak Rukmaya, *Village* Karang Mekar - Cimahi
    a. Why is the master plan just prepared now? I have heard about this project in 2011.
    b. The project needs land acquisition. What is the follow up action? Who will manage [the existing] communal facility?
    c. With regard to pipe laying works. How will these works be executed? Every earthwork leaves debris, especially by PLN. They leave much waste and debris after earthworks.

Pak Herry's response

a. MP was accomplished in 2011. Today is the implementation of such MP.
b. [The existing wastewater treatment consists of] 30% on site and some communal facilities. The off-site system will be built in Kelurahan currently not yet served [by this wastewater treatment service].
c. This meeting is the first one. There will be another meeting. Land acquisition for 2,500 m2 is just planned for Leuwi Gajah

Pak Djani's response

a. What is planned is for city scale, i.e. to serve 31,000 persons. [the facility will be managed by] KSM. However, they need further advocacy and this guidance has been provided and well runs.

Ariani's response

a. Clean construction will be introduced to avoid any damage. This approach has been implemented in Bali.
b. In this meeting, we also propose grievance redress mechanism for environmental complaints during construction. This mechanism is still a proposal, we invite suggestions if there are needed some additional clause or some questions.

2. Bapak Syarif Hidayat, *VIllage* Karang Mekar, Local Leader
    a. Based on the experience of communal WWTP, this facility may be constructed in alleys.
    b. The waste is disposed to river Cipolang due to no land for disposal.
    c. Piping system will be flushed with 1 pail of water only. What's about the slope? Will the waste drain away [just flushed with 1 pail of water]?

Pak Djani's response

a. [Owing to] limited land the communal system will be built along roads and public facility sites. There will be no unpleasant odor. In case of 100 – 200m of land, this plot will be sufficient to put up a communal system to serve 100 – 200 households.

3. Bu Artha of Health Agency Cimahi
    a. Investment funds are to decline

Bu Reni DKP (*Dinas Kebersihan dan Pertamanan)* Cimahi

a. MP plans [the project] in 3 stages at 3 locations, i.e. 1 stage 1 [ha] in Leuwi Gajah, stage 2 of 6 ha, and stage 3 for small scale, i.e. 1 ha. There is investment fund decrease.

4. Bapak Ahmad Mulyana, former teacher, local leader, *Village* Cimahi
    a. [He] principally agrees the program. The majority of communities dispose their waste in river. Only few of them use septic tank despite non standard construction. Socialization should be further intensified to elaborate the program in details. The program can decrease disease.
    b. Cimahi has hundreds of thousand inhabitants. How many WWTP will be developed? Where the route will go?
    c. I have my own septic tank. My neighbor, despite huge yards, he builds septic tank close to my house. It has contaminated my ground water.

Pak Herry's response

a. [He] appreciates the support.
b. Septic tank closed to the house/road without sound technology will cause problems, even though constructed in front of house.

Pak Djani's response

a. The resource person asked about septic tank. It must be emptied.

5. Bu Anis (E Rengganis), KLH (*Kantor Lingkungan Hidup*) or Environmental Office of Cimahi
    a. For WWTP investment and development there is socialization and consultation. What is about [the procurement of] sludge trucks? Is there any socialization?
    b. While it has been soundly designed, without good maintenance the facility will [shortly] damage and cause problems.

    P Achmad Mulyana
    a. Socialization has been made from year to year both for on-site and off-site systems. Any resident requiring further information may visit *DKP* office for discussion.
    b. Septictanks in Cimahi, built by local people, are leaked. They consist of conventional septictanks.

    Pak Herry's response
    a. Despite intensive socialization, not all people have same understanding. Support of Kelurahan will be necessary to map those who have yet to understand the program.
    b. Has the sanitation [sector] taken [the procurement of] sludge truck fleets into consideration? This issue has been mentioned in Master Plan.

    Pak Djani's response
    a. Socialization has been made to the representatives of community groups. They are expected to inform the materials of socialization to broader communities. Today, on-site system is just to reach 63% with 3 WWTP. The target is 100%.
    b. There is SNI standards on septic tanks.
6. Pak Harun Alrasyid of Kelurahan Leuwi Gajah (informal Leader)
    a. RW 6 and RW 7, IPAL in RW 2 next to the cemetery yard, survey team need to ensure whether the network will pass kampongs.
    b. Basically the program receives support from the communities. There is a pond that has been used for fishing. Sometimes, its water is taken for plant watering. When the WWTP facility has been developed, it is expected that the said pond will function as at present [i.e. for fishing and watering].

    Pak Djani's response

    There are 2 *embung*/ponds close to WWTP site. Recreation activity and fishing will be relocated to the *embung*/pond outside WWTP site.
7. Bapak Lito
    a. [Land acquisition] must be ensured and carried out. This issue is part of agreement.

    Pak Herry's response:
    a. [Land acquisition will follow] the procedure and executed as soon as possible.

b. Project must receive assurance [on land acquisition]. [Land acquisition] in Indonesia is complicated issue. It makes land acquisition issue more important [to deal with].

Pak Supriadi :

Peraturan Presiden (President Regulations) No 71 of 2012, concerning Land Procurement for Development in the Public Interest can fulfill the requirements of ADB. From where the compensation fund will be taken? Regulation of Finance Minister is needed to expedite [project] development.

8. Bu Dwi Retnani Y. of BPMPPKB

   Experience shows that approval of various parties [shareholders] will be necessary before a project is about to be executed. Otherwise there will be rejection by local communities.

   Pak Herry's response:

   Cimahi has long experience in this issue [project implementation] including those financed under World Bank. The city is also experienced in managing resettlement and managed to address such issue.

9. Ariani :

   DED and AMDAL will be funded by INDII.

Meeting closed at 12 noon.

APPENDIX 5

List of Participants of Initial Public Consultation and Information Disclosure (Cimahi Subproject, September 24th 2012)

Stakeholders/Participants:

1. Wiwin S. N, women organization leader (PKK), Cimahi Village
2. Ahmad Mulyana, villager, Cimahi Village
3. Syarif Hidayat, community leader, Karang Mekar Village
4. Rukmaya, villager, Karang Mekar Village
5. Lilis, women organization leader (PKK), Karang Mekar Village
6. Esther, women organization leader (PKK), Leuwi Gajah Village
7. Harun Alrasyid, community leader, Leuwi Gajah Village
8. Nono S., official of Cimahi Village
9. Surnama, official of Leuwi Gajah Village
10. Sri Wahyuni**,** Badan Pemberdayaan Masyarakat dan Perempuan Keluarga Berencana (BPMPPKB) Cimahi
11. Dwi Retnani T, Badan Pemberdayaan Masyarakat dan Perempuan Keluarga Berencana (BPMPPKB) Cimahi
12. Fitriani Manan, Health Office of Cimahi
13. Hendar, Health Office of Cimahi
14. Djani A.N, Sanitary Office of Cimahi
15. Parbowo, Sanitary Office of Cimahi
16. Reni Nuraeni, Sanitary Office of Cimahi
17. M. Thoha, Sanitary Office of Cimahi
18. E. Rengganis, Environmental Office of Cimahi

Public Work Office of Cimahi:

1. Indra H.

BAPPEDA of Cimahi:

1. Ifa Yasyfina
2. Amy Pringgo M.
3. Indra
4. Galih Imaduddin

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 (24 September 2012)

PEMERINTAH KOTA CIMAHI
BADAN PERENCANAAN PEMBANGUNAN DAERAH
Komplek Perkantoran Pemerintah Kota Cimahi Gedung B Lantai 3
Jl. R. Demang Hardjakusumah Telepon / Fax: (022) 6642865 Cimahi 40513

DAFTAR HADIR

HARI/TANGGAL : Senin / 24 September 2012
TEMPAT : Gedung Pertemuan Kantor Pemkot Cimahi

No.	Nama	Instansi	No. Telp	Tanda Tangan
1	WIMAN. S [illegible]	masy PKK KEL CIMAHI	081810372731	
2	NONO.S.	Kel. Cimahi	081562227736	
3	Ahmad Mulyana	masy Kel. Cimahi	085860404812	
4	SYARIF HIDAYAT	tokmas Karangmekar	085724110 9256	
5	Rukmayar	masy Kel. Kr. Mekar	08122152571	
6	LILIS	masy KT. TP. PKK Kel.	0822620222	
7	—	masy Kar. Mekar	05.	
8	ESTHER	masy Kec TP PKK Kel LG.	081. 32106717	
9	Ka Yasyfina	Bappeda		
10	Indra. H	DPU	085624146100	
11	Fitriani Manan	Dinas Kesehatan	081322222548	
12	Hendar	~ - ~	081320377280	
13	DJANI - A - N.	DKP	0812229 7877	
14	SRI Wahyuni	BPMPPKB	08124819066	
15	Hasan. Alkaryin	masy Tumas. LG	085624 403780	
16	SURATMAN	Kel. Leuwigajah	085722601967	
17	Dwi Retnani T	BPMPPKB	08122135951	
18	Parbowo	DKP	085793067010	
19	Galih Imaduddin	Humas & Protokol	085624693351	
20	Atty Pringgo M	Bappeda	081221436351	
21	Rudi	"		
22	Reni Nuraeni	DKP	0811226121	
23	M. Thoha	DKP	08180449756	
24	E. RENGGANI	KLH	081221532525	
25	RUEL JANOLINO	LAHMEYER - IBP		
26	ANGELITO N. CORPUZ	Lahmeyer - IBP		
27	SUPRIADI	MSMIP Konsultan		
28	Ariani Dwi Astuti	MSMIP Konsultan		
29				

APPENDIX 7

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

Photo No.5 – Cimahi BAPPEDA's representative explaining the components of the subproject. [24 Sep 2012]

Photo No.6 – A community leader raised some points [24 Sep 2012]

Photo No.7 A stakeholder raised some points [24 Sep 2012]

Photo No.8 – A community leader near the WWTP site raised some points [24 Sep 2012]

APPENDIX 8

SAMPLE CONTENTS OF ENVIRONMENTAL MONITORING REPORT

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

Executive Summary

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

1.0 Background

- Profile of Proponent
- Location Information

2.0 Status of Activities

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

3.0 Details of EMP Implementation Status /Evaluation

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

4.0 Conclusion

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

Appendices

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

APPENDIX 9

CIMAHI 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 Program

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…			

Screening Questions	Yes	No	Remarks
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	none
▪ 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

Screening Questions	Yes	No	Remarks
▪ 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
▪ 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
▪ contamination of surface and ground waters due to sludge disposal on land?		√	WWTP design: stabilized sludge will be mechanically dewatered prior to disposal
▪ 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
▪ 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
▪ 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
▪ 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
▪ 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**
▪ 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 VII based on the modified Mercalli Scale; no volcanic risk from holocene volcanoes; not in tropical storm risk zones; source: UN OCHA
▪ 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
▪ 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
▪ 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.