

Draft Initial Environmental Examination

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India: North-Eastern Region Capital Cities Development Investment Program (Project 3) – Agartala Septage Management Subproject

Prepared by State Investment Program Management and Implementation Unit (SIPMIU)
Urban Development Department, Government of Tripura

For the Government of Tripura
North-eastern Region Capital Cities Development Investment Program (NERCCDIP)

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Asian Development Bank

ABBREVIATIONS

ADB	—	Asian Development Bank
AMC	—	Agartala Municipal Council
BOQ	—	Bill of quantity
CBO	—	Community-based organization
CDP	—	City Development Plan
CFE	—	Consent for Establishment
CFO	—	Consent for Operation
CGWB	—	Central Ground Water Board
CLC	—	City Level Committee
CPHEEO	—	Central Public Health and Environmental Engineering Organization
DSMC	—	Design Supervision and Management Consultant
DTW	—	Deep Tube Well
DWS	—	Drinking Water and Sanitation
EAC	—	Expert Appraisal Committee
EARP	—	Environment Assessment Review Procedure
EARF	—	Environmental Assessment Resettlement Framework
EIA	—	Environmental Impact Assessment
EMP	—	Environmental Management Plan
EMS	—	Environmental Monitoring Specialist
EPA	—	Environmental Protection Agency
FFA	—	Framework Financing Agreement
GAPA	—	Greater Agartala Planning Area
GLSR	—	Ground level Storage Reservoir
GRC	—	Grievance Redress Committee
GWTP	—	Ground Water Treatment Plant
H and S	—	Health and safety
IEE	—	Initial Environmental Examination
INR	—	Indian Rupee
IRP	—	Iron Removal Plant
JNNURM	—	Jawaharlal Nehru National Urban Renewal Mission
KL	---	Kilo liters
LPCD	—	Liters per capita per day
MFF	—	Multitranches financing facility
MLD	—	Million liters per day
MOEF	—	Ministry of Environment and Forests
NAAQS	—	National Ambient Air Quality Standards
NER	—	North Eastern Region
NERCCDIP	—	North Eastern Region Capital Cities Development Investment Program
NGO	—	Nongovernmental organization
NRW	—	Non-revenue water
O&M	—	Operation and maintenance
OHSA	—	Occupational Health and Safety Administration
OHSR	—	Overhead storage reservoirs
OMC	—	Operations and Maintenance Contractors
PFR	—	Periodic Financing Request
PHED	—	Public Health Engineering Department

PWD	—	Public Works Department
ROW	—	Right of way
SEIAA	—	State Environment Impact Assessment Authority
SIPMIU	—	State-level Investment Program Management and Implementation Units
SPS	—	Safeguard Policy Statement
SR	—	Service Reservoir
TA	—	Technical Assistance
TDS	—	Total dissolved solids
TOR	—	Terms of reference
UDD	—	Urban Development Department
UFW	—	Un-accounted For Water
ULB	—	Urban local body

WEIGHTS AND MEASURES

dbA		decibels
ha		Hectare
KL		Kilo liter
km	—	kilometer
km ²		square kilometer
l		liter
m	—	meter
m ²		square meter
m ³		cubic meter
MT		metric tons
MTD		metric tons per day

NOTES

- (i) In this report, "\$" refers to US dollars.
- (ii) "INR" and "Rs" refer to Indian rupees.

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EXECUTIVE SUMMARY

1. The North Eastern Region Capital Cities Development Investment Program (NERCCDIP) envisages achieving sustainable urban development in the Project Cities of Agartala, Aizawl, Kohima, Gangtok and Shillong through investments in urban infrastructure sectors. NERCCDIP is being implemented over a six year period beginning in 2010, and is being funded by a loan via the Multitranche Financing Facility (MFF) of the Asian Development Bank (ADB). Project 1 was approved in July 2009 and the second Project (Project 2) was approved in December 2011. The executing agency (EA) is the Government of Tripura (GoT) Urban Development Department (UDD) and the implementing agency is the State-level Investment Program Management and Implementation Units (SIPMIU).

2. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB Safeguard Policy Statement (SPS), 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

3. This draft Initial Environmental Examination (IEE) has been prepared for Agartala Septage Management Subproject for funding under NERCCDIP Project 3 following the EARF and meeting the requirements of ADB SPS, 2009. The components of the subproject include: (i) procurement of conventional and split type cess pool machines, and (ii) construction of conventional septage treatment plant (STP) at Debendranagar, Agartala. This draft IEE is based on preliminary design and will be updated during detailed design phase. However, this IEE already covers assessment of the subproject's most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. An Environmental Management Plan (EMP) is part of this IEE which includes (i) mitigation measures for significant environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; and (iii) public consultation and information disclosure; and grievance redress mechanism.

4. Detailed design will be completed by June 2015, construction will begin end of 2015, and will take around 18 months. All civil works is expected to be completed by the mid of 2017. This IEE will be updated upon completion of the detailed design.

5. The STP will be located outside of main city and within the existing Agartala Municipal Council sanitary landfill facility (SLF) in Debendranagar therefore no additional land will be required. The site has boundary walls and no adjacent habitation is present. The topography is undulating however the site has already been developed due to construction of the SLF. There are no environmentally-sensitive areas (protected areas, wetlands, mangroves, or estuarines) or any historically-, culturally-, archaeologically- or architecturally-significant sites within or adjacent to the STP location. Trees, vegetation (mostly shrubs and grasses), and animals are those commonly found in urban areas.

6. Potential negative impacts were identified in relation to design, construction, and operation of the infrastructure. A number of impacts and their significance have been reduced by amending the designs and considering the environmental criteria for subproject selection specified in the EARF thus no impacts were identified as being due to the project design or location. The subproject's potential impacts will occur during construction and operations phases. During construction phase, there is (i) need to dispose/utilize moderate quantities of cut soil, (ii) increase in dust level due to earth movement, (iii) traffic along the routes for transporting

materials, and (iv) risk in workers' health and safety as the STP site is adjacent the active SLF cells. Potential impacts due to operation of the STP include (i) generation of solid waste from cleaning of sewer/septage collection systems, (ii) sludge from STP, and (iii) effluent, if only partially treated, can cause contamination of soil, groundwater, and surface water. Use of hazardous chemicals for wastewater treatment, such as strong acids and bases for pH control, chlorine or other compounds used for disinfection, etc., may pose occupational health and safety risks. The solid wastes from the STP will be disposed in the SLF and effluent will be further treated in the SLF's leachate treatment plant therefore the impacts are not significant. The subproject will include development of O&M manuals which includes occupational health and safety. Therefore anticipated environmental impacts are mainly related to the construction period which can be minimized by the mitigating measures and environmentally-sound engineering and construction practices. O&M impacts can be avoided by ensuring operators are qualified and experienced, complying with national and state regulations, and implementing mitigation measures per O&M manual.

7. The stakeholders were involved in developing the IEE through face-to-face discussions and public meetings organized by SIPMIU. Views expressed were incorporated into the IEE and the subproject planning and development. Relevant information will be disclosed to stakeholders in language and form understandable to them and to a wider audience via ADB website. The consultation process will be continued and expanded during subproject implementation to ensure that stakeholders are fully engaged in the project, have the opportunity to participate in its development and implementation, and made aware of the project grievance redress mechanism.

8. The EMP includes mitigation measures intended to protect the environment, workers and community and will form part of the civil works contract. Its implementation will be assured by an environmental monitoring program. SIPMIU, with the assistance of design, supervision and monitoring consultants (DSMC) will monitor and measure the progress of EMP implementation thru observations on- and off-site, document checks and interviews with workers and beneficiaries. Indicative EMP implementation cost includes budget to cover updating the IEE, preparing and submitting semi-annual reports, consultations and disclosure, application for environmental clearance/s, NOCs, CFEs, and CFOs and monitoring of EMP implementation. The cost of mitigation measures and surveys during construction stage will be incorporated into the contractor's costs. SIPMIU will communicate with ADB regarding environmental safeguard issues. EMP implementation reporting to ADB will be done on a semi-annual basis.

9. Therefore the subproject is unlikely to cause significant adverse impacts as the potential environmental impacts associated with design, construction, and operation can be mitigated to standard levels without difficulty. Based on the findings of the IEE, the classification of the Project as Category "B" is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS, 2009.

I. INTRODUCTION

A. Background

1. The North Eastern Region Capital Cities Development Investment Program (NERCCDIP) envisages achieving sustainable urban development in the Project Cities of Agartala, Aizawl, Kohima, Gangtok and Shillong through investments in urban infrastructure sectors. NERCCDIP is being implemented over a six year period beginning in 2010, and is being funded by a loan via the Multitranchise Financing Facility (MFF) of the Asian Development Bank (ADB). Project 1 was approved in July 2009 and the second Project (Project 2) was approved in December 2011. The executing agency (EA) is the Government of Tripura (GoT) Urban Development Department (UDD) and the implementing agency is the State-level Investment Program Management and Implementation Units (SIPMIU).

2. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB Safeguard Policy Statement (SPS), 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

B. Purpose of the IEE

3. This draft Initial Environmental Examination (IEE) has been prepared for Agartala Septage Management Subproject for funding under NERCCDIP Project 3 following the EARF and meeting the requirements of ADB SPS, 2009. The components of the subproject include: (i) procurement of conventional and split type cess pool machines, and (ii) construction of conventional septage treatment plant (STP) at Debendranagar, Agartala. This draft IEE is based on preliminary design and will be updated during detailed design phase. However, this IEE already covers assessment of the subproject's most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. An Environmental Management Plan (EMP) is part of this IEE which includes (i) mitigation measures for significant environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; and (iii) public consultation and information disclosure; and grievance redress mechanism.

II. DESCRIPTION OF THE PROJECT

A. Type, Category and Need

4. **Type.** This is an urban sanitation project intended to improve the current sanitation situation of Agartala in terms of improved septage management for central and south part of Agartala. This is one of a series of subprojects designed by NERCCDIP that are intended to raise the standards of the municipal infrastructure and services of Agartala.

5. **Category.** Environmental examination indicates the proposed subproject falls within ADB's environmental Category B projects. The subproject components will only have small-scale, localized impacts on the environment, and can be mitigated. Under ADB procedures such projects require an IEE to identify and mitigate the impacts.

6. **Need.** Septage is both solid and liquid waste that accumulates in onsite sanitation systems such as pit latrines and septic tanks. It has an offensive odour, appearance and

contains significant levels of grease, grit, hair, debris and pathogenic micro-organisms. In Agartala, the construction and management of onsite sanitation systems are left largely to ineffective local practices and there is lack of holistic septage management practices. 54% of the population use households' water closet linked to septic tanks but mostly without soak pits. Most of the existing septic tank systems do not meet technical standards and partially treated wastewater, in most cases flows to surface drains. Thus there is blending of partially treated wastewater and grey water emanating from households.

7. The present level of municipal information system does not hold information on details of septic tanks such as location, design standards, year of construction, operating performance and frequency of septage clearance. It is estimated on an average the volume of faecal sludge generated annually is 30,000 m³ from 90,000 household across Agartala City (70,000 have septic tanks while remaining 20,000 uses pit/dry latrines/unsanitary latrines). With improved water supply services thru NERCCDIP, increased domestic water will result to increase sewage.

8. Agartala Municipal Corporation (AMC) has limited capacity to collect sludge from the septic tanks as currently it has only 2 cesspool vehicles. Field survey investigations revealed that about 60% households can't be serviced by AMC existing cesspool vehicles thus residents generally resort to engaging manual labour to empty the septic tanks. Collected sludge by AMC is currently being dumped in an unused portion of the municipal sanitary landfill in Debendranagar while those collected by private entities are unaccounted and may be disposed or dumped in vacant lands.

9. In 2008, the Ministry of Urban Development (MOUD) issued the National Urban Sanitation Policy (NUSP). The policy has sets the following goals: raising awareness and promoting behaviour change, achieving open defecation-free cities, developing citywide sanitation plans, providing 100% sanitary and safe confinement, transport, treatment, and disposal of human excreta and liquid wastes, and providing proper operations and maintenance (O&M) of all sanitary installations. NUSP mandates states to develop state urban sanitation strategies and work with cities to develop city sanitation plans. It also includes draft frameworks to guide states and cities in developing their sanitation strategies. The NUSP, therefore, now makes it explicit that cities and states must issue policies and technical solutions that address onsite sanitation, including the safe confinement of septage.

B. Proposed Subproject

10. The components of the subproject include: (i) procurement of 4 conventional and 4 split type cess pool machines, and (ii) construction of conventional septage treatment plant (STP) at Debendranagar.

11. The STP will be located outside of main city and within the existing Agartala Municipal Council sanitary landfill facility (SLF) in Debendranagar therefore no additional land will be required. The site has boundary walls and no adjacent habitation is present. The topography is undulating however the site has already been developed due to construction of the SLF. There are no environmentally-sensitive areas (protected areas, wetlands, mangroves, or estuarines) or any historically-, culturally-, archaeologically- or architecturally-significant sites within or adjacent to the STP location. Trees, vegetation (mostly shrubs and grasses), and animals are those commonly found in urban areas. The STP location, layout plan and land marking are shown in **Appendixes 1 and 2.**

12. Process flow diagram and area requirement as per preliminary design is shown in **Appendix 3**. Photographs of the proposed STP location are attached in **Appendix 4**.

13. Benefits of scientific septage management includes clean and green environment, significant reduction in the pollution level of water bodies and rivers, prevention of various water borne diseases such as diarrhoea, dysentery, cholera, jaundice, typhoid, etc. saving huge amount of money which would have been spent for treatment of these diseases, and overall improvement of living standard.

C. Implementation Schedule

14. Detailed design will be completed by June 2015, construction will begin end of 2015, and will take around 18 months. All civil works is expected to be completed by the mid of 2017. This IEE will be updated upon completion of the detailed design.

III. POLICY AND LEGISLATIVE FRAMEWORK

A. Environmental Assessment Requirements

15. The Environmental Impact Assessment (EIA) Notification of 2006, which replaces the EIA Notification of 1994, requires environmental clearance for certain defined activities/projects. This notification classifies the projects/activities that require environmental clearance into 'A' and 'B' categories depending on the impact potential and/or scale of project. For both category projects, prior environmental clearance is mandatory before any construction work, or preparation of land except for securing the land, is started on such project or activity. The notification provisions are as follows:

- (i) Category 'A' projects require prior environmental clearance from the MoEF;¹
- (ii) Category 'B' projects require prior environmental clearance from the State Environment Impact Assessment Authority (SEIAA)²; and
- (iii) Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of protected areas, notified areas and inter-state and international boundaries³. Also, in the case where a SEIAA does not exist, Category B project will be reviewed by the MoEF and reclassified as Category A.

16. Consequently, the only NERCCDIP subproject listed in the EIA Notification of 2006 Schedule of Projects Requiring Prior Environmental Clearance is solid waste facilities, otherwise referred to as common municipal solid waste facilities (CMSWF), which qualify as Category B projects and are thus reviewed by the respective SEIAA. The STP will not require environmental clearance. However, since it will be located in the existing SLF, the environmental clearance issued to the SLF will need updating/amendment to include the STP as one of the components.

¹ For Category A projects, based on the preliminary details provided by the project proponent as per Notification, the Expert Appraisal Committee (EAC) of MoEF, determine comprehensive terms of reference (TOR) for EIA studies. This TOR will be finalized within 60 days. On the recommendation of the EAC based on EIA studies, MoEF provides the environmental clearance.

² The B category projects will be further divided by State Level EAC into B1 – that require EIA studies and B2 – no EIA studies. The State Level EAC will determine TOR for EIA studies for B1 projects within 60 days. On the recommendation of the State level EAC based on EIA studies, SEIAA provides the environmental clearance.

³ (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

B. Applicable legislations

17. The implementation of subprojects under NERCCDIP will be governed by the environmental acts, rules, policies, and regulations of the Gol and the respective state government. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. The following are the environmental regulations applicable to the subproject:

- (i) The Water (Prevention and Control of Pollution) Act, 1974, amended 1988;
- (ii) The Water (Prevention and Control of Pollution) Rules, 1975;
- (iii) The Air (Prevention and Control of Pollution) Act 1981, amended 1987;
- (iv) The Air (Prevention and Control of Pollution) Rules, 1982;
- (v) The Environment (Protection) Act, 1986, amended 1991
- (vi) Wild Life (Protection) Amendment Act, 2002;
- (vii) Environmental Impact Assessment Notification, 2006;
- (viii) Environmental Standards of Central Pollution Control Board (CPCB);
- (ix) The Indian Wildlife (Protection) Act, 1972, amended 1993;
- (x) The Wildlife (Protection) Rules, 1995;
- (xi) The Indian Forest Act, 1927;
- (xii) Forest (Conservation) Act, 1980, amended 1988;
- (xiii) Forest (Conservation) Rules, 1981 amended 1992 and 2003; and
- (xiv) Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980.

18. Key standards include those related to drinking water quality, air quality, effluent discharge, leachate quality, and protected areas. Compliance is required in all stages of the project including design, construction, and operation and maintenance.

19. Water treatment, sewage, and solid waste management subprojects require approval by the State Pollution Control Boards (SPCB) under the Water (Prevention and Control of Pollution) Act, 1974 and/or the Air (Prevention and Control of Pollution) Act, 1981. The following approvals from SPCB are required: No Objection Certificates (NOC), Consent for Establishment (CFE) and Consent for Operation (CFO). The CFE/CFO is issued upon project review and site visits. The SPCB issues the CFE before start of construction and the CFO after completion of construction and satisfying CFE conditions, if any. During the operation period, the effluent and air emissions must conform to the stipulated standards (CPCB Environmental Standards). The CFO is renewed every year based on the operation performance of the facility.

20. The following subproject components require CFE from SPCB: (i) STP; (ii) diesel generators/back up power; and (iii) hot mix plants, wet mix plants, stone crushers etc., if installed for construction.

21. A summary of the environmental compliance requirements is presented in below in Table 1.

Table 1: Environmental Compliance Requirements of the Proposed Subproject

	Component	Applicable Legislation	Compliance	Action Required
1.	All components that require forest land acquisition	Forest (Conservation) Act, 1980 & Wildlife Act, 1972	Approval from MoEF	Identify non-forest land and formulate afforestation program
2.	STP	Water (Prevention and Control Of Pollution) Act, 1974	NOC, CFE and CFO from SPCB	Obtain NOC and CFE from SPCB before construction. Obtain CFO from SPCB prior to commissioning. Renew CFO annually. Comply with CPCB environmental standards.
3.	Hot mix plants, wet mix plants, stone crushers etc., if installed for construction	Air (Prevention and Control of Pollution) Act, 1981	NOC, CFE and CFO from SPCB	Obtain NOC and CFE from SPCB before construction. Obtain CFO from SPCB prior to commissioning.
4.	Diesel generator (power back-up)			Renew CFO annually. Comply with CPCB environmental standards.
5.	All components requiring tree-cutting	Forest (Conservation) Act, 1980 & Wildlife Act, 1972	Approval from State Forest Department	Formulate afforestation program

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Administrative Boundaries

22. Agartala is the capital of Tripura, the third smallest Indian state considered as the gateway to the North-Eastern India. The AMC was established in 1871 with an area of only 3 km². Presently the extended limit of AMC covers an area of 62 km² comprising of 35 wards.

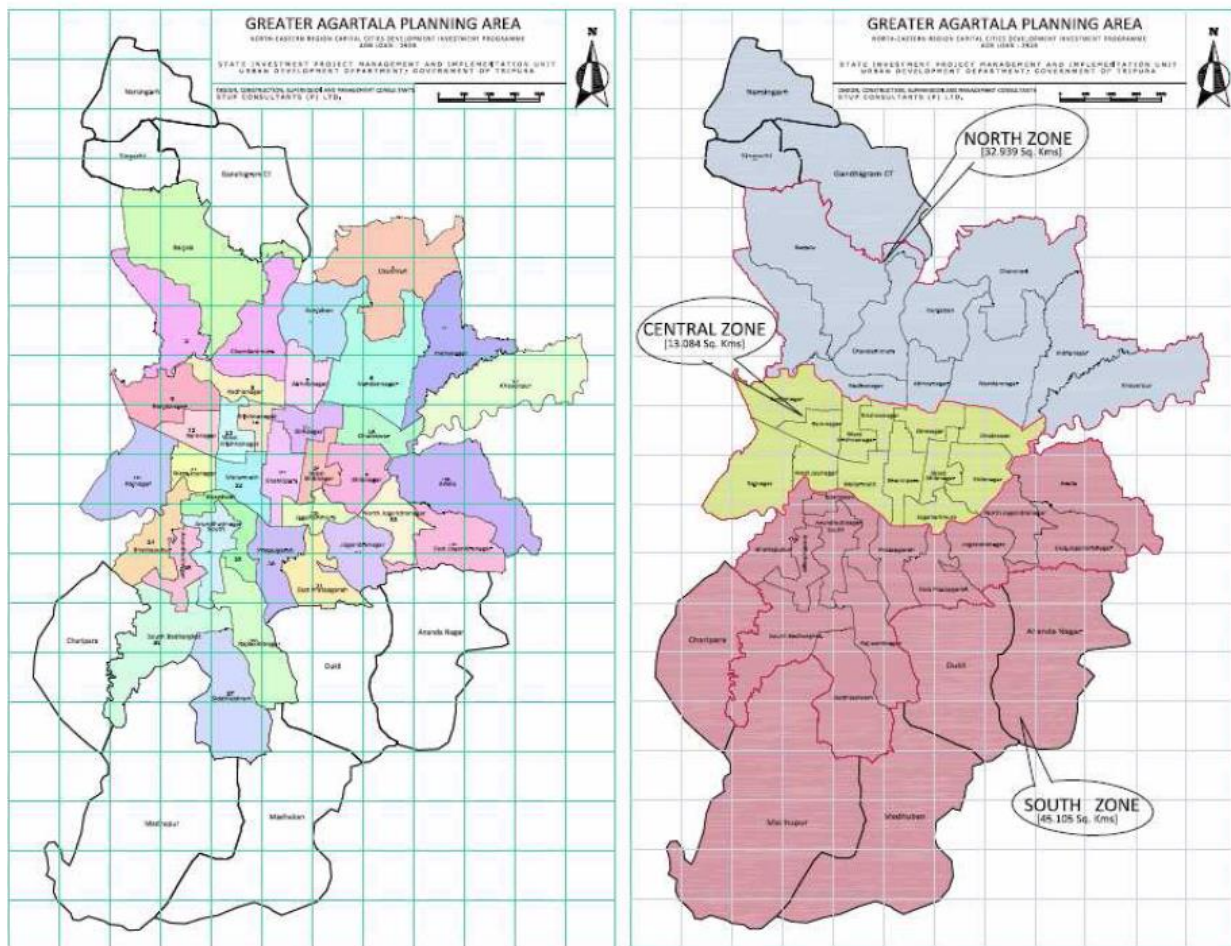
23. The Greater Agartala Planning Area (GAPA) is spread over an area of 92.0 km². It comprises AMC and eight other villages with population of more than 4 lakhs. **Figure 1** shows the AMC wards and GAPA zonal map. Considering the natural geographical division created by the Haora and Katakhal Rivers, the GAPA has been demarcated to distinguish the three (3) zones: the north zone, central zone and south zone.

- (i) North Zone: The area is located, north of Katakhal River. This zone comprises mainly the northern extension of the present AMC area (Wards 1 to 8) and peripheral villages, Narsingarh, Singarbil, and Gandhigram CT.
- (ii) Central Zone: The area bounded by Haora River embankment on the south and Katakhal River on the north. This zone mainly comprises the erstwhile AMC area and the newly extended areas (Wards 9 to 16 and Wards 18 to 22).

- (iii) **South Zone:** This area is located at the south of Haora River. This zone includes the southern part of the extended AMC (Wards 23 to 35) and the adjoining areas of Ananda nagar, Dukli, Madhupur, Madhuban and Charipara.

24. Considering similar geographical divisions, the subproject area has been defined to be the area comprising of the central zone (area measuring 13,084 km²) and south zone (area measuring 22,826 km²). The total subproject area is 35,910 km².

Figure 1: Ward Map of AMC and Zone Map of Greater Agartala Planning Area



2. Topography, Drainage, and Natural Hazards

25. **Topography.** The major part of Agartala has a flat terrain while GAPA is a combination of plain and undulating areas. The north and south zones have a rolling terrain with average altitude varying from a high of 25 to 30 m to a low of 8 m. The central zone is a flat land bounded by the rivers Haora in the south and Katakhal in the north. An important characteristic of the central part of GAPA is that it is located at a lower level than other areas giving it the appearance of a saucer. Due to its saucer shape, the low lying areas are vulnerable to inundation during monsoons.

26. **Drainage.** The drainage system of GAPA is dominated by two major rivers (Haora and Katakhal), which drains the core area of the city. These two rivers flow westward into

Bangladesh. In terms of catchment area, Haora River is the seventh largest in the Tripura and is the only source of surface water for GAPA. In addition to these two rivers, there are other rivers like Bangeshwar Gang, Debta Gang, Nagichara, Kalapani Charra and its tributaries within Greater Agartala. The Akhaura canal system running along the Akhaura road serves mainly the central area. All rivers are rain-fed and ephemeral in nature and their flow is directly related to rainfall.

27. **Natural Hazards.** North-eastern region of India extending to the Himalayan arc in the north and Burmese arc to the east is among the most seismically active regions of the world. The whole of Tripura State falls under seismic zone V, and is highly vulnerable to earthquakes. The sites covered by the subproject are not located in areas prone to water-logging, salinisation, and flash flood.

3. Geology, Mineral Resources, and Soils

28. **Geology.** The geology of GAPA is represented by the repetitive succession of sedimentary rock like sandstone, shale and clay from bottom to top, belonging to Surma group, Tipam group and Dupitila group. The valley is dominated by thick sandstones horizons with thin intervening shale/clay horizons. The sedimentary rocks are deformed and folded. The sandstones are highly porous underlain by impermeable shales or clay and are favourable for ground water retention.

29. **Mineral Resources.** The most important minerals in Tripura are glass sand, lignite, clay, and limestone. The most important of all the minerals that are associated with the state is natural gas and oil. There are good sources of white sand on the bank of the water body called Bijainadi close to the place called old Agartala. Some other reserves are found in the western and eastern parts of Champamura.

30. **Soils.** The plains of Haora River are alluvial in nature consisting of sand, silt and clay. The soil in GAPA is in general of poor to medium quality. It is characterized by a top soil underlain by a soft to medium/stiff, silty clay/clayey silt layer, which follows a moderately dense to very dense silty sand layer. Bearing capacity of soil is poor and usually is of the range of 4 – 6 tons per m² Central Agartala and most parts of south Agartala.

4. Climate

31. The climate of Agartala is of tropical monsoon type. The average annual rainfall is around 2,200 mm. The ambient temperature varies from 4.2 °C to 37.6 °C on the average. The winter period is from November to early March, summer is from March to May, and monsoon is from June to September. Winds, which are of moderate velocity, are from the south-to-south – east direction for most of the time. Average velocity of wind varies from 4 km to 9 km per hour.

5. Air Quality

32. There is no fixed ambient air quality monitoring stations under the Tripura State Pollution Control Board. There are no major air-polluting industries in Agartala and traffic/vehicular emission is the only significant source of pollutant. During the year 2013 ambient air quality monitoring at different locations of Agartala has been carried out under NERCCDIP Project 2. The results of the monitoring are shown in **Table 2**. Results show ambient air quality in the project area is well within the National Ambient Air Quality Standards (NAAQS).

Table 2: Ambient air Quality Monitoring for Agartala

Location	Date of sampling	Parameters (in microgram/cum)					
		PM 2.5	PM 10	NOx	SO ₂	CO	Pb
Area near AMC zonal office (ward 35)	13.11.2013	12.51	52.60	13.56	ND	ND	ND
	19.11.2013	14.7	51.9	9.5	ND	ND	ND
Camper Bazar- Deendayal Ashram	14.11.2013	9.10	42.73	10.17	ND	ND	ND
Near Aralia-II Deep TW	15.11.2013	6.26	33.24	ND	ND	ND	ND
Pratapgarh - Sadhu Tilla	16.11.2013	14.20	47.32	11.67	ND	ND	ND
Near Pragati School	18.11.2013	17.22	51.60	12.08	ND	ND	ND
Near Kali bari Sadhu Tilla	20.11.2013	21.2	57.6	12.4	ND	ND	ND
Near Sishu Vidya Mandir Nursery School (Aralia)	21.11.2013	27.8	73.6	14.6	ND	ND	ND
Near West Champamura School (Champamura)	22.11.2013	24.5	68.2	10.7	ND	ND	ND
Near Vidhyasagar School (Bankumari bazaar)	23.11.2013	20.6	63.4	11.2	ND	ND	ND
Near Vivekananda School (Bardowali)	25.11.2013	17.2	68.3	11.4	ND	ND	ND
Near SD Mission (Sarbadharma Ashram)	26.11.2013	19.1	72.6	14.2	ND	ND	ND
Near Cold Store (Dasaratdeb Stadium)	27.11.2013	15.8	65.3	10.6	ND	ND	ND
Near Badharghat School (Dukli)	28.11.2013	20.4	67.2	12.7	ND	ND	ND
Near AMC Sector Office (Ward No. 27)	29.11.2013	14.5	60.6	10.3	ND	ND	ND
Standard		60.0	100.0	80.0	80.0	4.0 (1 hr. limit)	1.0

(Source: Monitoring data as a part of NERCCDIP, Agartala, 2013)

6. Surface Water

33. The State of Tripura is well endowed with surface water resources. As many as ten major rivers are reported to generate an annual flow of 793 million m³ of water. All rivers are rain-fed and ephemeral in nature. All major rivers originate from hill ranges and show a typical drainage pattern called *trellis*, except a few instances of dendrite pattern.

34. **Haora River.** The Haora River originates from Baramura range and flows westerly via Agartala to Bangladesh. The total length of the river is 53 km. The quality of raw and treated water from Haora River is measured by the Drinking Water and Sanitation Department (DWSD.). Results of water quality analysis conducted in 18 June 2010 is shown in **Table 2** below. The physico-chemical analysis of the water of Haora River shows that iron levels (raw water) are more than the prescribed standard. All other parameters are within the prescribed limits. After Agartala, Haora River flows to Bangladesh, where it is used mainly for irrigation purposes.

Table 3: Surface Water Quality of Haora River – Raw & Treated (Date of Sampling: 18 June 2010)

Parameters	Raw Water	Treated water	Desired Limit (Drinking water BIS 2012)	Permissible Limit (Drinking water BIS 10500: 2012)
Temperature (°C)	31.0	-	-	-
Physical appearance	U	U	U	U
Colour in Hazen unit	<5	<5	5	25.0
Turbidity in NTU	0.2	0.2	5	10.0
Taste & Odour	A	A	A	A
pH - value	7.2	7.0	6.5 – 8.5	No relaxation
Total Alkalinity in mg/l as CaCO ₃	72.0	56.0	200.0	600.0
Total Hardness in mg/l as CaCO ₃	56.0	50.0	300.0	600.0
Total Iron in mg/l as Fe	2.986	0.034	0.3	1.0
Chloride in mg/l as Cl	12.0	13.0	250.0	1000.0
Total Solid in mg/l	-	71.5	5000.0	No guideline
Total dissolved solid in mg/l	82.55	BDL	500.0	2000.0
Total suspended solid in mg/l	-	71.5	25.0	100.0
Residual Chlorine as Cl in mg/l	-	0.2	0.2	No relaxation
Nitrate in mg/l as NO ₃	2.984	BDL	45.0	100.0
Arsenic in mg/l as As	BDL	BDL	0.05	No relaxation
Sulphate in mg/l as SO ₃	36.48	34.16	200.0	400.0
Calcium in mg/l as Ca	18.2	11.2	75.0	200.0
Magnesium in mg/l as Mg	1.3	5.3	30.0	150.0
Electrical Conductivity in µs	127.0	110.0	-	-
Total Fluoride in mg/l as F	0.256	0.056	1.0	1.5
Total Acidity in mg/l	4.0	6.0	<12	<12
Free Carbon dioxide in mg/l	5.0	3.0	-	-
Dissolved oxygen in mg/l	6.8	7.2	≥6.0	≥6.0

Note: BDL = below detection limit; mg/L = milligram per liter; U = unobjectionable; A = agreeable; Desired Limit = Bureau of Indian Standard (BIS) for Drinking Water (undesirable effects expected when exceeded); Permissible Limit = BIS for Drinking Water in absence of alternate source (beyond permissible limit is not allowed).

BIS: Bureau of Indian Standard

Source: Drinking Water and Sanitation Department, Government of Tripura.

35. Later in 2011 extent of pollution of Haora River was studied by the Tripura State Pollution Control Board. Results are shown in Table below. Results indicate that Haora River water is contaminated with discharge sewerage within city limit. Level of coliform count and BOD are high and above the standard.

Table 4: Haora River water quality at different locations

Parameters	Locations			Standard Value (Surface River Water)
	Point of origin of Haora River	Near Chandrapur Agartala	Near Bangladesh Boarder	
Temperature (°C)	28.5	30.0	30.5	-
Total dissolved solid in mg/l	156	174	220	500
Total suspended solid in mg/l	26	46	180	
pH - value	7.65	7.34	8.10	6.5 -8.5
Colour in Hazen unit	2.5	10.2	12.6	10
Turbidity in NTU	5	26	38	-

Parameters	Locations			Standard Value (Surface River Water)
	Point of origin of Haora River	Near Chandrapur Agartala	Near Bangladesh Boarder	
Total Alkalinity in mg/l as CaCO ₃	69.34	120.0	143.02	-
Dissolved oxygen mg/l	7.2	6.24	5.6	6.0
Biochemical Oxygen Demand mg/l	1.9	3.5	8.6	3.0
Chemical Oxygen Demand mg/l	8.0	22.0	39.0	-
Total Coliform (MPN/100 ml)	110	540	1800	500
Phosphates mg/l	0.010	0.020	0.065	-
Total Hardness in mg/l as CaCO ₃	59.55	84.36	178.65	300
Calcium in mg/l as Ca	15.91	23.86	35.79	80.10
Magnesium in mg/l as Mg	4.8	6.02	21.63	24.28
Chloride in mg/l as Cl	7.2	9.6	24	250
Nitrate in mg/l as NO ₃	0.02	0.025	0.060	20
Nitrite in mg/l	0.01	0.035	0.040	-
Ammoniacal Nitrogen mg/l	Nil	0.016	0.025	1.2

Source: Pollution Control Board) http://agartalacity.tripura.gov.in/PDF/Septage_Management.pdf

36. Recently DWSD. carried out monitoring for Haora River raw water and treated water. Results are depicted in Table below. Results indicate that treated water is suitable for drinking except high concentration of residual chlorine.

Table 5: Raw & Treated Water Quality of Haora River (2014)

Parameters	Raw Water	Treated water from Present WTP	Desired Limit (Drinking water BIS 2012)	Permissible Limit (Drinking water BIS 2012)
Physical appearance	Turbid	Unobjectionable	Unobjectionable	
Colour in Hazen unit	-	<5	5	25.0
Turbidity in NTU	261	1.02	5	10.0
Taste & Odour	Unobjectionable	Unobjectionable	A	A
pH - value	7.24	7.0	6.5 – 8.5	No relaxation
Total Alkalinity in mg/l as CaCO ₃	80.0	58.0	200.0	600.0
Total Hardness in mg/l as CaCO ₃	62.0	56.0	300.0	600.0
Total Iron in mg/l as Fe	2.874	0.033	0.3	1.0
Chloride in mg/l as Cl	10.0	11.0	250.0	1000.0
Residual Chlorine as Cl in mg/l	-	0.5	0.2	No relaxation
Nitrate in mg/l as NO ₃	-	0.392	45.0	100.0
Arsenic in mg/l as As	-	BDL	0.05	No relaxation
Sulphate in mg/l as SO ₃	-	38.91	200.0	400.0

Source: DWS Data on River Haora, date of sampling 27.05.2014

7. Groundwater

37. Surveys carried out by the Central Ground Water Board (CGWB) reveal that the aquifer system in the Agartala possesses good potential. The depth of the water table in both pre-monsoon and post-monsoon seasons range between 2 to 6 m with net seasonal fluctuations

ranging between 1 to 2 m. In GAPA, the depth of water level for shallow aquifer was observed to be in the range of 1 to 5 meter below ground level (mbgl), while the depth to water level in the deeper aquifers was observed between 1 to 7 mbgl. The pattern of pre-monsoon water table contours in Agartala reveals that the master slope of the ground water is towards West.

38. Hydrological surveys revealed that the valleys of Tripura have three to four major aquifers within 259 m in depth. Data from the CGWB² shows annual replenishable groundwater resource is 2.19 billion cubic meters (BCM) and the net annual groundwater availability is 1.97 BCM. It also shows that 0.17 BCM is drafted annually thus the groundwater is not over exploited and not critical.

39. Records of groundwater quality monitoring from DWSD. (Table 5) show raw groundwater quality, which supply directly to households in Agartala. The quality does not conform to the set norms of the BIS. It has been noted that iron levels in all the deep tube wells are above the desired and permissible limits. In few locations, levels of turbidity, colour, fluoride, and dissolved oxygen are above the permissible limits.

Table 6: Deep Tube Wells Ground Water Quality (Date of Sampling: 10th February 2009)

Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	GW-9	Desired Limit	Permissible Limit
Temperature (°C)	23	23	23	23	23	23	23	23	23	-	-
Physical appearance	O	U	U	U	O	U	U	U	U	U	U
Colour in Hazen unit	>25	<10	<10	<5	>50	<5	<10	<5	<5	5	25.0
Turbidity in NTU	32.1	8.9	6.1	1.3	76.0	2.6	4.8	3.7	1.1	5	10.0
Taste & Odour	A	A	A	A	A	A	A	A	A	A	
pH- value	6.49	6.35	6.74	6.31	7.05	6.34	6.28	6.47	6.15	6.5 – 8.5	No relaxation
Total Alkalinity in mg/l as CaCO ₃	92.0	84.0	86.0	88.0	72.0	90.0	76.0	84.0	72.0	200.0	600.0
Total Hardness in mg/l as CaCO ₃	62.0	56.0	58.0	50.0	44.0	42.0	58.0	20.0	44.0	300.0	600.0
Total Iron in mg/l as Fe	4.24	5.12	4.88	4.46	5.86	4.32	4.38	4.47	4.15	0.3	1.0
Chloride in mg/l as Cl	13.0	13.0	13.5	8.5	9.0	8.5	9.2	9.5	18.0	250.0	1000.0
Total Solid in mg/l	89.9	81.4	80.1	86.0	64.6	78.7	63.8	78.1	81.4	5000.0	No guideline
Total dissolved solid in mg/l	89.7	81.3	79.9	85.8	64.3	78.6	63.7	78.0	81.3	500.0	2000.0
Total suspended solid in mg/l	0.16	0.15	0.16	0.25	0.28	0.10	0.15	0.10	0.15	25.0	100.0
Residual Chlorine as	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	Not Found	0.2	-

² Data accessed from CGWB website (<http://cgwb.gov.in>) on 23-February-2011.

Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	GW-9	Desired Limit	Permissible Limit
Cl in mg/l											
Nitrate in mg/l as NO ₃	3.06	0.77	0.66	0.15	3.12	0.58	0.78	1.34	0.65	45.0	100.0
Arsenic in mg/l as As	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05	No relaxation
Sulphate in mg/l as SO ₃	12.2	0.74	1.11	BDL	25.56	2.96	2.56	2.96	0.56	200.0	400.0
Calcium in mg/l as Ca	12.0	4.0	11.2	8.0	8.8	6.4	5.6	6.4	3.2	75.0	200.0
Magnesium in mg/l as Mg	7.7	11.1	7.2	7.2	5.3	6.3	7.29	0.97	8.7	30.0	150.0
Electrical Conductivity in μ s	138	125	123	132	99	121	98.0	120	106	-	-
Total Fluoride in mg/l as F	0.04	BDL	0.081	0.28	BDL	0.16	BDL	0.08	BDL	1.0	1.5
Total Acidity in mg/l	32.0	32.0	18.0	64.0	12.0	60.0	40.0	46.0	66.0	<12	<12
Free Carbon dioxide in mg/l	58.0	82.0	20.9	180.0	22.0	86.0	48.0	124.0	90.0	-	-
Dissolved oxygen in mg/l	6.2	5.8	9.0	3.8	9.1	5.1	5.8	5.5	5.3	\geq 6.0	\geq 6.0

Note: BDL = below detection limit; mg/L = milligrams per liter; O = objectionable; U = unobjectionable; A = agreeable

Source: Drinking Water and Sanitation Department, Government of Tripura

Locations: GW-1: Deep Tube Well (DTW) at West Pratapgarh – Raw water; GW-2: DTW at Srinagar- Raw water; GW-3: DTW at Sripally – Raw water; GW-4: DTW at Beltali – Raw water; GW-5: DTW at Gajaria – Raw water; GW-6: DTW at Bairagitila – Raw water; GW -7: DTW at Siddhiashram (Pranavananda School)- Raw water; GW-8 : DTW at Subhashpally – Raw water; GW-9: DTW at Panchamukh – Raw water

40. New deep tube well water qualities have been tested by DWSD. at two locations. Results indicate that in both the samples concentration of iron is very high and much above the desirable and permissible limits for drinking water. Hence treatment (removal of iron) is required before supply.

Table 7: Recent data ground water quality from new deep tube well

Parameters	New DTW at Jogendranagar Ward No 32	New DTW at Pratapgarh- I Ward No 31	Desired Limit (Drinking water BIS 2012)	Permissible Limit (Drinking water BIS 2012)
Date of sampling	13.08.2013	26.09.2013		
Temperature ($^{\circ}$ C)	29	27.7	-	-
Physical appearance	Unobjectionable	Unobjectionable	U	U
Colour in Hazen unit	>25	>25	5	25.0
Turbidity in NTU	124.0	26.0	5	10.0
Taste & Odour	Agreeable	Agreeable	A	
pH- value	6.54	6.67	6.5 – 8.5	No relaxation
Total Alkalinity in mg/l as CaCO ₃	64.0	90.0	200.0	600.0
Total Hardness in mg/l as CaCO ₃	46.0	52.0	300.0	600.0
Total Iron in mg/l as Fe	6.092	4.166	0.3	1.0
Chloride in mg/l as Cl	10.0	6.5	250.0	1000.0

Parameters	New DTW at Jogendranagar Ward No 32	New DTW at Pratapgarh- I Ward No 31	Desired Limit (Drinking water BIS 2012)	Permissible Limit (Drinking water BIS 2012)
Date of sampling	13.08.2013	26.09.2013		
Total Solid in mg/l	-	-	5000.0	No guideline
Total dissolved solid in mg/l	81.9	91.0	500.0	2000.0
Total suspended solid in mg/l	-	-	25.0	100.0
Residual Chlorine as Cl in mg/l	Not Found	Not Found	0.2	-
Nitrate in mg/l as NO ₃	1.326	1.096	45.0	100.0
Arsenic in mg/l as As	BDL	BDL	0.05	No relaxation
Sulphate in mg/l as SO ₃	24.0	30.08	200.0	400.0
Calcium in mg/l as Ca	8.0	11.2	75.0	200.0
Magnesium in mg/l as Mg	6.31	5.83	30.0	150.0
Electrical Conductivity in μ s	126	140	-	-
Total Fluoride in mg/l as F	1.342	0.198	1.0	1,5
Total Acidity in mg/l	-	-	<12	<12
Free Carbon dioxide in mg/l	Escaped	Escaped	-	-
Dissolved oxygen in mg/l	7.8	7.6	\geq 6.0	\geq 6.0

Source: DWS (PWD), Agartala, Tripura, 2013

B. Biological Resources

41. There are no protected areas, wetlands, mangroves, or estuarines in or within the subproject area.

42. The Shipahijala Wild Life Sanctuary situated in Bishalgarh Development Block,³ is located at a distance of 28 km from Agartala city. The subproject components are not expected to have any direct, indirect or cumulative effect/impact on the sanctuary.

43. Forest map of Tripura shown in **Figure 2**. It shows that there are no forest areas nearby the STP site as the area is a shrub land and has been developed as a landfill facility.

44. **Flora.** There are no designated forest areas or sanctuaries within the GAPA boundaries. The Tripura State Biodiversity Action Plan has identified pockets of rich biodiversity as conservation hotspots. None of the identified hotspots are located within the GAPA boundaries. While a number of endangered primate species are found within Tripura state, none of them are reported within the GAPA.

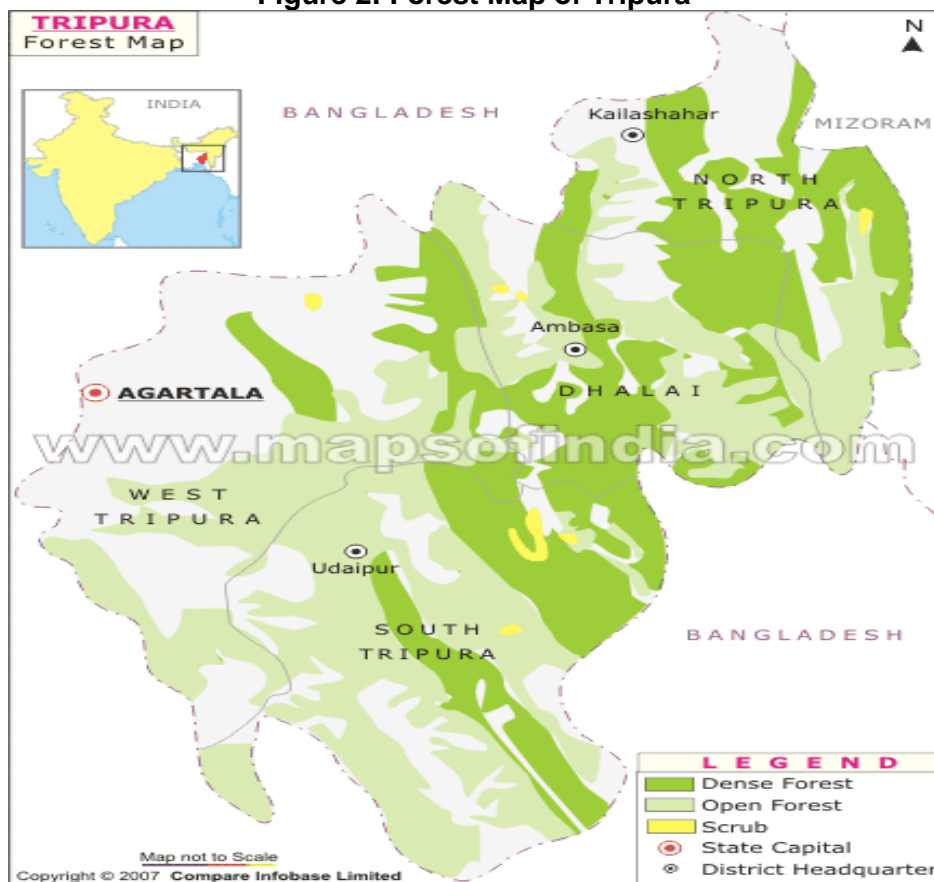
45. A phyto diversity survey and analysis was carried out at the subproject area in GAPA using the Shannon-Wiener Diversity Index, and evenness with the Evenness index. The indices show that the diversity in terms of flora is not significant, and the indices reveal that all locations fall short of that a primary forest. The trees are mostly timber yielding. While there exist some

³ The sanctuary covers an area of 18.53 sq. km, and possesses rich diversity of wild life particularly birds (migratory birds during winter seasons) and primates.

species in locations away from the inhabited areas, that are important, they are not unique. There are no rare/endangered tree/plant species identified in the subproject area.

46. **Fauna.** Existence of wild/threatened/extinct fauna has not been reported in GAPA. Only domestic animals such as pigs, dogs, cows, buffalos, cats and goats are present in the subproject area.

Figure 2: Forest Map of Tripura



C. Economic Development

1. Land Use

47. Total area of GAPA is 9,200 hectares (ha), out of which 3,125 ha are classified as developed area (residential, commercial, industrial, government and semi-government, recreation-park, public facilities, and circulation). The remaining 6,075 ha are water bodies, plantations, defence area, vacant land and agricultural area. The subproject area is in the developed area of GAPA.

2. Commerce, Industry and Agriculture

48. Tripura's gross state domestic product for 2004 is estimated at \$2.1 billion in current prices. The economy of Tripura is agrarian. More than 50 per cent of its population depends on agriculture for livelihood and contribution of agriculture and allied activities.

49. Tripura is characterised by low income, overwhelming percentage of population below the poverty line, income leakage, and unemployment. The state is predominantly rural in character (85.29%). Average land holding size is 0.97 hectare. 90% of the cultivators are either small or marginal.

50. **Trade and Commerce.** There are two small industrial estates, with a total number of 36 industrial units and with a total capital investment of INR 56.575 million. Other than the 2 industrial estates, there are 17 other significant industries in Agartala. These industries, as per records, are not in the category of large and medium industries.

51. Wholesale trade in the city is functioning mostly in the Gole Market area and spreads haphazardly mixing with the retail trade. There are 9 markets maintained by AMC within erstwhile Municipal limits, of which, Battala and Maharaj Ganja Bazaar are the main service and distribution centres of Greater Agartala.

52. **Agriculture.** Agriculture and allied activities is the mainstay of the people of Tripura and provides employment to about 64% of the population. There is a preponderance of food crop cultivation over cash crop cultivation in Tripura. At present about 62% of the net sown area is under food crop cultivation. Paddy is the principal crop, followed by oilseed, pulses, potato and sugarcane. Tea and rubber are the important cash crops of the State. Handicraft, particularly hand-woven cotton fabric, wood carvings and bamboo products, are also important. The subproject area is not located in agricultural lands.

3. Infrastructure

53. **Water Supply.** The people of Agartala get their water from piped water supply systems operated by the Public Health Engineering Department (PHED), private and community wells and the two rivers that run through GAPA. Although about 70% of the population of the area is served by central water supplies, water is available for only a few hours a day in most parts of GAPA. PHED's water supply systems have two main sources, comprising the Haora River and groundwater. Distribution of water is partly through distribution reservoirs and partly through direct pumping. Major parts of the distribution system pipelines are obstructed by iron deposits. The water supply system is unmetered. The major problems with the water supply system are under utilization of the capacity of the two treatment plants, under production from the ground water sources, ineffective treatment for iron removal, absence of proper disinfection and a substantial amount of unaccounted for water (UFW), presently about 35% of production.

54. **Sewerage and Sanitation.** Agartala city is not covered by an underground sewerage system at present. Although about 90% of households have cistern or pour flush latrines, about 10% use pit latrines. Open defecation is widespread among lower income group people especially those living along rivers and drains and in rural areas. The ground water table being very high there is a high risk of contamination of wells.

55. **Drainage.** Although GAPA has numerous storm water drains and two major rivers flowing through it, the city suffers from recurrent flood problems. During normal rainfall of about 3 to 4 hours, the central part of Agartala gets flooded. Although there is adequate fall in most parts of GAPA to support a gravity drainage system, some parts of the city are on low-lying land and drainage problem is more evident. The most severe problems arise when a combination of tidal conditions in the Brahmaputra basin and high rainfall cause the waters in the Haora and Katakhal Rivers to be higher than the city. Several pumps have been provided to lift the water

out of the city during these seasons. Most of the main drains are masonry-lined, but the feeder drains are earth-lined and in a poor condition with silt and vegetation choking them.

56. **Industrial Effluents.** Industries within the city area have no separate treatment facility. The industries are required to treat their own effluents before disposal and are not allowed by AMC to connect to the local drainage network.

57. **Solid Waste.** An estimated 200 tons/day of solid waste is generated within the city. Only 50% of the waste generated is collected and transported. The waste dumped haphazardly along roads, drains and open areas leading to unhygienic conditions. The collected waste is dumped at Hapania, situated in village Madhupur about a kilometer away from the Dr Ambedkar hospital.

58. **Transportation.** The Assam – Agartala – Sabroom Road (NH-44) connects Agartala with Silchar, Guwahati and other towns of Assam. The total length of roads in the city is approximately 390 km with a road density of about 4.2 km per km². The road system is planned, well defined and geometrical in the central core area, following a gridiron pattern. In the outer areas, it is more haphazard and ill planned. The mixed traffic and encroachments along roads like the Motor Stand to Subhash Market road, Hariganga Basak Road up to the Post Office Chowmani etc., leads to high levels of congestion in the city especially in the central business district area. The presence of cycle rickshaws adds to the congestion.

D. Social and Cultural Resources

59. **Demography.** The total estimated population of AMC limits as per 2011 census is 399,668. Population density of GAPA increased to 41% person per hectare in the year 2001 in compared to 38% in 1991. There are two major racial groups, namely the Indo-Aryans represented by the Bengalis and the Indo-mongoloid represented by communities like the Tripuris, the Reangs, the Noatis, the Kukis, the Halams, the Chakma, the Mogh and the Lushai. The percentage of Scheduled Tribe population to the total city population is estimated to be around 4%. The scheduled tribe populations living in the city is well integrated with the mainstream and is gainfully employed. The literacy rate in Agartala is the highest among the localities of Tripura.

60. **Health and Educational Facilities.** There are good educational facilities in Tripura state, which serve both Agartala urban people and inhabitants of surrounding villages and towns in the hinterland. There are about 21 colleges in Agartala comprising Medical college, Degree college, Nursing college, Polytechnic college and Open university. Percentage of literacy according to 2011 census is 93.88, higher than the national literacy rate.

61. There are also 9 nos. nursing home and hospital at Agartala. One Government Medical College is also located at Agartala.

62. **History, Culture, and Tourism.** The city has a historical back ground. The ancient capital of the princely State 'Swadhin Tripura' was at Rangamati (Udaipur, South Tripura) by the bank of the river Gomti and in 1760 A.D., It was shifted by the Maharaja Krishna Manikya to the site of old Agartala by the bank of river Haora and was named 'Haveli'. The Capital city of Agartala was founded in 1838 AD by Maharaja Krishna Kishore Manikya (1830-49 A.D.).

63. Agartala is a city of many tourist attractions. These include palaces, temples, wildlife sanctuaries and many others. The most popular tourist place in Agartala is the Tripura Sundari Temple, popularly known as Matabari that is located at a distance of 55 km from the city. Other

places of interest are, the Ujjayanta Palace, located within the city, Neer Mahal located 53 km from the city, Unnakoti- a pilgrimage center with rock carvings and murals. The tourism industry in Agartala city is growing at a fast pace. The subproject area is not located within any historically-, culturally-, archaeologically- or architecturally-significant or tourists area.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

64. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. The primary impact areas are (i) site for STP and approach road; (ii) main routes/intersections which will be traversed by construction vehicles and operation equipment/ vehicle; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire GAPA area outside of the delineated primary impact area; and (ii) entire West Tripura district in terms of over-all environmental improvement.

65. The ADB Rapid Environmental Assessment (REA) Checklist for Sewage Treatment was used to screen the subproject for environmental impacts and to determine the scope of the IEE investigation. The completed REA Checklist is found in **Appendix 5**. Based on the checklist, there are no sensitive and protected areas in and around the proposed facilities. The subproject's potential impacts will occur during construction and operations phases. During construction phase, there is (i) need to dispose/utilize moderate quantities of cut soil, (ii) increase in dust level due to earth movement, (iii) traffic along the routes for transporting materials, and (iv) risk in workers' health and safety as the STP site is adjacent the active SLF cells. Potential impacts due to operation of the STP include (i) generation of solid waste from cleaning of sewer/septage collection systems, (ii) sludge from STP, and (iii) effluent, if only partially treated, can cause contamination of soil, groundwater, and surface water. Use of hazardous chemicals for wastewater treatment, such as strong acids and bases for pH control, chlorine or other compounds used for disinfection, etc., may pose occupational health and safety risks.

A. Pre-construction – Impacts due to Location and Design

66. A number of impacts and their significance have been reduced by amending the designs and considering the environmental criteria for subproject selection specified in the EARF thus no impacts were identified as being due to the subproject design.

67. There are no environmentally-sensitive areas (protected areas, wetlands, mangroves, or estuarines) or any historically-, culturally-, archaeologically- or architecturally-significant sites within or adjacent to the STP location. The site has already been developed due to construction of the SLF. Trees, vegetation (mostly shrubs and grasses), and animals are those commonly found in urban areas. Access to the site is thru existing roads thus no impacts were identified as being due to the subproject location.

68. **Encroachment into private properties, forestland and others.** The STP will be located outside the main city and within the existing AMC SLF in Debendranagar therefore no additional land will be required. The site has boundary walls and no adjacent habitation is present. Only there is existence of defence land nearby the SLF site. Proper dialogue is required with defence authority.

69. No forest area is involved in the subproject. Forest Clearance from the Tripura Environment and Forest Department will be not required. In case tree felling will be required as per detailed design, permission will be taken up from Forest Department.

70. **Utilities.** No utilities existing within proposed STP site.

71. **Social and Cultural Resources.** For this subproject, excavation will occur in open and developed area. The subproject area is not within or adjacent to any historically-, culturally-, archaeologically- or architecturally-significant or tourists site, so there is a very low risk of such impacts. Nevertheless, DSMC/SIPMIU will:

- Provide to the construction contractors the protocols/guidelines developed in NERCCDIP Project 2 in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.

72. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the subproject sites. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals on water bodies, swamps, or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings.

73. **Site selection of sources of materials.** Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be sites already permitted by Mining Department. If other sites are necessary, these would be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval. If additional quarries will be required after construction is started, then the construction contractor shall use the mentioned criteria to select new quarry sites, with written approval of AMC.

B. Impacts due to Construction

74. **Construction method.** The works will involve earth-moving and excavation; mostly those involved in common and simple construction works. Materials will be brought in on trucks and offloaded by hand. Excavation for construction of different units of STP will be done by backhoe and supplemented by manual digging. Excess spoils generated will be utilized as site, since topography of the site is undulating and which required cutting & filling.

1. Screening of No Significant Impacts

75. The construction work is expected not to cause major negative impacts, mainly because:

- (i) Most of the activities will be within the scrub land of Debendranagar. No as such significant impact on biodiversity is expected. Only few tree felling may be required;
- (ii) Project site located on an government-owned land which is not occupied or used for any other purpose;
- (iii) Overall construction program will be relatively short and is expected to be completed in 18 months with activities to conducted by small teams and specified location so most impacts will be localized and short in duration; and
- (iv) Most of the predicted impacts associated with the construction process. However the routine nature of the impacts means that most can be easily mitigated and the impacts are clearly a result of the construction process rather than the design or location, as impacts will not occur if excavation or other ground disturbance is not involved.

76. As a result, there are several aspects of the environment which are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in **Table 7**. These environmental factors are screened out presently but will be assessed again during detailed design.

Table 8: Fields in which construction is not expected to have significant impacts

Field	Rationale
Topography, Drainage, and Natural Hazards	Activities are not large enough to affect these features.
Geology, Geomorphology, Mineral Resources, and Soils	Activities are not large enough to affect these features. No mineral resources in the subproject site.
Climate	Activities are not large enough to affect this feature.
Air Quality	Short-term production of dust is the only effect on atmosphere, but no as such locality nearby the subproject area
Geohydrology and Groundwater	Activities will not be large enough to affect these features
Protected Areas	No protected areas nearby the subproject area
Flora and Fauna	No reported rare or endangered species.
Land Use	No change in major land use, STP site within SLF.
Socio-economic	Subproject site is located within AMC land thus no resettlement impact
Commerce, Industry, and Agriculture	Activities are not large enough to affect these features
Population	Activities are not large enough to negatively affect the population. Once subproject is completed and operational, people of Agartala will be benefited
Health and education facilities	Activities are not large enough to affect this feature. There is positive health impact due to improved septage management.
Historical, Archaeological, Paleontological, or Architectural sites	No scheduled or unscheduled historical, archaeological, paleontological, or architectural sites

2. Anticipated Impacts and Mitigation Measures

77. During the construction phase, impacts mainly arise from the need to dispose moderate quantities of cut soil, increase in dust level due to earth movement, traffic along the routes for transporting materials and workers health and safety as the STP site is adjacent the active SLF cells. These are common impacts of construction, and there are well developed methods for their mitigation. For this subproject, the mitigation measures were based on the World Bank

Environmental, Health, and Safety (EHS) Guidelines and Government of India standard safety norms.⁴

78. **Sources of Materials.** Significant amount of gravel, sand, and cement will be required for this subproject. The construction contractor will be required to:

- (i) The material sources permitted by government;
- (ii) Verify suitability of all material sources and obtain approval of State Investment Program Management & Implementation Unit (SIPMIU); and
- (iii) Submit to DSMC on a monthly basis documentation of sources of materials.

79. **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

- (i) Consult with SIPMIU/DSMC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
- (ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
- (iii) Avoiding the need to stockpile on site;
- (iv) Use tarpaulins to cover sand and other loose material when transported by trucks; and
- (v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

80. **Surface Water Quality.** Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate nearby stream. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

- (i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with SIPMIU/DSMC on designated disposal areas;
- (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (v) Dispose any wastes generated by construction activities in designated sites; and
- (vi) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

81. **Noise Levels.** Increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures. The construction contractor will be required to:

⁴ Occupational Health and Safety of employees working only in factories and mines have been specifically covered in GOI laws. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection.

- (i) Plan activities in consultation with SIPMIU/DSMC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
- (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
- (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

82. **Generation of Spoil and disposal.** Excavated soils will be utilized for land development and as cover materials in the SLF active cells.

83. **Landscape and Aesthetics.** The construction works will produce excess excavated, excess construction materials, and solid waste such as wood, trees and plants, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Prepare and implement Waste Management Plan;
- (ii) Avoid stockpiling of excess excavated soils and specifically use of the same;
- (iii) Recover used oil and lubricants and reuse or remove from the sites;
- (iv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (v) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (vi) Request SIPMIU/DSMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

84. **Surface and Groundwater Quality.** Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. To ensure that water will not pond in pits and voids near subproject site, the construction contractor will be required to conduct excavation works on non-monsoon season.

85. **Accessibility.** Hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (ii) Schedule transport and hauling activities during non-peak hours;
- (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (iv) Keep the site free from all unnecessary obstructions;
- (v) Drive vehicles in a considerate manner;
- (vi) Coordinate with Govt. Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

86. **Socio-Economic – Income.** The subproject components will be located in Government land. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

- (i) Leave spaces for access between mounds of soil;
- (ii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

87. **Socio-Economic – Employment.** Manpower will be required during the 18-months construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

- (iii) Employ at least 50% of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
- (i) Secure construction materials from local market.

88. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

- (i) Designate a safeguard focal person and undertake safeguards orientation by SIPMIU/ DSMC
- (ii) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training⁵ for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- (iii) Strict compliance of H&S plan and requirements of wearing personal protective equipment (PPE) during work hours;
- (iv) Provide specific guidance for suitable PPE for every on-site work assignment.
- (v) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- (vi) Provide medical insurance coverage for workers;
- (vii) Secure all installations from unauthorized intrusion and accident risks;
- (viii) Provide supplies of potable drinking water;
- (ix) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- (x) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;

⁵ Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

- (xi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- (xii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (xiii) Ensure moving equipment is outfitted with audible back-up alarms;
- (xiv) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
- (xv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

89. **Maintaining Core Labour Standard.** The Contractor and SIPMIU are responsible for ensuring that international CLS⁶ –as reflected in national labour laws and regulations are adhered to. SIPMIU is ultimately responsible for monitoring compliance with national labour laws and regulations, provided that these national laws are consistent with CLS. ADB will carry out due diligence – during loan review missions - to ensure that executing and implementing agencies and contractors comply with applicable (national) core labour standards and labour laws. SIPMIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labour laws and core labour standards on: (a) prohibition of child labour as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labour; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites. These will be monitored as part of the project's safeguards reporting requirements.

90. **Community Health and Safety.** Project site is located at isolated area; hence health and safety risk to community is minimum. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan routes to avoid times of peak-pedestrian activities.
- (ii) Liaise with SIPMIU/DSMC in identifying risk areas on route cards/maps.
- (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- (iv) Provide road signs and flag persons to warn of dangerous conditions, at the entry point of site from the road.

91. **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

⁶ Core Labor Standards (CLSs) are a set of four internationally recognized basic rights and principles at work: (i) freedom of association and the right to collective bargaining; (ii) elimination of all forms of forced or compulsory labor; (iii) effective abolition of child labor; and (iv) elimination of discrimination in respect of employment and occupation.

- (i) Consult with SIPMIU/DSMC before locating project offices, sheds, and construction plants;
- (ii) Minimize removal of vegetation and disallow cutting of trees;
- (iii) Provide water and sanitation facilities for employees;
- (iv) Prohibit employees from poaching wildlife and cutting of trees for firewood;
- (v) Train employees in the storage and handling of materials which can potentially cause soil contamination;
- (vi) Recover used oil and lubricants and reuse or remove from the site;
- (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (ix) Request SIPMIU/DSMC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

92. **Social and Cultural Resources.** For this subproject, excavation will occur at specific isolated location, so it could be that there is a moderate risk of such impacts. Nevertheless, the construction contractor will be required to:

- (i) Strictly follow the protocol for chance finds in any excavation work;
- (ii) Request SIPMIU/DSMC or any authorized person with archaeological/historical field training to observe excavation;
- (iii) Stop work immediately to allow further investigation if any finds are suspected; and
- (iv) Inform SIPMIU/DSMC if a find is suspected, and take any action they require ensuring its removal or protection in situ.

C. Impacts due to O&M

93. Once the system is operating, the cesspool equipment will operate with routine maintenance. Potential impacts due to operation of the STP includes generation of solid waste from cleaning of sewer collection systems, sludge from STP, and effluent, if only partially treated, can cause contamination of soil, groundwater, and surface water. Use of hazardous chemicals for wastewater treatment, such as strong acids and bases for pH control, chlorine or other compounds used for disinfection, etc., may pose occupational health and safety risks.

94. The solid wastes from the STP will be disposed in the SLF and effluent will be further treated in the SLF's leachate treatment plant therefore the impacts are not significant. The subproject will include development of O&M manuals which includes occupational health and safety. Therefore anticipated environmental impacts are mainly related to the construction period which can be minimized by the mitigating measures and environmentally-sound engineering and construction practices. O&M impacts can be avoided by ensuring operators are qualified and experienced, complying with national and state regulations, and implementing mitigation measures per O&M manual. **Appendix 6** shows the effluent standard. Sludge will be utilized (after drying) as manure for production of vegetables. Frequency of collection will be assessed after development of design.

D. Operation and Maintenance

1. Screening out areas of no significant impact

95. Because a septage management system should operate without the need for major repair and maintenance, there are several environmental sectors which should be unaffected once the system begins to function. These are identified in **Table 8** below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 9: Fields in which Operation and Maintenance of the Septage Treatment Plant Component is not Expected to have Significant Impacts

Field	Rationale
Climate	No impact expected
Wildlife, forests, rare species, protected areas	There are no wildlife, forests, rare species, and protected areas.
Coastal resources	Agartala is not located in a coastal area.
Industries	Septage system is not linked to industry

96. O&M of the subproject will be the responsibility of DWS. A small number of people will be employed to operate and maintain the STP. DWS will employ local contractors to conduct repairs, and contractors should be required to operate the same kinds of Health and Safety procedures as used in the construction phase to protect workers and the public.

97. The system have a design life of 30 years, during which shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the STP and other equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

2. Anticipated Environmental Impacts and Mitigation Measures

98. **General.** The work will follow the same procedures during the construction stage. DWS needs to require its O&M contractor to:

- (i) Maintenance of Treatment Plant should be done as per supplier repairing guideline
- (ii) Prior to discharge, ensure compliance of Indian (Central Pollution Control Board) Effluent Discharge standard.
- (iii) Conduct work during non-monsoon period; and
- (iv) Cover construction material like cement to prevent dusts.

99. O&M Manual of the STP will be prepared at advance stage of construction before commissioning of system.

100. **Sludge and Wastewater Handling.** During operation of STP, sludge will be generated. Farmer can utilize sludge as manure after dewatering and drying. The details of the sludge management will be included in the O&M manual. Wastewater from the STP will be discharge into the SLF leachate treatment plant. DWS needs to require its O&M contractor to:

- (i) Land application of wastes with high dissolved solids concentrations is generally preferred over discharge to surface water subject to an evaluation of potential impact on soil, groundwater, and surface water resulting from such application; and
- (ii) Treat and dispose of reject streams, consistent with CPHEEO requirements.

- (iii) Ensure effluent complies the Indian standard for discharge of effluent in environment (**Appendix 6**).

101. **Hazardous Chemicals.** Septage treatment may involve the use of chemicals for neutralization. DWS needs to require its O&M contractor to:

- (i) Minimum storage of chemicals;
- (ii) Develop and implement a prevention program that includes identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures; and
- (iii) Develop and implement a plan for responding to accidental releases.

102. **Air Emissions.** Air emissions from the STP involve odour however, no impact is anticipated as it is located inside the SLF facility and there are no habitations near the area.

103. **Ecological Resources.** There are no significant ecological resources in or around GAPA as well as subproject area, so any repairs or maintenance work can be conducted without ecological impacts.

104. **Economic Development.** There are no major anticipated economic development impacts during O&M of the facilities.

105. The provision of an improved sanitation system is not expected to have direct economic benefits for business or industry, as service will only be provided to domestic users. However businesses will almost certainly benefit from the expected improvement in the health and well-being of their workforce as this should result in fewer days lost through illness, and overall increased productivity.

106. **Social and Cultural Resources.** Although there is a very low risk of discovering material of historical or archaeological importance during O&M.

107. The citizens of the Agartala city will be the major beneficiaries of the improved sanitation system, as they will be provided with a constant supply of better quality water, piped into their homes and as well as scientific septage management facility. In addition to improved environmental conditions, the subproject will improve the over-all health condition of the town as diseases of poor sanitation (such as diarrhoea and dysentery) will be reduced.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

108. The stakeholders are:
- (i) Residents, farmers (who can utilize STP sludge);
 - (i) Urban Development Department (UDD) as the Executing Agency;
 - (ii) Other government institutions whose remit includes areas or issues affected by the subproject (state and local planning authorities such as PWD, AMC);
 - (iii) Non-government organizations (NGOs) and community-based organizations (CBOs) working in the affected communities;
 - (iv) Other community representatives (prominent citizens, religious leaders, elders, women's groups);
 - (v) The beneficiary community in general; and
 - (vi) ADB, Gol, and Ministry of Finance.

B. Consultations and Disclosures Conducted

109. Discussion will be held with the local people during project design. Issues to be discussed are:

- (i) Awareness and extent of the project and development components;
- (ii) Benefits of the subproject for the economic and social upliftment of community;
- (iii) Labour availability in the subproject area or requirement of outside labour involvement; and
- (iv) Local disturbances due to construction works.

110. A training and awareness programme on Septage Management for Urban Local Body (ULB) Engineers, of the Government of Tripura was conducted in collaboration with the Government, Water and Sanitation Programme (WSP) of the World Bank, Consortium for DEWATS Dissemination (CDD) Society, International Water Management Institute (IWMI) and Asian Development Bank. The programme was conducted at Pragna Bhavan in Agartala during September 5th-6th, 2013. **Appendix 7** shows the training note.

111. English version of the EARF has been placed in the offices of AMC, DWS and SIPMIU. Begalee (local language) versions of the EARF and this IEE will be provided during workshops to ensure stakeholders understood the objectives, policy, principles, and procedures. A copy of the IEE will be disclosed in the project website.

C. Future Consultation and Disclosure

112. UDD significantly extended and expanded the consultation and disclosure process during implementation of NERCCDIP. They temporarily appointed an NGO to handle this key aspect of the programme. The NGO continuously (i) conducts a wide range of community development activities in relation to all subprojects in the city; and (ii) ensures the needs and concerns of stakeholders are registered and are addressed in subproject design.

- **Consultation during detailed design:**
 - ✓ Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary; and
 - ✓ Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.
- **Consultation during construction:**
 - ✓ Public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started
 - ✓ Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.
- **Project disclosure:**
 - ✓ Public information campaigns (via newspaper, TV and radio) to explain the project to the wider city population and prepare them for disruption they may experience once the construction program is underway;

- ✓ Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in local language;
- ✓ Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and
- ✓ Providing a mechanism through which comments can be made.

113. Based on ADB requirements, the following will be posted on ADB website: (i) this IEE, upon receipt; (ii) a new or updated IEE, if prepared, reflecting significant changes in the subproject during design or implementation; (iii) corrective action plan prepared during subproject implementation to address unanticipated environmental impacts and to rectify non-compliance to EMP provisions; and (iv) environmental monitoring reports, upon receipt.

VII. GRIEVANCE REDRESS MECHANISM

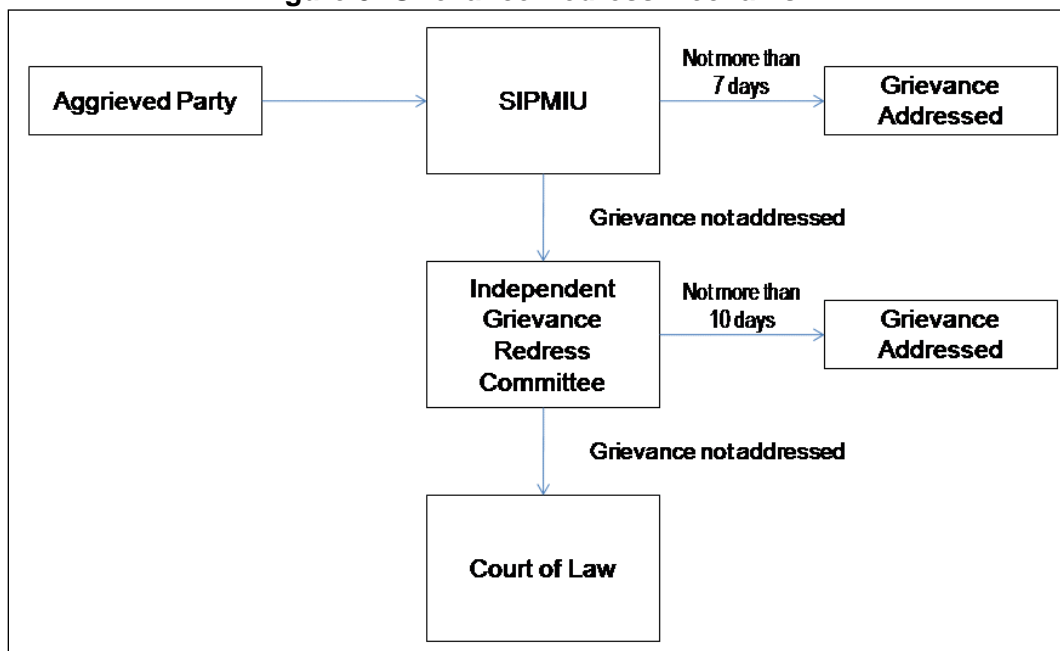
114. The grievance redress mechanism established in Projects 1 and 2 will be implemented for Project 3. Grievances of affected persons will first be brought to the attention of the SIPMIU. Grievances not redressed by the SIPMIU will be brought to the Independent Grievance Redress Committee (IGRC) set up to monitor project implementation in Agartala. The IGRC is chaired by the Secretary, Urban Development Department⁷ with representatives from the ULB, state government agencies, community-based organizations (CBOs) and NGOs. The GRC will determine the merit of each grievance, and resolve grievances within 10 days of receiving the complaint. Grievance not redressed by the IGRC will be referred to the appropriate courts of law. The DSMC will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. The grievance redress process is shown in **Figure 3**.

115. All costs involved in resolving the complaints will be borne by the SIPMIU. The GRCs will continue to function throughout the project duration.

116. **Appendix 8** shows grievance redress notification at website and process shown in local language.

117. **Appendix 9** shows The Grievance Registration/Suggestion Form in English and local language.

⁷ The Secretary, Urban Development Department with Chief Engineer Public Works Department, PWD (Road and Bridge, R & B), Chief Engineer PWD (DWS, Drinking water & Sanitation) and Chairman cum Managing Director, will chair the Independent Grievance Redress Committee (IGRC). The Project Director would be the Secretary of the Committee. The IGRC will be fully empowered to take decisions in all matters related to the Project, which will include financial and administrative approvals.

Figure 3: Grievance Redress Mechanism

VIII. ENVIRONMENTAL MANAGEMENT PLAN

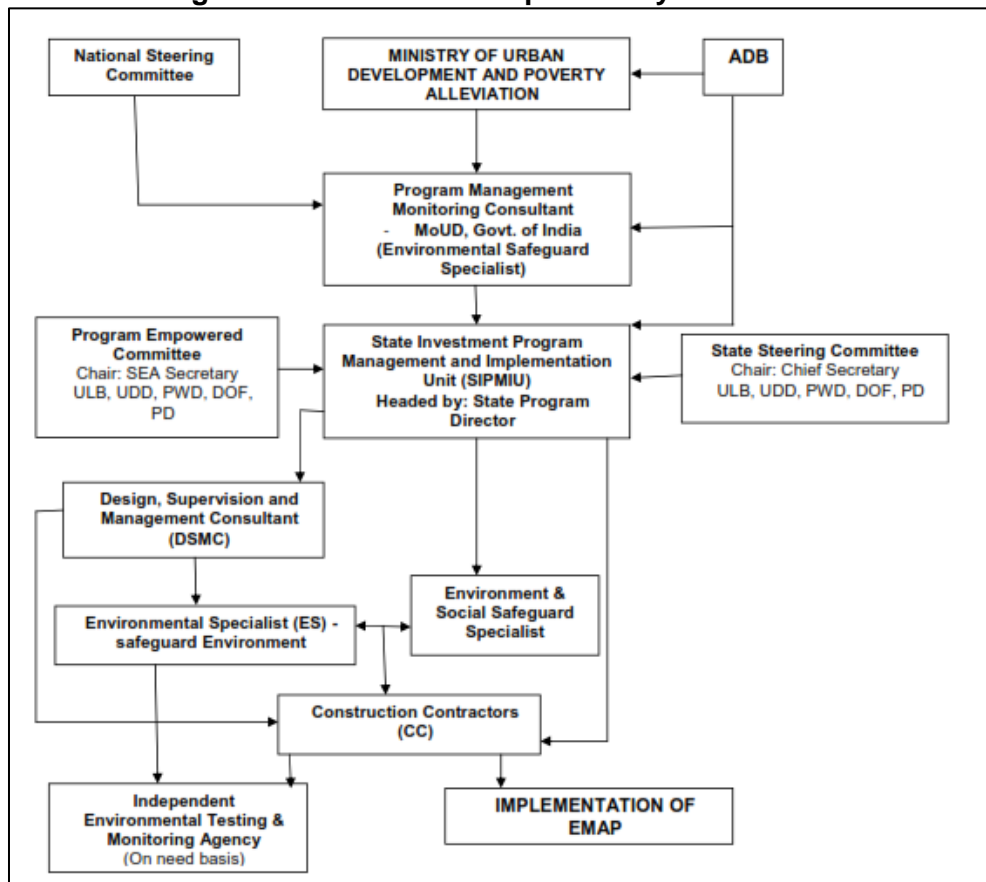
A. Institutional Arrangements

118. The main agencies involved in managing and implementing the subproject are:
- (i) The national-level Executing Agency (NEA) for the Investment Program is MOUD;
 - (ii) Investment Program Coordination Cell (IPCC) as Program Management Monitoring Consultant (PMMC) is established in MOUD. PMMC is responsible for overall management of the Investment Program in the city and they include social/environmental safeguard specialists whose tasks include monitoring Program implementation and reviewing and screening the subprojects submitted by State in accordance with subproject selection criteria, including the environmental provisions;
 - (iii) National level Steering Committee (NSC) set up by GOI to monitor the use of funds under MFF and overall implementation performance of the Investment Program;
 - (iv) State-level Executing Agency (SEA) is responsible for executing the part of the loan falling under the State Government;
 - (v) State Investment Program Management and Implementation Unit (SIPMIU) established in SEA and headed by a Program Director (PD). SIPMIU will oversee the Program's environment and resettlement planning. This includes the preparation of all documentation needed for decision-making, contracting, and supervision of work and providing progress-monitoring information to the PD;
 - (vi) The SIPMIU have one Environment & Social Safeguard Specialist. The Environment and social Safeguard Specialist of SIPMIU shall be responsible for implementing the environmental safeguard provisions in the project including (i) ensuring environmental criteria for subproject selection in the EARP are followed, (ii) ensuring mitigation requirements are in contractor bidding

- documents, and (iii) liaising with various Central and State government agencies on compliance matters. The SIPMIU will appoint and manage Construction Contractors (CC) to build elements of the infrastructure who are required to submit Environmental Implementation Plans (EIPs) for SIPMIU approval;
- (vii) The SIPMIU is assisted by the DSMC, who is responsible for design the infrastructure, manage tendering of contracts, and supervise the construction process;
- (viii) An Environmental Specialist (ES) in the DSMC is responsible for addressing the environmental issues in the project components during design and implementation. The ES will ensure all mitigation requirements are in contractor bidding documents and EIPs, and will supervise the effective implementation of environmental provisions during construction. In addition, the ES will assist the SIPMIU on the procurement needs and other project implementation aspects and shall play a central role in ensuring capacity building on environmental management of the SIPMIU, Contractor and Line Departments through capacity development support and training;

119. **Figure 4** shows institutional responsibility for implementation of environmental safeguard at different level.

Figure 4: Institutional Responsibility- NERCCDIP



AMC = Agartala Municipal Corporation, DOF = Department of Forest, PHED = Public Health Engineering Department, PWD = Public Work Department, SEA = State Executing Agency- Urban Development Dept. Govt. of Tripura, ULB = Urban Local Body.

1. Responsible for carrying out mitigation measures

120. During construction stage, implementation of mitigation measures is the construction contractor's responsibility while during operation stage, DWS will be responsible for the conduct of maintenance or repair works.

2. Responsible for carrying out monitoring measures

121. During construction, Environmental Specialist (ES) of DSMC and Environment & Social Safeguard Specialist of SIPMIU will monitor the construction contractor's environmental performance.

122. During the operation stage, monitoring will be the responsibility of DWS.

3. Responsible for reporting

123. Construction contractor will submit monthly environment compliance report to DSMC. DSMC will submit quarterly monitoring and implementation reports to SIPMIU, who will take follow-up actions, SIPMIU will submit monitoring reports to the PD who will then submit to ADB. DSMC along with SIPMIU will prepare semi-annual environment monitoring report for ADB. The semi-annual report is to focus on the progress of implementation of the EMP and EARP and issues encountered and measures adopted, follow-up actions required, if any, as well as the status of Program compliance with subproject selection criteria, and relevant loan covenants. PMMC will seek clearance for submission and disclosure of the annual environmental monitoring report to ADB.

124. Environment monitoring report format checklist for Projects 1 and 2 is attached as **Appendix 10**. Sample semi-annual report format of Project 3 is attached as **Appendix 11**.

B. Environmental Mitigation Plan

125. **Table 10 to 12** shows the potential adverse environmental impacts, proposed mitigation measures, responsible parties. EMP will be revised after finalization of design. Revised EMP will be included in the bid documents and will be further reviewed and updated during implementation.

C. Environmental Monitoring Program

126. **Table 13 to 15** shows the proposed environmental monitoring program for this subproject. It includes all relevant environmental parameters, location, responsibility of mitigation and monitoring, method of monitoring and frequency of monitoring. Monitoring activities during the detailed engineering design stage will form part of the baseline conditions of the subproject site and will be used as the reference for acceptance of restoration works by the construction contractors. Environment monitoring program will be revised after finalization of design of the project.

Table 10: Anticipated Impacts and Mitigation Measures – Pre-construction Environmental Mitigation Plan

Field/Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	(i) Consult Archaeological Survey of India (ASI) or concerned dept. of Tripura Govt. to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.	SIPMIU & DSMC	Chance Finds Protocol
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors along distribution pipeline laying area	(i) Prioritize areas within or nearest possible vacant space in the subproject site; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, and drinking water supply systems; (iii) Do not consider core residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.	SIPMIU and DSMC to determine locations prior to award of construction contracts.	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion,	(i) Prioritize sites already permitted by the Mining Department; (ii) If other sites are	SIPMIU and DSMC to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials;

Field/Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	disturbance in natural drainage patterns, ponding and water logging, and water pollution.	necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of SIPMIU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from SIPMIU.		(ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.

CPHEEO = Central Public Health and Environmental Engineering Organization, DSMC = Design Supervision Management Consultant, EIA = Environmental Impact Assessment, O&M = operation and maintenance, SIPMIU = State-level Investment Program Management and Implementation Units, DWS= Drinking Water and Sanitation.

Table 11: Anticipated Impacts and Mitigation Measures – Construction Environmental Mitigation Plan

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Sources of Materials	Extraction of rocks and material may cause ground instability	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability of all material sources and obtain approval of Investment SIPMIU; (iii) If additional quarries will be required after construction has started, obtain written approval from SIPMIU; and; (iv) Submit to DSMC on a monthly basis documentation of sources of materials.	Construction Contractor	Construction Contractor documentation
Air Quality	Emissions from construction vehicles, equipment, and machinery used for excavation and construction resulting to dusts and increase in concentration of	(i) Consult with SIPMIU/DSMC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices;

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons)	(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; and (iv) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.		(iv) Ambient air for respirable particulate matter (RPM- PM10 & PM2.5) and suspended particulate matter (SPM); (v) Vehicular emissions such as sulphur dioxide (SO ₂), nitrous oxides (NO _x), carbon monoxide (CO), and hydrocarbons
Surface water quality	Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate nearby surface water (River water) quality.	(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with SIPMIU/DSMC on designated disposal areas; (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (v) Dispose any wastes generated by construction activities in designated sites; and (vi) Conduct surface quality inspection particularly for River water according to the	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along drainages leading to water bodies; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures; (v) For inland water: suspended solids, oil and grease, biological oxygen demand (BOD), and coliforms.

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		Environmental Management Plan (EMP).		
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with SIPMIU/DSMC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and night time noise levels
Ecological resources – Terrestrial	Felling of the trees (if any) – affect terrestrial ecological balance	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit from Municipal Corporation, (iii) Require to plant three (3) native trees for every one (1) that is removed; and (iv) Prohibit employees from poaching wildlife, bird	Construction Contractor	(i) Complaints from sensitive receptors; (ii) checking of conservation management plan for tree species

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Landscape and Aesthetics	Solid wastes as well as excess construction materials	<p>hunting, and cutting of trees for firewood.</p> <p>(i) Prepare and implement Waste Management Plan;</p> <p>(ii) Avoid stockpiling of excess excavated soils;</p> <p>(iii) Coordinate with AMC/PWD for beneficial uses of excess excavated soils or immediately dispose to designated areas;</p> <p>(iv) Recover used oil and lubricants and reuse or remove from the sites;</p> <p>(v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(vi) Remove all wreckage, rubbish; and</p> <p>(vii) Request SIPMIU/DSMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.</p>	Construction Contractor	<p>(i) Waste Management Plan;</p> <p>(ii) Complaints from sensitive receptors;</p> <p>(iii) SIPMIU/DSMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.</p>
Accessibility	Traffic problems and conflicts near project locations and haul road	<p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;</p> <p>(ii) Schedule transport and hauling activities during non-peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(iv) Keep the site free from all unnecessary</p>	Construction Contractor	<p>(i) Traffic Management Plan;</p> <p>(ii) Complaints from sensitive receptors;</p> <p>(iii) Number of signages placed at subproject site.</p>

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		obstructions; (v) Drive vehicles in a considerate manner; (vi) Coordinate with Agartala Municipal Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.		
Socio-Economic – Income.	In significant impact	(i) Leave spaces for access between mounds of soil; and (ii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors;
Socio-Economic Employment	- Generation of contractual employment and increase in local revenue	(i) Employ at least 50% of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and (ii) Secure construction materials from local market.	Construction Contractor	(i) Employment records; (ii) records of sources of materials
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves,	Construction Contractor	(i) Site-specific Health and Safety (H and S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>nose mask and ear plugs;</p> <p>(c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;</p> <p>(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(iii) Provide medical insurance coverage for workers;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(v) Provide supplies of potable drinking water;</p> <p>(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(vii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter</p>		<p>where workers are not exposed to hazardous or noxious substances;</p> <p>(vii) record of H and S orientation trainings</p> <p>(viii) personal protective equipments;</p> <p>(ix) % of moving equipment outfitted with audible back-up alarms;</p> <p>(xi) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.</p>

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>hazard areas unescorted;</p> <p>(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(x) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and</p> <p>(xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</p>		
Core Labour Standard (CLS)- safety and compliance	Impact on health of contractor's labour	Monitoring compliance with national labor laws and regulations provided that these national laws are consistent with CLS. (SIPMIU will ensure that bidding and contract documents include specific provisions requiring	Construction Contractor	All records, documents related to health & safety of labours

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>contractors to comply with all: (i) applicable labor laws and core labor standards on: (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.</p>		
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	<p>(i) Plan routes to avoid times of peak-pedestrian activities. (ii) Liaise with SIPMIU/DSMC in identifying high-risk areas on route cards/maps. (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (iv) Provide road signs and flag persons to warn.</p>	Construction Contractor	<p>(i) Traffic Management Plan; (ii) Complaints from sensitive receptors</p>
Office, Work Camps & storage	Temporary air, land and noise pollution from operation of camp & machine, water pollution from storage and use of fuels, oils, solvents, and lubricants	<p>(i) Consult with SIPMIU/DSMC before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow</p>	Construction Contractor	<p>(i) Complaints from sensitive receptors; (ii) Water and sanitation facilities for employees; and (iii) SIPMIU/DSMC report in writing that the camp has been vacated and restored</p>

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		cutting of trees; (iii) Provide water and sanitation facilities for employees/labours; (iv) Prohibit employees from poaching wildlife and cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ix) Request SIPMIU/DSMC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		to pre-project conditions
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Request SIPMIU/DSMC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately	Construction Contractor	Records of chance finds

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		to allow further investigation if any finds are suspected; and (iv) Inform SIPMIU/DSMC if a find is suspected, and take any action they require ensuring its removal or protection in situ.		

DSMC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, SIPMIU = State-level Investment Program Management and Implementation Units, SPM = suspended particulate matter, AMC= Agartala Municipal Council, PWD= Public Works Department, DWS= Drinking Water and Sanitation

Table 12: Anticipated Impacts and Mitigation Measures – Operation and Maintenance Environmental Mitigation Plan

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Occupational Health and Safety	Adverse impacts on the appearance of surrounding environment and exposure of workers to hazardous debris	(i) Ensure persons employed will be provided with suitable equipment; and (ii) Ensure all removed material will be deposited in the municipal waste storage bins.	PWD (DWS) and O&M Contractors	(i) Records of training; (ii) H and S Plan approved by UDD
General	General impact	(i) Conduct work during non-monsoon period; and (ii) Cover or wet excavated material to prevent dusts.	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors
STP sludge	Environmental pollution - Potential impact on soil, groundwater, and surface water nearby the disposal site	Use of sludge by nearby farmers as manure	PWD (DWS) and O&M Contractors	(i) Complaints from sensitive receptors (ii) Field checking (iii) Testing of soil, surface and ground water nearby
Wastewater	Discharge into water causing water pollution	(i) Land application (utilization by farmers) of wastes with high dissolved solids concentrations (ii) Treat and dispose of reject streams as per CPHEEO norm and O&M Manual	PWD (DWS) and O&M Contractors	(i) Complaints from sensitive receptors (ii) Field checking (iii) Testing of soil, surface and ground water

Field/ Issues	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Hazardous Chemicals	Release to nature causing air, water and soil pollution	(i)Minimum storage of chemicals; (ii)Develop and implement a prevention program that includes identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures; and (iii) Develop and implement a plan for responding to accidental releases.	PWD (DWSD) and O&M Contractors	(i) Complaints from sensitive receptors (ii) Site checking (iii) Checking of awareness and emergency training document
Air Emissions	Air pollution from odour generated from STP	Proper storage and scientific utilization of chemicals utilized in treatment process Collection of air samples Use of spray for minimization of odour	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors
Health and Safety	<ul style="list-style-type: none"> Development of septage treatment system is expected to significantly enhance hygienic condition of GAPA Reduction in health risks to the citizens. 	<ul style="list-style-type: none"> Undertake regular monitoring and maintenance of treatment process Carry out waste water quality monitoring 	PWD (DWSD) and O&M Contractors	Complaints from sensitive receptors

H&S = health and safety, O&M = operation and maintenance, PWD (DWSD) = Public Works Department (Drinking water and sanitation)

Table 13: Pre-construction Environmental Monitoring Program

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Baseline Environmental Condition – Ambient Air and noise Quality	Subproject location	Contractor	Establish baseline values of (i) respirable particulate matter (RPM) and (ii)CO, SO ₂ & NO _x	Air sample collection and analyses by in-house laboratory or accredited 3rd party laboratory	GOI Ambient Air Quality Standards	Once prior to start of construction	SIPMIU
Social and	As per site	SIPMIU and	Chance Finds	Checking of	Chance Finds	Once	SIPMIU

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Cultural Heritage	requirement	DSMC	Protocol	records	Protocol provided to construction contractors prior to commencement of activities		
Construction work camps, stockpile areas, storage areas, and disposal areas.	As per site requirement	SIPMIU and DSMC to determine locations prior to award of construction contracts.	List of selected location for construction work camps, stockpile areas, storage areas, and disposal areas.	Checking of records	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas provided to construction contractors prior to commencement of works.	Once	SIPMIU
Sources of Materials	As per site requirement	SIPMIU and DSMC to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	Checking of records	(i) List of approved quarry sites and sources of materials provided to construction contractors (ii) Bid document included requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	Once	SIPMIU

DSMC = Design Supervision Management Consultant, O&M = operation and maintenance, SIPMIU = State-level Investment Program Management and Implementation Units.

Table 14: Construction Environmental Monitoring Program

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Sources of Materials	Quarries and sources of	Construction Contractor	Construction Contractor	(i) Checking of records; (ii)	(i) Sites are permitted;	Monthly submission for	DSMC

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
	materials		documentation	visual inspection of sites	(ii) Report submitted by construction contractor monthly (until such time there is excavation work)	construction contractor As needed for DSMC	
Air Quality	Construction sites and areas designated for stockpiling of materials	Construction Contractor	(i) Location of stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control devices; (iv) ambient air for respirable particulate matter (RPM- PM2.5 & PM10) and suspended particulate matter (SPM); (v) vehicular emissions such as sulphur dioxide (SO ₂), nitrous oxides (NO _x), carbon monoxide (CO), and hydrocarbons (HC)	(i) Checking of records; (ii) visual inspection of sites	(i) Stockpiles on designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) air pollution control devices working properly; (iv) GOI Ambient Quality Standards for ambient air quality; (v) GOI Vehicular Emission Standards for SO ₂ , NO _x , CO and HC.	Monthly for checking records	DSMC in coordination with Pollution Control Board
Noise Levels	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and night time noise levels	(i) Checking of records; (ii) visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) silencers in noise-producing equipment functioning as design; and (iii) sound barriers installed where necessary	Monthly	DSMC in coordination with Pollution Control Board

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Ecological resources – Terrestrial	Construction sites	Construction Contractor	Record related of tree felling and aquatic floral and faunal impact if any	(i) Checking of records; (ii) visual inspection	(i)Complaints from sensitive receptors; (ii) checking of conservation management plan for tree species	Quarterly	DSMC
Landscape and Aesthetics	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Waste Management Plan; (ii) complaints from sensitive receptors; (iii) SIPMIU/DSMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	(i) Checking of records; (ii) visual inspection	(i)No accumulation of solid wastes on-site; (ii) implementation of Waste Management Plan; (iii) complaints from sensitive receptors satisfactorily addressed.	Monthly	DSMC
Accessibility	(i) Construction sites; (ii) traffic haul road	Construction Contractor	(i) Traffic Management Plan; (ii) complaints from sensitive receptors; (iii) number of signages placed at subproject site.	Visual inspection	(i) Implementation of Traffic Management Plan, if required; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) signages visible and located in designated areas	Monthly	DSMC
Socio-Economic Income -	Construction sites	Construction Contractor	(i) Complaints from sensitive receptors; (ii) number of signages, at subproject site.	Visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) signages visible and located in designated areas	Quarterly	DSMC
Socio-Economic employment -	construction sites	Construction Contractor	(i) Employment records; (ii) records of sources of materials	Checking of records	Number of employees from Agartala equal or greater than 50% of	Quarterly	DSMC

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Occupational Health and Safety	construction sites	Construction Contractor	(i) Site-specific Health and Safety (H and S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H and S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms; (x) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.	(i) Checking of records; (ii) visual inspection	total workforce (i) Implementation of H and S plan; (ii) number of work-related accidents; (iii) % usage of personal protective equipment; (iv) number of first-aid stations, frequency of potable water delivery, provision of clean eating area, and number of sign boards are according to approved plan; (v) % of moving equipment outfitted with audible back-up alarms	Quarterly	DSMC

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Core Labour Standard	Construction sites	Construction Contractor	Monitoring compliance with national labor laws and regulations provided that these national laws are consistent with CLS. (SIPMIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on: (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities	(i) Checking of records; (ii) visual inspection	Implementation of Core Labour Standard	Quarterly	DSMC, SIPMIU

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			surrounding the project sites.				
Office, Work Camps and storage areas	Work camps, Office And storage areas	Construction Contractor	(i) Complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) SIPMIU/DSMC report in writing that the camp has been vacated and restored to pre-project conditions	Visual inspection	(i) Designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DSMC
Chance Finds	Construction sites	Construction Contractor	Records of chance finds	Checking of records	Implementation of Chance Finds Protocol	As needed	DSMC

BOD = biological oxygen demand, DSMC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, GOI= Government of India, SIPMIU = State-level Investment Program Management and Implementation Units SPM = suspended particulate matter.

Table 15: Operation and Maintenance Environmental Monitoring Program

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Occupational Health and Safety	subproject site	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	(i) Records of training; (ii) H and S Plan approved by PWD (DWS)	Complaints from sensitive receptors satisfactorily addressed	As needed	SIPMIU
General Maintenance work	subproject site	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	SIPMIU
Community Health and Safety	subproject site	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Checking of records	complaints from sensitive receptors satisfactorily addressed	As needed	SIPMIU
Accessibility	subproject site	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	SIPMIU
Waste Water Quality	All STP location	PWD (DWS) and O&M Contractors	Drinking water and surface water quality as per BIS	Sample collection and laboratory analyses	GOI Drinking Water Standards	As needed	SIPMIU

Field of Mitigation Measures	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			specification				
Solid Wastes/ sludge	Near STP Disposal / utilization location	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Sample collection and laboratory analyses	Complaints from sensitive receptors satisfactorily addressed	Quarterly	SIPMIU
Hazardous Wastes	STP	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	(i) Site checking (ii) Checking of document	Complaints from sensitive receptors satisfactorily addressed. Awareness and emergency training document	Quarterly	SIPMIU
Air Emissions	STP location	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Air sample collection and laboratory testing	GOI air quality standard	Quarterly	SIPMIU
Health and Safety	subproject site	PWD (DWS) and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU/PIU

CPCB = Central Pollution Control Board; DWS = Drinking Water and Sanitation Department; O&M = Operation and Maintenance; PWD = Public Works Department, SIPMIU = State-level Investment Program Management and Implementation Units

D. Environmental Management Costs

127. Most of the mitigation measures require the Construction Contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the construction contractors or DSMC are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of UDD will be provided as part of their management of the project, so this also does not need to be duplicated here.

128. The remaining actions in the EMP are the various environmental monitoring activities to be conducted by the Environmental Monitoring Specialist. These have not been budgeted elsewhere, and their costs are shown in **Table 15**. The figures show that the total cost of environmental management and monitoring for the subproject as a whole (covering operation & design phase) is **INR 0.335 million**.

Table 16: Environmental Management and Monitoring Costs (INR)

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor.	As required	Applicable	Applicable	-
Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	25,000	Concerned Contractor during project implementation will do public consultation Information disclosure in website by SIPMIU – project budget
Baseline Monitoring	Site preparation and preliminary activities				
Air	Once before start of construction works Covering working site	5 samples	8,000 per sample	40,000	Covered under engineering design and cost - Concerned Contractor
Noise	Once before start of construction works Covering working site	5 samples	2,000 per sample	10,000	Covered under engineering design and cost - Concerned Contractor
Construction Monitoring					
Air	Quarterly at 5 locations near project sites for at	15 samples	8,000 per sample	1,20,000	Covered under engineering design and cost -

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
	least 1 year				Concerned Contractor
Noise	Quarterly at 5 locations near project sites for at least 1 year	15 samples	2,000 per sample	30,000	Covered under engineering design and cost – Concerned Contractor
Defect Liability Period (No. of sites will be finalized as per Consent to Operate condition)					
Air	Twice at 3 locations near project sites for 1 year	6 samples	8,000 per sample	48,000	Covered under engineering design and cost – Concerned Contractor
Noise	Twice at 3 locations near project sites for 1 year	6 samples	2,000 per sample	12,000	Covered under engineering design and cost – Concerned Contractor
Any unanticipated impact due to subproject implementation (including compensation for tree felling)	Mitigation of any unanticipated impact arising during construction phase and defect liability period.	Lump sum	Lump sum	50,000	As per requirement - SIPMIU
TOTAL (INR) Rupees fourteen lakh twenty thousand only					3,35,000.00
TOTAL (US\$)					5583.00

IX. FINDINGS AND RECOMMENDATIONS

129. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Agartala Septage Management sub project. Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure, but no impacts were identified as being due to either the project design or location. Mitigation measures have been developed in generic way to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

130. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of the invasive nature of excavation; so there is a medium risk that ground disturbance may uncover important remains. Because of these factors the most significant impacts are on the physical environment, the human environment, tourism, and the cultural heritage.

131. During the construction phase, impacts mainly arise from the need of utilization of waste soil; and from the disturbance of residents by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation.

132. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain; and ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

133. Once the system is operating, most facilities will operate with routine maintenance, which should not affect the environment. Generation and disposal of sludge from STP is also an issue. Utilization of waste water and sludge for agriculture is the best option.

134. The main impacts of the operating septage management system will be beneficial as the citizens of Agartala city will be provided along with a constant supply of water, which will serve a greater proportion of the population, including slum-dwellers. This will improve the quality of life of people as well as benefiting both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

135. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the SIPMIU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population.

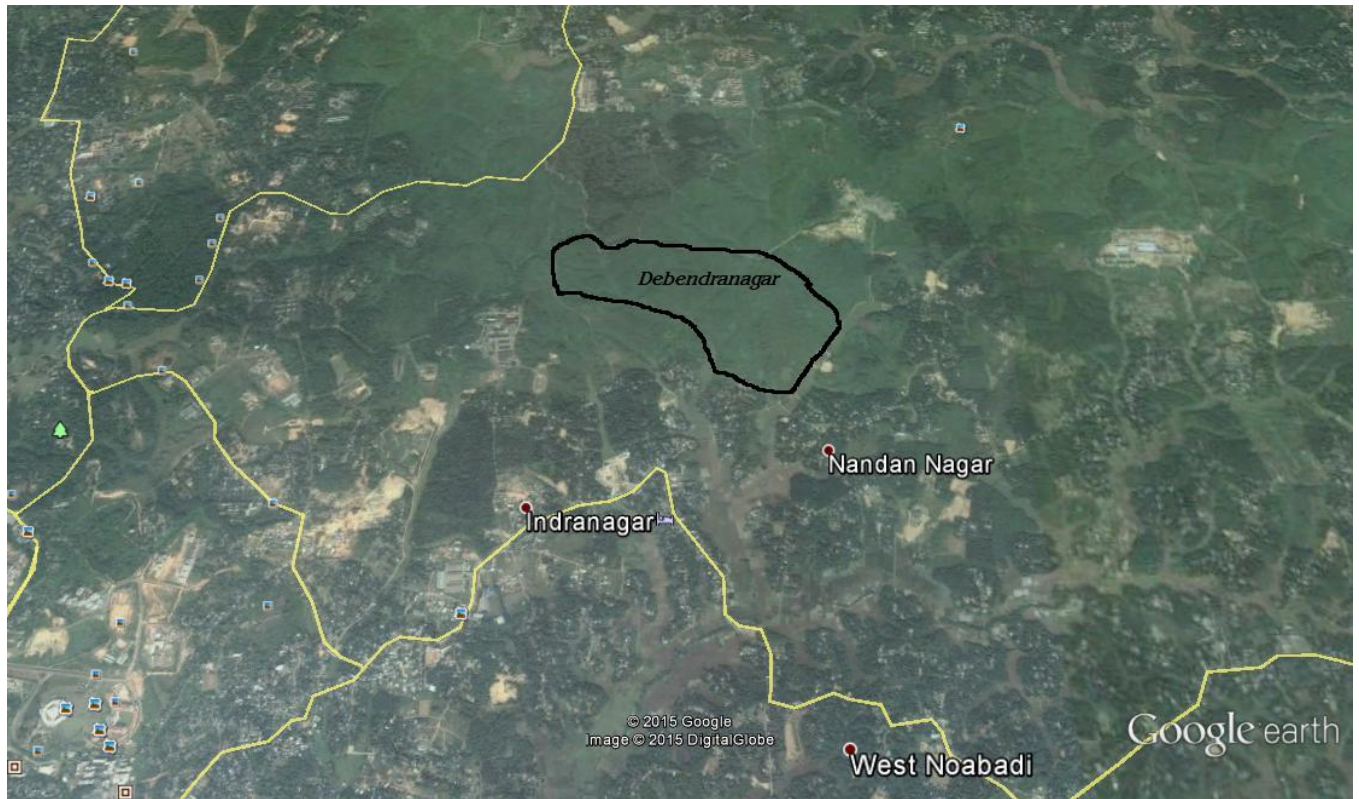
136. Finally, stakeholders were involved in developing the IEE through face-to-face discussions and on site meeting held in GAPA, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in GAPA and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation, when a nationally-recognised NGO will be appointed to handle this key element to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

X. CONCLUSIONS

137. The subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

138. Based on the findings of the IEE, the classification of the Project as Category "B" is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006).

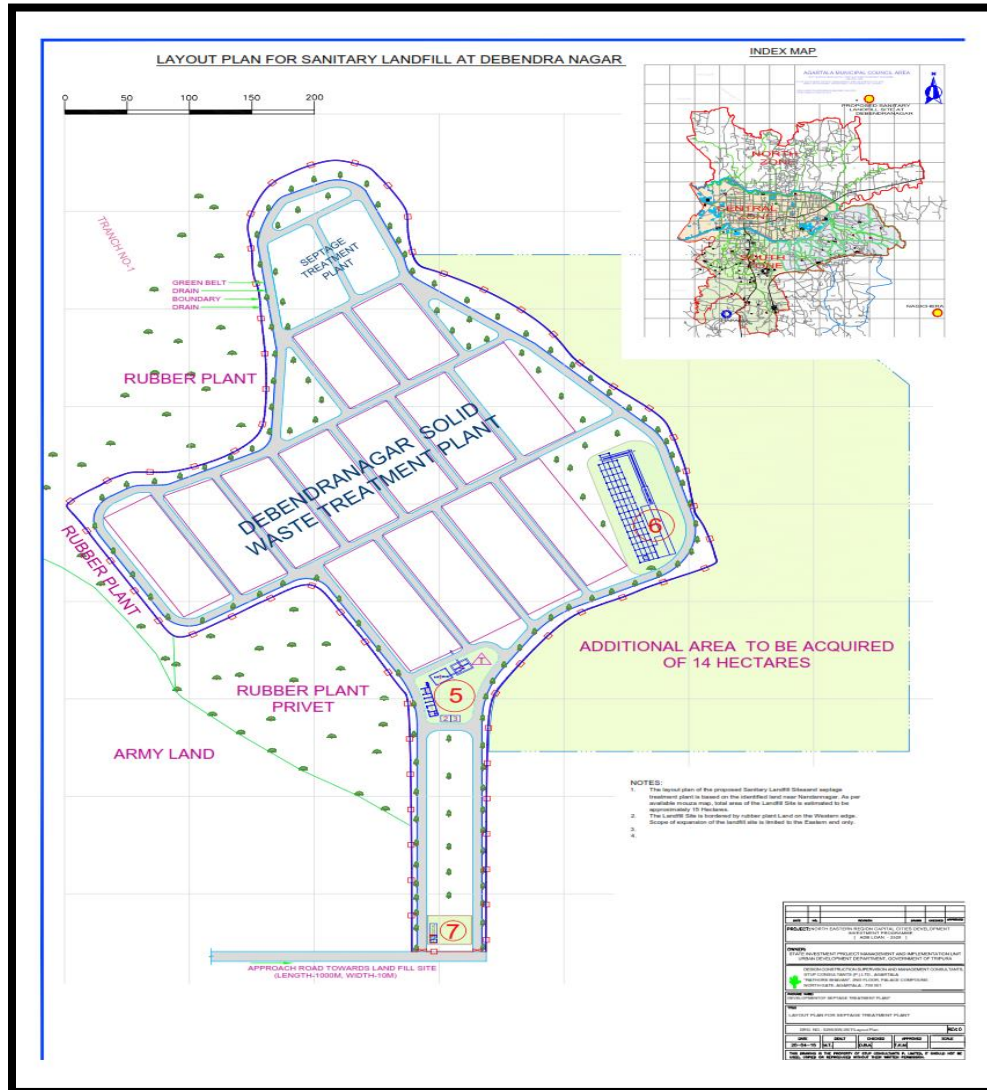
APPENDIX 1: Location of Debendranagar Septage Treatment Plant



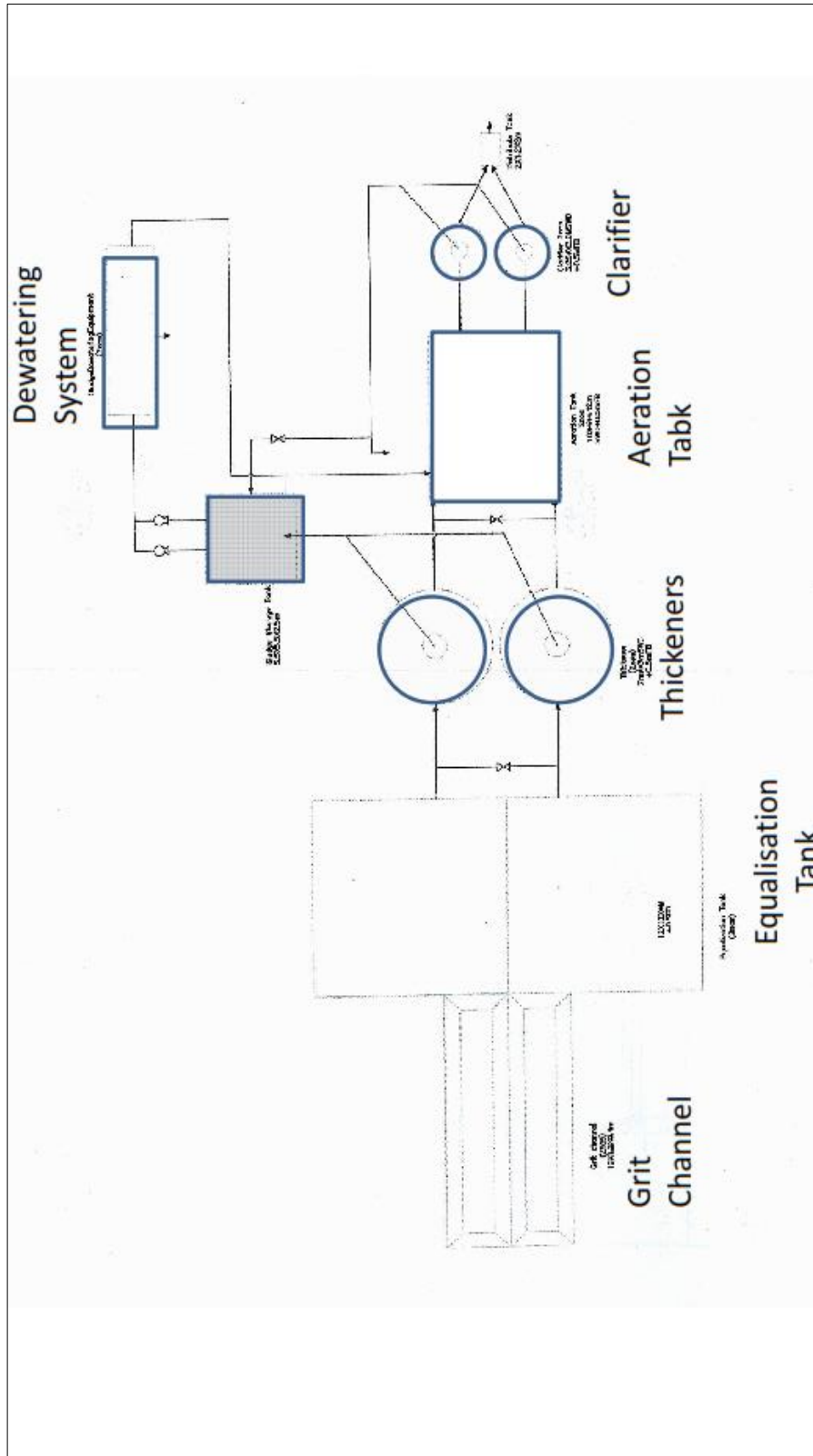
APPENDIX 2: LOCATION OF SEPTAGE TREATMENT PLANT BESIDE SOLID WASTE MANAGEMENT AREA



LAND RECORD MARKING OF DEBENDRANAGAR LAND – AMC LAND



APPENDIX 3: FLOW DIAGRAM – SEPTAGE TREATMENT



APPENDIX 4: SITE PHOTOGRAPHS – DEBENDRANAGAR



APPENDIX 5: ADB RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST (SEPTAGE MANAGEMENT- AGARTALA, TRIPURA)

Instructions:

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

Screening Questions	Yes	No	Remarks
A. Project Siting Is The Project Area...			
• Densely populated?		✓	Agartala is not densely populated. There are no heavy development activities in the subproject area.
• Heavy with development activities?		✓	
Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site		✓	
• Protected area		✓	
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	
B. Potential Environmental Impacts Will the project cause...			
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	Not applicable. There are no historical/cultural monuments/areas within or adjacent to subproject sites.
• Interference with other utilities and blocking of access to buildings?		✓	Not anticipated. STP will be located in a designated area within the municipal SLF thus will not interfere with utilities and buildings.
• Nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?		✓	Not anticipated. STP will be located in the municipal SLF. There are no habitations near the subproject sites. STP O&M manual will include mitigation measures to control insects, vectors, etc.
• Dislocation or involuntary resettlement of people?		✓	Not applicable.
• Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?		✓	Not applicable.
• Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		✓	Not anticipated. Collected septage will be treated at the STP. Effluent from the STP will be further treated at the SLF leachate treatment plant.
• Overflows and flooding of neighboring properties with raw sewage?		✓	Not anticipated. The subproject will improve current situation of discharging raw sewage and sludge to open drains.
• Environmental pollution due to inadequate		✓	Not anticipated. Collected septage will be

Screening Questions	Yes	No	Remarks
sludge disposal or industrial waste discharges illegally disposed in sewers?			treated at the STP. Design of the STP ensures sludge and effluent will comply with Indian standards. Reuse of dewatered and dried sludge will follow internationally-accepted best practices. STP O&M manual will include environmental monitoring program.
• Noise and vibration due to blasting and other civil works?	✓		Anticipated during construction activities. However, impacts are temporary, short in duration and confined within the designated area of the municipal SLF. The EMP ensures measures are included to mitigate the impacts.
• Risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?		✓	Not anticipated. The EMP ensures occupational health and safety measures are included. Chemicals will not be used during construction and operation activities.
• Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		✓	Not applicable as per nature of work.
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		✓	Buffer zone not required as STP will be located in the municipal SLF. No habitations nearby.
• Road blocking and temporary flooding due to land excavation during the rainy season?		✓	Not anticipated. Construction activities will be conducted during non-monsoon season.
• Noise and dust from construction activities?	✓		Anticipated during construction activities. The impacts are negative but short-term and site-specific within a relatively small area (confined within the designated area of the municipal SLF) and reversible through mitigation measures. Good construction practices will mitigate noise and dust, and will be specified in the EMP.
• Traffic disturbances due to construction material transport and wastes?	✓		Anticipated during construction activities. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Traffic management will be specified in the EMP.
• Temporary silt runoff due to construction?		✓	Due to excavation and run-off from stockpiled materials. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Good construction practices will mitigate soil erosion and silt runoff and will be specified in the EMP.
• Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		✓	Not anticipated. Design life of subproject is 30 years.
• Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		✓	Not anticipated. Collected septage will be treated at the STP. Design of the STP ensures sludge and effluent will comply with Indian standards. Reuse of dewatered and dried sludge will follow internationally-accepted best practices. STP O&M manual will include environmental monitoring program.
• Contamination of surface and ground waters due to sludge disposal on land?		✓	Not anticipated. Reuse of dewatered and dried sludge will follow internationally-accepted best practices. STP O&M manual will include environmental monitoring program.
• Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and	✓		Anticipated during operations (collection of septage using cesspool machines). Workers health and safety, specifically the use of

Screening Questions	Yes	No	Remarks
exposure to pathogens in untreated sewage and unstabilized sludge?			personal protective equipment and trainings, will be included in the O&M manual.
• Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	Priority in employment will be given to local residents.
• Social conflicts between construction workers from other areas and community workers?		✓	Priority in employment will be given to local residents.
• 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?		✓	Not applicable. Construction will not involve use of explosives and chemicals. Trenching will be done manually.
• 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?		✓	Operational area will be clearly demarcated and access will be controlled. Only workers and project-concerned members will be allowed to visit the sites.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/ North-Eastern Region Capital Cities Development Investment Program - Agartala Septage Management (Tr-3)

Sector: Urban Development

Subsector: Waste Water

Division/Department: Urban Development Department

Screening Questions		Score	Remarks ⁸
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

⁸ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low Risk

APPENDIX 6: STANDARDS- EFFLUENT AND DRINKING WATER

General Standards for Discharge of Environmental Pollutants: Effluents

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
		(a)	(b)	(c)	(d)
1.	Colour and odour	remove as far as practicable			
2.	Suspended solids mg/l. max.	100	600	200	(a) For process waste water 100 (b) For cooling water effluent 10% above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve			(a) Floatable solids, max. 3mm. (b) Settable solids (max 850 micron)
4.	pH value	5.5. to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 5 ⁰ C above the receiving water temperature			shall not exceed 5 ⁰ C above the receiving water temperature
6.	Oil and grease, mg./l, max.	10	20	10	20
7.	Total residual chlorine, mg/l. max.	1.0			1.0
8.	Ammonical nitrogen (as N.) mg/l max	50	50		50
9.	Total Kjeldahl Nitrogen (as NH ₃) mg/l. max	100			100
10.	Free ammonia (as NH ₃), mg/l.max	5.0			5.0
11.	Biochemical oxygen demand (3 days at 27 ⁰ C), mg/l. max.	30	350	100	100
12.	Chemical oxygen demand, mg/l,	250			250

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
	max.				
13.	Arsenic (as As) mg/l, max.	0.2	0.2	0.2	0.2
14.	Mercury (As Hg), mg/l, max.	0.01	0.01		0.01
15.	Lead (as Pb) mg/l, max	0.1	1.0		2.0
16.	Cadmium (as Cd) mg/l. max	2.0	1.0		2.0
17.	Hexavalent chromium (as Cr. +6). mg/l, max	0.1	2.0		1.0
18.	Total Chromium (as Cr) mg/l, max	2.0	2.0		2.0
19.	Copper (as Cu) mg/l, max	3.0	3.0		3.0
20.	Zinc (as Zn) mg/l, max	5.0	15		15
21.	Selenium (as Se) mg/l, max	0.05	0.05		0.05
22.	Nickel (as Ni) mg/l, max	3.0	3.0		5.0
23.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max	2.0	15		15
25.	Dissolved phosphates (as P) mg/l, max	5.0			
26.	Sulfide (as S) mg/l, max	2.0			5.0
27.	Phenolic compounds (as C ₆ H ₅ OH) mg/l, max	1.0	5.0		5.0

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
28.	Radioactive materials: (a)Alfa emitters microcurie/ml, max. (b)Beta emitters micro curie/ml,max.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
		10^{-6}	10^{-6}	10^{-7}	10^{-6}
29.	Bio-assay test	90% Survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l			20 mg/l

These standards shall be applicable for industries, operations or process other than those industries operations or process for which standards have been specified in schedule of the Environment Protection Rules, 1989

APPENDIX 7: TRAINING ON SEPTAGE MANAGEMENT FOR ULB ENGINEERS, GOVERNMENT OF TRIPURA

A Training programme on Septage Management for Urban Local Body (ULB) Engineers, of the Government of Tripura was conducted in collaboration with the Government, Water and Sanitation Programme (WSP) of the World Bank, Consortium for DEWATS Dissemination (CDD) Society, International Water Management Institute (IWMI) and Asian Development Bank. The programme was conducted at Pragna Bhavan in Agartala during September 5th-6th, 2013. The organisation of the programme was coordinated by WSP and the Government of Tripura and technical inputs were provided by WSP, CDD Society, IWMI and ADB. 50 engineers from 8 districts of Tripura attended the programme.

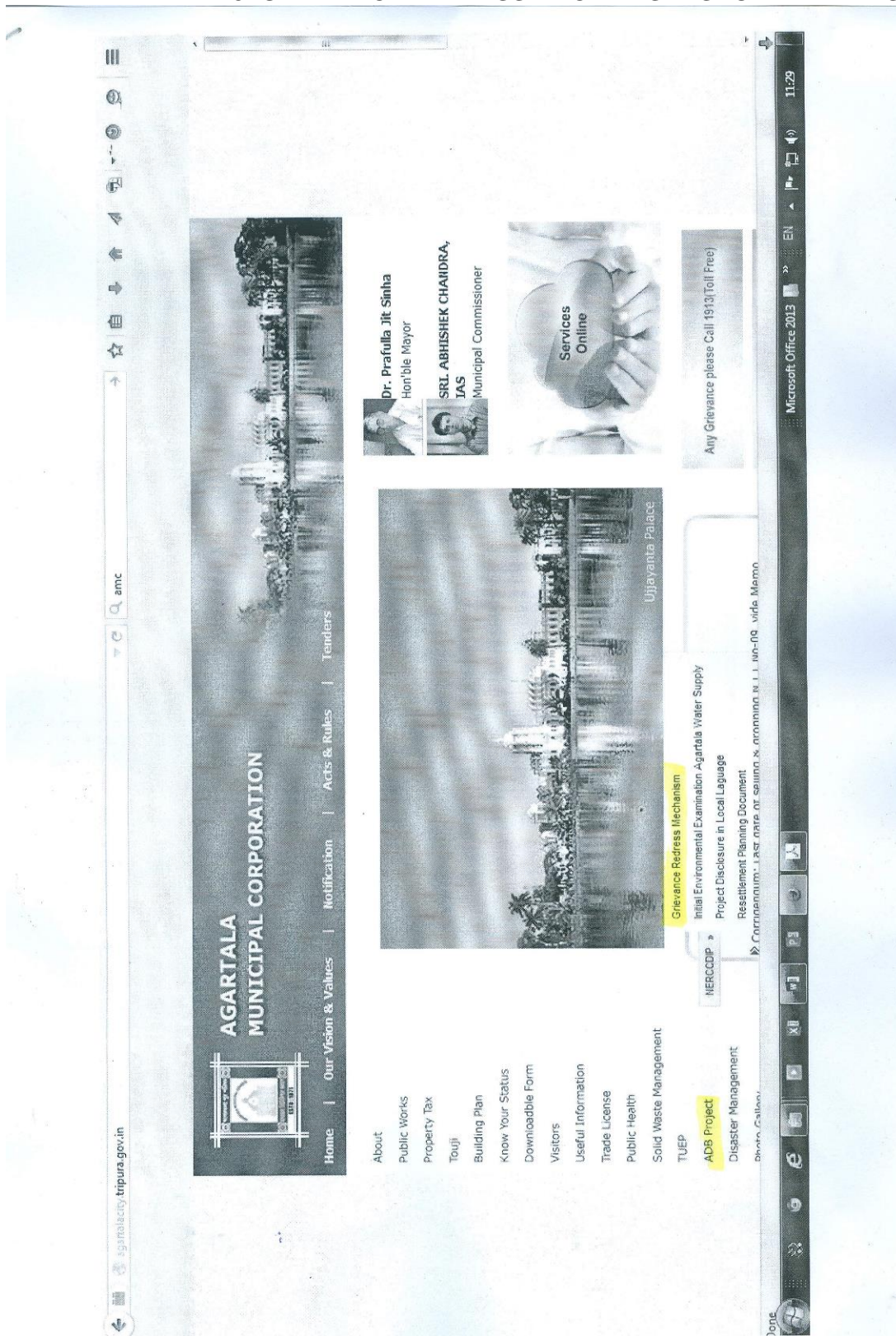
The two-day programme aimed to bring together engineers from urban development departments of cities and towns in Tripura to enhance their understanding of septage management through knowledge sharing, practical exercises, project planning and field visits.

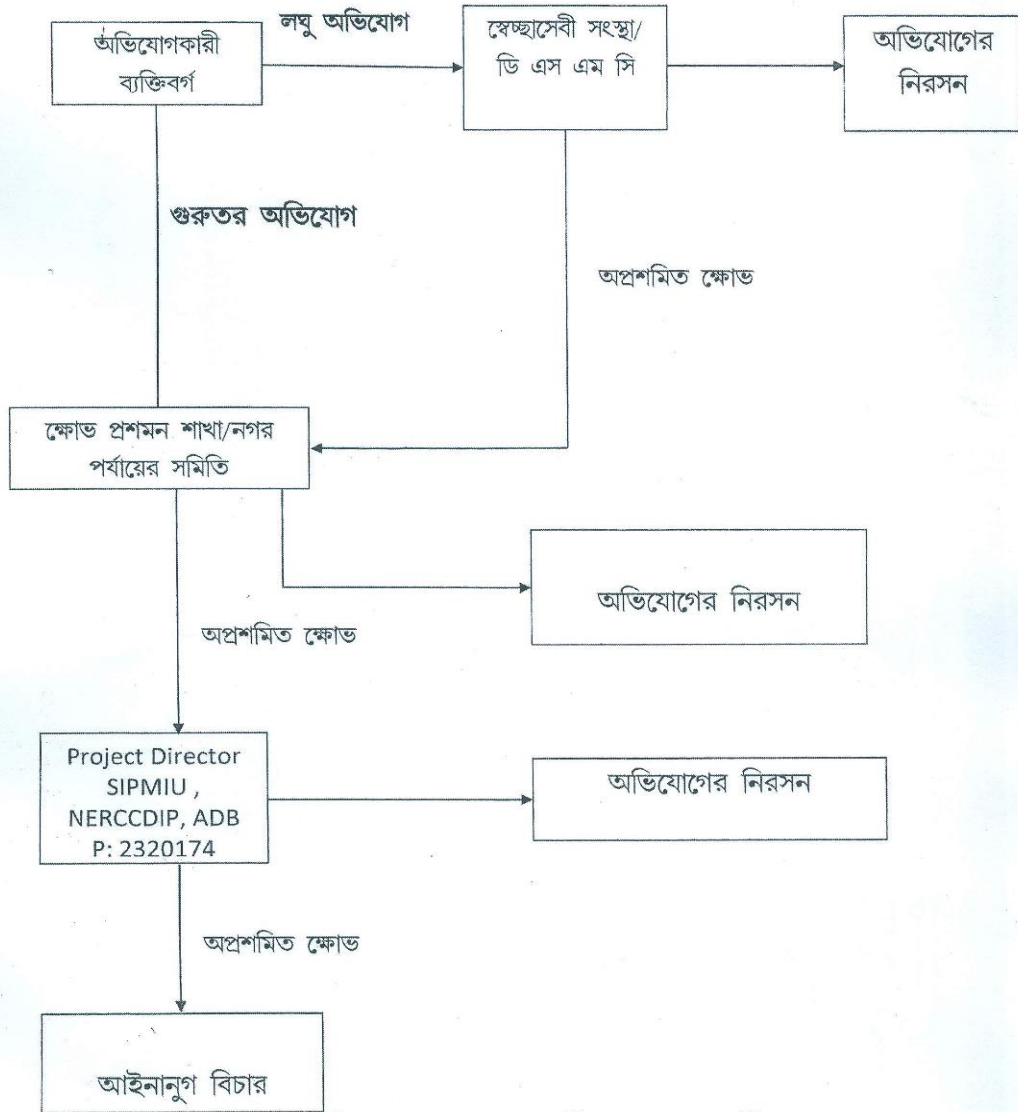
Day one was given to understanding septage generation and its characteristics as well as the involvement of the government, policy, institution, regulatory and legal framework in Tripura. This session was followed by detailed discussions on technology options for septage treatment and Decentralised Wastewater Treatment Systems (DEWATS™). DEWATS™ could be an option for septic tank effluent treatment as well as an on-site treatment option for institutions and residential colonies. On Day two, participants were taken to a household where the septic tank was being desludged. Currently the practice is to dispose collected septage in the River Haora. Once the sewage treatment plant (STP) is in place, the collected septage will be disposed into the STP.

This was followed by a visit to the STP which is of 8 MLD capacity. It comprises of sequential batch reactors for sewage treatment and decanter for sludge compaction. The treated effluent will be chlorinated and disposed into the nearby river.

The participants evinced keen interest in further understanding treatment options especially DEWATS™. It was therefore recommended that the different towns identify problematic areas and develop appropriate solutions. This can be facilitated and supported by conducting design input sessions through practical training programmes. Pilot implementations can therefore be initiated for septage management as well as for septic tank effluent treatment – a step towards a cleaner Tripura.

APPENDIX 8: GRIEVANCE REDRESS MECHANISM- SHOWN IN WEBSITE





চিত্র নং- ১ ক্ষোভ নিরসনের পদ্ধতি।

Project Director
SIPMIU, NERCCDIP, ADB

APPENDIX 9: SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Hindi, English or local language, if any)

The **NERCCDIP** welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.

Date		Place of registration			
Contact Information/Personal Details					
Name		Gender	Male Female	Age	
Home Address					
Village / Town					
District					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode:	
<input type="checkbox"/> Note/Letter	
<input type="checkbox"/> E-mail	
<input type="checkbox"/> Verbal/Telephonic	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	<input type="checkbox"/> Yes <input type="checkbox"/> No
Means of Disclosure:	

GRIVENCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainer	Type of Complain	Place	Status of Redress	Remarks

LOCAL LANGUAGE

এন, ই, আর, সি, সি, ডি, আই, পি প্রকল্প বাস্তবায়ন সংক্রান্ত অভিযোগ, পরামর্শ, প্রশ্ন এবং মন্তব্য স্বাগত জানায়। আমরা শোধন এবং প্রতিক্রিয়ার জন্য আপনার সাথে যোগাযোগ পেতে সক্ষম তাদের নাম এবং যোগাযোগের তথ্য প্রদান অভিযোগ ব্যক্তিদের উত্সাহিত করি।

আপনি আপনার ব্যক্তিগত বিবরণ অন্তর্ভুক্ত করতে কিন্তু যে তথ্য গোপন থাকা চাই উচিত, আপনার নামের উপরে / টাইপ * (গোপনীয়) * লিখে আমাদের অবহিত করুন।

আপনাকে ধন্যবাদ।

তারিখ		নিবন্ধন স্থান			
যোগাযোগ তথ্য / ব্যক্তিগত তথ্য					
নাম		লিঙ্গ	পুরুষ / মহিলা	বয়স	
বাড়ির ঠিকানা					
গ্রাম / শহর					
জেলা					
ফোন নম্বর					
ইমেল					
অভিযোগ / পরামর্শ / মন্তব্য / প্রশ্ন (কে, কি, কোথায় এবং কিভাবে) নীচের আপনার অভিযোগের বিবরণ প্রদান করুন: সংযুক্তি / নোট / চিঠি হিসাবে অন্তর্ভুক্ত করা হয়, এখানে টিক করুন:					
কিভাবে আপনি আপনার মন্তব্য / অভিযোগ প্রতিক্রিয়া বা আপডেটের জন্য আপনি পৌঁছাতে চান?					

শুধুমাত্র সরকারী ব্যবহারের জন্য

(অফিসিয়াল নিবন্ধনের অভিযোগ নাম): দ্বারা নিবন্ধিত	
- তারপর মোড:	
<ul style="list-style-type: none"> ▪ উল্লেখ্য / পত্র ▪ ইমেল ▪ মৌখিক / টেলিফোনে 	
পর্যালোচনা: (নাম / অফিসিয়াল (গুলি) পর্যালোচনা অভিযোগ পজিশন)	
গৃহীত পদক্ষেপ:	
যতই কর্ম প্রকাশ নেওয়া:	<ul style="list-style-type: none"> ▪ হ্যাঁ ▪ না
প্রকাশ মাধ্যম:	

অভিযোগ তালিকা ও গৃহীত পদক্ষেপ

ক্রমিক সংখ্যা	তারিখ	অভিযোগকারীর নাম এবং যোগাযোগের বিশদ	অভিযোগের প্রকার	স্থান	প্রতিকারের অবস্থান	মন্তব্য

APPENDIX 10: PROJECT 1 MONITORING CHECKLIST

Project: Water Supply – Package No: Progress: Physical progress :						
Sr. No.	Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Responsible for Monitoring	Compliance Status/ Explanation
Pre-Construction Design phase						
1	Site preparation work completed including necessary clearance					
Construction						
2	Establishment of temporary camps with sanitary and solid waste management arrangement					
3	Removal of overburden and excavated material from working site and use / preservation of the same – as per mitigation measures					
4	Water sprinkling at construction site for arresting dust (if any during dry period)					
5	Materials carrying vehicle are covered					
6	All vehicles and equipments mobilized to construction site and producing emission, have Pollution Control Board certification					
7	At sensitive locations enclosures provided around generator set or other noise producing machinery					
8	Regular maintenance of noise producing equipment done					
9	Arrangement of drainage of waste water and arresting solid waste from waste water generated at construction site					
10	Arrangement of pit for storage of muck					
11	Felling of trees done (if necessary) with					

Project: Water Supply – Package No: Progress: Physical progress :						
Sr. No.	Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Responsible for Monitoring	Compliance Status/ Explanation
	mitigation measures i.e. planting of three trees for each tree fell.					
12	Pollution of water bodies at construction site					
13	Disposal of construction debris if any as per mitigation measures					
14	Ensure use of Personal Protective Equipment like helmet, gumboot, gloves, and earplugs at work place Arrangement of First Aid Box at working site					
15	Provide Health and Safety training to all personnel and implement H&S plan					
16	Plan truck routes (for carrying construction materials including pipes) to avoid narrow or congested roads and tourist sites					
17	Consideration of public safety - as per prescribed mitigation measures					
18	Employ at least 50% of workforce from communities near sites					
19	Continuous monitoring on implementation of mitigation measures					

Project 2- Monitoring checklist

Project: Water Supply- Package No:						
Progress:						
Physical progress:						
Sr. No.	Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Responsible for Monitoring	Compliance Status/ Explanation
Pre-Construction Design phase						
1	Site preparation work completed including necessary clearance					
Construction						
2	Establishment of temporary camps with sanitary and solid waste management arrangement					
3	Removal of overburden and excavated material from working site and use / preservation of the same – as per mitigation measures					
4	Water sprinkling at construction site for arresting dust (if any during dry period)					
5	Materials carrying vehicle are covered- Reducing dust hazard					
6	All vehicles and equipment mobilized to construction site and producing emission, have Pollution Control Board certification					
7	At sensitive locations enclosures provided around generator set or other noise producing machinery					
8	Regular maintenance of noise producing equipment done					
9	Arrangement of drainage of waste water and arresting solid waste from waste water generated at construction site					
10	Felling of trees done (if necessary) with mitigation measures i.e. planting of three trees					

Project: Water Supply- Package No:						
Progress:						
Physical progress:						
Sr. No.	Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Responsible for Monitoring	Compliance Status/ Explanation
	for each tree fell.					
11	Pollution of water bodies at construction site					
12	Disposal of construction debris if any as per mitigation measures					
13	Ensure use of Personal Protective Equipment like helmet, gumboot, gloves, and earplugs at work place Arrangement of First Aid Box at working site					
14	Provide Health and Safety training to all personnel and implement H&S plan					
15	Plan truck routes (for carrying construction materials including pipes) to avoid narrow or congested roads and tourist sites					
16	Consideration of public safety - as per prescribed mitigation measures					
17	Employ at least 50% of workforce from communities near sites					
18	Continuous monitoring on implementation of mitigation measures					

APPENDIX 11: SEMI-ANNUAL ENVIRONMENTAL REPORTING FORMAT

I. INTRODUCTION

- Overall project description and objectives
- Description of subprojects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
 - (i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
 - (ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
 - (iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
 - (iv) Are there designated areas for concrete works, and re-fuelling?
 - (v) Are there spill kits on site and if there are site procedures for handling emergencies;
 - (vi) Is there any chemical stored on site and what is the storage condition?
 - (vii) Is there any dewatering activities if yes, where is the water being discharged;
 - (viii) How are the stockpiles being managed?
 - (ix) How is solid and liquid waste being handled on site?
 - (x) Review of the complaint management system;
 - (xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table –Water supply subproject

A. Pre-construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Utilities/Tree cutting	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. (iii) Collection of tree cutting permission with assistance SIPMIU/DSMC					
Traffic Management	(i) Prepare a short traffic management schedule during preconstruction phase.					
Social and Cultural Resources	(i) Consult Archaeological Survey of India (ASI) or concerned department in Agartala to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Develop a protocol for use by the construction					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.					
Construction work camps, hot mix plants, stock pile areas, storage areas, and disposal areas.	(i) Prioritize areas within or nearest possible vacant space in the subproject site; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community; and (v) Avoid setting up of labour camp near river					
Sources of Materials	(i) Prioritize sites already permitted by the Mining Department; (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	of SIPMIU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from SIPMIU					

DSC = Design Supervision Consultant, PMU = Project Management Unit; PIU = Project Implementation Unit

B. Construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Sources of Materials	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability of all material sources and obtain approval of Investment SIPMIU; (iii) If additional quarries will be required after construction has started, obtain written approval from SIPMIU; and (iv) Submit to DSMC on a monthly basis documentation of sources of materials.					
Air Quality	(i) Consult with SIPMIU/DSMC on the designated areas for stockpiling of pipes, soils, gravel, and other construction					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	materials; (ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; and (iv) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly. (v) Carry out air quality monitoring					
Traffic Management	(i) Implement a traffic management schedule during preconstruction phase.					
Noise Levels	(i) Plan activities in consultation with SIPMIU/DSMC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>barriers the sound impact to surrounding sensitive receptor, and</p> <p>(iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.</p>					
Ecological resources – Terrestrial	<p>(i) Minimize removal of vegetation (if any) and disallow cutting of trees;</p> <p>(ii) If tree-removal will be required, obtain tree-cutting permit from Municipal Corporation,</p> <p>(iii) Require to plant three (3) native trees for every one (1) that is removed; and</p> <p>(iv) Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood.</p>					
Landscape and Aesthetics	<p>(i) Storage areas will be properly fenced off.</p> <p>(ii) Prepare and implement Waste Management List;</p> <p>(iii) Avoid stockpiling of excess excavated soils;</p> <p>(iv) Coordinate with AMC for beneficial uses of excess excavated soils</p> <p>(v) Recover used oil and lubricants and reuse or remove from the sites;</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>(vi) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(vii) Remove all wreckage, rubbish;</p> <p>(viii) Retain mature trees on and around the site where possible;</p> <p>(ix) Cluster construction activities on site on a specific area to avoid "sprawl";</p> <p>(x) Unwanted material and litter will be removed on frequent basis; and</p> <p>(xi) Request SIPMIU/DSMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.</p>					
Accessibility	<p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;</p> <p>(ii) Schedule transport and hauling activities during non- peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>(iv) Keep the site free from all unnecessary obstructions;</p> <p>(v) Drive vehicles in a considerate manner;</p> <p>(vi) Coordinate with Agartala Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;</p> <p>(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints; and</p> <p>(viii) Provide planks across trenches in front of businesses, and ensure works are completed quickly to avoid disruption</p>					
Socio-Economic–Income.	<p>(i) Leave spaces for access between mounds of soil; and</p> <p>(ii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p>					
Employment Generation	<p>(i) The use of labor intensive construction measures will be used where</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>appropriate;</p> <p>(ii) Employ local (unskilled) labor if possible;</p> <p>(iii) Training of labor to benefit individuals beyond completion of the subproject;</p> <p>(iv) The training of unskilled or previously unemployed persons will add to the skills base of the area. and</p> <p>(v) Recruitment of labors will take place offsite.</p>					
Occupational Health and Safety	<p>(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as:</p> <p>(a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, gloves, nose mask and ear plugs; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;</p> <p>(ii) Designate a safeguard focal person and undertake safeguards orientation by PMU/PIU;</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>(iii) Ensure H&S plan is easily understandable to workers and laborers. Keep in mind that this plan will be used on-site and workers/laborers may not always understand highly technical terms;</p> <p>(iv) Strict compliance of H&S plan and requirements of wearing personal protective equipment (PPE) during work hours;</p> <p>(v) Provide specific guidance for suitable PPE for every on-site work assignment</p> <p>(vi) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the project site;</p> <p>(vii) Provide medical insurance coverage for workers;</p> <p>(viii) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(ix) Provide supplies of potable drinking water at working sites;</p> <p>(x) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; and</p> <p>(xi) Provide H&S</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(xii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(xiii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(xiv) Ensure moving equipment is outfitted with audible back- up alarms;</p> <p>(xv) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	workers, visitors, and the general public as appropriate; and (xvi) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.					
Community Health and Safety.	<p>(i) Plan routes to avoid times of peak-pedestrian activities.</p> <p>(ii) Liaise with SIPMIU/DSMC in identifying high-risk areas on route cards/maps.</p> <p>(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>(iv) Provide road signs and flag persons to warn.</p> <p>(v) Provide protective fencing around open trenches, and cover any open trench with metal planks during non-construction hours. potentially cause soil contamination;</p> <p>(vi) Recover used oil and lubricants and reuse or remove from the site;</p> <p>(vii) Manage solid</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; and</p> <p>(viii) Request SIPMIU/DSMC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.</p>					
Camp sites	<p>(i) Consult SIPMIU/DSMC before locating project offices, sheds, and construction plants;</p> <p>(ii) Minimize removal of vegetation and disallow cutting of trees;</p> <p>(iii) Provide water and sanitation facilities for employees;</p> <p>(iv) Prohibit employees from cutting of trees for firewood;</p> <p>(v) Train employees in the storage and handling of materials which can potentially cause soil contamination;</p> <p>(vi) Recover used oil and lubricants and reuse or remove from the site;</p> <p>(vii) Manage solid waste according to the following preference hierarchy: reuse,</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ix) Request SIPMIU/DSMC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.					
Social and Cultural Resources	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Request SIPMIU/DSMC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform SIPMIU/DSMC if a find is suspected, and take any action they require ensuring its removal or protection in situ.					

DSC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, SPM = suspended particulate matter, PMU = Project Management Unit; PIU = Project Implementation Unit

C. Defects Liability Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
General maintenance	(ii) Conduct work during non-monsoon period; and (ii) Cover or wet excavated material to prevent dusts.					
Health & safety	Undertake regular monitoring and maintenance of water supply infrastructure.					

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

III. Training Orientation program details – Date, Venue, Participants, Subjects

IV. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each subproject

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

V. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

Summary of follow up time-bound actions to be taken within a set timeframe

VI. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Others