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MINISTRY OF WATER AND ENERGY
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Second Urban Water Supply and Sanitation Project

Environmental and Social Impact Assessment

(Fecal Sludge Management, Project for Gondar City)

[Final]

Financed By WORLD BANK

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November 2023
Addis Ababa

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ACRONYMS

ABR	Anaerobic Baffled Reactor
AF	Anaerobic filter
ARCCH	Authority for Research and Conservation of Cultural Heritage
BAU	Business as Usual
BFP	Belt Filter Press
BH	Borehole
BOD	Biological Oxygen Demand
BP	Bank Procedures
ANRS	Amhara National Regional state
CBOs	Community Based Organizations
CITES	Convention on International Trade in the Endangered Species of Fauna and Flora
CRGE	Climate Resilient Green Economy
CR-WSP	Climate Change Resilience Water Safety Plan
CSE	Conservation Strategy of Ethiopia
GWSSS	Gondar Water Supply & Sewerage Service
EA	Environmental Assessment
EEPO	Establishment of Environmental Protection Organs
EPA	Environmental Protection Authority
EPC	Environmental Pollution Control
EIA	Environmental Impact Assessment
EPE	Environmental Policy of Ethiopia
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EHS	Environmental Health and Safety
FDRE	Federal Democratic Republic of Ethiopia
FSM	Fecal Sludge Management
FSTP	Fecal Sludge Treatment Plant
GoE	Government of Ethiopia
GHG	Greenhouse Gas
GTP	Growth and Transformation Plan
GBV	Gender Based Violence
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HASP	Health and Safety Plan
HNAP	Health National Adaptation Plan to climate change
HSDP	Health Sector Development Program
IEC	Information Education and Communication
IFC	International Finance Corporation
ITCZ	Inter Tropical Convergence Zone
IT	Imhoff Tank
MoH	Ministry of Health
MoWE	Ministry of Water and Energy
MoWIE	Ministry of Water, Irrigation and Energy
NAP	National Adaptation Plan
NGO	Non-Government Organization
OP	Operational Policy
PAP	Project Affected People
PDB	Planted Drying Bed
PCT	Public and Communal Toilet
PPE	Proper care of Protective Clothing and Equipment
POPs	Persistent Organic Pollutants
PT	Public Toilets
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SA	Sexual Abuse
SEA	Sexual Exploitation and Assault
SEP	Stakeholder Engagement Plan
STD	Sexually Transmitted Disease
S & T	Settling – Thickening Tank
ToR	Terms of Reference
TMP	Traffic Management Plan
UAFB	Up flow anaerobic sludge blanket reactor
UDP	Unplanted Drying Bed
UWSSP-II2nd	Urban Water Supply and Sanitation Project
UWWM	Urban Waste Water Management
WASH	Water, Sanitation and Hygiene
WB	World Bank
WB's (EHS)	World Bank Environment, Health and Safety
WHO	World Health Organization
WIF	WASH Implementation Framework
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

INTRODUCTION

Gondar City is the administrative center of the Central Gondar Zone of Amhara National Regional State. It is located in the northern parts of Ethiopia, at a distance of 737 Km from Addis Ababa and 180 Km from the capital of Amhara National Regional State, Bahir Dar. The city is situated in the foothills of the Simien Mountains. Astronomically, the town is located at 12° 35' 60.0000" N latitude and 37° 28' 0.0012" E longitude with an elevation ranging between 2000 to 3000 meters above sea level and average elevation of 2200masl. The town has a total population of 465,973as of July 2022[1], with rapid increasing trend. From 2007 to 2022, the population increased by 125%, which put pressure on available sanitation infrastructure services. The town lacks a centralized sanitation system, and it relies fully on onsite sanitation technologies, with most of the population utilizing different types of pit latrines with or without a soak-away system. The town's sanitation facility problems are deep-rooted and accumulated for a long period of time. Fecal wastes are disposed of illegally in open areas. The majority of the existing private, public, and communal toilets are not giving proper service due to poor construction works and lack of service for emptying the toilets. A large amount of the dwellers of the town cannot afford the emptying charges of private operators.

To alleviate the observed sanitation problems, Gondar city Water Supply and Sewerage Service (GWSSS) is currently implementing the 2nd Urban Water Supply and Sanitation Project (UWSSP-II), which the World Bank supports. The primary objectives of the UWSSP-II are to construct a new FSTP, 76 communal toilets,18 public toilets and three vacuum trucks with capacity of 8 cubic meters, 3 small vehicles (three wheels) with a capacity of up to 500 liters, in the short-term to improve the sanitation problems for the town. This is needed because some of the existing infrastructure facilities were either old or insufficient to meet the desired needs of the communities fully. The PCT will be constructed in different parts of the town to improve the town's sanitation facilities in public and residential slum areas (e.g., sport fields, churches, taxi stations, markets places, and highly populated areas/villages) and low-income communities.

The infrastructure development may bring adverse environmental and social impacts. Hence, this project aims to provide insight into the possible positive as well as negative environmental and social impact analysis that can occur due to the design, construction, and operation of the proposed project during different phases and the possible mitigation measures that can be adopted. In connection with this, the Ministry of Water and Energy (MoWE) signed a consultancy service contract with Motion Consultancy and Training PLC to undertake the ESIA study for the FSTP Construction projects for Gondar town. While site specific environmental assessment that includes preparation of ESMPs shall be considered for each of the toilet schemes, this report presents an Environmental and Social Impact Assessment (ESIA) for the upcoming Fecal Sludge Treatment plant (FSTP) subproject.

The overall objective of the ESIA is to identify, predict, and evaluate the potential impacts of the proposed FSTP project on the biophysical and socio-economic environment in terms of magnitude, spatial extent, duration, and significance. The study also aims to provide recommendations for enhancing the beneficial impacts and mitigation measures for the adverse impacts as well as the environment and social management and monitoring plans that would help implement the recommended enhancement and mitigation measures. The scope of the ESIA study includes:

- Identification and analysis of the national and the World Bank environmental safeguard policies and regulations that will be triggered by the project (FSTP) activities; 11111

- Describe the views and concerns of the public and stakeholders towards the implementation of the project;
- Establish baseline features of the biophysical, socio-economic and cultural attributes of the project area;
- Identify and evaluate the significant impacts (both beneficial and adverse) associated with project implementation and subsequent operation;
- Propose specific mitigation for inclusion in the project detail design and management plan to reduce or avoid significant adverse environmental and social impacts; and
- Prepare Environmental and Social Management and Monitoring Plans for the recommended measures that will minimize adverse impacts and enhance beneficial impacts during planning, construction, operation as well and the decommissioning of the proposed sub-project.

METHODOLOGY

The ESIA study process followed the environmental and social management framework (ESMF) for UWSSP-II, the Government of Ethiopia (GoE) environmental and social impact assessment proclamation, ESIA guideline and the World Bank's safeguards policies. As such, a scoping exercise was carried out as an initial step of the ESIA study. The scoping exercise was aimed at determining the scope of work to be undertaken including the specific activities, locations, and potential environmental and social impacts of the proposed project.

This is followed by detail data collection, which includes gathering information on the project site, baseline environmental and socio-economic conditions. Qualitative and qualitative data was collected from primary and secondary sources typically through field surveys, literature reviews, stakeholder consultations and key informant interviews. The ESIA study also considered the legal and regulatory frameworks and international standards to ensure compliance and promote sustainable development.

The next step involves impact prediction, where the potential environmental and social impacts are identified and assessed based on the collected data. The impacts are evaluated in terms of their significance and magnitude, considering both short-term and long-term effects using impact matrices and risk assessments to determine the overall environmental and social impacts. Mitigation measures are proposed to minimize or eliminate any adverse impacts identified.

Finally Based on these findings and expert judgment, the consultant has compiled the projected social and environmental impacts (positive and negative) likely to emanate from proposed project activities and the Environmental and Social Management (ESMP) and Monitoring Plans which details how adverse impacts and risks will be reduced or eliminated and by whom.

DESCRIPTION OF THE PROPOSED PROJECT

Of twenty-two secondary cities benefiting out of the UWSSP-II Project, five cities: Gondar, Debre Berhan, Dessie, JigJiga, and Degahbur have been selected to participate in this round of the ESIA study. The project's development objective is to contribute to improving the socio-environmental conditions for the residents of these cities by providing effective and efficient sanitation services. To achieve the goals delineated under the immediate horizon urgent works, the following measures have been proposed for the city of Gondar:

- 1 fecal sludge treatment plant

- 76 communal and 18 public toilets in the selected area of the town.

Along with constructing FSTP and PCT, three vacuum trucks with capacity of 8 cubic meters, 3 small vehicles (three wheels) with a capacity of up to 500 liters are proposed to be purchased.

The proposed FSTP site which is the existing fecal sludge dumping site, is located 5 km at the southeastern part of Gondar town to the east of Gondar University Campus and the Gondar By-Pass Road. GPS coordinates latitude12°34'3.03"N and longitude 37°26'46.25"E. To select the site multi-criteria analysis was used and sites was evaluated against certain criteria, taking into consideration the nature of the work and the socio-environmental condition of the sites. The criteria include proximity to social and cultural amenities, proximity to water bodies and other natural resources, accessibility & distance from the town, and land use and cover.

Design capacity

The design assumed the population projection for the next five years and the fecal sludge treatment unit (Settler + ABR + AF) will have a capacity of 126 m³/day or 45,990 m3/year.

Treatment process

The treatment process comprises course screening solid liquid separation, solid line treatment, liquid line treatment and tertiary treatment for liquid effluent. In the first unit the liquid and solid part of the fecal sludge will be separated and the solid part goes to treatment lines (unplanted drying bed). The collected leachate (liquid part) goes to the liquid treatment units called anaerobic Baffle reactor and will be treated in series ponds. The dried sludge will be stored on for reasonable period for further dewatering and stabilization.

The FSTP components:

The project component includes ***Inlet, Screening, and Grit Removal Channels***; 22 in number reinforced concrete unplanted ***sludge drying beds*** for solid treatment***; a*** combination of ***Settler, Anaerobic baffled reactors and anaerobic filter*** for liquid treatment (seven in number standard structure in parallel) and ***two warehouses*** of 30m x30m will be constructed a surface area of 1800m on the FSTP site for dried sludge storage.

The ancillary works include construction of office, guard house, internal paves and internal access roads, laboratory, warehouse and fencing & gate, appropriate drainage for the whole site to avoid flooding conditions, water tanks and water connections.

Project Cost

Project capital cost is estimated to be ETB 754,091,000.00 (USD 15,082,000.00). However, this is an estimate which may be subject to changes during the course of construction works.

POLICIES, LEGISLATIONS, AND INSTITUTIONAL FRAMEWORK

Relevant National Policies and Strategies

The Constitution of the Federal Democratic Republic of Ethiopia (FDRE), adopted in 1995, provides the overriding principles and legal provisions for all legislative frameworks in the country. The concept of sustainable development and the environmental rights of the people are addressed in the Constitution's Articles 43, 44 and 92. These Articles, among others, state the right to development, the right to live in a

clean and healthy environment, and the right to monetary or alternative means of compensation, including relocation with adequate state assistance for persons displaced or whose livelihoods adversely affected by programs. Article 35 provides a foundation for the recognition and protection of women's rights and guarantees women equal rights with men. The Environmental Policy of Ethiopia, issued in 1997, has the overall policy goal to improve and enhance the health and quality of life of all Ethiopians, to promote sustainable social and economic development through sound management and use of natural, human-made, and cultural resources and their environment as a whole. Environmental policies are included in the cross-sectoral environmental policies, and they emphasize the early recognition of environmental issues in project planning, public participation, mitigation and environmental management, and capacity building at all levels of administration.

Other relevant policies issued by the Government of Ethiopia (GOE), including Water Resources, Wildlife, Population, Health, HIV/AIDS Policies, etc., have been reviewed. Applicable strategies and programs include the Climate Resilient Green Economy Strategy, Urban Wastewater Management Strategy, Health National Adaptation Plan to Climate Change (HNAP), the Second Urban Water Supply and Sanitation Program (2017 to 2022), Integrated Urban Sanitation and Hygiene Strategy, National Hygiene and Sanitation Strategy, and Water, Sanitation, and Hygiene (WASH) Implementation Framework and Climate Change Resilience Water Safety Plan (CR-WSP) Strategic framework, Environmental and social framework for USWSSP-II, etc., have been reviewed.

Environmental Framework Legislations

The GOE has issued several Proclamations and Regulations that are aimed at fostering environmental protection and sustainable use of natural as well as man-made resources. Among these legislations are the Proclamation on Establishment of Environmental Protection Organs (EEPO), the Proclamation of EIA, and the Proclamation on Environmental Pollution Control (EPC), all came into effect in 2002. The EEPO establishes the Federal EPA and empowers every sector ministry or agency and regional state to establish or designate a Sectoral Environmental Unit and Regional Environmental Agency, respectively. The EIA Proclamation makes an EIA mandatory for specified categories of activities undertaken by either the public or private sectors and is the legal tool for environmental planning, management, and monitoring. The EPC Proclamation is mainly based on the right of each citizen to have a healthy environment. Other most relevant laws and regulations include Water Resources Management Proclamation (Proclamation No. 192/2000); Solid Waste Management Proclamation (Proclamation No. 513/2007); Expropriation of Land Holdings, Payment of Compensation and Resettlement Proclamation (Proclamation No. 1161/2019) [2]; Public Health Proclamation (Proclamation No. 200/2000); Labor Proclamation (Proclamation No. 1156/2019) [3]; Regulation on Prevention of Industrial Pollution (Regulation No. 159/2008); and Regulation on Expropriation and Valuation, Compensation and Resettlement (Regulation No. 472/2020).

The World Bank's Safeguard Policies

Five of the ten WB safeguards Policies are triggered as part of implementation of the UWSSP II (Environmental Assessment (OP/BP 4.01), Safety of Dams (OP/BP 4.37), Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12) and Projects on International Waterways OP/BP 7.50). Besides, the World Bank Group (WBG) Environment, Health and Safety Guideline (EHSG) shall be applicable as deemed necessary. Of the World Bank (WB) Safeguard Policies, OP/BP 4.01 Environmental Assessment (EA) is the most relevant one for the administration of Environmental and Social Impact Assessment of any development projects. The objective of this policy is to ensure that Bank-financed

projects are environmentally sound and sustainable, and that decision-making is improved through the appropriate analysis of the projects‟ actions and their likely environmental impacts. The Bank undertakes environmental screening for each proposed project to determine the appropriate extent and type of ESA. The Bank also classifies a proposed project into one of three categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. A project designated as Category A requires a full environmental assessment followed by Independent Environmental Review; Category B projects require a lesser level of environmental investigations; Category C projects require no environmental analysis. Based on the findings of environmental screening process carried out, the proposed project is categorized under schedule 2 or category B which needs preparation of ESIA.

DESCRIPTION OF BASELINE CONDITIONS

Physical Environment

Gondar is the administrative center of the Central Gondar Zone of the Amhara Region, with an elevation ranging between 2000 to 3000 meters above sea level and average elevation of 2200m asl. The annual mean temperature of the area is 20.5°C (17.2–23.9°C) and annual rainfall is about 1000 mm (600–1400 mm). The city has a typical woyena Dega climate (KöppenCwb).

Biological Environment

An observation-based biodiversity assessment was made in the proposed project sites. The site selected for the proposed FSTP is the existing fecal sludge disposal site. No threatened, near threatened or any rare and declining species are identified to occur on the study sites. There are no sensitive bird species that would occur in the vicinity of the site. Most of the immediate habitat surrounding the proposed development is vacated. Therefore, the conservation issue is insignificant and the project can have minimal or no impact on local fauna and flora. The downstream of FSTP site is characterized as settlement and a crop dominant land use type.

Socio-economic Environment

The total population of the study area is estimated to be 465,973 of these, 228,306 (49%) are males and 237,667 (51%) females, but according to data from city administration, the total population is estimated to be about 750,000[7]. The town has three administration layers, namely Town, Sub-city (middle-level administration), and Kebele (lower-level of administration). The town has six sub-cities consisting of 26 Kebeles (18 urban and 8 rural).The town has different governmental and non-governmental institutions such as schools, pharmacies, residential houses, clinics, market areas, roads, hospitals, universities & colleges, manufacturing industries, electric and Ethio telecom infrastructures, and other institutions and facilities. None of the observed institutions and infrastructures is expected to be affected by the construction of the proposed project.

PROJECT ALTERNATIVES

This ESIA study was conducted in joint meetings and discussions with the parties involved in the feasibility study and project design consultants. During the feasibility and ESIA studies, alternative sites and alternative technologies were assessed, analyzed, compared, and recommended.

Different alternatives of FSTP technologies were reviewed and compared in terms of the best biological treatment technologies, and solids treatment. These are Unplanted Drying Bed, settling– thickening Tanks for solids-liquid separation; and Anaerobic Baffled Reactor (ABR), a waste stabilizing pond for effluent treatment; and Sludge drying bed for solids treatment. These alternative technologies were evaluated and ranked based on technical feasibility, financial considerations, environmental impacts, social, and economic factors. Accordingly, unplanted drying bed with Settler, Anaerobic baffled reactors and anaerobic filter is deemed to be the most advantageous technology to be adopted.

In the alternative 'without project' analysis, it was found that the 'without project' option is not acceptable, and it is recommended that the envisaged project be implemented in order to address the sanitation problem, which has mainly caused by a lack of sufficient sanitation facilities in the town.

PUBLIC AND STAKEHOLDER CONSULTATION

Consultation meetings were conducted with key stakeholders and project proponents with the main objective of presenting the proposed project and getting feedback from the stakeholders and local community on the project contents and its possible impacts. The members of the consulting team and the GWSSS have taken the time to thoroughly explain the nature, scope, and components of the project. A detailed explanation was given to address some of the attendees' questions. Stakeholder consultations were carried out with different actors who have a direct or indirect stake in the implementation of the proposed project. Accordingly, consultations were made with Mayor's Office and its subsequent sectoral offices such as Agriculture, health, education, environmental protection, beautification and Sanitation, Regulation enforcement protection, Water and Energy at the town level and ANRS EPA, Bureau of Water and Energy at regional level. Grassroots consultation was done with the local community (Appendix 1&2).

According to the findings of the discussion with the aforementioned parties, all parties are in support of the project's implementation, provided that it has no detrimental effects on the surrounding communities. The main issues/concerns raised by the stakeholders and recommendations provided include the following:

- The project is critical, and its construction and operation need to be started urgently in such a way to ensure the health and wealth of the public;
- The implementation of the project is very critical to meet the SDG-6 goal and ensuring equitable share considering the interests of all stakeholders in addressing population sanitary demand;
- Currently, in the town, inadequacy of stakeholder engagement is highly observed in the implementation of projects. However, as Fecal Sludge management issue is an outstanding problem in the town, all concerned stakeholders need to play their role in engagement of stakeholders in the design, implementation, and operation of the project;
- In the project, gender inclusion should be enhanced for the sustainability of the project;
- Reusing of FSTP effluent for irrigation and its sludge fertilizer were also one interest areas discussed and agreed; and
- For controlling of bad odor, buffering and landscaping of the site are also among the issues and recommendations forwarded by the stakeholders.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The implementation of FSTP is proposed mainly to improve the quality of the social and natural environment of Gondar town. The existing sanitation situation in the town is very poor and the absence of well-organized sanitation facilities has caused deterioration of the social and natural environment with adverse consequences

on human health, which is directly, or indirectly associated with water, air, and soil pollution resulting from improper fecal waste disposal. Though the construction and operation of the proposed FSTP is a well-recognized solution to overcome the existing environmental pollution and associated health impacts, some impacts are expected to occur during the construction, operation, and decommissioning phases of the project. In this ESIA, both positive and adverse environmental and social impacts were identified. Adverse impacts are characterized by type, magnitude, nature, spatial extent, and duration, and assessed for significance.

The construction of FSTP will be undertaken in publicly owned lands. Hence, there will be no negative impacts associated with the loss of land and livelihoods.

Impacts during Construction Phases

The main positive impact during the construction phases is job creation for skilled and unskilled workers, particularly for the jobless youth in the project area, and for national and international contractors and consultants. Proposed enhancement measures include giving priority to the local communities for women and providing business opportunities, job training, and capacity building for potential workers.

Potential adverse impacts include:

- Air pollution due to dust emission caused by vehicle traffic movements on unpaved access roads, land clearing, excavation and earthmoving activities, and transport of spoil materials to disposal sites, and gaseous emissions from vehicles and construction equipment;
- Noise pollution resulting from operation of construction vehicles and equipment;
- Soil compaction and soil erosion caused by project activities including site clearing, excavation in soil, and hauling of spoils to disposal sites, which would involve operation of heavy-duty equipment and dump trucks;
- Pollution of water bodies due to inadequate handling and spillage of pollutants (like fuel, oils, greases, and paints), release of solid and liquid wastes from construction camps and workshops;
- Accident risks to project construction workers, roadside communities, road users, and pedestrians due to increased traffic volume on the roads;
- Impacts on occupational health and safety resulting from construction activities, operation of project vehicles and equipment, storage and use of hazardous chemicals and explosives, dust and exhaust emissions etc.;
- Alteration of landscape due to construction of treatment plants and exploitation of construction materials from borrow and quarry sites and impacts on aesthetic quality of the sites;
- Conflict on employment opportunities created by the project between local and migrant job seekers; and
- Increased rate of HIV/AIDS and other sexually transmitted infections due to arrival of construction workers and relations with local women including commercial sex workers.

The identified impacts are predicted to be low to moderate, short-term, reversible, and direct adverse impacts. They can be minimized to acceptable levels by adopting appropriate mitigation measures including the following:

- Regularly spraying water on unpaved access roads, exposed earth and any stockpiles on site;
- Impose speed limits for project vehicles to 30km/hour on unpaved access roads esp. in the vicinity of sensitive areas (residential and business areas, social services, religious places);

- Keep noise level near sensitive areas such as residential areas and camps below the WHO[8] and Ethiopian maximum allowable noise level standards;
- Prevent environmental pollution by hazardous substances through proper storage and handling of those substances;
- Choose hours of less traffic volume on roads for mobilizing materials and construction machinery;
- Implement appropriate traffic management at and in the vicinity of the FSTP sites;
- Create awareness for drivers and equipment operators on health, safety and traffic accident prevention;
- Post proper and clearly visible signs, barricades, reflectors at appropriate locations so that road users are aware of the active construction works and take precautions while driving through or at nearby project operational areas;
- Reinstate the damaged sections of roads as soon as the construction works have been completed;
- Plant suitable trees and shrubs on the boundary of the FSTPs;
- Provide awareness education about HIV/AIDS, other STIs and preventive measures for project workers and local community, and avail protective materials;

Impacts during Operation Phase

During the project's operational phase, most of the positive impacts include enhancing the living conditions of Gondar town residents through improved public health and sanitation facilities. This leads to a reduction in waterborne diseases such as cholera, typhoid, amoeba, and diarrhea due to the provision of sanitation facilities and improved hygiene. The health quality is improved through the proper management of fecal matter that would otherwise be haphazardly dumped and drain into rivers, potentially affecting others. Additionally, the availability of manure can lead to increased agricultural productivity. However, there are also potential adverse impacts during the operation phase which include;

- The major negative impact of the proposed project is displacement of residents which are in a near proximity to the FSTP (with in 300m radius from the core activities of the FSTP such as fecal receiving units and treatment bonds), these residents are located within the buffer zone area need to be relocated to minimize the impact of bad odor from the FSTP
- Some offensive odor at and around the treatment plant sites mainly due to the release of hydrogen sulphide resulting from anaerobic digestion;
- Pollution of groundwater at treatment sites due to infiltration of wastewater through permeable soils;
- Contamination of water bodies mainly streams and rivers due to leakages or overflow from treatment plants;
- Contamination of the soils at the temporary storage of sludge that may contain hazardous substances like heavy metals as well as in case of spillages and overflows of FSTP;
- Public health and safety risks related to spills, leakages or discharge of sewage or uncontrolled spreading of sludge. Also, operators of the treatment plants could be exposed to hydrogen sulphide pathogenic and microorganisms in wastewater and sludge that may cause risks of infection and disease. Other potential health and safety risks are related to accidents and malfunctioning of plants.

Most of the identified adverse impacts of the operation phase are possible, reversible, of moderate to high significance, and long-term. They can be mitigated through:

- Adherence to national rules and regulations and appropriate contract specifications and guidelines;

- Maintaining appropriate buffer zones (minimum of 300m) around the treatment plants and planting trees to prevent spread of nuisance odor and improve aesthetic view of the treatment sites;
- Relocate the houses near to the FSTP and provide appropriate compensation for displaced persons. In this case Abbreviated Resettlement Action plan/ARAP/ by independent consultant is required
- Fencing at least the treatment process areas to guard against vandalism and to protect the public from entering to the treatment sites;
- Proper handling of chemicals and other materials to be used in the treatment process and keeping good personal hygiene;
- Applying aeration, proper chemical dosing and oxidation or pH adjustment to reduce offensive odor;
- Covering tanks or installation of exhaust hoods;
- Operating equipment at optimum/design conditions;
- Regular facility maintenance and monitoring operational practices including process control and treatment, continuous process of the operation

Impacts during decommissioning phase

At the end of the design life of the FSTP, GWSSS could upgrade or decommission the treatment plants. The following Potential adverse impacts are predicted assuming that the waste treatment plants will be decommissioned at the end of their design lifetime.

- Air pollution: During the decommissioning, structures installed to aid the treatment plants will be dismantled and demolished, which will cause the release of dust and other pollutants embedded in the demolished structures.
- Impacts on Soil and Water Bodies: If the contaminated soil is dumped outside the designated area or outside the properly designed and constructed sanitary landfill, it would pollute the soil and water resources including groundwater. Moreover, decommissioning the sites without availing a better substitute for the treatments of ever-increasing wastewater would also adversely affect the soil and water resources of the areas and their downstream.
- Loss of Job Opportunity: decommissioning of the treatment plants means number of skilled and unskilled workers will lose jobs which would adversely affect workers and their dependents. Health Impact: health impacts (occupational and safety) associated with dismantling of concrete structures and from the removal process of contaminated sludge and soil.

The identified adverse impacts of the decommissioning phase are possible, reversible, of low to moderate significance, and temporary. They can be mitigated through:

Mitigation measures

- Systematically demolish structures considering reuse of materials for other use;
- Wet the materials before demolishing to suppress the release of dust; and
- Avoid burning any material.
- Remove all the contaminated soil from the treatment plants sites and dispose of it at a designated waste disposal sites or at sanitary landfills;
- Give job priority in other related projects;
- Secure pension benefit if the age of the job loser is in the set range of pension; and
- Organize, train and promote to establish their own small-scale enterprises through the facilitation of loan or financial support. Create links with appropriate government agencies and financial sources.

- Plan the decommissioning work ahead of time to avoid sudden stop of the treatment plant before completely treating the influent reached to the treatment plant, and
- Provide appropriate PPE for the workers to be involved in decommissioning works
- The treatment plant sites should be reinstated after the plants stop their functions
- All the unwanted structures should be removed and disposed of at a designated waste disposal landfill

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This section provides an Environmental and Social Management Plan (ESMP) that comprises a specific plan of action for the proposed set of feasible and cost-effective mitigation and institutional measures directed at mitigating, minimizing, or controlling negative impacts arising throughout the different phases of the project.

This ESMP defines the roles and responsibilities of various stakeholders for ensuring smooth and well-integrated implementation and monitoring of the project operations. It contains commitments that are binding on the proponent. It can be translated into project documentation and provide the basis for a legal contract that establishes the responsibilities of the proponent. In turn, the proponent can use the ESMP to establish environmental and social performance standards and requirements for those carrying out the work or providing supplies. It can also be used to prepare an environmental and social management system for the project's operational phase.

ENVIRONMENTAL AND SOCIAL MONITORING PLAN

The environmental monitoring plan is developed to provide a basis for evaluating the proposed mitigation measures' efficiency and updating the actions and impacts of baseline data. It also gives information for adopting additional mitigation measures if the proposed measures are found insufficient. Thus, it will assist in identifying where additional mitigation effort or where an alteration to the adopted management approaches may be required. Monitoring should be done during construction, operation and decommissioning phases.

Implementation arrangements and capacity building

GWSSS has an established and functional position for Environmental and social Safeguard officer (2 positions), which will provide oversight on the implementation of the project's environmental and social impact assessment (ESIA) components. It is further planned that oversight on environmental issues shall be supplemented through the recruitment of additional environmental and social safeguard officer by the supervising consultant as well as by the contractor once the project commences. In the interim, this staffing arrangement is deemed adequate.

The responsibility for implementing the ESMP during construction will be of the contractor and GWSSS. During the operation and maintenance of the FSTP works, the responsibility will be mainly under the GWSSS. Similarly, Amhara Regional State EPA and Gondar city environmental agency have the sole responsibility for monitoring and regulating the overall social and environmental performance of the project activities.

The Ministry of Water and Energy (MoWE) and Amhara Regional State and Energy Bureau are ‘Promoter’ and will have the ultimate ownership of this project. A WB’s Supervision team is another part of the institutional structure, its role being to act as “a third party contracted by and acting on behalf of the WB to

monitor the Project, including monitoring physical progress and compliance, procurement supervision and quality assurance of technical solutions and physical deliverables.

The environmental sustainability of the FSTP project is dependent on the capacity of institutions at all levels (i.e., staffing, training, and other necessary support services) to carry out the associated ESMP implementation work. Thus, GWSSS must allocate sufficient resources for training and capacity building. These efforts will benefit the enterprise and build local capacity to undertake other development initiatives.

Budget estimation

The estimated total budget for the ESMP, which is mainly for environmental and social monitoring programs and training required to implement the ESMP, is about **8,369,000.000** ETB. As it is proposed in the feasibility study, the treatment plant is to be implemented in Design Build, and operate contract modality. Therefore, the cost of the ESMP will be covered by the contractor as the same will be taken care of by the specifications and bill of quantities as well as overall contractor's and consultant's fees.

CONCLUSION AND RECOMMENDATIONS

Implementation of the proposed project will certainly be a major solution to minimize the prevailing poor sanitation-related environmental pollution affecting the social dynamics and its consequences in the town and downstream communities and environments. The project will serve as a very important intervention for the protection of the socio-economic and biophysical environment of the town. The identified adverse environmental, social, and health impacts related to the construction and operation of the proposed FSTP as compared to the project benefits, have low to moderate significance and can be easily mitigated to acceptable levels by properly applying the proposed mitigation measures stated in this report.

It is recommended that proper implementation of the proposed mitigation and enhancement measures for each stage of the project will avoid or minimize adverse impacts and enhance beneficial impacts.

1. INTRODUCTION

1.1. Background

Safe sanitation is one of the indispensable services for human health through preventing infectious diseases and maintaining physical, mental as well as social well-being by ensuring environmental safety. Like other sub-Sahara countries, Ethiopia faces various sanitation problems related to a low level of priority for sanitation, poverty, unavailability of equipped skilled human resources, unclear institutional framework, and responsibilities. As a result, only 4% of rural and 16% of urban households use improved toilet accommodations. About 56% of rural households rely on unimproved toilet facilities and more than 35% of toilet accommodations are shared in urban households, whereas only 2% of rural households share their toilet facilities with other households [1]. One in three Ethiopian households has no toilet facility; defecate in bush/fields (39% in rural areas and 7% in urban areas) [1]. Furthermore, according to the WHO estimates, diarrhea contributes to more than one in every ten child deaths in Ethiopia [9].

To improve the situation, the government of Ethiopia has developed the Second Urban Water Supply and Sanitation Project (UWSSP-II) with financial support from the World Bank. The objective of the Project is "to increase access to improved sanitation facilities and improve efficiency in water supply service delivery in Addis Ababa and selected secondary cities" of which Gondar town is one. The Gondar town sanitation facility problems are deep-rooted and accumulated over a long period of time. Fecal wastes are disposed of illegally in open areas. The majority of the existing private, public, and communal toilets are not giving proper service due to poor construction works and lack of service for emptying the toilets. A large amount of the dwellers of the town cannot afford the emptying charges of private operators. Potentially, this impacts the fact that up to 50 % of the city populations with access to their own toilet have not yet emptied so far, their toilet according to socio-economic survey. The diagnostic performed during the assessment phase highlighted some important sanitation problems in some condominiums in the town. These include, the constructed septic tanks' capacity and quantities being inadequate; Lack of O&M of the septic tanks and emptying frequency; and Solid waste accumulation and clogging of the sanitation system. These problems were also studied during the feasibility study by ARTELIA in association with MCE consultant in October 2022 [10].

Hence, to alleviate these problems and achieve the goal set in the Second Growth and Transformation Plan (GTP II) and SDG, a portion of the World Bank fund secured by Gondar Water Supply and Sewerage Service GWSSS) for the Second Ethiopia Urban Water Supply and Sanitation Project (UWSSP-II) is allocated for the provision of wastewater collection, treatment, and disposal infrastructures to serve the Gondar town as one of 22 secondary cities selected for the project. To meet the future needs of the town, it has planned to construct a fecal sludge treatment plant; new communal & public toilets and decentralized waste treatment Plants.

The infrastructure development may bring adverse impacts on the environment and social aspects that need efforts to minimize impacts and set mitigation measures to make the project environmentally and socially acceptable. Without proper planning and management, the project may result in severe economic, social, and environmental impacts. Hence, this assignment aims to provide an insight into the possible environmental and social impacts that can occur due to the construction and operation of the proposed transfer stations and wastewater treatment plants with their sewer line networks during different phases and the possible mitigation measures which can be adopted. In connection with this, the Ministry of Water and Energy has

signed consultancy service contracts with Motion Consultancy and Training PLC to undertake the ESIA Studies of Gondar, Dessie, Debre Berhan, Jigjiga and Degehabur Towns. This ESIA study deals with Gondar city.

1.2. Objectives of the ESIA study

1.2.1. General Objective

The general objective of the ESIA study is to describe the existing bio-physical and socio-cultural features of the proposed Gondar city sanitation project environment, assess the potential positive and negative impacts, and recommend appropriate enhancement and mitigating measures that will enhance the positive impacts and avoid or minimize any undesirable impacts expected to result from the construction and operation activities of the sanitation project.

1.2.2. Specific objectives of the ESIA

- To review the Federal Government of Ethiopia's environmental and sectorial policies, legislation, regulatory and administrative framework in conjunction with the World Bank's safeguards policies;
- To identify and describe the baseline Physical, biological and socio-economic environmental condition in the project implementation area and highlight the major constraints that needs to be taken in to account in the course of project implementation;
- In light of the available information, to develop an environmental and social screening and scoping process for the project;
- To identify, predict and evaluate the potential positive and negative impacts of the proposed project on the physical, biological and socio-economic environment in terms of magnitude, extent, and duration;
- To develop a stakeholder consultation process that ensure all stakeholders, including potentially affected persons, are aware of the objectives and potential environment and social impacts of the project, and that their views are incorporated in to the project's design as appropriate;
- To prepare an Environmental and Social Management and Monitoring Plan including monitoring indicators during the mobilization, construction, operation and decommissioning phases of the FSTP proposed for the short-term intervention; and
- To evaluate alternatives to the proposed project.

1.3. Scope of the ESIA

This ESIA was conducted in Gondar town of Amhara Regional State on the proposed FSTP. The scopes of service of the ESIA were as follows:

- Provide a comprehensive description of the project units, size, nature, and characteristics, land and other resource requirements, waste generated, project implementation period, and the like;
- Review existing project documents mainly Situation Assessment and Preparation of Immediate Short-term intervention, Feasibility study final design reports of the project, and other related progress reports;
- Identify and analyze the national and the World Bank environmental safeguard policies and regulations that will be triggered by the project activities;

- Review the ESMF for Urban Water Supply and Sanitation Project Phase II dated May 2020 and ensure that the requirements specified in the ESMF are considered properly in the ESIA study.
- Review the Resettlement Policy Framework [11] issued in 2016 and make sure that the guidelines provided in the document are considered sufficiently in the ESIA process.
- Conduct baseline surveys to identify and analyze the existing condition and carry out all the required survey data collection and investigations. The baseline assessment was address:
  - Physical and bio-physical environment (climate, topography at the project site(s), geology, hydrogeology, surface water, soils, erosion sensitivity, flora, fauna, including the identification of any protected or endangered species);
  - Land use at the project site(s) and in its (their) vicinity;
  - Human environment: description of the town communities (population size, population structure and demography, socio-political organization, livelihoods, access to public services);
- Identify biophysical, socio-economic and cultural components likely to be impacted by the project;
- Make analysis of alternatives of the proposed project;
- Assess, predict and evaluate potential impacts of the proposed project and its potential alternatives at different stages of the project;
- Conduct public consultation to obtain people's perception about the project: -

-with interested parties (beneficiary communities, communities potentially affected by the project, downstream water users, local authorities, regional authorities)

- with the implementing agency (identify the implementing agency),
- with the design team,
- with the Amhara Regional State EPA;

- Propose mitigation measures;
- Develop an environmental and social management plan (ESMP) with mechanisms for monitoring and evaluating the compliance and environmental performance which include the cost of mitigation measures and the time frame of implementing the measures;

1.4. Team in charge of the ESIA

More than eight senior professionals with diverse backgrounds and extensive relevant experience were involved in the process of the ESIA. The Team Composition and their task assignments are attached in annexes (annex 14).

2. METHODOLOGY OF THE ESIA STUDY

2.1. Approach

To conduct the ESIA study, we followed the Ethiopian ESIA and World Bank Guidelines. We reviewed relevant studies, policies, and guidelines, and collected primary data through field observations and beneficiary consultations. We conducted a field survey of FSTP project site, identified, assessed, and documented the potential environmental impacts of the expected project activities. We also consulted with key stakeholders, PAPs and local community representatives to address socio-economic and environmental issues. In addition, we obtained expert opinions and learned from previous experiences to ensure a comprehensive study approach.

2.2. Methodology

This ESIA study is based on the review of relevant data, studies and reports gathered from various offices at regional, town and Kebele levels including the feasibility and design study reports; we collected primary data through a comprehensive field works and observation. Consultations with project-affected communities/people, relevant expert, as well as city and kebele administrators were conducted.
The methodology used in this assessment corresponds with the EIA Proclamation of 295/2002, adopting the approach of identifying, collecting, and analyzing information which included:

- Undertaking the activities initiated during the scoping phase including involvement of key stakeholders and collecting of the baseline information on both natural and built environments including socio-economic conditions surrounding the project area and the municipality at large.
- Analysis of data for identification, prediction, and evaluation of the impacts both beneficial and adverse ones from the proposed project development and operation. This was achieved through the use of checklists, simple matrices, and use of engineering judgment [10], standards, and guidelines.
- Identifying and proposing mitigation measures aimed at minimizing and where possible eliminating the potential negative impacts and enhancing positive ones using expert judgment.
- Preparing environmental and social management and monitoring plans for follow-up during project operation.
- Presenting the information in the ESIA Report (the present report).

The methodology took into account the likely impacts on the physical and biological environment (on air, soil, water, flora, and fauna).

The necessary activities involved in undertaking the study are as follows:

- Consult key stakeholders to gather their concerns and opinions about proposed project and in particular how the surrounding communities will be impacted by the project.
- Carry out additional information or data to supplement ESIA.
- Establish environmental conditions in the proposed sites for project activities.
- Assess the status of ecological and social receptors.
- Describe the project characteristics and affected environment.
- Assess and evaluate the potential environmental impacts resulting from the proposed project, especially within the zones of project influence.
- Identify mitigation measures for adverse social and environmental impacts. and

- Develop an ESMP detailing actions and responsibilities for the mitigation of impacts and for monitoring them.

2.2.1. Review of Relevant Studies, Policies, and Legal Documents

Policies, legislation, and guidelines pertinent to social safeguard and environmental protection were gathered and reviewed for assessing the relevant environmental and social safeguard policies, laws, and regulations related to social and environmental protection matters in general and the expected socio-environmental impacts of the proposed development in particular.

2.2.2. Scoping

Environmental scoping was carried out to identify valued environmental components for the project, to identify influential areas where the impacts of the project implementation are felt most, and to identify the significance of the project implementation both from beneficial and adverse impacts of the Project.

Site visits, in combination with the document assessment, enabled the identification and definition of the Valued Environmental Components for the project implementation sites which include FSTP existing site, 36 public, and 76 communal sites. The selected sites belong to the Municipality land and do not affect individual properties. The scoping exercise revealed that there are no environmentally sensitive/ fragile ecosystems like dense forests, parks and wildlife habitats, historical and cultural sites, or sensitive landscapes in the site selected. There are no social service centers (schools, churches, health institutions, etc.) at the proposed FSTP that can be negatively affected by the construction of operation of the project.

During the scoping exercise, relevant stakeholders and PAPs were identified. The main stakeholders are the National and regional environmental protection authority, ANRS Urban Development and Construction, Health Bureau, education, culture and tourism, women and children affairs, Municipal Environment Management and beautification, village Committees, and GWSSS.

The environmental and social impacts likely to be significant were determined in the Scoping process and these were analyzed in detail in Section 8. The Scoping exercise also identified the data required to describe the baseline E&S baseline conditions that would be the basis for the impact analysis. Moreover, it showed the availability of the required baseline data and additional surveys that need to be carried out to fill data gaps.

2.2.3. Baseline Surveys and Data Collection

Following an extensive review of existing documents related to the proposed projects, field investigation and collection of detailed data on the social and natural environment were carried out in the project area. The aim of the survey was to collect socio-environmental baseline data for the project influence area and to identify sensitive environmental components that are likely to have a significant effect due to the implementation and operation of the envisaged sanitation projects. Data collection was carried out using a checklist. The checklist was filled at the site and used to identify potential adverse socio-environmental impacts and to categorize and determine the level of ESIA to be conducted.

Figure 1:Observation at FSTP Site

2.2.4. Public and Stakeholders Consultations

The main purpose of public and stakeholders' consultation was to disseminate information about the project to the public and affected parties and to obtain their views and concerns. Individuals and groups of the local communities in the project area who are likely to be affected directly or indirectly by the implementation of the proposed project were consulted. Groups of community members focusing on PAP in gender, elders, youths, and vulnerable groups inclusive way; concerned government officials, and professionals (social and environmental experts) at the Regional State, municipal and kebeles Administrators were consulted during the ESIA fieldwork.

Information related to the existing waste management system focuses on constraints, existing environmental and social features of the project influence area, potential environmental issues/impacts related to the proposed project components and activities, as well as the attitudes of the officials, local communities, and experts towards the planned scheme were assessed. This information and opinions have been considered in this socio-environmental impact analysis. Formal and informal consultations were also conducted with the design consultant's staff, Client's officials, and experts. Outcomes of the consultations are summarized in section- 7.

2.2.5. Use of Relevant Data Generated by Other Disciplines

Data collected by the project feasibility study and design consultant (engineering team) were reviewed and the relevant data was used to supplement the environmental and social data and to understand the proposed technical features of the project [10]so that to render the impact assessment as comprehensive as possible.

2.2.6. Identification and Analysis of Environmental and Social Impacts

The impact assessment was based primarily on the selected valued environmental and social components. Field investigation, public consultation, literature survey, and expert judgment were applied to screen the

valued environmental and social components. Impacts and their depth and significance were outlined with reference to environmental and social settings on a temporal and spatial basis. The following stepwise approach was followed:

- ***Identification***- This includes a description of the existing environment, determination of the project components, and definition of the environment that will be modified by the project.
- ***Prediction***- Forecasting of the quality and/or spatial dimensions of the changes and estimation of the probability that the impact will occur.
- ***Evaluation***- Determination of the incidence or magnitude and significance of the impact before mitigation.

Key, potentially beneficial as well as adverse impacts on the physical, biological, and socio-economic environment associated with the project operation were identified with the help of checklist and matrices method.

The impacts of the proposed project have been analyzed along the following parameters:

- Probability of occurrence
- Extension in space
- Duration in time
- Magnitude
- Significance

The predicted environmental and social impacts are characterized as follows:

- Nature of Impact: Direct, indirect or cumulative;
- Type of impact: Positive, negative or both
- Duration of impact: short term, medium term or long term;
- Spatial scale of impact Local, regional, National, International
- Significance of Impact: Low, Medium, High or Very High

A combination of these parameters were summarized in an all-encompassing measure of significance which is the basis for identifying and prioritizing major significant impacts and recommending mitigating measures. Finally, the magnitude and significance level of the identified impacts were evaluated as minor, medium, or major significance impacts.

2.2.7. Data Gaps and Assumptions

Data gaps and assumptions have been assessed based on:

a) Identifying knowledge gaps, assumptions, and unavailable information;
b) Reasons for the incomplete nature and/or assumptions of information;
c) Implications of those identified knowledge gap and assumptions for decision making and
d) Proposals and/or suggestions to avoid the identified constraints and limitations

Since this ESIA report was prepared by multidiscipline expertise, significant gap in knowledge was not observed. Also, the ESIA team didn't face any major difficulty in getting relevant information as the ESIA report was developed after the project feasibility study was completed and in parallel with the detail design.

3. DESCRIPTION OF THE PROPOSED PROJECT

3.1. Overview of UWSSP-II project

The Urban Water Supply and Sanitation Project (UWSSP) is an extension of the World Bank's long-term involvement in Ethiopia's urban water supply and sanitation sector. It aims to support the government's efforts in improving sanitation services in urban areas. Key principles of the project include implementing an integrated citywide approach to sanitation improvement that offers diverse service options to accommodate different settlement types.

The project emphasizes the development of a comprehensive suite of services for the collection, transportation, treatment, and disposal/reuse of liquid waste. It recognizes the importance of public awareness and social engagement in promoting proper waste management practices and encourages the involvement of the private sector to provide services, goods, and construction work, as well as improving the efficiency of utilities in resource utilization and management.

The government has secured finance from the World Bank under the Second Ethiopia Urban Water Supply and Sanitation Project (UWSSP-II) to increase access to improved sanitation facilities and improve efficiency in water supply services in Addis Ababa and 22 secondary cities[1]. The project will support these cities to achieve the targets set under the Growth and Transformation Plan II (GTP II) and the Sustainable Development Goals (SDGs).

Gondar city is among these selected cities for the implementation of UWSSP-II project for the immediate, intermediate and long-term sanitation intervention sub projects. The main goal of the subprojects is to enhance and expand the availability of proper sanitation facilities establish a long-lasting waste management system.

The proposed development interventions in Gondar city for the short term are

- Extension of the current onsite sanitation facilities in the town with improved sanitation technologies.
- Construction of a fecal sludge treatment plant.
- Construction of 18 Public toilet facilities (2 type I and type II) in areas where densely populated and open defecation is noted.
- Construction of 76 communal toilets (41 type 1, 1 type 2, 6 type 4, and 28 type 5) for residents living in neighborhoods without latrine facilities.
- Provision of vacuum trucks and small vehicles in order to collect and transport fecal sludge.

This report is prepared pursuant to the service contract between MOTION Consultancy and Training PLC, the consultant and Ministry of Water and Energy, the client to undertake Environmental and Social Impact Assessment of envisaged FSTP subproject to be implemented in Gondar city.

[1]Dire Dawa, Mekelle, Adama, Bahiredare, Hawassa, Jimma, Gonder, Sodo, Adigrate, Harer, Jigjiga, Degahbur, Gambella, Assosa, Semera Bishoftu, Dessie, Shashemene, Nekemte, Asela, Arbaminch, and Debreberhan

3.2. Project Description

The proposed Fecal Sludge Treatment Plant (FSTP) project in Gondar aimed at addressing the challenges associated with the management of fecal sludge in the city. The project aims to provide a sustainable and environmentally friendly solution for the treatment and disposal of fecal sludge. The FSTP project will involve the construction and operation of a treatment plant specifically designed to effectively manage and treat fecal sludge generated from households and other sources within the town. The plant will be strategically located in an area that minimizes environmental and social impacts, while also ensuring accessibility for the collection and transportation of fecal sludge from various sources within the city.

The FSTP component will have a capacity of 126 m³/day or 45,990 m^3/year in the next five years, but after the five-year period, it is recommended by the design consultant that the FSTP will be upgrade / be extended and relevant additional facilities should be suitably designed accordingly.

The fecal sludge treatment unit has several key components. First, there is a reception area where fecal sludge collection trucks unload the sludge. The fecal sludge is then sent to a pre-treatment unit, where the coarse materials will be filtered and unwanted solid substances that include plastic wastes and debris will be removed. After pretreatment, the fecal sludge goes through a series of advanced treatment processes. In the first unit the liquid and solid part of the fecal sludge will be separated, the solid part goes to solid treatment lines (unplanted drying bed) and the collected leachate (liquid part) goes to the liquid treatment units called Anaerobic Baffle reactors (ABR). Where, the main function of these structures is destruction of pathogens, they also carry out polishing of the wastewater to achieve the stands for Biological Oxygen Demand (BOD) and suspended solids. The dried sludge will be stored for an extended time for further dewatering and treatment.

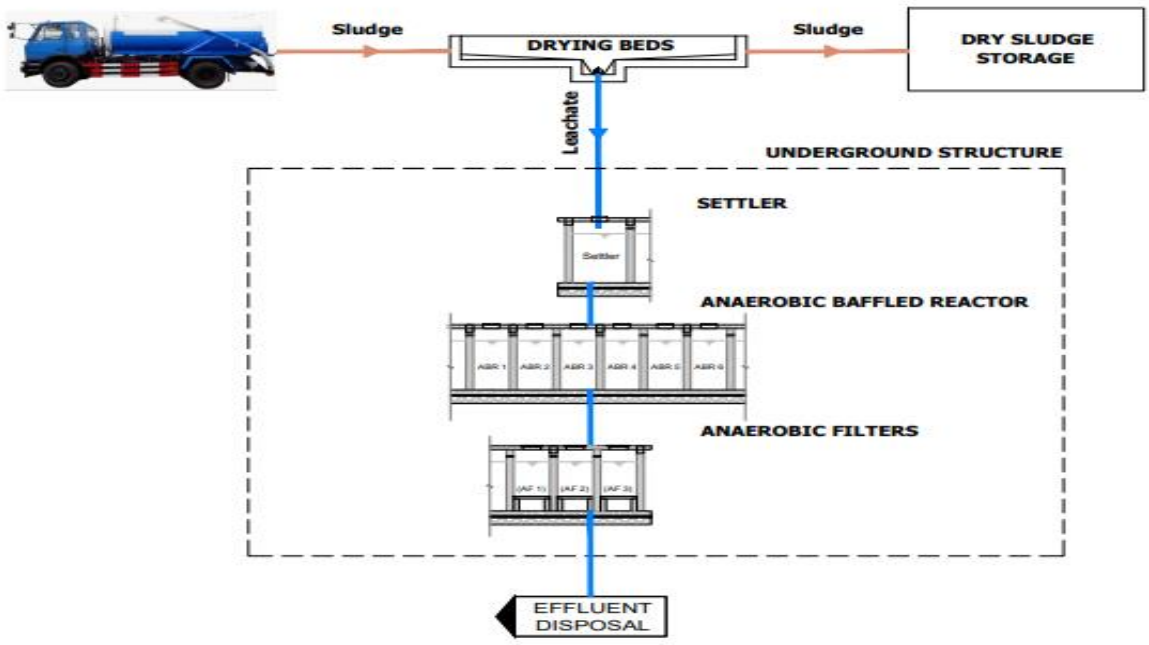

Figure 2: Process Flow of Treatment System
Source: [[12]

The main activities include demolishing of the existing fecal treatment structures, and excavations for the construction of project components. The components of fecal sludge treatment plant also include

Infrastructures and Auxiliary Facilities such as access pathways and roads; drainage of the whole site to avoid flooding conditions; an office with a toilet/washroom; a small laboratory; a warehouse of 900 m² to receive the dried sludge from the drying beds and to store it for five months; and fencing.

3.2.1. Project Location

Gondar is a historical town that consists of many historical heritages including the Palace of Fasilides, which is registered by UNESCO. The city is situated in the foothills of the Simien Mountains. Astronomically, the town is located at 12° 35' 60.0000" N latitude and 37° 28' 0.0012" E longitude with an elevation ranging between 2000 to 3000 meters above sea level and average elevation of 2200masl.

The proposed FSTP site is located 5 km at the southeastern part of Gondar town to the east of Gondar University Campus and the Gondar By-Pass Road. GPS coordinates latitude12°34'3.03"N and longitude 37°26'46.25"E. The proposed FSTP site is the existing fecal sludge-dumping site.

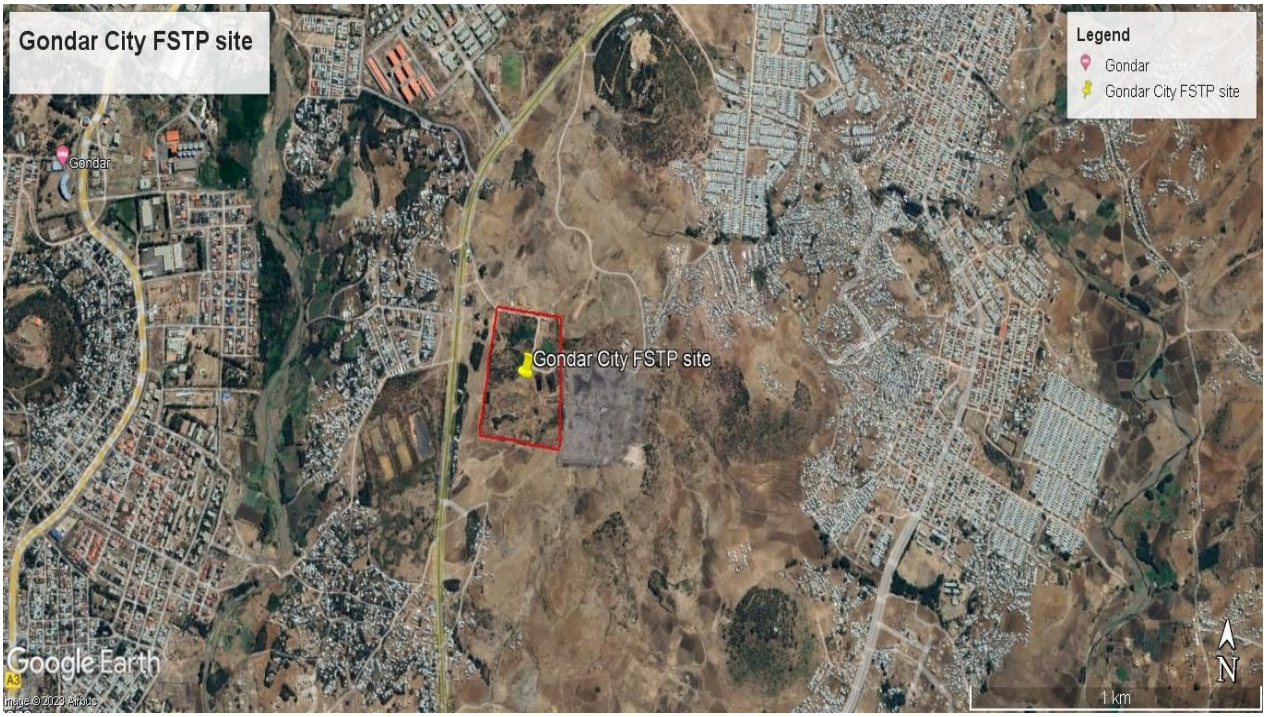

Figure 3: Relative Location Map of the FSTP within Gondar City
Source: Google earth

The topology of the town is characterized by undulating mountainous topography. The majority of the parts of the town mainly has hilly and mountainous and proposed FSTP also lays within the elevation ranges between of 2088 to 2,118 meter above sea level. Please correct like “The treatment site, considered to have a low to flat slope, is located on the town’s outskirts, approximately 5km east of the town center. Within a 250m radius of the site, there are no settlements. However, between a 250 to 300m radius, there are 15 houses and a church. These are situated within the recommended buffer zone and relocation will be necessary (please see section 8.4.2 for details on the recommended buffer zone)

To the east of FSTP the solid waste disposal site is found, there is no proper demarcation and fence between the sites, this may have risks of flooding and transporting of wastes such as plastic by wind which affect the proper functioning of the FSTP. Hence proper flood protection and wind protection is necessary to protect

the FSTP.

3.2.2. Components of Fecal Sludge Treatment Plant

The proposed FSTP comprises 1) Fecal sludge receiving unit (Inlet), 2) Unplanted sludge drying Beds, and 3) liquid Treatment Units (Settler Anaerobic baffled reactors anaerobic filter) 4) auxiliary facilities such as dried sludge storage, office facilities, laboratory, parking and internal access road and fence as described below. The layout of the FSTP is as indicated in figure below

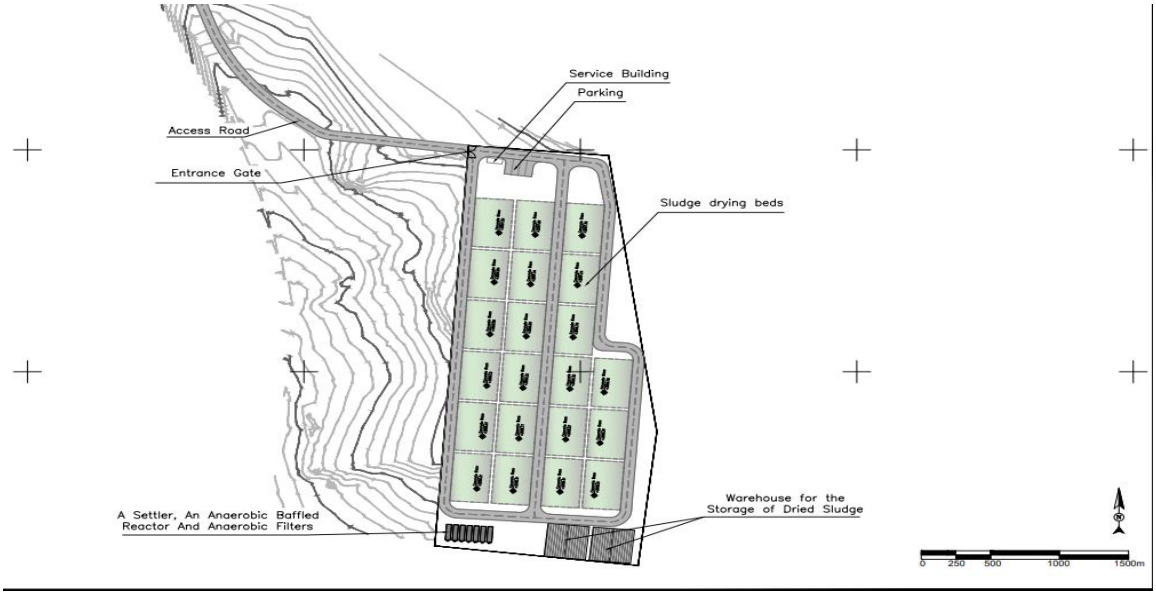

Figure 4: Layout ofFSTP And Its Facilities
Source: [12]

The proposed FSTP has the capacity to treat 126 m³/day or 45,990 m^3/year end expects to fulfill the existing demand of the next five years.

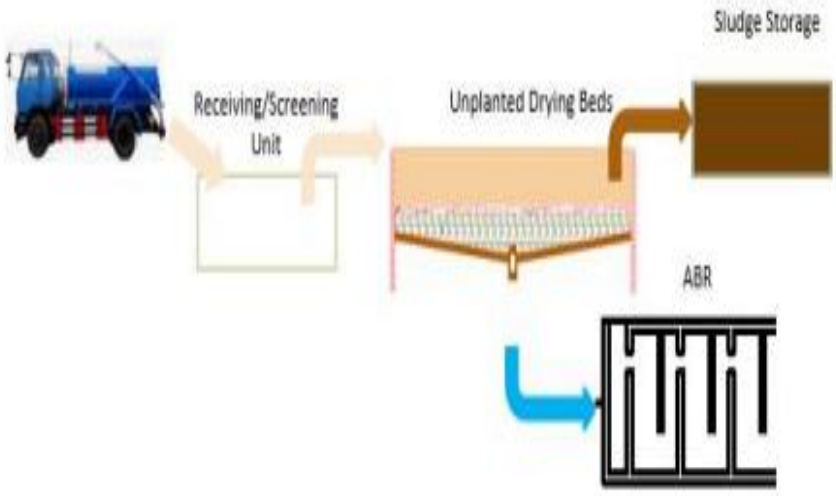

Figure 5: Proposed Treatment Scheme
Source:[12]

3.2.2.1. Receiving and Screening Units

The FSTP Receiving and Screening units comprise a coarse screen. The coarse screens are recommended to remove potential hard items such as those used for anal cleansing. Screens are installed on a hinge system so that the operator can tilt up the screen, and then rake the debris into the trough. The vacuum trucks will discharge directly in coarse screens, incorporated in each drying bed.

The proposed screens are manually raked screens due to their simplicity, robustness, and relatively low cost to avoid the supply of spare parts and requirement of skilled labor as well as an adequate supply of water required for regular cleaning in mechanically raked screens. The spacing between bars on a coarse screen is 40mm. Steel with a suitable paint or coating, possibly tar or epoxy-based is recommended to prevent corrosion. In addition, the bars will be tapered slightly inwards from front to back in order to reduce the likelihood of solids becoming jammed between the bars. A splash plate should be used to prevent erosion of the sand layer. The screenings will be dried and disposed of through burial in excavated trenches within the treatment plant. Without a splash plate, the sand layer would be destroyed during the very first loading operation.

Table 1:Dimensions of the Screens

Parameters	Value	Unit
Bar width	10	mm
Bar height	500	mm
Space between bars	40	mm
Angel to Horizontal	50	Degree

Source: [10]

3.2.2.2. Unplanted drying beds

Sludge drying beds are the longest-established and simplest option for sludge dewatering. It is a simple, permeable bed that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by percolation and evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates[13]. This technique is the most widely used method for sludge dewatering. The sludge is dried naturally by the sun and wind over a civil works structure. It does not require energy input. It however requires some extensive land availability

The sludge, however, is not effectively stabilized or sanitized. The bottom of the drying bed is lined with perforated pipes to drain the leachate away that percolates through the bed. On top of the pipes are layers of gravel and sand that support the sludge and allow the liquid to infiltrate and collect in the pipe. It should not be applied in layers that are too thick (maximum 20 cm), or the sludge will not dry effectively[13]. The final moisture content after 10 to 15 days of drying should be approximately 60%. When the sludge is dried, it must be separated from the sand layer and transported for further treatment, end-use, or final disposal. The drainage pipes are covered by 3-5 graded layers of gravel and sand. The bottom layer should be coarse gravel and the top fine sand (0.1 to 0.5 mm effective grain size). The top sand layer should be 250 to 300 mm thick because some sand will be lost each time the sludge is removed. To improve drying and percolation, sludge application can alternate between two or more beds.

A hard concrete or block work splash pad will be provided below the inlet to each drying bed to ensure that incoming sludge does not scour the sand bed. To achieve this objective, it is suggested that the splash pad should extend at least 0.5 m for each side. In addition, a ramp is provided to each bed to facilitate the sludge removal and ease access to sludge removal equipment into the beds.

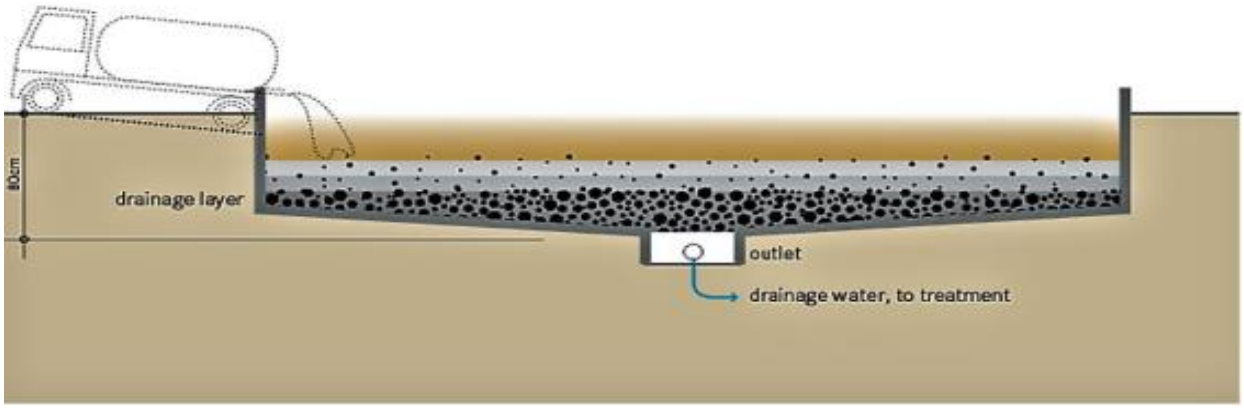

Figure 6: Schematic of an Unplanted Drying Bed
Source:[13].

Unplanted drying beds are preferable and suitable for developing countries due to their low capital and operating costs, simplicity of operation, and good dewatering efficiency, especially in dry and hot climates[13]. Moreover, dried sludge can be used for compositing, which is an important input in agricultural production. However, this treatment technology requires large land areas; it is labor intensive, especially for the dried sludge removal; and it has limitations in stabilization, pathogen, odors, and flies reduction.

Treatment Principles

Sludge is deposited on each of the drying beds where it remains until the desired moisture content is achieved. The first treatment principle consists of the percolation through shallow filters filled with sand and gravel with an under-drain at the bottom designed to collect leachate. The second principle consists of the evaporation of the bound water.

The FSTP will have a total of 22 unplanted drying beds with a dimension of 44m length and 27m width. The detail of dimensions and area requirements for drying bed indicated in the following table.

Table 2: Sizing of Sludge Drying Beds and area Requirement

Parameter	Value	Unit
TSS Content, Ci	16	g/l
Number of beds	22.0	
Mean daily influent flow, Q	163.8	m^3/day
Design daily influent flow, Q	229.3	m^3/day
The annual mass of sludge	954,402.3	KgTSS/year
Required Daily Drying Bed	1,146.6	m^2
Width	27.0	m
Length	44.0	m
Required Daily Drying Bed	1,188.0	m^2
The drying beds total surface	26,136.0	m^2

Parameter	Value	Unit
Additional Area for DB related infrastructures	3,920.0	m^2
Total DB area requirement	30,056.4	m^2
Effective sludge loading rate	36.5	KgTS/ $m^{2/}$/year

Source: [10]

3.2.2.3. Effluent Treatment Units

As described previously, a combination of settler, Anaerobic Baffled Reactor (ABR) and anaerobic filter are proposed for the effluent treatment for this project. This maintains passive operation and low construction and operating costs; however, they must be dislodged periodically. An anaerobic baffled reactor (ABR) is an improved Septic Tank with a series of baffles under which the wastewater is forced to flow. The increased contact time with the active biomass (sludge) results in improved treatment. Anaerobic baffled reactors (ABRs) are concrete, masonry, or prefabricated fiberglass tanks consisting of several compartments in series.

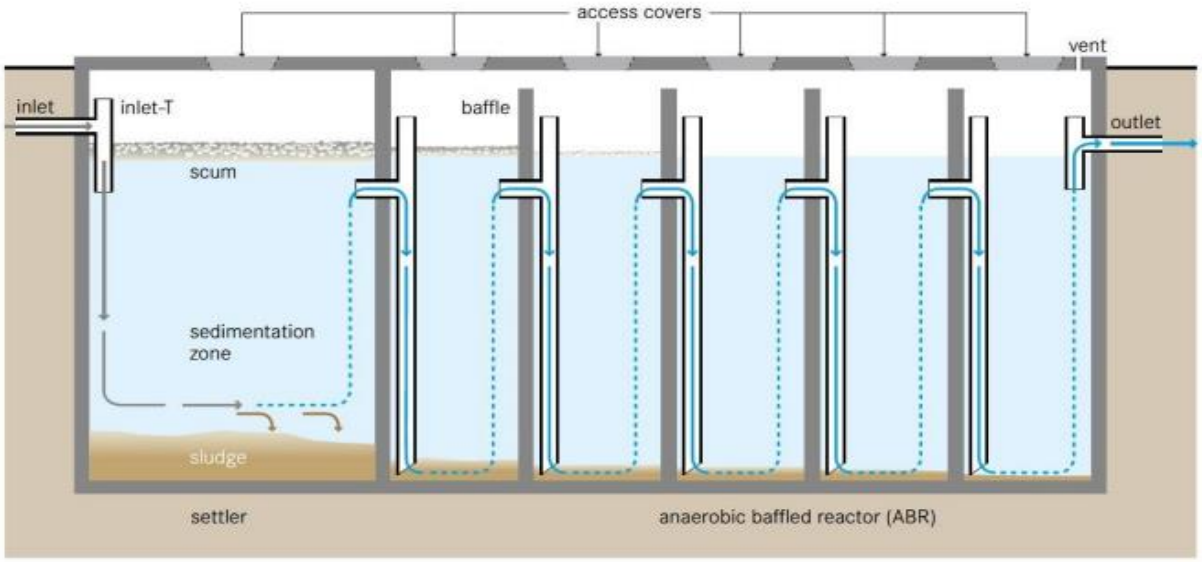

Figure 7: ABR and AF with Typical Down Flow Pipes and Manholes above Baffle
Source: [10]

Depending on the effluent volume to be treated each day, seven in number standard structure (Settler + ABR + AF) needed in parallel. Treatment capacity of one standard structure (Settler + ABR + AF) 18 M3/d The ABR treatment capacity and number of structures required are indicated in the table below.

Table 3: Sizing and Area Requirement of ABR

Parameter	Value	unit
FSTP inflow	163.8	M3/d
Volume reduction trough drying	20	%
Effluent to be treated	131	M3/d
Treatment capacity of one standard structure (Settler + ABR + AF)	18	M3/d
Number of standard structure (Settler + ABR + AF) needed in parallel	7	

Source:[12]

3.2.2.4. Dried Sludge Management

If the proposed design is well implemented and maintained, the sludge can be sufficiently stabilized or digested. Hence it can be reused for energy sources such as biogas and composting. Reusing dry sludge for biogas may help in providing affordable energy sources and reducing the use of natural resources that contribute to combating climate change. The dried sludge with the proposed design procedure is also suitable for agricultural uses except for fruit and vegetable growing. Moreover, it may be applied in forage development but animals should be restricted from grazing before three weeks after the application of sludge on the grazing land.

Two sheds of 30m x 30 m (area of 1800 m² Warehouse) will be constructed on the FSTP site to receive the dried sludge from the drying beds and to store it until it is well stabilized. The shed construction will ensure that the drainage of stored sludge is provided at the bottom. In addition, it has to be well covered to avoid rewetting by rainwater and protected from surface runoff. This temporary storage contributes to further dehydration of the product and the die-off of pathogens before the end use is discussed and agreed upon. This can improve the public perception of the sludge reuse. To increase awareness of the use of sludge for fertilizer and other uses such as biogas, there should be training and communication campaigns to the local community.

3.2.2.5. Infrastructures and Auxiliary Facilities

The main components of the fecal sludge treatment plant include access pathways and roads; an office with toilets/washrooms and a small laboratory and; a warehouse of 1800 m² will be constructed on the FSTP site to receive the dried sludge from the drying beds and to store it; it has appropriate drainage for the whole site to avoid flooding conditions. Sidewalks and pavement shall be provided around the office and an elevated water tank is required to allow regular water access at the plant. The auxiliary works also include a parking area and fencing of the complete FSTP site with 1.55 m of height and one access gate for security reasons.

3.2.3. Construction and civil works of FSTP

Though the implementation mechanism related to the tendering procedure is subject to the rules and regulations of the financing agency, packaged contract tendering is the most recommended implementation mechanism that attracts the most competent local contractors. Estimated total cost by the engineering consultant for the construction of FSTP is ETB 754,091,000.00 (USD 15,082,000.00). The detail of estimated cost of the proposed fecal sludge treatment facilities is indicated in the following table

Table 4: Estimated Cost of the Proposed Fecal Sludge Treatment Facilities

Item	Cost (ETH Birr)	Cost (USD)
General items	4,205,000.00	84,000.00
Demolishing old FSTP	2,358,000.00	47,000.00
Access road	99,637,000.00	1,993,000.00
Service building	6,796,000.00	136,000.00
Warehouse	42,532,000.00	851,000.00
Drying beds	551,973,000.00	11,039,000.00
ABR	45,656,000.00	913,000.00
Distribution chamber	934,000.00	19,000.00
Total Cost	754,091,000.00	15,082,000.00

Source: Feasibility and Design report of the project-Gondar

4. POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

The implementation of the FSTP project of Gondar town could have the potential to cause environmental and social impacts that shall be addressed in accordance with relevant Ethiopian legislation as well as the requirements of the World Bank Environmental and Social safeguards policies. The subsections below provide more details on the applicable legislative framework for the ESIA.

4.1. Relevant National Policies and Strategies

This section addresses the legislative and institutional framework relating to ESIA, specifically relevant to the proposed FSTP project. For this project, the EIA (here ESIA Assessment Report) has been prepared under specific consideration of the national legal frameworks and safeguard policies.

Table 5: Summary of National Laws

Category	Summary
Constitution of FDRE [14]	According to Article 44 of the FDRE constitution, every citizen has the right to a healthy and satisfying environment, and it is the duty of every individual to protect and preserve the environment. In order to address environmental concerns and maintain a clean environment, Article 92 of the Ethiopian constitution mandates the proper collection, treatment, and management of waste, including household and industrial waste, to prevent any degradation of the environment and minimize adverse effects on human health, natural resources, flora, and fauna. The Ethiopian Constitution also acknowledges the right to private property and ownership (Article 40), stating that laws should be in place to regulate the acquisition, transfer, and use of land. Consequently, individuals affected by development projects should be fairly compensated for any damage or loss to their property. Additionally, the Ethiopian legal system recognizes various treaties ratified by the Government of Ethiopia as integral components.
Policies	**Environmental Policy of Ethiopia (EPE)** [15]**:** emphasizes the importance of integrating environmental considerations into all sectors and levels of decision-making. It promotes the conservation and sustainable use of natural resources, the prevention and control of pollution, and the promotion of environmental education and awareness. Overall, the EPE serves as a comprehensive framework for addressing environmental concerns in Ethiopia. It provides guidelines and principles for sustainable development, resource management, pollution control, community participation, and impact assessments.
	Ethiopian Water Resources Management Policy [16]**:** The main objective of the policy is to ensure sustainable and efficient use of water resources in Ethiopia for socioeconomic development. The policy addresses sectoral and cross-sectoral environmental issues, conducting an Environmental and Social Impact Assessment study to identify and mitigate potential negative impacts during project phases. An Environmental and Social Management Plan need to be developed based on this assessment. Overall, the policy guides activities to prevent harm to ecosystems, promote coordination in environmental management, and help achieve sustainable development goals.
	National Health Policy [17]**:** was issued in 1993, with the aim of giving special attention to women and children, to neglected regions and segments of the population, and to victims of manmade disasters. The policy places give emphasis on the control of communicable diseases, diseases that are related to malnutrition and poor living conditions, the promotion of occupational health and safety, and the development of environmental health.
	National Policy on Women [18]**:** The primary objective of the policy is to ensure gender equality and equal access to resources and decision-making processes for both men and women in Ethiopia without discrimination. It highlights the importance of women's participation in economic and social .projects, emphasizing that they should benefit equally from all activities carried out by government institutions. In line with this policy, the proposed project in Gondar town will prioritize equal economic opportunities for both men and women. This includes ensuring equal access to job opportunities and a fair land acquisition process during various project phases.

Category	Summary
	National Policy on HIV/AIDS [19]**:** The 1998 Policy on HIV/AIDS of the Federal Democratic Republic of Ethiopia urges communities at large, including government ministries, local governments, and the civil society, to feel responsibilities for carrying out HIV/AIDS awareness and prevention campaigns "to provide an enabling environment for the prevention and control of HIV/AIDS in the country."". So that it is expected that sufficient awareness exists within the community. In addition, all the workers and contractors working in the proposed project shall be treated fairly in accordance with the policy.
Strategies and Programs	**Climate Resilient Green Economy Strategy /2011**[14]: The strategy's objective of the strategy is to protecting the country from the adverse effects of climate change and promoting a green economy. By implementing different initiatives, Ethiopia aims to limit its greenhouse gas emissions by 2030 to the levels of 2010. This would result in a reduction of 250 MtCO2e per year. Additionally, the strategy emphasizes the importance of sustainable and clean waste management practices to reduce greenhouse gas emissions in the waste sector.
	Urban Wastewater Management Strategy/2017 [20]**:** The Ministry of Water, Irrigation, and Energy (MoWIE) issued a strategy in 2017 to provide a common understanding and guide with the aim of providing a common understanding and guiding vision for effective wastewater management. The strategy focuses on prioritized interventions, targeted. projects, and the sustainable use of resources. Its objectives include developing robust wastewater management institutions, preparing master plans, implementing methods for wastewater collection, treatment, and reuse of treated effluent and sludge, and ensuring the protection of the environment from wastewater discharge.
	National Hygiene and Sanitation Strategy : This National Strategy for Improved Hygiene and Sanitation has been developed to complement the existing health policy developed by the MoH[21] and the national water sector strategy [16] in placing greater emphasis on 'on-site' hygiene and sanitation. The primary focus is on blocking faces from entering the living environment through the safe management of faces, hand washing at critical times, and the safe water chain from source to mouth. Thus, the ESIA consultant believes that the current project will contribute to the national hygiene and sanitation strategies.
	Ministry of Water Irrigation and Electricity, Environmental and Social Management Framework (2017): According to this framework Piped sewerage systems and wastewater/ fecal sludge management treatment facilities are under schedule 2 that requires partial or limited ESIA study withy preparation of ESMP. Accordingly, the project is clearly schedule 2 with limited ESIA study.
Proclamations and Regulations	**Proclamation on Establishment of Environmental Protection Organs** [22]**:** The objective of this Proclamation (No. 295/2002) is to assign responsibilities to separate one organization for environmental development and management activities on one hand, and environmental protection, regulations, and monitoring on the other, in order to ensure sustainable use of environmental resources, thereby avoiding possible conflicts of interest and duplication of effort. It also intends to establish a system that fosters coordinated but differentiated responsibilities among environmental protection agencies at federal and regional levels. This Proclamation re-established the EPA as an autonomous public institution of the Federal Government of Ethiopia. Furthermore, the Proclamation states that each regional state should establish an independent regional environmental agency or designate an existing agency that shall be responsible for environmental monitoring, protection, and regulation in their respective regional states.
	Environmental Impact Assessment Proclamation: General EIA Guidelines 299/2002 [23]**:** The Environmental Impact Assessment (ESIA) Proclamation makes ESIA a mandatory requirement for the implementation of major development projects, programs, and plans in Ethiopia. The proclamation is a tool for harmonizing and integrating environmental, cultural, and social considerations into decision making processes in a manner that promotes sustainable development. The Proclamation states that ESIA studies need to include measures to eliminate, minimize, or mitigate negative impacts, a contingency in cases of incidents, and procedures of self-auditing and monitoring during the implementation. EIA guideline determining the modalities of protection, conservation, and promotion of the environment in Ethiopia regulates the conduct of Environmental Impact Assessments (EIAs). In its article, it states that, every project shall be subjected to EIA before obtaining authorization for its implementation. This applies to programs and policies that may affect the environment and with which ESIA has complied. The Vision further requires that an Environmental and Social Impact Assessment (ESIA) be carried out for development and infrastructure infrastructures activities likely to negatively impact the environment. Hence, this project is assessed based on the legal requirements indicated in the proclamation and associated guidelines.

Category	Summary
	Proclamation on Environmental Pollution Control [24]**:** The main objective of Proclamation No. 300/2002 is to protect the environment and ensure the well-being of citizens in Ethiopia. It establishes environmental standards and makes violating the violation of these standards a punishable offense. The "polluter pays" principle is applied to all individuals, and the Environmental Protection Agency (EPA) is responsible for enforcing these standards by appointing through the appointment of Environmental Inspectors. This proclamation also helps ensure occupational health and safety for customers and workers involved in the project.
	Public Health Proclamation, Proclamation No. 200/2000 [25]**:** The proclamation emphasizes the need for occupational health and safety, the development of environmental health, and the provision of safe and adequate water for both urban and rural populations. It also encourages the safe disposal of waste and measures to improve the quality of housing and work premises for better health.
	Solid Waste Management- Proclamation No. 513/2007 [26]**:** The objective of the solid waste management proclamation is to prevent adverse impacts and create beneficial assets from solid waste. It emphasizes community participation and the management of various types of solid waste. The Proclamation addresses existing waste management problems and aims to prevent environmental pollution. The EPA and regional environmental agencies have responsibilities in implementing the Proclamation. Community participation is promoted, and urban administrations are required to prepare solid waste management plans. Project proponents must adhere to regulation requirements and allocate necessary resources for waste management.
	Proclamation on Ethiopian Water Resources Management [27]**:** The Proclamation (Proc. No. 197/2000) issued in March 2000 regulates water resources management, protection, and utilization in Ethiopia. Its aim is to ensure the proper conservation, utilization, and prevention of harmful effects related to water resources. The Supervising Body, either the Ministry or a delegated organ, is responsible for planning, managing, and protecting water resources. Certain activities, such as constructing water works, supplying water, transferring water, and releasing waste into water resources, require a permit from the supervising body.
Proclamations and Regulations	**Proclamation on Hazardous Waste Management** [28]**:** The purpose of this proclamation (Proclamation No.1090/2018) is t to prevent and control problems of environmental pollution caused by the mismanagement and disposal of hazardous waste. It deals with creating a system to control the generation, storage, treatment, recycling and reuse, transportation, disposal and movement of hazardous wastes is of paramount importance to prevent harm to human and animal health as well as the environment due to the mismanagement of hazardous waste. The project contractor and proponent must establish clear procedures in terms of handling hazardous wastes such as fuels, chemicals, and others based on the requirements in this proclamation. Subsequent implementation of the procedures needs to be inspected by an environmental expert involved in the project.
	Proclamation on the Development, Conservation, and Utilization of Wildlife [29]**:** The Proclamation (Proc. No. 541/2007) issued in August 2007 serves three main objectives: conserving, managing, and utilizing wildlife resources in Ethiopia; fulfilling government obligations under wildlife conservation treaties; and promoting wildlife-based tourism and private investment. The proclamation establishes designated wildlife conservation areas administered by the Federal Government, regions, private investors, and local communities. It addresses hunting permits, scientific collection of wildlife, and economic activities related to wildlife resources, such as tourism and trading. The proclamation includes provisions for penalties.
	Proclamation on Forest Development, Conservation and Utilization/ Proclamation No.1065/2018 [30]**:** The proclamation prohibits cutting endangered indigenous naturally grown trees from state forests or those naturally grown in the community forest. So, in this regard, the relevant stakeholder shall be involved in the site selection for FSTP in Gondar town that does not cause any permanent damages to the forest/natural resources in the surrounding environmental settings.
	Proclamation on Research and Conservation of Cultural Heritage/ Proclamation No. 209/2000 [31]**:** The Proclamation provides a legal framework for the management, exploration, discovery, and study of Cultural Heritage in Ethiopia. Article 41 specifically addresses the fortuitous discovery of Cultural Heritage during various activities such as mining explorations, building works, road construction, or other similar activities. It states that any person who discovers Cultural Heritage in these circumstances must report it to the Authority and protect it until the Authority delivers it. The Authority is responsible for examining, delivering, and registering the discovered Cultural Heritage. Additionally, the Proclamation states that if Cultural Heritage is discovered during construction activities in a reserved area, the construction must be stopped, and the discovery must be reported to the

Category	Summary
	Authority.
	Ethiopian Wildlife Protection Proclamation [32]**:** The Wildlife Proclamation No.541/2007, enacted in August 2007, approves the development, conservation, and utilization of wildlife in Ethiopia. This legal enactment aims to enhance the contribution of the wildlife sector towards poverty reduction and maximize the economic and social benefits of derived from wildlife resources. The proclamation emphasizes the importance of protecting and conserving wildlife species and establishing mechanisms for their conservation and protection. Wildlife conservation and protected areas are categorized into four categories from the highest protection ranking, 'National Park', followed by 'Game Reserve' and 'Sanctuary' to 'Controlled Hunting Area'. Thus, protection and conservation aspects of wildlife species, established mechanisms for conservation and protection of wildlife, etc., shall be assessed to ensure/enhance wildlife management shall be formulated as part of ESMP. However, the designated FSTP site for Gondar town is not under the category of any of the above wildlife conservation areas and does not impact the wildlife and their habitats.
Proclamations and Regulations	**Ethiopian building code Proclamation no. 624/2009** [33]**:** The building code in Ethiopia determines the minimum national standards for the construction or modification of buildings to ensure public health and safety. It applies to urban centers with 10,000 or more dwellers and regulates design, materials used, and other minimum standards for public safety. The code also considers the impact on surrounding economic and public movement, ensuring that buildings do not impair the safety of people, other constructions, or properties. Precautionary measures must be taken during excavation to maintain the safety and stability of neighboring properties or services. The code applies to all classes of buildings and covers health and safety precautions for common construction activities. Special construction methods require associated health and safety measures. These codes should be considered throughout the implementation of project.
	Land Laws-Expropriation and Payment of Compensation (Proclamation 1161/2019 and Regulation No. 472/2020) [2]**:** This proclamation is the main legislation in Ethiopia regarding land expropriation. It provides guidelines for the expropriation process, compensation, and the purposes for which expropriation can be carried out. The power to expropriate land for public purposes lies with Woredas or urban administrations, and compensation must be paid in advance. Concerning the compensation, the government has developed a regulation (Regulation 472/2020) [34] which defines in detail how compensation for the expropriated property should be calculated. According to the law, people who are displaced due to expropriation in rural lands (lands used for production) have the right to be compensated for the loss of income from the land if they do not receive replacement land. The compensation is defined as 10 times the yearly income from the land, based on the average income from the last 5 year (article 8(1)).
	Labour Law/Proclamation 1156/2019 [3]**:** The Labor Proclamation in Ethiopia, revised in 2019, governs labor conditions based on the political, economic, and social policies of the federal government and international conventions and treaties. It includes provisions on occupational safety, health, working environment, prevention measures, and employer obligations. The proclamation requires employers to take necessary measures to safeguard workers' health and safety. The Occupational Health and Safety Directive provide limits for occupational exposure to working conditions. According to the proclamation, employers must be obligated to pay workers their entire wages, which should be done at the end of a month or based on an agreement. The intended Environmental and Social Impact Assessment (ESIA) will assess the availability and level of labor required for the project and considers measures to safeguard the socio-cultural component of the area.

4.2. World Bank Environmental and Social Safeguard Policies

4.2.1. The World Bank Operational Policy 4.01

In addition to the requirements of the Federal Government of Ethiopia, donor organizations such as the World Bank have requirements for environmental assessment (EA). The WB E&S safeguards policies are applicable as part of the UWSSP II implementation. Five of the ten WB safeguards Policies are triggered as part of the implementation of the UWSSP II (Environmental Assessment (OP/BP 4.01), Safety of Dams (OP/BP 4.37), Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12) [5] and Projects on International Waterways OP/BP 7.50). Besides, the World Bank Group (WBG) Environment,

Health and Safety Guideline (EHSG) shall be applicable as deemed necessary. The World Bank Operational Policy 4.01 requires EA of projects proposed for Bank financing to ensure that they are environmentally sound and sustainable, thus improving decision-making. The Bank favors preventive measures over mitigatory or compensatory measures whenever feasible.

EA considers the natural environment (air, water, and land); human health and safety, social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans-boundary and global environmental aspects. It also considers the variations in project and country conditions, the country's overall policy framework, national legislation, and obligations of the country, about project activities under relevant international environmental treaties and agreements. The Bank does not finance project activities that would contravene such country obligations.

Based on the outcome of the Bank's environmental screening, projects can be categorized as A, B, C, or Fl. The selection of the category is based on the expected environmental impacts.

- Category A: A full EA is required. I.e., a proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented.
- Category B: Although a full EA is not required, environmental analysis is required. A proposed project is classified as Category B if its potentially adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats, are less adverse than those of a Category A project. These impacts are site-specific; few, if any, of them are irreversible, and in most cases, mitigation measures can be designed more readily than for Category A projects.
- Category C: No EA or environmental analysis is required. A proposed project is classified as Category C if it likely has minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
- A proposed project is classified as Category Fl if it involves an investment of Bank funds through a financial intermediary in project that may result in adverse environmental impacts.

The FSTP has been rated Environmental Risk Assessment Category B and triggers five environmental and social safeguard policies. However, the following safeguards policies are more relevant and applicable as part of the implementation of the proposed FSTP project activities: Environmental Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12) [5]; and Physical Cultural Resources (OP/BP 4.11).

OP/BP 4.01 requires environmental and social impact assessment (ESIA) of projects to ensure that they are environmentally sound and sustainable. The ESIA process will lead to the preparation of an ESMP for proposed project activities in the town. The ESMP sets out mitigation, monitoring, and institutional measures to be taken during operations of these activities to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.

4.2.2. Physical Cultural Resources (OP/BP 4.11) [4]

The objective of this policy is to assist countries in avoiding or mitigating adverse impacts of development projects on physical and cultural resources. For purposes of this policy, ‘physical cultural resources’ are defined as movable or immovable objects, sites, structures, groups of structures, natural features, and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

4.2.3. Involuntary Resettlement (OP/BP 4.12)

WB Involuntary Resettlement Policy OP 4.12 [5] requires that all projects with land acquisition implications are guided by a Resettlement Policy Framework (RPF), which outlines processes and procedures to be followed for the preparation of site-specific RAPs during project implementation. However, in Ethiopia, there are no explicit requirements for an RPF or RAP. As regards to compensation, Ethiopia requires only the rightful land or property owner (statutory or customary rights of occupancy) should be compensated, while the WB OP 4.12 requires that any person (whether is the rightful owner or not) who loses or is denied or restricted access to economic resources including tenants, squatters should either be compensated for use of the land or assisted to move.

4.2.4. General Environmental Health and Safety (EHS) Guidelines

The General EHS Guidelines[6], developed by the International Finance Corporation (IFC), cover a wide range of technical references that can be applied to general and industry-specific actions that resonate with Good international Industry Practices. These Guidelines can apply to this project, along with the mentioned legislation outlined in this section. Specifically, the following EHS guidelines can be considered:

- General EHS Guideline (1): Environmental
- General EHS Guideline (2): Occupational Health and Safety
- General EHS Guideline (3): Community Health and Safety
- General EHS Guidelines (4): Construction and Decommissioning
- Donor Safeguard Requirements and Applicable Standards
- General Environmental Health and Safety Guidelines

4.3. Comparison between Ethiopian and World Bank Safeguards Policies

Project Categorization in World Bank and Ethiopian Legislation: it is interesting to observe that environmental screening is the cornerstone of both Ethiopian legislation and World Bank policies about EA. Both screening processes address the need for further EA and its level and scope. The categorizations that result from the screening processes are slightly different in their definition but still are roughly equivalent.

In general, it is understood that “Schedule 1” and “Category A” are roughly equivalent as they both include projects with potentially significant adverse impacts that demand a full-fledged EIA. In a similar manner, “Schedule 2” and “Category B” projects are more or less similar in their definitions; both categories refer to projects with less impact than those of Category A or Schedule 1 projects. Under OP 4.01, category B projects require environmental work at the appropriate level, be it an EMP, an EA, or implementing mitigation measures in the context of an environmental and social screening process as outlined in this ESMF.

This approach is not in contradiction with the Ethiopian guidelines. However, the Ethiopian guidelines do not make provisions for the screening of project of a smaller scale than those listed in Schedules 1 and 2, which may have negative localized impacts that will require mitigation. Therefore, the ESMF has been prepared to bridge this gap to ensure that the UWSSP project is implemented in an environmentally friendly and socially acceptable manner.

“Schedule 3” and “Category C” are also equivalent (they require no further environmental assessment).

Ethiopia has a comprehensive framework for assessing and managing environmental impacts of development projects. However, the Ethiopian framework does not provide clear requirements or guidance on the following two aspects:

- Public consultation and disclosure and
- Environmental and social screening process for small-scale project that could have negative localized impacts.

Another issue is that while most of the responsibility for assessing, mitigating and monitoring environmental impacts falls under regional environmental agencies, these either do not exist or lack the capability to carry out the tasks assigned to them by law. Otherwise, Ethiopian requirements are generally consistent with World Bank policies.

There are some gaps between Ethiopian laws and regulations and the requirements for resettlement as laid out in OP 4.12. In some cases, the Ethiopian laws and regulations are incompatible with the Bank's OP 4.12 provisions. Table 6 below compares Ethiopian Law on land acquisition and the World Bank's operational policy and recommended measures to address the gaps:

Table 6: Comparison of Ethiopian Legislation and World Bank's Operational Policy

Theme	World Bank's Safeguard Policies Applicable	Ethiopian Legislation	Measures to Address the Gaps
Eligibility for Compensation	World Bank OP4.12 gives eligibility to: Those who have formal legal rights to the land; Those who do not have formal legal rights to land but have a claim to such land; and Those who do not have recognizable legal right or claim to the land	Proclamation No1161/2019, Article 8(1) allows' landholders' to be eligible for compensation, No.1161/2019 [2] Article 8, landholders or their agents whose landholdings are to be expropriated shall submit landholding certificates or other proofs that show their landholding rights over the lands	Eligibility criteria for compensation and assistance shall be in line with the WB eligibility to benefits.
Public consultation and disclosure procedures	Consult project-affected persons, host communities, and local NGOs, as appropriate. Provide them opportunities to participate in the planning, implementation, and monitoring of the resettlement project, especially in the process of developing and implementing the procedures for determining eligibility for compensation benefits and development assistance (as documented in a resettlement plan), and for establishing appropriate and accessible grievance mechanisms.	There is specific Guideline entitled with" Guideline on Public Consultations in Environmental and Social Impact Assessments Process" which has entered into force in December 2018 by the FDRE EPA.	Provide project-affected persons and local NGOs/CSOs, local leaders, vulnerable groups, media, and women as appropriate the opportunities to participate in the planning, implementation, and monitoring of the resettlement program.
Measures for livelihood restoration and assistance	Livelihoods and living standards are to be restored in real terms to pre-displacement levels or better. OP 4.12 further requires attention to be given	There are no specific laws or regulations specifying support for livelihood restoration and transition and moving allowances. Ethiopian	Additional support may be needed for vulnerable groups. Vulnerable groups

Theme	World Bank's Safeguard Policies Applicable	Ethiopian Legislation	Measures to Address the Gaps
to vulnerable groups	to the needs of vulnerable groups such as those who are below the poverty line, landless, elderly, women and children, indigenous groups, ethnic minorities, and other disadvantaged persons.	law makes no specific accommodations for potential Vulnerable groups such as women, children, the elderly, ethnic minorities, indigenous people, the landless, and those living under the poverty line.	in the project area will be identified, and the support needs specified in livelihood restoration plan/LRP.

4.4. International Conventions/Agreements

Environmental protection related International Conventions and Protocols to which Ethiopia is a signatory include the following:

- Vienna Convention for the Protection of the Ozone Layer, 1985;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora "CITES", ratified by the government on 5/04/1989;
- United Nations Framework Convention on Climate Change, ratified on 5/04/1994 through proclamation 92/1994;
- Convention on Biological Diversity, ratified by the government on 5/04/1994 through proclamation 98/1994;
- United Nations Convention to Combat Desertification, ratified by the government through proclamation No. 80/1992, signed on 15/10/1994;
- Montreal Protocol on Ozone Depleting Substance, ratified by the government on 11/10/1994;
- Convention on the Prohibition of the Development, Production, Stockpiling and use of Chemical Weapons and their Destruction, 1995;
- Global Environmental Facility (GEF); the EPA has been officially designated as an Operational Focal Point for GEF projects in Ethiopia as of 11 October 1997; and
- Basel Convention on Trans-Boundary Hazardous and Toxic Wastes, ratified by the government 2/10/2000

4.5. Administrative and Institutional Framework

The most lined administrative and institutional framework of the project is briefly described below.

4.5.1. Ministry of Water and Energy

MoWE is responsible for the overall coordination, monitoring, and evaluation of the project, facilitation of capacity building, and policy formulation. As it is the responsible organization for the implementation of SUWSSP for secondary cities, the feasibility detail design and the ESIA studies were conducted under the supervision of the Ministry. The construction of the project is also contracted out and managed by the Ministry.

4.5.2. Federal Environmental Authority

The then Environment, Forest and Climate Change Commission (EFCCC) and Environmental Protection Authority (EPA) was re-established under Proclamation No.1097/2018 issued for "Definition of Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia." It is an autonomous public institution of the Federal Government of Ethiopia entrusted with the protection and conservation of natural resources in the country.

The environmental legislation gives the EPA powers to fulfill its role, support all federal institutions in establishing environmental units, and develop skills in strategic environmental analysis of policies and public instruments. The EPA is involved in the development of environmental policy and legislation, setting environmental quality standards for air, water, and soils, monitoring pollution, establishing ESIA procedures and an environmental information system, and undertaking capacity development in relevant agencies to ensure the integration of environmental management in policy development and decision making. The responsibilities of EPA with respect to ESIA process are establishment of a system for environmental assessment of public and private sector projects, as well as social and economic development policies, strategies, laws, and programs of federal level functions; review, decision-making and follow-up implementation of environmental impact study reports for projects, as well as social and economic development programs or plans where they are subject to federal licensing, execution or supervision; also proposed activities subject to execution by a federal agency, likely to entail inter- or trans-regional and international impacts; notification of its decision to the concerned licensing agency at or before the time specified in the appropriate law or directives; ensure that the proponent complies with requirements of the ESIA process; auditing and regulation of implementation of the conditions attached to the decision; provision of advice and technical support to the regional environmental agencies, sectoral institutions and proponents; making its decisions and the ESIA report available to the public; resolution of complaints and grievances in good faith and at the appropriate time; development of incentives or disincentive structures required for compliance with Regional State Environmental Protection Authorities requirements.

4.5.3. Amhara Regional State Water and Energy Bureau

As specified in SUWSSP-II ESMF, the Regional Water Bureaus are responsible for overall project planning, management, coordination, and capacity building at the regional level. The Regional Water Bureaus play an important role in arranging technical assistance for towns and cities. Thus, the Amhara Regional State Water and Energy Bureau is responsible for the overall coordination of the project study, design, and implementation in collaboration with MoWE. Environmental and social personnel assigned for the ongoing UWSSP at the Regional level will assist the water utility of the project area in monitoring and following up on the implementation of the proposed mitigation measures for each project found in their respective regions.

4.5.4. Amhara Regional State Environmental Protection Authority

In accordance with the principles of government decentralization and Proclamation no. 295/2002, in which The Environmental Protection Organs Established, each national regional state shall establish an independent Regional Environmental Agency or designate an existing agency that shall, based on the Ethiopian Environmental Policy and Conservation Strategy and ensuring public participation in the decision-making process, be responsible for:

- Coordinating the formulation, implementation, review and revision of regional conservation strategies; and
- Environmental monitoring, protection and regulation.

The Proclamation also states that regional Environmental Protection Authorities shall ensure the implementation of federal environmental standards or, as may be appropriate, issue and implement their own no less stringent standards. Finally, the Proclamation states that regional EPAs shall prepare reports on the respective state of the environment and sustainable development of their respective states and submit them to EPA. For the Amhara Regional National State in which the Gondar town sanitation project is located, the Amhara Environment Protection Authority is responsible for environmental protection matters in the Region. The Bureau is responsible for the review and approval of ESIA development proposals under the mandate of

the Regional Government and follows up on the implementation of ESIA recommendations of such proposals. Therefore, to implement the ESIA, the project proponent Ministry of Water and Energy, and Gondar town Municipality should closely work with the Regional State EPA.

4.5.5. Gondar Town Water and Sewerage Services Utility

As specified in the ESMF of the project, the utility is required to allocate an appropriate budget and assign/recruit safeguards experts to implement and monitor the ESMP study documents. Accordingly the GWSSS has environmental and social safety officer (2 in number), and is currently under recruitment process for additional staffs for the project unit these includes waste water engineer, water supply & operational specialist, water supply & sanitation engineer.

Besides, utilities will be responsible for the preparation of the periodical safeguards implementation status report and submit it to the MoWE. These reports will provide summaries of (i) environmental screening; (ii) ESIAs carried out in the course of the budget year; Environmental and Social Management Framework - Second Phase of UWSSP (iii) overall implementation status of the ESMPs, and (iv) summary of the environmental monitoring carried out on systems at both construction and operation phases. Annual reports will be reviewed by the EPA and the MoWE, and copies will be sent to the World Bank.

5. DESCRIPTION OF BASELINE CONDITIONS

This Section describes the physical, socio-economic, and biological baseline of the proposed project sites, based on the findings of the data collection, field investigations, and review of the relevant documents (including feasibility study and detailed design).

5.1. Physical Environment

5.1.1. Climate

The location where Gondar is found is classified as Cwb (Subtropical highland climate or Monsoon-influenced temperate oceanic climate) by Köppen and Geiger[35]. The rainfall within the city in a year range between 711.8 to 1822.42 mm with an average annual rainfall of 1200 mm. The main rainy season of the area is from May to August. July and August are the months in which most of the rain occurs, while short rain also falls in April. The area has a mono-modal type rainfall characteristic.

The mean temperature of the town and its surrounding area ranges from 15˚C and 22.9˚C. The average maximum and minimum temperatures are 29.0°C and 10.0°C respectively. The hottest month, with a maximum temperature of 29.0°C is March to May, while the coldest month is November to January, with a minimum mean temperature of 10°C. Generally, the town is characterized by weynaDega climate condition.

The average hourly wind speed in Gondar is characterized by a significant seasonal variation over the year. As per the data from weatherspark.com, the windier part of the year lasts for 8.7 months, from October 9 to June 30, with average wind speeds of more than 8.0 kilometers per hour. The windiest month of the year in Gondar is, with an average hourly wind speed of kilometers per hour. May is the windiest month of the year in the town, with an average hourly wind speed of 9.7 kilometers per hour. While August is the calmest month with average hourly wind speeds of 6.1 kilometers per hour. The calmer time of year lasts for 3.4 months, from June 30 to October 9.

The major average hourly wind direction in Gondar also varies throughout the year. Easterly winds are the most prevailing wind in the town. The wind is most frequently from the east for 10 months and from the north for 1.6 months [36].

5.1.2. Geology and Soils

As per the design study, the Geology of Gondar area is characterized by Cenozoic rocks. The Cenozoic (Tertiary) rocks are predominantly basaltic lava flows with rare pyroclastic ejecta intercalations. The Tertiary mappable units that cover the prominent area of Gondar city and its suburb are:

The lower lava flows, the middle lava flows, the upper lava flows, and, Plateau basalts. They are mainly fissure basaltic rocks except the plateau basalts which are central eruptions. The areal distributions of these rock units are shown in the following figure. The FSTP project site is characterized by very thin soil cover overlying weathered basaltic rock.

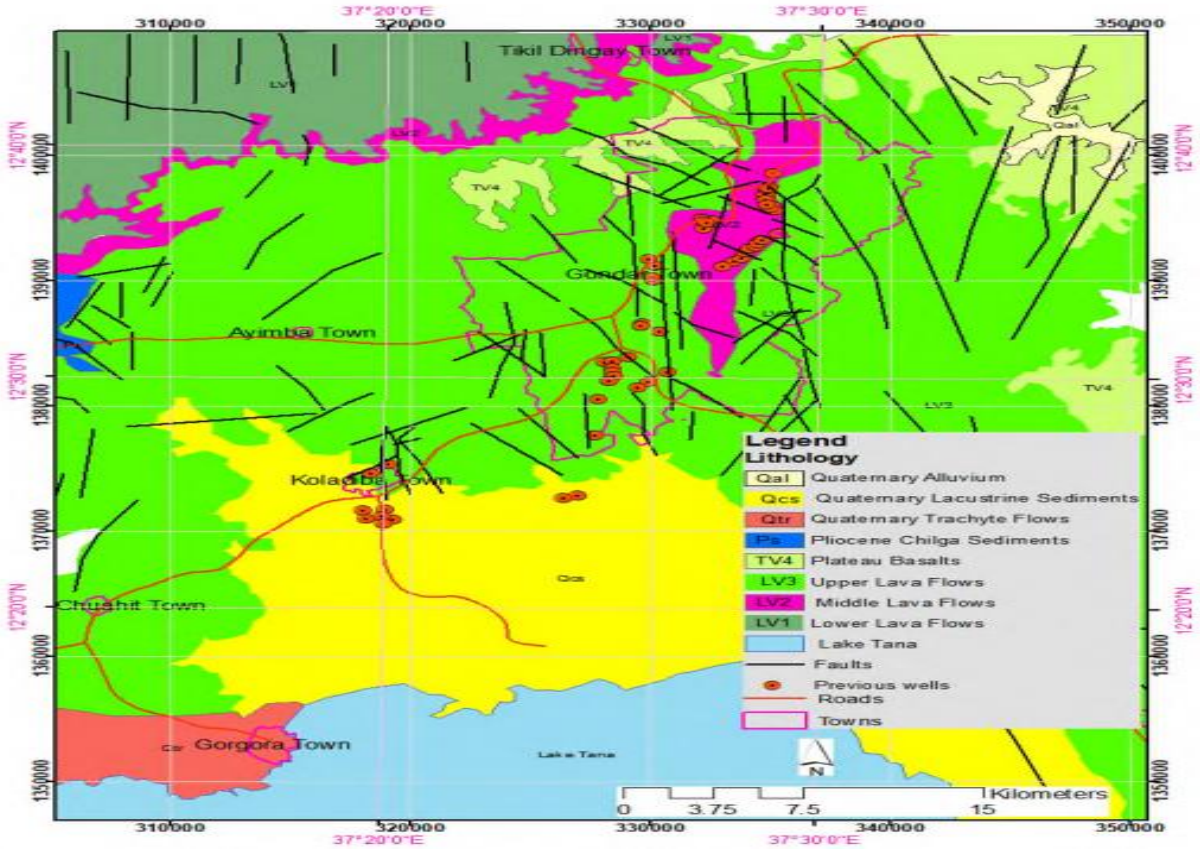

Figure 8: Geological map of Gondar City and its Suburbs
Source: [10]

5.1.3. Water Resource

There are a number of perennial and/or intermittent rivers and streams flowing within the city limits. These include Angerebe River, Shenta River, Qeha, Dimaza, and other smaller streams. These rivers are not used as a source of drinking water but they are used for different purposes including irrigation by the downstream rural population.

There are several small streams originating from the mountainous topography of Gondar collecting water from the general topography of the city and draining runoff to Angereb River that finally joins Megech River. Apart from the natural drains, there are open and closed man-made storm drainage systems in Gondar.

5.1.4. Water Quality

During the field data collection, sample was collected from one site at the downstream of the proposed fecal sludge treatment plant in Kebele 5/Ayra. On-site water quality test and analysis from samples on some parameters were conducted. The result of the test is indicated below.

Table 7: On Site Water Quality Test Results

Parameters	unit	guideline value	Site coordinate point	
			(1339716N,330992E)	1339330N, 30833E
Fecal coliform	Number/100ml	0	7.68×10^3	1.23×10^3
Total coliform	Number/100ml	0	2.02×10^4	2.67×10^4
Chlorine	Mg/l	0.2-0.7 for DW	0.21	0.06
NO_3-	Mg/l	10 for DW	24.72	35.145
NO_2-	Mg/l	1	0.35	0.435
NH_3	Mg/l	0. 5	0.04	0.77
NH_4+	Mg/l	0.5	0.04	0.83
SO_4^{2-}	Mg/l	250 for DW	40	98
PO_4^{3-}	Mg/l	0.01 for DW	1.05	0.02
TURBIDITY	NTU	5 for DW	4.5	1.78
Ph		6.8-8.4	6.9	7.2
TDS	Ppm		442	442
EC	µc/cm		884	884

5.1.5. Noise

Most of the town areas experience noise and vibration which are generated from normal human activities and vehicles (e. g. 'Bajaj'). Road traffic noise levels are considered below 55 Decibels during the day and 45 Decibels during the night, and the range of densely traveled roads as established by WHO [8] is representative of urban city areas. Unfortunately, as there are no forced laws in Ethiopia that regulate the noise pollution emanating from different sources, the people of the country, including the study area, are suffering from noise originating from churches, mosques and night clubs. They are releasing escalated levels of noise even during the night.

The maximum allowable noise standard issued by the EPA for day and night-time as well as for industrial and residential areas is shown in the table below.

Table 8: Noise Standard of Ethiopia

Category of Area	Limits in dB (A) Leq	
	Day time	Night time
Industrial area	75	70
Commercial area	65	55
Residential area	55	45

Source: [37]

5.1.6. Air Quality

Air quality is influenced by anthropogenic activities distinguishing two main sources, namely mobile and stationary sources associated with the project activities. Emissions to the ambient air from FSTP may include pollutants particulate matter (PM), Carbon dioxide (CO_2), Nitrous oxide (NOx), TVOC and so on.

Figure 9: Air Quality Test at Different Sites in the FSTP

Gas emissions below are the findings of Gas emissions concentrations levels for specific site. The potential exiting sources are waste treatment ponds. In conclusions from the findings showed all areas with readings below detectable levels (BDL). Except total volatile organic compound (TVOC) which is greater than guideline values.

Table 9: Results of Onsite Air Quality Test

Parameters	unit	Guideline value	Site One (North of FSTP) 1339618N 3331181E	Site two (North east of FSTP) 1339507N,331254E	Site three (west of FSTP) 1339409N ,331240E
CO/carbon monoxide	Ppm/m3	35/hr	8	4	3
CO2/carbon dioxide	Ppm/m3	400 -1000	612	636	6116
PM2.5/particular matter with a diameter of 2.5 microns or less	µg/m3	65 24hrs	16	14	13
PM10/particular matter with a diameter of 10 microns or less	µg/m3	150 in 24rs	29	21	27
TVOC/ total volatile organic compound	ppm	0.3 to 0.5	9.999	9.999	9.999
Formaldehyde	Ppm WHO	0.1 for 30' life	1.999	1.999	1.999
Humidity	%	30 to 40	52	50	40
Temperature	°c	18 to 21	23	26	33

5.2. Biological Environment

The FSTP is located at the old fecal sludge treatment site, considering the natural biological environment, the flora and fauna information at the concerned sites can be summarized as follows:

- The proposed site (FSTP) is not located in any conservation area.
- No threatened, rare, or endangered species of fauna or flora were registered or known to exist around the site.
- No sensitive or fragile habitats were noted in relation to the extent and magnitude of the envisaged works.
- No species of fauna or flora that could be exploited for commercial purposes have been noted in proximity to the proposed works.
- The current degree and extent of the proposed works do not interfere with any protected area.

5.2.1. Local Flora and Fauna

An observation-based biodiversity assessment was made in the sites proposed for the FSTP. The area proposed for the FSTP site has not been identified as an area of significant sensitivity. No threatened, near threatened, or any rare and declining species are identified to occur on the study site. There are no sensitive bird species that would occur in the vicinity of each of the sites. Therefore, the conservation issue is insignificant and the project can have minimal or no impact on local fauna and flora.However, there are some plant species found at the project site, the following table shows the types of tree species found in the project site.

Table 10 Types of Plant Species Found at the Project Site

No	Local Name	Scientific Name
1	Sesbania/ Girangire	*Sesbaniasesban*
2	Gulo/Bulqa	*Ricinuscommunis*
3	Dewenigrar	*Acacia tortilis*
4	Grevila	*Grevillearobusta*
5	Yefernjtsid	*Cupruceslicitanica*
6	Shewshewe	*Casuarinaequisetifolia*
7	Weira	*Oleaeuropaea*
8	Kitkita	*Dodonaeaviscosa*
9	Anfar	*Buddleia polystachya*
10	Kentefa	*Entadaabyssinica*
11	Kulkual	*Euphorbia abyssinica*
12	Bisana	*Croton macrostachyus*
13	Grawa	*Vernoniaamygdalina*
14	Kega	*Rosa abyssinica*

Source: Source on site survey, 2023

The habitat for wildlife has been significantly modified because of human activities of agriculture, deforestation and urbanization. As the project corridor is mainly a settlement (urban) area, the vicinity is poorly endowed with wildlife resources of conservation interest. At the urbanized municipal center, there are virtually no game species whereas there are reports that some wild animals are seen in the project site. The ecological setting of the larger part of the municipality does not allow wildlife game species to flourish. As such, there are no known rare or endangered species in the town and its vicinity (e. g. by IUCN categories[38]).However, there are some wild animals at the project site includingHyena, fox, Hedgehog, and different birds. The type of wild animals found at the project site is indicated in table 11 below.

Table 11: Type of Wild Animals Found at the Project Area

No.	Local Name	Scientific name
1	Wanosirgib, Kura, Amora, Chlfit, Sabisa	Different birds
2	Midaqua	*Aepycerosmelampus*
3	Jib	*Crocutacrocuta*
4	Awaldigesa/Awuch	*Orycteropusafer*
5	Kebero	*Lupulellaadusta*
6	Jart	*Hystrixcristata*

Source: Source on site survey, 2023

5.2.2. Conservation Areas

The specific project investment areas (FSTP) have no forest reserves, no National Parks, or any form of conservation area as defined in the National Wildlife Policy. Similarly, there are no culturally, historically, or archaeologically sensitive areas close to the FSTP.

5.3. The Human Environment (socio-economic settings)

5.3.1. Socio-Economic Environment

Administrative Context

Gondar city is administratively organized into 6 sub-city (AzezoTeda, Fasil, Maraki, Zobil, Jantekel, and Arada) which constitute 36 Kebeles, (25 urban, and 11 rural). Kebeles are the lowest levels of administration.

Population and Settlements Areas:

Gondar is one of the towns among those rapidly expanding urban centers in the Amhara regional state in terms of population and physical size. The population of Gondar was registered to be 207,044 of which 47.4% (98,120) were male and 52.6% (108,924) were female[39]. The religion of majority of the inhabitants practiced Ethiopian Orthodox Christianity (84.15%), Muslims (11.77%), and 4% practiced other religions.

Currently, the population of the town is estimated to be 465,973 of which 228,306 are Male and are 237,667 Female. with a total area coverage of 292.80 km2 (29280 hectares) a population density of 1,591.4/km[7]. Between 2007 and 2022 the population increased more than doubled (125%). As a result, during the phase of the project, this increase in population is expected to continue producing larger quantities of excreta. However, due to the high influx of people to the town during the last years, the town administration estimates the population to be750, 000.

The settlement pattern of the town includes urban and rural. As the city is old there are slums and squatter settlements in many parts of the town. The explosion of informal settlements is also exhibited in different parts of the city including the project areas.

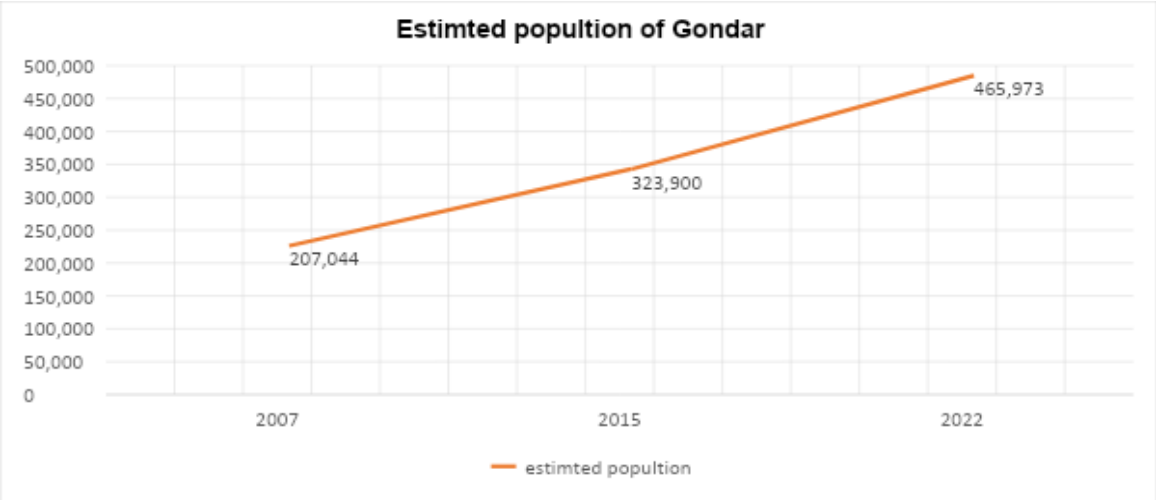

Figure 10: Population Trends of Gondar Town
Source: compiled by consultant based on CSA Data

5.3.2. Housing Conditions

During the field data collection, it was observed that houses in the area of slums and informal settlements have been constructed without state control; the designs of the houses have no permanent structure or are sub-standard and very low quality. The materials used to build the houses in most areas are mud and wooden walls with iron sheet roofs. The location of the houses is also an unsafe and hazardous area. Moreover, the observation during this study reveals that the houses in the majority of the town are old and are made of wood walls with corrugated iron roofs and soil or cemented floors. The houses are closely spaced making the town fairly congested.

5.3.3. Economic Conditions

Gondar is a major tourist and business hub in North-West Ethiopia. There are a number of tourist attraction sites in Gondar and within a near distance of the city including the Semen National Park. As a result, the city earns a significant amount of money from hotels and tourism. In general, the income-generating activities of a bigger part of the urban population are mainly nonagricultural. The important economic activities include employment in public and private sectors, petty trading, hotels, restaurants, cafeterias, and transportation services. The majority of the town's population is driving their livelihoods by undertaking small and medium trades. There are a number of kiosks/small shops, small hotels and open markets, and several government and non-governmental institutions in the town.

Agricultural production which is practiced in the periphery of the town and in rural Kebeles is also among the main source of livelihood for the residents of the town. Crop production using rain, irrigation, and animal husbandry are among the main agricultural activities within and around the city.

5.3.4. Health

The major health institutions in the town include hospitals, health centers, clinics owned by both public and private. The type and number of health institutions are indicated in the following table.

Table 12: Type and Number of Health Institutions in Gondar City

Health institution	Public	private	Total
Health post	14		14
Clinic		25	25
Hospital	2	2	4
Laboratory centers		3	3
Pharmacies		37	37

Source: Gondar city administration health office

Based on data from Gondar town administration health office, malaria, typhoid, skin diseases /itching and diarrhea are among the top five prevalent diseases occurring in the town. The lists of top five diseases and the number of cases registered in 2021/22 are indicated in the table below.

Table 13: Top ten Diseases and Number of Cases in Gondar Town 2021(2013 EC)

NO	Disease	Registered No of cases
1	Typhoid	3,151
2	Typhus	818
3	Skin diseases /itching	1,480
4	Diarrhea	1,682
5	Malaria	10,445

Source: [40]

5.3.5. Education

There are government and privately owned-educational facilities in the town. Such facilities include nurseries, several primary and secondary schools. Gondar University is one of the higher educational institutes in the town.

Table 14: Number of Schools and Students in Gondar City

No	School	Public	private	Total	Number of students		
					Female	male	Total
1	Secondary	12	5	17	11205	15210	26415
2	primary	44	21	65	26809	27247	54056
3	KG	1	26	27	5123	4992	10115

Source: Gondar city administration education office

5.3.6. Utilities and Services

Major transportation facilities comprise roads leading to different parts of Gondar, neighboring zones of the Amhara regional state and Sudan. As the town is an administrative center of the Central Gondar zone and there are historical places in the city, the influx of visitors and travelers in and out of the town is increasing from time to time which is expected to contribute and increase waste generation in return. The road which connects Sudan to Gondar also provides good economic opportunities to the town but creates the generation of waste.

Regarding electricity power supply, the town is being serviced on a 24-hour basis with power supply from the national grid. Although there is occasional interruption of power supply, the town has almost 100% power supply coverage. In the town, there are also communication facilities for mobile phones, line phones, internet, fax, and postal services.

5.3.7. Water Supply

The lack of suitable water supply lies at the root of many of the difficulties experienced by developing countries. Besides fulfilling basic life requirements, water availability is a cornerstone of satisfactory sanitation, public health, agricultural production, industry, recreation, environmental maintenance, and urban development. In this respect, Gondar city is one of the cities with sever water scarcity in Amhara national regional state. Currently, due to a shortage of groundwater sources, an old water supply system, rapid population growth, and expansion of the city, the residents of the city are facing a critical water shortage and the existing system is unable to satisfy the required water demand.

According to the data from the town water supply and sanitation service, clean water coverage of the city as of 2021/22 is 21% in urban and 71% in rural Kebeles. This is much lower than the national average.

According to the 2016 Demographic and Health Survey in Ethiopia, 97% of urban and 57% of rural households have access to an improved source of drinking water [1].

The city water supply and sanitation service are facing significant challenges in distributing water to the city. The source of water supply for the town is mainly from Angereb water treatment plant (surface water), it is about 2.3 km in the east direction of the center of the city which was built in 1986. The dam has recently been filled with sediment, reducing the amount of water the reservoir holds.
There are also about 16 bore wells found in Angereb Valley well fields and Koladiba groundwater development project which supply water for the city. However, with little amount of underground water available, the yield from these fields is diminishing from time to time due to depletion of water resources. As a result, the rain also remained a major source of water to the public in the town.

5.3.8. Land Use

The land use in Gondar city is basically categorized into three major land use types (agricultural, built up, and green areas). The urban center of the city is dominated by built-up areas while peri-urban and rural areas are agriculture-dominant. The land use category under the settlement includes residential areas, governmental and non-governmental institutions, service institutions such as education institutions (KG up-to-University level), health institutions (including health post-health centers and hospitals); civic and cultural service giving places (ceremonial places, youth centers,) and worship places & cemetery places; market and industrial areas.

There are many open spaces in different parts of the town and farmlands that are used as a source of livelihood for the residents in and around the town. The site proposed for the construction of project is categorized into these land use patterns.

As per the site survey and observations made on the proposed FSTP site, the site was previously used for the same purpose that is for fecal sludge disposal site. The land proposed for all the proposed project is under the ownership of the municipality and the GWSSS.

However, it is observed that there are informal settlements including the construction of church around the FSTP fence. In the long run if the informal settlement is not controlled, the FSTP may have an impact (odour) to residents if they construct houses near the FSTP especially within 200 to 300m radius of the treatment units.
Land use in the downstream area is largely occupied by informal settlements, farmland, and grazing lands. Therefore, if the FSTP (Fecal Sludge Treatment Plant) is not managed effectively, it may have negative consequences on the community, crop land, and the quality of grazing land in the area. Hence, effluents from the plant need to be properly guided to the designed outlet. Moreover, any waste material should be disposed properly in a way that the community could be safeguarded from the associated impact. Here the proposed monitoring plan need to be adhered strictly (see section 10). In the middle of the downstream of the project site, there is a storm water way. Although there is no direct impact from the project activity, it is a storm water way that can be mixed with treated and untreated liquid fecal waste.

According to the information from sub-city administration and the local community, informal settlement is expanding around the FSTP. Hence, due consideration should be given to the design and management of the proposed project.

5.4. Existing Waste Management Practice

5.4.1. Solid Waste Management

The sanitary condition of the town is poor, like many similar towns in the Amhara region in particular and Ethiopia in general. Most of the households use pit latrines that are in poor condition and domestic solid waste disposal in open field is common.

The major sources of solid waste in Gondar town could be categorized into domestic, commercial, institutional, and construction & demolition. The predominant quantities of waste generated in the town are from domestic and commercial followed by others. The other major solid waste contribution comes from the streets and open markets of the town where different inorganic and organic materials like vegetables, fruits, etc. are generated daily in huge quantities.

In Gondar, there are about 13 organized groups that work on waste collection and management. However, waste collection systems are not properly planned to effectively utilize available resources. The topography of the town and the nature of the settlement which is characterized mainly by old and slum settlements make this difficult. Almost all of the collected waste from the town is dumped haphazardly into open spaces, drainage canals, and river sides. The town has a solid waste disposal site but its management is poor and all types of solid wastes are randomly dumped at the site.

Figure 11: Existing Solid Waste Disposal Site of Gondar City

There is no evidence that wastes collected from the town are used as inputs for various production such as fertilizers (composts) and biogas. The current solid waste collection practice in Gondar town includes communal containers, curbside truck collection, and in some areas of the town door- door collection is used.

5.4.2. Wastewater and Fecal Sludge Management

The sanitation in Gondar town, like many other towns in Ethiopia, is quite poor. One of the main concerns for Gondar is the inadequate management of liquid waste, which poses a threat to public health and the natural environment. Greywater and Blackwater generated from various sources such as households, commercial establishments, health facilities, hotels, and community spaces are the two main types of wastewaters. Both on-site and off-site management of wastewater need improvement.

Many households' resort to collecting and disposing of wastewater in drainage canals, open spaces, and nearby rivers. This observation was made during fieldwork and community discussions (through key informant interviews and focus group discussions).

These problems contribute to severe air and water pollution, which in turn lead to major health issues for the residents of Gondar and its surrounding areas. More than 10 Kebeles (neighborhoods) in the Gondar city administration have been significantly affected by harmful pollutants and sewage that flow through open drains along the roads, providing a serious pathway for infectious diseases [41].

According to the Gondar town water and sewerage service, most of the municipal residents use pit latrines that are in poor condition, and the majority of fecal sludge produced in the town is not safely managed. It is disposed of into the natural environment without proper treatment, including open defecation, overflowing on-site sanitation facilities, and illegal dumping. The lack of lined containment facilities and the later stages of the sanitation service chain, including emptying, transportation, treatment, and safe disposal or reuse, are the main causes of unsafely managed sludge in the town.

Currently, Gondar does not have a properly designed and constructed fecal sludge treatment system, relying instead on on-site sanitation technologies such as pit latrines. The city disposes of fecal sludge at a designated disposal site, but poor management of the site affects the local community. Odor and waste overflow from the disposal site contaminate nearby communities and downstream areas.

The private sector is not currently involved in fecal sludge management services in Gondar. Encouraging private sector engagement in service provision is necessary as the utility alone cannot provide this service for the entire city. Furthermore, due to the undulating nature of the town, many parts, including slum areas, are not accessible to large vacuum trucks.

To address this sanitation problem, various organizations, including the town water and sewerage service, have implemented efforts to plan and implement wastewater management. These efforts include the rehabilitation and construction of communal latrines and effective fecal sludge management. However, despite these efforts, wastewater management continues to pose threats to the local communities and the environment.

Figure 12: Improper Discharges of Wastewater Around Condominium Sites

Figure 13: Fecal Sludge Despoil Site at Ayra /Kebele 5

6. PROJECT ALTERNATIVE ANALYSIS

The purpose of alternative analysis is to identify other options, including not carrying out the project, achieve ing the project objectives and comparing their impact with the original proposal. The analysis, then systematically compares feasible, less adverse, alternative technologies, designs, operations, and sites – including the "no project" option – to the proposed project in terms of:

- effectiveness of achieving the project objectives as well as potential trade-offs
- potential environmental and social impacts
- The feasibility of mitigating these impacts
- Operational requirements and their suitability under local conditions
- institutional, training, and monitoring requirements and
- their estimated cost-effectiveness;

6.1. FSTP Location

The selection of a site specifically for FSTP's construction is one of the most important and challenging decisions to be made by the GWSSS and city administration. The new and old master plan of the town has designated a site for fecal sludge disposal site but some sites exhibit technical limitations.

Six separate FSTP sites including the site proposed in the new master plan as well as old and previously used waste disposal sites were proposed by the city administration and design consultant in collaboration with GWSSS and other relevant stakeholders. During the fieldwork the ESIA consultant team visited the sites. The proposed alternative sites are described below.

The proposed project sites were assessed at this preliminary phase with the objective of addressing issues, which will be related to the FSTP development. The site evaluation stresses the following points.

- From the perspective of selecting the most degraded areas under no/little economic activity (the selected land is not economically active)
- From the perspective of optimizing site selection with the rehabilitation of degraded area with the development of FSTP site (not applicable since the land already existing FST site)
- From the point of view of enhancing the opportunity for minimizing land ownership and compensation issues
- To adopt previous dumpsites and incorporate the Client's interest in the assessment.

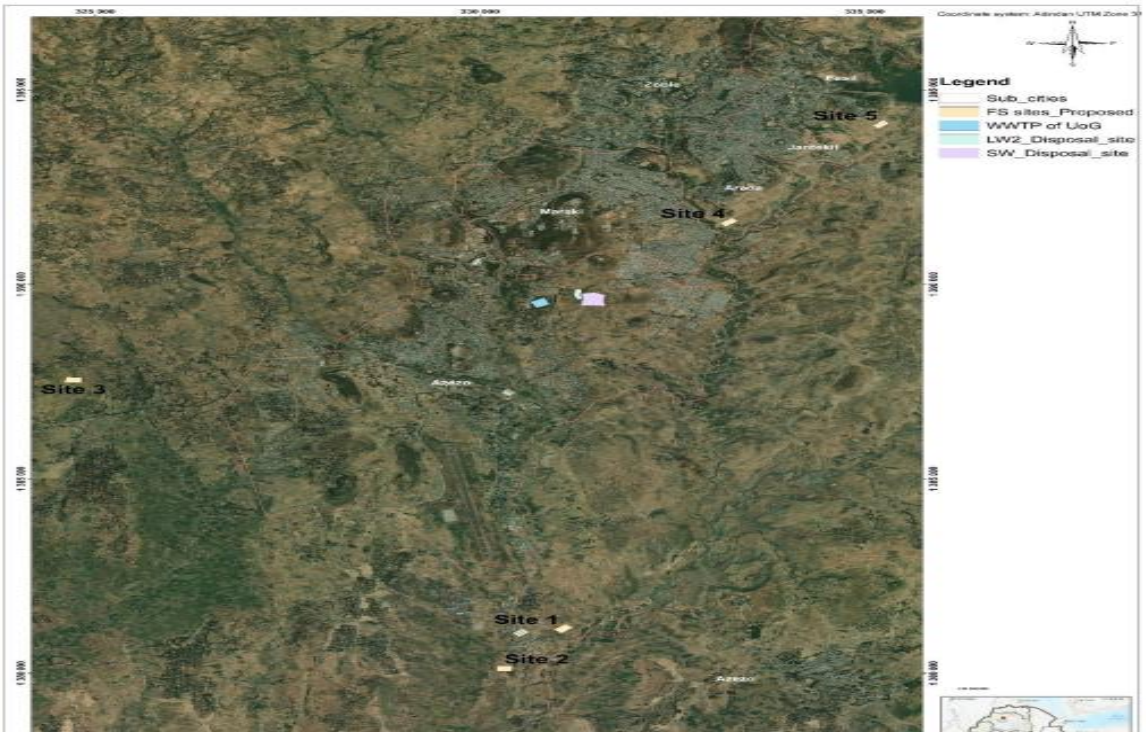

Figure 14: Proposed FSTP Sites

Option site -1

The site is located in Azezo-Teda Sub – city found near an old bridge around Megech dam. This site was proposed by the design consultant to be adjacent to the wastewater treatment plant proposed in the Structural Plan (SP) approved in 2019. According to the SP, the area is proposed for recreation, services (WWTP), and special functions such as flood plains. The site is located close to Megech Dam which is under construction by the federal government.

- It is adjacent to Megech River which is situated at around 300m at the foot of the proposed site
- There are no groundwater sources around the site
- The site is not currently accessible due to the fact there is no access road and the land is either cultivated, or severely excavated for borrow materials, and cart away materials are dumped in the area that needs extensive earth works-cut and fill.
- No vegetation cover, no farm (since it is a quarry site).
- Topographically the site is undulating and no need for land compensation/it is free from private ownership.
- This site is on the road to Bahir Dar and far from the center, where the high population is located.

Option site -2

The site is located in Azezo-Teda Sub–city, found around the industrial area. It is located on the adjacent to Megech River (about 300m downstream of the Megech River).

- It is proposed to be adjacent to the wastewater treatment plant proposed in the Structural Plan approved in 2019.
- There is no groundwater source around the site.
- The site is not currently accessible due to the fact that there is no access road and the land is cultivated.
- The site is far from the center and might incur additional costs to the service provider.

- The site is sloppy and uphill covered with vegetation and the site itself is farm side where the foot ends at the river.

Option site -3

The third alternative site is located in Azezo-Teda Sub–city around Kilil Eyesus along Metema road. This FSTP site is proposed to be adjacent to the solid waste treatment plant proposed in the Structural Plan approved in 2019. According to the SP, the area is proposed for urban agriculture, services (WWTP), and special functions (flood plains, etc.)

- The site is a settlement, with trees and farms.
- The downstream is Ankara River which is about 500m away from the site
- There are no groundwater sources around the site
- It may require resettlement and loss of property including farm lands.
- The site is not currently accessible due to the fact that there is no access road and the land is cultivated.

Option Site 4

This site is located in Maraki Sub-city at the back of Bezawit Maryam church. The area is in proximal distance to the junction point for Angereb and Qeha rivers. This FSTP site is proposed to be adjacent to the solid waste treatment plant proposed in the Structural Plan approved in 2019.

- This site is used as agricultural land
- Not covered with any vegetation.
- High potential for river pollution.
- Closer to the side, there are irrigated vegetable farms. It is directly fed to the Megech potentially pollutes it.
- The site is not currently accessible due to the fact that there is no access road but a bridge is under construction
- The ground water sources and surface water sources are within 500m and 250m away from the site.

Option Site 5: The site is located in Fasil Sub–city, Angereb area near to Angereb drinking water treatment plant and dam. This FSTP site is proposed to be adjacent to the wastewater treatment plant proposed in the Structural Plan approved in 2019. According to the SP, the area is proposed for residence, services (WWTP), and special functions (flood plains, etc.).

- It is on the upper side of the drinking water treatment plant side and drinking water dam along the Angereb River (about 350m)
- This site is located close to the center (about 3.5km).
- The site is sloppy and the upper part of the proposed site is close to the settlement and hilly which might expose it to running water/storm water.
- Close to small industry (chicken farm-even though currently not functioning).
- Downstream (just below the road) farming and next to the farm side is River Angereb.
- The site is currently relatively accessible and the land is not cultivated.
- There are no groundwater sources around the site.

Option site 6: the existing FS dumping site/Ayra Kebele

It is about five kilometers away from the center. The site is already an existing FS dumping site which is currently operating. The site is fenced and well-demarcated for this purpose. Adjacent to the site, there is a public park protected by Environmental protection, sanitation, and beautification) greenery and beatification agency.

- It is bordered by the solid waste dumping site to the east and a small pig farm; with the greenery area which is covered by various tree species to the west. There is an Orthodox Church near the border of the proposed FSTP in the west direction, and a farm and two informal houses are under construction. To the south of the site, there are farm areas. There is a runway for the storm water which the discharging canal from the existing FSTP is connected and the overflow of fecal sludge from ponds causes some problems on the farmers and downstream communities. Similarly, the overflow and storm water mixed with fecal sludge join Shinta River which also tributes to Megech at Old Bridge.
- The site has an access road. It is cleared of any compensation and land-related issues. However, there is an informal settlement within 300m radius that needs a continuous consultation and awareness creation. During the consultation, we have learned that the community near the FSTP has no a clear information and are not aware of the operation & level of technology used by the proposed FSTP project. Moreover, community structure and dynamics near FSTPs may evolve over time, and their needs and concerns may change. Thus, continuous consultation allows the FSTP operators to enhance transparency and information sharing, to build trust, to adapt their operations and outreach efforts to meet these changing needs.
- No farm (since it is a waste disposal site)

Each of the sites was evaluated against certain criteria taking into consideration the nature of the work and socio-environmental condition of the sites. The criteria include: Resettlement or Land acquisition and displacement, Disturbance to the community (noise, odour), Threat to water sources (surface or groundwater Impact on vegetation, land use and economic potential of the site, Vehicular accessibility, proximity to wetlands and rivers, susceptibility to flood, opinion of local community.

The alternatives sites were evaluated using multi-criteria analysis, based on this method each of the selected criterion was scored on a negative scoring basis, with a score of between 0 and 4 assigned per the following approach:

- ✓ 0 – Excellent
- ✓ 1 – Very Good
- ✓ 2– Good
- ✓ 3– Poor
- ✓ 4 – Very Poor

A weighting factor in percentage was assigned to each criterion as per Table 15 below. The site with the lowest total weighted score was deemed the most favorable site for the construction of FSTP.

Table 15: Multi-Criteria Analysis of FSTP Site Evaluation

	Evaluation Criteria	weight	option 1/Azezo-Tseda Sub	option 2/Azezo-Tseda Sub	option 3 Azezo-Tseda Sub - city	option 4/Maraki Sub - city	option 5/Fasil Sub - city	option 6/ existing FS disposal site
A	**Natural Environment**		**score**	**score**	**score**	**score**	**score**	**score**
1	Proximity to a river (m)	**10%**	2	2	1	2	1	0
	observation		300m away from Megech River	300m away from Megech River	surface water source is more than 500m	500m and 250m	350m away from Megech	>1000
	Normalized score		0.250	0.250	0.125	0.250	0.125	0.000
	weighted Score		3%	3%	1%	3%	1%	0%
2	Likely impact on the groundwater table (m)	5%	**score**	**score**	**score**	**score**	**score**	**score**
			1	1	1	2	1	1
	observation		Very low/no ground water source around	Very low/no ground water source around	Very low/no ground water source around	500m and 250m	Very low/no ground water source around	Very low/no ground water source around
	Normalized score		0.143	0.143	0.143	0.286	0.143	0.143
	weighted Score		1%	1%	1%	1%	1%	1%
3	Flooding risk	5%	**score**	**score**	**score**	**score**	**score**	**score**
			1	1	0	0	0	0
	observation		low	low	No flooding risk	No flooding risk	No flooding risk	No flooding risk
	Normalized score		0.500	0.500	0.000	0.000	0.000	0.000
	weighted Score		3%	3%	0%	0%	0%	0%
	Sub Total	20%	6%	6%	2%	4%	2%	1%
B	**Biological Environment**							
4	Biodiversity and habitats	10%	**score**	**score**	**score**	**score**	**score**	**score**
			1	1	1	1	1	0
	observation		locations with little vegetation cover and fauna presence	locations with little vegetation cover and fauna presence	locations with little vegetation cover and fauna presence	locations with little vegetation cover and fauna presence	locations with little vegetation cover and fauna presence	Urban and industrial areas, with little or no vegetation cover and fauna presence
	Normalized score		0.200	0.200	0.200	0.200	0.200	0.000

	Evaluation Criteria	weight	option 1/Azezo-Tseda Sub	option 2/Azezo-Tseda Sub	option 3 Azezo-Tseda Sub - city	option 4/Maraki Sub - city	option 5/Fasil Sub - city	option 6/ existing FS disposal site
	weighted Score		2%	2%	2%	2%	2%	0%
5	Proximity to wetlands, Environmentally Protected and Sensitive Areas and their Biodiversity,	10%	**score**	**score**	**score**	**score**	**score**	**score**
			1	2	1	2	3	0
	observation		300-500m	100-200m	300-500m	100-200m	50-100m	>500m
	Normalized score		0.111	0.222	0.111	0.222	0.333	0.000
	weighted Score		1%	2%	1%	2%	3%	0%
	sub total	20%	3%	4%	3%	4%	5%	0%
C	**Social Environment**		**score**	**score**	**score**	**score**	**score**	**score**
6	Proximity to residences (m)	15%	0	4	3	1	3	1
	observation		Above 500 m	below 50m	200-300m	300-500m	200-300m	250- 300
	Normalized score		0.000	0.333	0.250	0.083	0.250	0.083
	weighted Score		0.00%	5.00%	3.75%	1.25%	3.75%	1.25%
7	Proximity to social, cultural, and religious infrastructures	10%	**score**	**score**	**score**	**score**	**score**	**score**
			0	0	0	1	1	1
	observation		≥500m	≥500m	≥500m	200-300m	200-300m	200
	Normalized score		0.000	0.000	0.000	0.333	0.333	0.333
	weighted Score		0%	0%	0%	3%	3%	3%
8	Traffic and dust pollution	5%	**score**	**score**	**score**	**score**	**score**	**score**
			1	0	1	0	0	1
	observation		with moderate transportation loads or manmade activities	with no transportation and non-intense manmade activities	with moderate transportation loads or manmade activities	no transportation and non-intense manmade activities	no transportation and non-intense manmade activities	low transportation and non-intense manmade activities
	Normalized score		0.333	0.000	0.333	0.000	0.000	0.333
	weighted Score		1.7%	0.0%	1.7%	0.0%	0.0%	1.7%

	Evaluation Criteria	weight	option 1/Azezo-Tseda Sub	option 2/Azezo-Tseda Sub	option 3 Azezo-Tseda Sub - city	option 4/Maraki Sub - city	option 5/Fasil Sub - city	option 6/ existing FS disposal site
9	Socio-economic factors/farm lands/	15%	**score**	**score**	**score**	**score**	**score**	**score**
			1	2	2	3	0	0
	observation		moderate socioeconomic resource(s) quarry site and materials are dumping in the area, no agriculture	Moderate significance socioeconomic resource(s) such as agricultural activities	Moderate significance socioeconomic resource(s) agricultural land	include significant socioeconomic resource(s) agricultural land	no agricultural and no other economic activity	existing FSTP no socioeconomic resource(s)
	Normalized score		0.125	0.250	0.250	0.375	0.000	0.000
	weighted Score		1.9%	3.8%	3.8%	5.6%	0.0%	0.0%
10	Proximity to urban city Centre (km)	5%	**score**	**score**	**score**	**score**	**score**	**score**
			2	3	2	0	2	1
	observation		far > 5 km	relatively far > 8 km	>7km	3-5km	>5km	5km
	Normalized score		0.200	0.300	0.200	0.000	0.200	0.100
	weighted Score		1%	2%	1%	0%	1%	0.50%
	Sub Total	50%	5%	10%	10%	10%	8%	7%
D	**Infrastructures**							
11	Accessibility of the site by an existing road (m)	5%	**score**	**score**	**score**	**score**	**score**	**score**
			2	2	2	1	1	0
	observation		≥300	300-500m	300 -500m	200 - 100	100 - 200	50m
	Normalized score		0.250	0.250	0.250	0.125	0.125	0.000
	weighted Score		1%	1%	1%	1%	1%	0%
12	Available infrastructure (water supply, electricity etc.)	5%	**score**	**score**	**score**	**score**	**score**	**score**
			4	4	4	2	0	1
	observation		no access to existing water supply network	no access to existing water supply network	no access to existing water supply network	500 - 300m	50 - 100m	≥300m
	Normalized score		0.267	0.267	0.267	0.133	0.000	0.067
	weighted Score		1%	1%	1%	1%	0%	0%
	Sub Total	10%	3%	3%	3%	1%	1%	0%
	Grand Total	**100%**	**16%**	**23%**	**18%**	**20%**	**16%**	**8%**

The ESIA consultant also compares the proposed alternative site giving more emphasis to environmental and socio-economic factors that have a low impact on water bodies, biodiversity, socio-economic of the community, dust and odor pollution, etc. as indicated in the above table. Accordingly, option 6 or the existing fecal sludge disposal site is found suitable by the ESIA consultant from the environmental and socio-economic point of view.

6.2. Technology Alternatives

This involves looking at various possible technology alternatives, project designs, and layouts. The objective is to ensure that it was cost-effective, easy to manage, and has fewer social and environmental impacts.

6.2.1. Technology Alternatives for FSTP

Fecal Sludge Management involves the use of onsite facilities and the management of the resultant sludge usually by emptying, transportation, treatment, and finally disposal or reuse; the handling of sludge from all points of generation poses various contamination risks and requires proper management. Fecal sludge can be treated in a variety of ways and there is no single best option considering the widely varying conditions of urban areas.

Various technologies for the treatment of sludge are available. Because sludge comprises complex organic minerals, most of the treatment options involve some form of anaerobic digestion to complete the process of mineralization. Subsequent treatment processes may include solid-liquid separation, liquid treatment, pathogen removal, and solid treatment. The table below presents the treatment methods that were considered by the design consultant for Gondar town.

Table 16: Screened Fecal Sludge Treatment Options for the Town

Solid/ liquid separation	Liquid /Effluent treatment	Solid treatment
Unplanted Drying Bed	Waste stabilization bonds	Sludge drying bed
Settling– thickening Tank	Anaerobic baffle reactor (ABR)	
	An aerobic filter	

Screened Fecal Sludge Treatment for the town comprise a combination of different options for Solid /Liquid separation, Primary liquid treatment and Secondary effluent treatment and Solid's treatment. To assist in making informed decisions on the selection of the most appropriate treatment process, these technologies are evaluated for each treatment step.

In this regard considering the local operation and maintenance capabilities and local socioeconomic conditions, three alternative schemes are proposed by the design consultant for the sludge treatment.

Alternative 1: Settling-Thickening Tanks + Unplanted Drying Beds + ABR
Alternative 2: Unplanted Drying Beds + ABR
Alternative 3: Unplanted Drying Beds + Waste stabilization ponds (Anaerobic bond, Maturation Pond and Facultative ponds)

Alternative 1: Settling-Thickening Tanks + Unplanted Drying Beds + ABR

Alternative 1 used a combination of Settling-Thickening Tanks, Unplanted Drying Beds and ABR as indicated in the following figure.

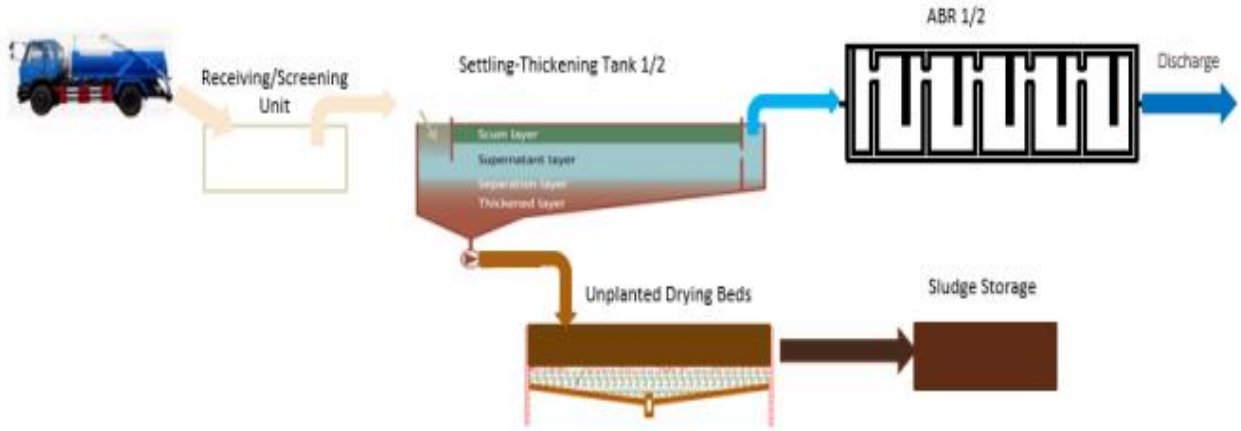

Figure 15: Logical Arrangement of Settling-Thickening Tank, Unplanted Drying Bed AndABR
Source: [10]

Settling-Thickening Tanks

Settling-thickening tanks for FS treatment are rectangular tanks typically 2−3 m in depth with sloppy floor with an intake at the top of one side and an outlet on the opposite side, where settled solids are held at the bottom of the tank and scum floats on the surface. They are used for thickening sludge and separation of the liquid and solid parts of fecal sludge. Solids settle along the length of the tank. Unlike sedimentation tanks, Settling-thickening tanks operate in batch mode, with each tank loaded for several days and then allowed to rest before sludge is removed. During this period, discharge continues to a second tank. The typical settling-thickening tank is shown in the diagram below.

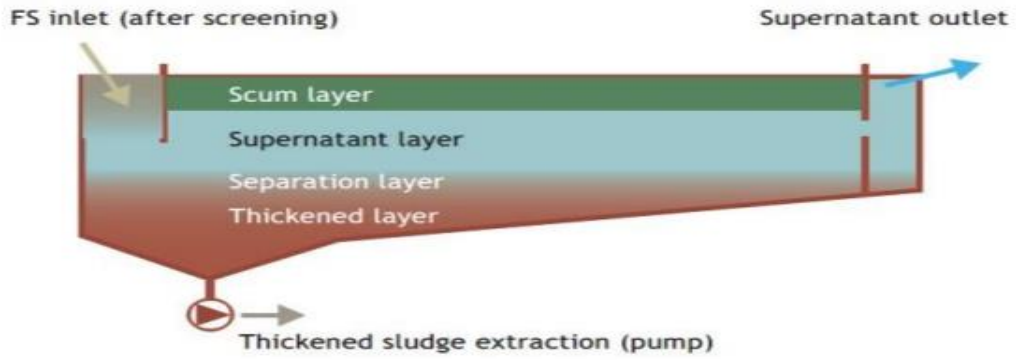

Figure 16: Settling-Thickening Tank
Source: [10]

Unplanted Drying Beds

An unplanted drying bed is a simple, permeable bed filled with several drainage layers that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by percolation and evaporation. Around 50% to 80% of the sludge volume drains off as liquid or evaporates[13]. Wet sludge is discharged

onto a bed to a depth of 200–300 mm. It is then left on the bed to allow water to percolate through the bed and evaporate from the surface until the material on the bed has dried sufficiently to allow its removal using spades or other suitable equipment. Unplanted drying beds need to be desludged before fresh sludge is applied (Figures 6 in chapter 3 shows a Schematic of a typical drying bed). It is proposed as the most suitable and favorable technology to be adopted due to simplicity to construct operation and maintenance and cost-effectiveness.

Anaerobic Baffled Reactor

As indicated in section 5.2.43 an anaerobic baffled reactor (ABR) is an improved septic tank with a series of baffles or vertical pipes and chambers which increase the contact time of the untreated effluent and the active biomass. These results in an improved treatment where the removal of 65% to 90% COD and 70% to 95% of BOD can be achieved. This treatment performance is better compared to the conventional septic tank. The ABR is simple to build and operate. In addition, they are more resistant to organic and hydraulic shock loads, have low operating costs, and have long service life

In order to control the release of odorous and potentially harmful gases, at least the last chamber needs to be vented. Similarly, the outlets of each tank as well as the final outlet should be placed slightly below the liquid surface to allow the retention of any possible scum formed in the up-flow chamber. ABR tanks should be checked from time to time to ensure that they are watertight.

Alternative 2: Unplanted Drying Beds + ABR

The second alternative uses unplanted sludge drying bed and Anaerobic Baffle reactor. In this alternative, a vacuum truck is discharging directly in the drying beds. Due to the absence of solids/liquid separation at their upward, this would avoid bed clogging and allow effective infiltration of the liquid fraction as the sludge still has high water content. As indicated in the following figure drained liquid from the sludge drying beds is directed into ABR for further treatment and the dry sludge will be stored for further dewatering.

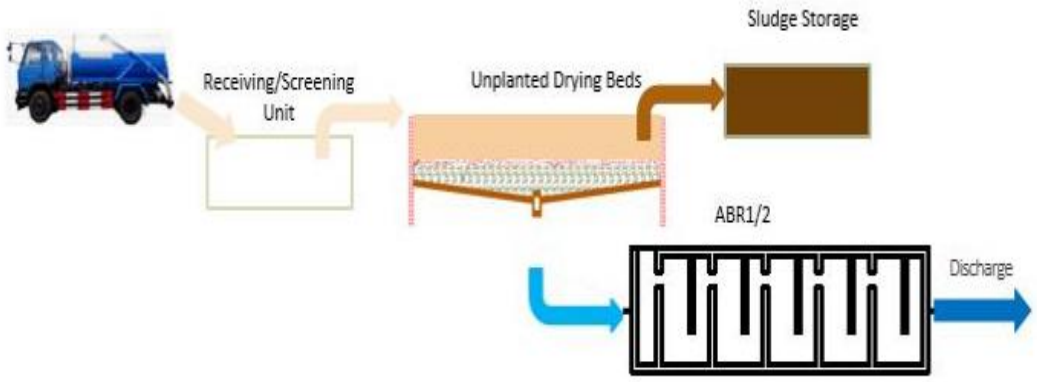

Figure 17: Arrangement of Unplanted Drying Bed and ABR
Source: [10]

Unplanted Drying Beds

As indicated in the previous alternative sludge drying beds provide a simple dewatering option.

Anaerobic Baffled Reactor

The inflow will be the leachate drained from the unplanted drying beds where it will be the supernatant from the settling-thickening tanks for the alternative 1. Apart from the design process, the other part is the same as the ones of the alternative 1.

Alternative 3: Unplanted Drying Beds + Waste Stabilization ponds

This alternative uses unplanted sludge drying bed with a combination of anaerobic bond, maturation pond, and facultative ponds. The design of the unplanted beds is the same as the one presented under alternative 2. In this alternative, the drained liquid from the beds is directed into the waste stabilization ponds for further treatment as indicated in the following diagram.

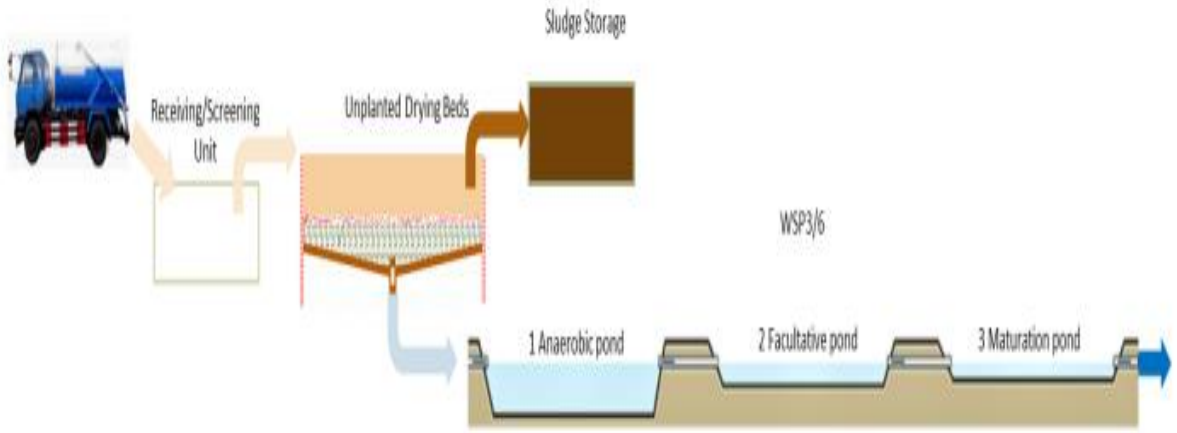

Figure 18: Arrangement of Unplanted Drying Bed and Waste Stabilization Ponds
Source: [10]

Supernatant from the unplanted drying bed will resemble very high-strength wastewater. The BOD and TSS in the liquid stream are expected to be reduced high degree; this is almost an order of magnitude higher than domestic sewage. The higher strength of septage/fecal sludge creates a need for more than one treatment stage; if an acceptable effluent standard is to be achieved accordingly it will be treated in seriously connected waste stabilization ponds.

Waste stabilization ponds

Waste stabilization ponds are sizable, shallow basins surrounded by earthen embankments where raw sewage is naturally cleaned by bacteria and algae. Long hydraulic retention times are used because the rate of oxidation is slow due to the usage of natural processes; these times typically range from 30 to 50.

The effluent is effectively treated by connecting the three ponds. Pre-treatment is strongly advised at the ponds' inlets to prevent scum formation and to stop extra sediments and trash from getting in. If they are properly constructed and run, they are suitable for high solids, BOD, and pathogen reduction; nonetheless, they have some minor issues with insects or odors.

Treatment principles

Anaerobic pond*:*

The pond is intended to lessen the organic load by anaerobic bacteria and serves as a primary pretreatment of the effluent. The pond is 2 to 5 m deep with a retention time varying between 1 and 7 days.

Facultative ponds: The type of pond sewage from the preliminary treatment (anaerobic pond) it reduces the pathogen using both anaerobic and aerobic treatment which occur respectively towards the bottom and in the upper layers of this pond.

Maturation ponds: maturation bond receives the effluent from the facultative pond and effectively reduces the remaining pathogens. It represents an inhospitable environment for fecal bacteria and viruses and results in their elimination.

6.2.2. Comparison of the FSTP Alternative Technologies

The selection of technology for FSTP is governed by a number of factors that include land availability, treatment efficiency, ease of design and construction, adaptability to the local climate, ease of operation and maintenance, etc. For Gondar city, there is limited availability of land, low funding for both capital investments and operation and maintenance (O&M) and relatively low staff skills. Consequently, the situation favors low-cost technologies with little or no energy requirement that can be constructed and operated with minimum skills. Moreover, climatic condition of the city is also key factor in selecting the technology. Comparison of the three alternatives using selected criteria is indicated in the following table.

The alternatives technologies were evaluated using multi-criteria analysis, based on this method each of the selected criterion was scored on a negative scoring basis, with a score of between 0 and 4 assigned per the following approach:

- ✓ 0 – Excellent
- ✓ 1 – Very Good
- ✓ 2– Good
- ✓ 3– Poor
- ✓ 4 – Very Poor

A weighting factor in percentage was assigned to each criterion as per Table 17 below. The technology with the lowest total weighted score was deemed the most favorable treatment technology for the town.

Table 17: Summary and Comparison of Alternative Technologies

Criteria	Weight	Settling-Thickening Tanks + Unplanted Drying Beds + ABR (option 1)	Unplanted Drying Beds + ABR (option 2)	Unplanted Drying Beds + Waste stabilization ponds (option 3)
		score	score	score
		2	1	0
Cost (OPEX & CAPEX)	25%	High cost due to thickening tank than option 2	Moderately high compared to option 3,	Lower cost
	Normalised score	0.67	0.33	0.00
	weighted Score	16.7%	8.3%	0.0%
operation& maintenance		Score	Score	Score
		2	1	0
	15%	Complex	moderate	simple
	Normalised score	0.67	0.33	0.00
	weighted Score	10.0%	5.0%	0.0%
Treatment effectiveness		Score	Score	Score
		0	1	1

Criteria	Weight	Settling-Thickening Tanks + Unplanted Drying Beds + ABR (option 1)	Unplanted Drying Beds + ABR (option 2)	Unplanted Drying Beds + Waste stabilization ponds (option 3)
and efficiency	25%	High treatment efficiency	Moderate treatment efficiency	Moderate treatment efficiency
	Normalised score	0.00	0.50	0.50
	weighted Score	0.0%	12.5%	12.5%
Land Requirement		Score	Score	Score
		0	0	1
	10%	require small area of land	require small area of land	require larger area of land compared to option 1 & 2
	Normalised score	0.00	0.00	1.00
	weighted Score	0.0%	0.0%	10.0%
ease of design and construction /complexity		Score	Score	Score
		2	1	0
	10%	Complex	Moderate	Simple
	Normalised score	0.67	0.33	0.00
	weighted Score	6.7%	3.3%	0.0%
Adaptability to area/cold climate		Score	Score	Score
		0	0	1
	15%	good for cold climate	good for cold climate	mostly used for hot climate
	Normalised score	0.00	0.00	1.00
	weighted Score	0.0%	0.0%	15.0%
Total score	**100%**	**33.3%**	**29.2%**	**37.5%**

Based on the above evaluation of selection criteria, the second alternatives deemed suitable to be adopted for Gondar city, the option was also adopted by the client.

Though alternative two is relatively costly and need relativity skilled labor compared to alternative three, but due to scarcity of land in the city it is the best choice for the city balancing the advantages and limitation of alternative one and three as alternative three require larger area of land compared to alternative two It has also good treatment efficiency in the local context.

The selected FSM technologies will also meet the WBG EHSG effluent standard values as stated in table 18 below.

Table 18: WBG EHSG/UWSSP II ESMF recommended Treated Effluent Standards

Parameter	Maximum Value	Unit
pH	6 – 9	
BOD	25	mg/l
COD	125	mg/l
Oil and Grease	10	mg/l
TSS	20	mg/l
Ammoniac nitrogen	25	mg/l
Phosphorus	15	mg/l
Total Nitrogen (as N)	30	mg/l
E.Coli 1	235	cfu/100 mL
Helminth egg 2	< 1	helminth egg/L

6.3. 'No project' option

These FSTP project in Gondar town are expected to: improve sanitation and public health in the urban setting. The municipal population is growing fast amid the absence of adequate and quality sanitation services and facilities. From the economic perspective as well as health and social considerations, the following benefits will be realized: i) improved sanitation; ii) enhanced modern FSM; iii) employment; and iv) low incidence of pollution, diseases, and accidents. For this project, the alternative of "no-project" will increase the risks of poor public health and environmental degradation. Hence, the 'no project option is not a viable alternative.

As anticipated, the zero-alternative option (do nothing scenario) was eliminated since it would have meant that the urban population would continue to have insufficient access to clean waste management (FSM) and consequently, poor sanitary conditions. It entails releasing all organic wastes—including those containing nitrogen and phosphorus directly into the environment without any biological processing.

7. CONSULTATION PROCESS

During the preparation of the ESIAs, extensive consultations were conducted at various levels. The public consultation process was conducted in accordance with the Ethiopian Environmental Impact Assessment Regulation of 299/2002 and the UWSSP II ESMF to provide clear and accurate information about the proposed project to communities living in the project area, and promote understanding through the active engagement of individuals, groups, stakeholders, and organizations who have a stake in the subproject and its outcomes.

Information related to the existing waste management system focusing on constraints, existing environmental and social features of the project influence area, potential environmental issues/impacts related to the proposed project component and activities, were collected and assessed to understand and reflect the attitudes of local communities, design consultant's staff, Client's officials and experts towards the planned scheme. This information and opinions have been considered in this socio-environmental impact analysis.

7.1. Consultation with the local communities at Ayra Kebele/ FSTP site/

In the presence of the kebele leaders, a focus group discussion was conducted with members of the local community who live close to the FSTP. The kebele office compound served as the venue for the discussion. The discussion participants shared their opinions on whether modern technologies support the FSTP, and if so, they applauded the implementation of the project (see Appendix 1 for information on the community consultation). A total of 20 (4 female and 16 male) were participated in the meeting (Appendix-1 Community consultation minutes). The presentations highlighted the project background, objectives, expected upcoming activities, and potential socio-economic and environmental impacts of the proposed project intervention. After the presentations, the floor was open to the community for discussion and to forward their views, comments, and queries. The members of the consulting team and GWSSS staff have taken the time to thoroughly explain the nature, scope, and components of the project. A detailed explanation was given to address some of the attendees' questions and their recommendations received for further deliberation.

Then, the team requested them to express their feelings, anticipated positive and negative impacts, and the possible mitigation measures to avoid the expected adverse impacts in various phases of the project implementation. All members of consultation meetings were very interested to participate in the discussions and they shared their views and opinions on the points of discussion

From the discussion, it was learned that there is a lack of transparency and awareness about the importance of the proposed project activities and technological improvement.

All participants of the meeting mentioned that Gondar city resident has serious sanitary challenges. However, they have complaints and concerns regarding the project activities and consequent problems. This is mainly because the previous poorly managed project history. The meeting participants raised the issue of safe disposal of the fecal sludge and proper treatment in order to ensure the health of the local community and the environment.

The main impacts of the project include Odor, overflow of wastes due to the storm water. The waste from the site affects the children who tend to play with the wastes causing them illnesses.

For the raised questions and complaints, responses have been given by the ESIA team on the technical issues such as odor, downstream pollution, etc., by describing that the newly proposed FSTP will avoid such problems.

As the land is owned by the city water supply sewerage service and the municipality, there is no issue of land ownership and compensation.

Figure 19: Community Consultation at Kebele Office Compound

Major issues raised by the participants of the meeting were:

- Odor problem need precautionary measure;
- The downstream were affected by storm water containing different wastes from the FSTP which affected the health of the community and contaminated the grazing land due to overflow of effluent
- They indicated lack of transparency and awareness about the importance of the proposed project activities.
- The involvement of the local communities including women during the proposed project planning, and design was insignificant

Thus, we strongly recommend a continuous awareness campaign to the local community, including informing them about technological advancement in waste treatment process. The client has to respond to ensure proper management of the site in a way that doesn't pollute the environment. In doing so, it'll create a suitable condition for the local community and stop causing an additional socio-economic problem to the people living in close proximity. The participants of the consultation meeting repeatedly mentioned the problem of nuisance odor and waste discharge that needs to be addressed during the all the phases of the project. Moreover, the utility shall closely work and engage with the local communities in all phases of the project.

7.2. Consultation with the management of Church

In addition to the community consultation, a separate meeting was held with the management of a nearby church. The meeting included representatives from the municipality and GWSSS. The primary focus of the meeting was to discuss the potential odor impact from the proposed FSTP on the church and to explore mitigation measures. The participants agreed that although there may be some negative odor impacts, they will be minimal due to the use of improved technologies in the project, the prevailing wind direction being away from the church, and the presence of trees surrounding the site. Additionally, the Ethiopian Orthodox Church has a rich experience in planting trees within and around its compound. Overall, the participants

expressed no opposition to the project and agreed to take measures to minimize any possible impact. (Refer to consultation minutes in annex 12 for details).

The consultation was conducted with the PAPs including the church management with the aim of community engagement and communication. As indicated above the most prevailing wind direction is away from the church as well as the nearby settlement areas and the site has better vegetation coverage that can shield bad odour. In addition to this, landscaping and establishing buffer zones with dense vegetation or constructing physical barriers such as walls to minimize the impact of odors to the church and the nearby settlements should be emphasized. Moreover, conducting ongoing odor impact assessments to ensure that mitigation measures remain effective over time can help to address odor issues without necessitating the relocating of the church and nearby settlements, which also consented by the PAPs including the Church.

Figure 20: Consultation with the Church Management and Religious Leaders

7.3. Consultation with governmental stakeholders at Gondar town

Similarly, a stakeholder meeting was held on 29th March, 2023 and November 2023. It was chaired by the Deputy Mayor of the Gondar city administration and the city water supply and sanitation service manager respectively. The consultations with various stakeholders who have a direct or indirect interest in the proposed project's implementation were conducted. In light of this, discussions were held with the mayor's office and the sectoral offices that followed, including those for agriculture, health, education, environmental protection, beautification, and sanitation; water and energy at the town level; and ANRS EPA, Bureau of Water and Energy at the regional level (Appendix 2). Accordingly, all parties are in support of the project's implementation, provided that it has no detrimental effects on the surrounding communities.

The objective of the consultation was to discuss the project's issues and identify the possible avoiding solutions and mitigation measures for the problems that would be caused due to the project intervention in the city. All the consulted organizations were very cooperative in sharing their concern and information about the project.

The project has a steering committee chaired by the head of the town administration/Mayor, vice-chaired by the Gondar health and deputy mayor, and a technical committee chaired by the utility. The committee consists of agriculture, health, education, environmental protection, Water and Energy.

During the discussion, the land issue specially the informal settlement in the area was intensively discussed, and the city administration showed strong commitment to resolve any potential issues. During the discussion key recommendations were also forwarded by the participants.

Furthermore, the officials confirmed that they are not standing against the arrangements made to the FSTP to Gondar town. They felt that the development of this project is very vital to improving the hygiene and sanitation problems of their people. During the discussion the following issues were discussed and recommended

- The project is critical and needs to urgently start its construction and operation in such a way as to ensure the health and wealth of the public.
- Implementing this project is critical to bring about sustainable development and ensuring equitable share, considering the interests of all stakeholders to address the increasing population's sanitary demand.
- Currently, there is a lack of stakeholder engagement, but the wastewater and fecal sludge management are long-standing problems of the city of Gondar that need to engage all stakeholders in the design, implementation, and operation.
- In the project, gender inclusion should be enhanced
- Reusing FSTP effluent for fertilizer and water for irrigation was discussed and they showed interest. Hence, it is possible to use effluent from FSTP for green areas just below the FSTP.
- Controlling of bad odor, buffering, and landscaping of the site are also among the issues and recommendations forwarded by the stakeholders.
- Another issue is the settlement; the urbanization/expansion of an informal settlement is a key challenge for the treatment plant capacity and sustainability. However, this issue must be dealt seriously by the city manager and city administration closely

Figure 21: Stakeholders' Consultation (Location: At Gondar City Mayor Office)

Consultation with the design consultant has been conducted to discuss the design and selection of technologies and sites. The consultation was conducted on April 28, 2023. During the discussion, we had deeply raised issues regarding site selections and technological alternatives.

7.4. Consultation findings

The findings of the consultation are summarized in the following table

Table 19: Issues and concerns raised during stakeholder meeting for proposed work

Stakeholder	Project impacts/concern raised	Mitigation suggested
Institutional stakeholders	Project delay, appropriate operation and use of effluents and dry sludge, Lack of coordination	Improve project communication and capacity of the project proponent and its stakeholder's coordination system
Community	Impacts of nuisance odor, aesthetic value deterioration, contamination by waste from FSTP	The project ensures proper management and operation of the facility to avoid pollution, fencing and application of proper mitigation measures,

7.5. Public Disclosure

Series of consultations were made with the stakeholders at the town administration and Kebele levels. Through these consultations, project information (including purpose, project type, and project location) and the ESIA requirements were disseminated to the stakeholders and local community. This helped to gain feedback and concerns that must be addressed during the project planning, construction, and implementation processes. This ESIA report has been prepared taking into account all the feedback from stakeholder and community consultations. In accordance with the World Bank policy on access to information, disclosure of relevant project information needs to be posted on MoWE website (executive summary translated in Amharic and full ESIA document) and the World Bank external website to receive the opinions and suggestions of civil societies, academics, and other professionals as well.

8. IMPACT IDENTIFICATION, ANALYSIS, AND POSSIBLE MITIGATION MEASURES

8.1 General Considerations

This part of the report addresses potential impacts associated with the proposed project and measures for avoidance, reduction, or restoration of the negative impacts and enhancing (improvements) of positive effects of the projects. For the assessment of the socio-environmental impacts of the proposed projects, the following issues were considered:

- Impacts should be assessed for all phases of the project cycle, including construction, operation, and decommissioning;
- All elements of the project infrastructure and activities associated with the project, including actions by third parties on which the project depends, should be assessed, whether they are funded as part of the project or by other parties;
- The assessment should address the potential impacts of the project on the physical and natural environment, social, economic and cultural environment including impacts on the health and safety of the local communities and project workers;
- The assessment should address positive impacts as well as adverse effects, and measures to enhance the beneficiary impacts, and mitigation measures for the adverse impacts should be proposed.

Proposed Topics to be Scoped Out: Concerning the analysis of the legal and institutional framework and collected information in the baseline, there are certain topics considered irrelevant, or with less importance to the project and therefore proposed to be scoped out.
Topics of less importance and therefore proposed to be scoped out

- Surface and groundwater resources as there are no such resources near the project sites.
- Biodiversity conversion and sustainable management of living natural resources. Not relevant, given that there are no threatened, rare, or endangered species of fauna or flora registered or known to exist around the site.
- Climate change assessment (climate check).

8.1. Impact Identification

When identifying the potential impacts of the project on the existing environment, it is necessary that it should be measured against the existing baseline conditions. In this section, the possible impacts that are expected under each stage of the project activities were identified and analyzed for the proposed FSTP project in relation to the various stages of its implementations.

For the purpose of this assessment, the impacts identified were those which are considered to be significant impacts. This is not to say that minor impacts were disregarded, but that their impact, whilst detectable, is not considered significant. The overall level of predicted impacts, these being both positive and negative ones, are evaluated. Realistic assumptions have been made and qualified. The impacts may be positive as well as negative and may be short or long-term, temporary, and reversible or permanent. The impact assessment for the proposed project works has considered the level of the potential impacts, this being based on both the value of the environment and the nature and magnitude of the potential impact.

Identifying boundaries within which the ESIA was undertaken is an important component of the study. The identification process focused and delineated the FSTP within an area where impacts, both positive and

negative, will be felt on the environment, economy, and the local community. The types of boundaries considered were institutional, temporal, and spatial in nature.

8.1.1. Institutional Boundaries

The institutional boundaries are composed of institutions and sectors which are relevant to the project development. These can be determined from the political boundaries, regulations, institutional mandates, and structures. The proposed project is likely to affect directly or indirectly the interests of the surrounding institutions. Therefore, these institutions will be adequately consulted during the ESIA process.

The institutional framework for environmental management and handling ESIA requirements in the city\region exists at the regional, sector, Municipality/GWSSS/, sub-city/ local government, and Village (Kebeles). The relevant institutions for handling ESIA requirements for the construction sector include the following: National and Regional Environmental Protection Authority, ANRS Urban Development and Construction, Health Bureau, education, culture and Tourism, women and children affairs, and Municipal Environment Management and Beautification, village Committees, and GWSSS.

8.1.2. Temporal Boundaries

Temporal boundaries refer to project life span and the reversibility of impacts. For example, the impact of construction works on natural vegetation may be short-lived if measures to restore vegetation and the land are taken after material extraction. However, the resettlement of the community to give way for proposed works, if applicable, may have a long-lasting impact, stretching far into the future in terms of loss of income, land, and disruption in cultural life and livelihood of the people. In this regard there will be some resettlement and loss of properties at FSTP sites to maintain a buffer zone.

Table 20: Estimated Temporal Boundaries of the Project

Project phase	Duration
Construction	Up to 1-year
Operation	20 years
Decommissioning	After 20 years depending on the conditions

8.1.3. Spatial Boundaries:

Spatial boundaries refer to the area affected by the project. The area of direct impact for the proposed FSTP will be within the legal framework of the project where most of the activities will take place. The immediate impact area of the proposed projects is adjacent to the farm site and the village residence where some of the impacts, such as the damage to people's properties or interference with business, traffic accidents, spread of communicable diseases such as HIV/ public health, and dust pollution will be felt directly.

The influential impact area is defined as the one comprising areas where decisions are made. For this project, decisions are made mainly at the regional, municipality, sub-city, and Kebele administration levels. In addition, regional land administration and environmental protection, GWSSS together with town administration may all have input regarding land ownership and construction permits and issues.

8.2. Impact Characterization and Significance

When identifying the potential impacts of a new project on the existing environment, it is necessary that it should be measured against the existing baseline conditions.

The significance of each identified impact was decided by an expert's judgment based on past experience, field observation, the outcome of consultation with stakeholders, and project-related legal frameworks, regulations, and standards. Key experts involved in the impact assessment were assigned impact significance for each impact separately and finally each rating of experts combined into one significance rating (low, medium, high) for each impact.

The overall significance of the possible impacts has been determined by combining the perceived 'Likelihood of Occurrence' of the source of the impact in combination with the corresponding impact 'Consequence' describing the severity of the impact, 'Significance' describing the level of required mitigation measures, the 'Spatial Influence', describes the proximity of the impact, 'Temporal Influence' describes the duration of the impact, and finally, 'Reversibility' describes the ability to return to original conditions after implementing mitigation measures.

The detailed classification of impacts is provided in Table 21 below and the Matrix of Potential impacts against classification and significance for each project.

Table 21: Detailed Impacts Classification Approach

Impact Criterion	Effect on Environment	Classification of Effect	
		Expression	Impact description
Likelihood of occurrence	What certainty of occurrence is associated with impact?	Unlikely	Probably will not occur
		Likely	May occur
		Certain	Will occur
Consequence	How severe the impact will be?	Marginal	Little impact
		Critical	Moderate impact
		Severe	High impact
Significance	How important is impact in Project design?	Low	Impact of little importance, needs limited mitigation
		Medium	Impact has influence and requires mitigation
		High	Impact of great importance, mitigation is a must
Spatial influence	How the impact shall be extended spatially?	Local	Within the surrounding area of the project
		Regional	Extends beyond the surrounding area
Temporal influence	How shall the impact extend over time?	Short term	The impact shall last a short period of time
		Medium term	The impact shall last a medium period
		Long Term	The impact shall be permanent
Reversibility	Can the influence of the impact be removed once the impact ends or the influence will remain?	Reversible	The influence of the impact can be reversed
		Irreversible	The influence of the impact cannot be reversed and shall be permanent

Table 22: Prediction and Significance of Potential Impacts of FSTP Project Activities

No	Identified Potential Impacts	Type of Impact		Likelihood of occurrence			Consequence			Spatial influence		Temporal influence			Reversibility		Significance without Mitigation/ Enhancement Measures			
		Positive	Negative	Unlikely	Likely	Certain	Marginal	Critical	Severe	Local	Regional	Short	Medium	Long	Reversible	Irreversible	None	Low	Medium	High
	CONSTRUCTION PHASE																			
1.	Loss of land and Land use change		X	x			x			X				X		X		x		
2.	Soil compaction and erosion		X		X			X		X		X			X				X	
3.	Risk of flooding, erosion, landslide		X		X		X			X		X			X				X	
4.	Noise dust and vibration		X			X	X			X		x			x				X	
5.	Impact on ambient air quality		X			X	X			X		x			x				x	
6.	Pollution of surface water		X	X			X			X		X			X				X	
7.	Impact on flora and fauna		X	X			X			X			X			X			X	
8	Traffic congestion and accident		x		x				x	x		x							x	
9	Impact on livelihood		X	X			X			X				X		X	x			
10	Job creation	X				X				X			X						X	
11	Skill transfer to local workers	X			X					X			X					X		
12	Indirect job opportunities for coffee and tea venders	X		X			X			X				X				X		
13	Occupational Health and safety of workers		X		X			X		X		x	x		x				X	
15	Health impact (HIV AIDS/ STDs)		X		X			X		X		X				x			X	
16	GBV/SA		X		X		X	X		x		X			x	X			X	
17	Impact on archaeological & cultural heritage sites		X	X				X		X	X		X		X				X	

No	Identified Potential Impacts	Type of Impact		Likelihood of occurrence			Consequence			Spatial influence		Temporal influence			Reversibility		Significance without Mitigation/ Enhancement Measures			
		Positive	Negative	Unlikely	Likely	Certain	Marginal	Critical	Severe	Local	Regional	Short	Medium	Long	Reversible	Irreversible	None	Low	Medium	High
	OPERATION PHASE																			
1	Displacement		X			X			X	X				X		X				X
2	Odor (Foul smell) at the site and surrounding environments		X			X	X			X				X	X				X	
3	Impact on ambient air quality		X			x	x			x				x	x				x	
4	Impact on water and soil bodies		x		x			x			x			x		x				x
5	Risk of flooding, erosion, landslide		X	X				X		X			X		X				X	
6	Impact on downstream and riverine flora		x		x			x			x			x	x			x		
7	Impacts on Fauna		x		x		x			x				x	x				x	
8	Impact on public health		X		X			X			x		X		X				X	
9	Impact on public health (malaria spread)		X		X			X			x		X		X				X	
10	Occupational safety		X		X			X		X				x	X				x	
11	GBV/SA		X		X		X			X				X	X				X	
12	Job creation	X								X	X			X					X	
13	Compost generation from sludge	X								X				X					X	
	DECOMMISSIONING PHASE																			
1.	Air and Noise pollution		X			X		X		X			X		X				X	
2.	Impact on soil and water bodies		X		X		X				X		X			X			X	
3	Soil compaction and erosion		X		X		X			X		x			x				x	

No	Identified Potential Impacts	Type of Impact		Likelihood of occurrence			Consequence			Spatial influence		Temporal influence			Reversibility		Significance without Mitigation/ Enhancement Measures			
		Positive	Negative	Unlikely	Likely	Certain	Marginal	Critical	Severe	Local	Regional	Short	Medium	Long	Reversible	Irreversible	None	Low	Medium	High
4	Spoil disposal		X			x	x			X		x			x				X	
5	Loss of Job opportunity		X		X		X			X									X	
6	Health impact (HIV AIDS/ STDs)		X		X					X									X	
7	GBV/SA		X		X		X			X				X		X			X	

8.3. Positive Impacts and Enhancement Measures

The most significant benefit derived from the project will be the well-developed institutional capability for sanitation and hygiene service delivery and eventually a cleaner natural and living environment and greatly improved health standards in the Gondar city targeted by the project. This then has much broader implications in terms of better economic productivity, and it will contribute to boosting development, particularly in the tourism sector, and boosting service sector investment (hotels) for which reliable and affordable sanitation and hygiene facilities are essential.

The fecal sludge management will contribute to alleviating the impacts of the existing uncontrolled fecal waste disposal into the environment, which include nuisance odors, poor aesthetics, and risk of groundwater pollution/contamination, among others. The impact analysis presented in Table 22& 23 identified positive and negative impacts of the proposed project activities. The identified impacts and their enhancement measures are briefly described in the sections below.

8.3.1. Job Creation

The construction, operation, and decommissioning of the project activities will create both short- and long-term employment opportunities. Most of it will be during the construction phase, where the possibility of engaging skilled and unskilled labor from the project-affected communities can be created. Skill transfer from experienced and skilled workers to others will also be one of the beneficiary impacts of the project. This beneficiary impact is rated as low to high based on different phases of the project (duration and extent of the project).

Enhancement measures: Benefits from job opportunities can be enhanced by providing priority for the project-affected people and for women. By providing on-the-job training and capacity building, it is possible to enhance job opportunities for the project-affected people.

8.3.2. Health

The implementation of the proposed project will prevent any health-related problems, particularly from outbreaks of waste-related diseases (such as cholera dysenteric disease caused by poor sanitation). The proposed project will improve environmental sanitation and community health in Gondar City.

Enhancement measures: The health advantage of treating the wastewater would be enhanced by creating awareness among the users on clean and polluted water as well as its advantages and disadvantages. It is also advisable to provide sufficient information and raise awareness of local communities at project site.

8.3.3. Air Quality in the Catchment

Though the localized odor at treatment sites and their boundaries is expected to be adverse, the overall air quality of the catchment will be improved. This is because fecal sludge discharged to a wider environment without treatment, will be treated at FSTP to remove harmful elements. As the project itself is designed to mitigate environmental pollution, the project's impact on air quality will be highly positive.

Enhancement measures: To improve the air quality in the FSTP project intervention sites by properly managing the treatment plants.

8.3.4. Improvement of Water Quality

Properly designed and operation of FSTP protect water resources from pollution. The quality of water flowing from the FSTP to the nearby rivers can be improved by way of changing water quality parameters such as the BOD, COD, turbidity, color, pH, temperature, total dissolved and suspended solids, conductivity, coliforms, nutrients, and trace metals positively.

Concerning surface water, including the bottom sediment, the major positive impact of the operation of the FSTP is the improved water quality within the project area and downstream. Therefore, properly managing FS and wastewater generated from it will play a key positive role in protecting against water pollution.

Enhancement measures: To enhance the positive impacts on downstream water quality, it would be important to regularly monitor the quality of the effluent, if any, to be released to downstream rivers and check whether the effluent quality complies with the Ethiopian effluent discharge standards. Furthermore, it is advisable to plan and implement integrated watershed management in the micro-catchment that helps to enhance the quality of water resources and reduce the negative impacts. This can be implemented with the regional water and energy agriculture and natural resource bureaus.

8.3.5. Production of Compost/Fertilizers

Dried sludge removed from the FSTP process can be utilized for fertilization and conditioning of the soils in the immediate agriculture area and/or far beyond downstream and upstream. Biodegradable materials removed in the process can be given to the agricultural sector to produce natural fertilizers and to be used in place of other inorganic products. This could be an additional benefit for the local community. In addition, the Gondar town water and energy office can mobilize resources to take advantage of FS wastes to generate biogas for households and institutions. In this regard, the related office can collaborate with the institutions such as Gondar University in Gondar town to convert waste into biogas. Motion Consultancy and Training is ready to advice on the design and development of household and institutional biogas development projects.

Enhancement measures: Creating a demonstration field and training farmers on how to use the compost on their farm plots and how to produce biogas would enhance the benefit. Producing marketable compost will enhance the benefit and generate income (establishing small enterprises that prepare marketable compost). This needs to work closely with the regional bureau of agriculture to ensure the quality of compost prepared.

8.3.6. Supplementary Measures

The following proposed measures would scale up the expected benefits obtained due to the implementation of the project activities. These include:

- Capacity Building: The other broad area of intervention required to enhance the identified positive impacts is conducting capacity-building programs within GWSSS, municipality, and other relevant stakeholders, including environmental protection, health and agriculture. Implementing training and capacity-building programs would serve the project's sustainability.
- Strengthening the legal framework: Another recommended enhancement measure is to work on and strengthen the legal aspect. Laws relevant to solid and liquid waste management (including the disposal methods) should be reinforced, and their application must be monitored to minimize the ongoing gap. This approach can be supported through continuous awareness raising and local capacity building on handling, processing, and reusing the generated wastes.

- Awareness rising on construction, proper utilization, and maintenance of sanitation and hygiene facilities: Integrating hygiene promotion and awareness creation activities will enhance the positive impacts or results of the proposed project. In this regard, a national one
- Give priority to job opportunities for the local people in general and the women and disabled community groups in particular.

Table 23: ESMP for Enhancing Beneficial Impacts

Socio-Environmental Component	Proposed Enhancement measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		Implementation	Supervision		
Job opportunities	- Benefits from job opportunity can be enhanced by providing priority for the project affected people and for women. By providing on-the-job training and capacity building, it is possible to enhance job opportunities for the project-affected people. - Recruit local labor in consultation with the project administration office	Construction Contractor	GWSSS/ Supervisory Consultant /SC/	construction phase	Not required
	- Provide on-the-job training to build the capacity of workers.	GWSSS/FSTPs Management	Labor office	Operation phase	100,000
Improvements on public health	- Creating awareness among the users on clean and polluted water and its advantages &disadvantages. - Advising residents to organize an environmental health committee and monitor their environmental sanitation status. Responsible governmental offices should provide health centers in areas with no health facilities. - Promote proper solid waste collection, treatment, and disposal systems to supplement the benefit obtained from treatment.	Gondar Health Office	Community Health Promotion Office	Operation phase	Cost for health centers /is part of the government budget.
Production of compost/fertilizers from the Sludge	- Creating a demonstration field and training farmers on how to use the compost on their farm plots would enhance the benefit. - Producing marketable compost will enhance the benefit and generate income for GWSSS.	GWSSS/FSTPs Management in cooperation with Agriculture Offices	ANRS EPA, Agriculture, and Natural Resource Department		Part of the FSTPs operation budget and for field demonstration and training 400,000.00

8.4. Negative Impacts and Recommended Mitigation Measures

An impact evaluation matrix has been used for the identification and assessment of potential negative impacts of the proposed project activities in terms of spatial extent, duration, level of significance, probability of occurrence, and reversibility of the issue for the stages of construction, operation, and decommissioning.

The assessment is made against each issue or medium of impact on physical elements that include water bodies (surface and ground), soils, ambient air and flora, as well as the human or socio-economic elements that include the socio-economy, health, and safety, noise and vibration, traffic accidents referring to the impacts on the overall wellbeing. These impact areas that are of concern for implementing the project and its proposed mitigation measures are presented below:

8.4.1. Construction phase

Loss of land and Land use change: The FSTP is planned to be implemented in the existing fecal sludge dumping site owned by the town administration; hence, there will not be an impact on livelihood due to loss of land and will not have an impact on land used.

Soil Erosion and pollution: Potential impacts on soils during the project construction phase include soil compaction, soil erosion, and soil contamination by hazardous substances. Among the activities that would affect the soil resources include site demolition of existing Fecal sludge treatment structures, disposal of sludge from the existing bonds, clearing, stripping of topsoil, excavation in soil, loading of spoils, and hauling to the same disposal sites. These undertakings can potentially cause soil pollution, compaction and damage soil structure and expose the soil to runoff water erosion.

In addition, there will be a risk of soil contamination from leakages of hazardous substances such as fuel and oils from equipment and vehicles.

Mitigation measures

- Limit land clearing and excavation works only to what is necessary and carry out the works in the dry season only to reduce soil exposure to runoff water erosion.
- Remove all the contaminated soil and waste from the existing bonds and sludge drying beds and dispose of it at designated waste disposal sites or sanitary landfills; Careful removal and proper stockpiling of the demolished structures, topsoil removed from the sites and re-using it for site restoration when construction works are finished.
- Reduce the time-exposed surfaces or excavated soils remaining bare following completion of works and implement restoration measures such as re-vegetating exposed areas as quickly as possible.
- Prevent environmental pollution by hazardous substances such as fuel, oil, cement sludge, and detergents through proper storage and handling.
- Install drip pans and fuel funnels at dispensing points of fuels and lubricants.
- Oil exchange should take place only in the pre-prepared workshop area. Washing of vehicles and machinery should only be conducted in the workshop area and never done in rivers and open soils.
- Use only existing roads to the extent possible, and do not drive through farmlands or unpaved soil.
- Park all the vehicles and machineries at only designated parking areas.
- Construction sequencing, locating stockpiles away from watercourses, and disposing of grit, screenings, and sludge from existing lagoons in a landfill.

Risk of flooding and landslide: During construction phase, occurrence of damages from flooding and landslides is anticipated to be less adverse, unlikely, reversible, of moderate significance, and short-term. However, precautionary action needs to be taken before construction starts, including the site preparation works to avoid any risks of flooding and landslides.

Mitigation measures:

The following activities shall be considered to avoid and protect the surrounding environment and social amenities from risks of flooding, erosion, and landslides.

- Providing appropriate waterways or not blocking the natural waterways.
- Removing/clearing any materials from the natural waterways, including soils and other construction materials.
- Providing awareness to the construction site manager and the employee on flood/erosion and landslide management as appropriate.

Pollution of Water Bodies: Pollution of water bodies could be anticipated during the construction phase due to inadequate handling and spillage of pollutants (like fuel, oils, and paints) and improper disposal of Sludge waste from the existing structures. The release of solid and liquid wastes from construction camps has also the potential to affect the surface and groundwater quality

Mitigation Measures

- Perform excavation works and earth-moving activities during the dry season only
- Minimize land clearance and earthworks to the imperative area necessary for the project works.
- Minimize soil erosion by refilling the trenches and other excavated/exposed places soon, and establishing protective cover such as appropriate grasses and other vegetation
- Locating storage areas and compounds away from watercourses.
- Providing suitable facilities for workers,
- Properly collect and dispose used oil and other chemicals
- Install drip pans and fuel funnels at dispensing points of fuels and lubricants.
- Oil exchange should take place only in the pre-prepared workshop area.
- Washing of vehicles and machinery should only be conducted in the workshop area and never done in rivers and open soils

Noise Impact: Similar to air pollution, noise pollution is one of the adverse impacts of construction activities involving vehicles and heavy equipment operation. In particular, high noise levels above WHO and Ethiopian noise standards can cause health impact on recipients. The Ethiopian noise standard for daytime in residential area is 55 dB, and for night time it is 45 dB. Long-term exposure to noise above this standard in residential areas is expected to cause health impact.

Activities expected to generate significant noise and/or vibration include

- Operation of the traffic that will deliver construction materials to and from the laydown areas to the site.
- Excavation works to construct the proposed wastewater treatment plants.
- The activities involved in the production of concrete pipes, and

Considering the nature and extent of construction works and types of machinery involved, the noise impact of the project is rated as moderate, localized, short-term, and reversible.

Mitigation Measures

- **Carry out** noisy construction activities near sensitive areas during normal working hours;
- Provide ear protection equipment (earplugs) for workers in the vicinity of noise emissions;

- Use types of machinery that will not produce heavy vibration.

Impacts on Ambient Air Quality: The emission sources in the construction phase are:

- Site clearance;
- Excavation and earth moving activities;
- Dust emissions from handling and transportation of excavated materials, construction inputs, and auxiliary materials;
- Vehicular traffic movements on unpaved roads and earth moving activities, and
- Gaseous emissions from vehicles and construction equipment.

The impact on air quality is rated as moderate, localized, short-term, and reversible without applying any mitigation measures.

Mitigation measures

- Regular water spraying on unpaved access roads, exposed earth, and any stockpiles on site.
- Minimize excavation and earth moving to only what is required for the specific nature and type of construction.
- Limit stockpiling of excavated topsoil to a maximum of 2m height.
- As much as possible, use paved roads
- Limit the speed of vehicles to 30km/hour on unpaved access roads, especially near sensitive areas (residential and business areas, social services, religious places).

Impacts on Fauna and Flora: The construction of the proposed project is not expected to cause significant adverse impacts on fauna and flora. Only a few scattered bushes would be affected by the project development.

The excavated trenches, stockpiles, and other construction activities may prohibit the free movement of wild animal and wild animals may be killed by workers. However, this impact is short-term moderate.

In general, the impact on flora and fauna during the construction phase is considered as moderate, localized, and temporary.

Mitigation measures

- Planting of appropriate trees (10 seedlings per removal of a single tree), which are friendly to the environment, including watering and protection of seedlings until it reaches to 1.5 meters height.
- The selection of appropriate tree species and locations of planting shall only be done in consultation with the concerned environmental protection/ natural resource management Offices.
- Collect and dump excess spoils as quickly as possible.
- Demarcation and fencing off the construction areas.
- Prohibit poaching and killing of wildlife by the workers.
- Backfilling of trenches and other excavated areas and grading to the natural topography

Traffic Accident Risks: During construction, there will be increased traffic volume on the roads along the construction of FSTP site; this may result in increased traffic accident risks to local community and the workers. In general, the factors that could contribute to traffic accidents include

- Low awareness of many drivers about traffic safety and traffic regulations and signs, as well as lack of discipline.
- Lack of awareness of pedestrians about traffic safety and regulations and signs.
- Presence of roadside poles, trees, ditches, and barriers that impair the visibility of the road.
- Absence of adequate zebra crossings, lack of parking areas, and bus stop arrangements.
- Use of alcohol and substances such as chat/khat.

Traffic accident risks during construction are anticipated to be moderate, short-term, and direct adverse impacts.

Mitigation measures

- Develop and strictly implement and follow up a well-designed work program and traffic management plan (TMP) that would consider local conditions like normal traffic and socio-economic conditions.
- Provide necessary information such as speed limits, hazard locations, sensitive sites (e.g., schools, religious areas, health centers, etc.) by putting appropriate signs and hazard markings.
- Assign traffic regulators or police to control traffic flows at critical sections or periods where/when traffic safety is a significant issue.
- Provide awareness training for operators of equipment and construction vehicles in traffic safety measures.
- Establish speed limits and controls for construction vehicles and create discipline awareness for drivers.
- Provide awareness education for the nearby residents in traffic safety measures at public meetings, social gatherings, schools, mosques churches, etc.
- Ban use of substances and alcohol while at work.

Occupational Health and Safety Impact: construction works, by their nature, are hazardous jobs, and hence, they require adopting appropriate occupational health and safety measures. Safety risks could be related to the storage and use of hazardous chemicals and explosives. The impact on the health and safety of project workers, local people, and users of the existing roads or paths affected during the construction of FSTP is anticipated to be a moderate to high, short-term to long term and direct adverse impact.

Mitigation measures

- The contractor (s) to take maximum care and minimize accident risks by applying internationally accepted standards and recognized occupational health and safety guidelines;
- The contractor takes appropriate care in storing and using hazardous chemicals and provides training to workers in handling hazardous chemicals;
- Conduct daily health and safety toolbox meeting to create awareness of employees on various safety issues.
- Prepare and distribute an Emergency Response Plan (ERP) to site workers.
- Provide first aid training to workers.
- Provide first aid kits at workshops, construction worksites, and inside vehicles;
- Provide workers with appropriate PPE such as hand gloves, eye goggles, safety shoes, reflective vests, helmets, etc., based on their work condition as much as possible and strictly inspect proper use throughout the construction phase;
- Hung-up fire extinguisher bearing detailed information about its status at appropriate places;
- Appropriate signs must be erected on the site to warn workers and visitors.
- All personnel, vehicles, and machinery should be covered under an appropriate Insurance System;
- Carefully record and keep all incidences of injuries and accidents including date, time, and place of occurrence, level of injuries, resources damage, people injured/dead, major causes for the accident, measure taken, etc.;
- Introduce a traffic management plan with speed and traffic regulation through the neighboring areas by using appropriate traffic signs.

Exposure to HIV/AIDS and Other Sexually Transmitted Diseases (STDs)

Construction project workers are considered to have a high potential for the spread of HIV/AIDS and other sexually transmitted infections partly because construction workers are mostly young, sexually active groups of the population, mobile and partly because they are forced to live in hotel rooms or in construction camps.

Hence, this makes the project area highly vulnerable and easily exposed to the spread of STIs and HIV/AIDS transmitting diseases. The nature of the impact is medium and short term in impact.

Mitigation Measures

- Launch awareness and education campaigns about HIV/AIDS and STIs among the construction workers and community to make them informed.
- Condoms shall be provided at a subsidized rate or for free to construction workers and health facilities must be supported with a supply of condoms.
- Town administrations and health offices, HIV/AIDS Prevention and Control Office, Elders, and NGOs operating in the area need to work jointly to create a positive impact and bring major attitudinal and behavioral changes.

Gender and Gender-Based Violence/SH Risks: female construction workers could face difficulties in their workplaces, such as GBV and sexual harassment. Hence, there is a potential that gender abuse might occur during the construction of the proposed fecal sludge treatment plant through unequal distribution of work, sexual harassment, discrimination against women, and unequal pay for women, among others. This impact is rated medium and short term

Mitigation measures

- Provide awareness on the GBV/SH to the staff/workers;
- The Contractor is required to design gender core labor standards and employment and contract procedures, and also design gender-responsive workers manuals.
- Prepare and implement code of conduct among others strictly forbid sexual harassment /GBV and to be signed by all workers including international workers if involved and subcontract workers;
- Provide and avail a separate sanitation facility for women at construction camp;
- Provide women-friendly safety equipment and materials;
- Assign women in works that do not affect their biological condition;
- Assign gender specialist at the construction site to aware and prevent GBV and sexual harassment
- Ensure equal pay for women and men for equal jobs;

Impact on Cultural, Religious, and Archaeological Sites: According to site observations, the proposed project sites are not located in any historical or cultural and archaeological sites and are unlikely to be affected. However, the Project Contractor must take appropriate measures not to affect any chance of finding cultural or archaeological assets during the project construction and immediately report to the relevant Culture and Tourism Office.

Mitigation measures:

If archaeological, cultural, and religious resources are discovered during excavation of the proposed project, the Contractor shall stop the construction at that specific location and report to the relevant Culture and Tourism Office. After the Culture and Tourism Bureau takes necessary measures, construction work could be resumed.

8.4.2. Operation Phase

Displacement /relocation of houses

The houses between 250 to 300m radiuses from the fecal treatment units will be affected by unpleasant odors due to the operation of the FSTP. Hence, there will be displacement of houses to establish a buffer zone to minimize this impact.

Mitigation measure

Undertake ARAP and provide appropriate compensation as per the law of the land.

Odor (Foul smell): The frequent dumping of truckloads of fecal sludge may cause a bad smell in and around the FSTP. There could also be limited odor emission from the treatment plants, particularly in those associated with anaerobic processes. There are settlements situated between a 250 to 300m radius around the treatment plant, and an Orthodox Christian Church is located approximately 290m from the core activities of the FSTP. It is anticipated that these areas may be affected by an unpleasant odor emanating from the treatment plant. The impact is moderate and long term.

Mitigation measures

- Regular facility maintenance and monitoring operational practices including avoidance of pools of dirty stagnant waters, spills, process control and chemical treatment, continuous process of the operation
- Covering swampy parts of the settlement and drying beds with a layer of earth or sand.
- Aerate, adjust chemical dosing and oxidation or pH to reduce odor from plant influents.
- Cover tanks or installation of exhaust hoods.
- Operate equipment at optimum/design conditions.
- Operate especially the secondary treatment processes at optimum condition.
- Plant layers of shrubs and trees along the periphery and provide adequate stack height to exhaust emissions.
- Provide adequate buffer zone, particularly along the major windward at least 300m from the Core activity areas of the FSTP. This will result in relocation of residential houses.

Establishment of a buffer Zone

Currently, there is no scientific basis or nationally or internationally developed standard available for making provisions for buffer zones around waste treatment plants. However, different countries have adopted different buffer zones based on their context such as land availability, type of settlement and urbanization of the area around the waste treatment plant. Many countries set buffer zones with distance criteria from a minimum of 100 meters to a maximum of 500 meters especially for landfill as well as waste processing facilities[2].

Hence, in context of Gondar, considering the existing vegetation cover of the proposed site and a green belt that can absorb odor, the nature of the settlement around the FSTP which is insignificant, and the limited availability of land in the city, a buffer zone at least 200m from the core activity areas (sludge receiving and treatment units) of the FSTP is recommend by the ESIA consultant. However, based on the suggestion from the WB Experts a buffer zone of300m from the core activities of the FSTP is recommended.

[2] Strategic assessment of solid waste management services and systems in Nepal; City-level Assessment and Draft Service Improvement Plan for Solid Waste Management For Pokhara Metropolitan City June 2020, page 83

Impact on ambient air quality: multiple contaminants gases (CH_4, CO_2, and H_2S) will be generated from fecal sludge treatment plants and there will be a release of these gases into the atmosphere, and impact on the environment through generation of bad odors. The impact is adverse, possible, reversible, of moderate significance, and long-term.

Mitigation Measures:

- Regular monitoring of the ambient air including measuring H_2S presence in air,
- Control an aerobic digester parameter (pH, Temperature, oxygen level etc.) for H_2S producing bacteria/microorganism (creating unfavorable environment),
- Changing redox potential, this helps in reducing or oxidizing capacity of anaerobic digestion system.

Impact on water and soil bodies: Neither the sludge nor the drained water will be allowed to leave the FSTPs without proper treatment. For these reasons, the impact of treatment plants is rated as very high positive for downstream areas and would minimize the existing uncontrolled discharge of wastewater into the water bodies. However, the contamination risk will be high if there is leakage or overflow. The heavy metals in the treated wastewater may have potential human and environmental health impacts. The proposed FSTP will be able to retain a significant amount of such contaminants. Still, they can just transfer from the liquid phase into the solid phase (sludge) in case of primary and secondary treatment. It is anticipated that most of the high molecular and non-polar petrochemicals can be efficiently retained in the proposed FSTP. However, as some of them are persistent in both aerobic and anaerobic biodegradation treatment processes, they can easily be accumulated in the sludge. This will prohibit the potential use of a large amount of sludge as a fertilizer. The impacts associated with heavy metals in sludge are adverse, irreversible, of high significance, and long term.

Mitigation Measures

- Close monitoring of the facilities to ensure their functions are as plane and no leaked is observed this involves monitoring ground and surface waters in the surroundings of the FSTP.
- Ensuring that the facilities' effluent complies with the national effluent standards.
- Dispose of the sludge with dangerous substances in a designated landfill.
- Prohibit the use of untreated dry sludge for fertilizer

Impact on downstream and reverie flora: During the operation phase, aquatic plants, reverie trees, and shrubs will get better water for their growth free from toxic substances. However, if the treatment plant releases untreated effluent for some unforeseen reasons, any untreated or practically treated waste effluent into downstream rivers, it would adversely affect the reverie and aquatic plants. This impact is less probable and rated to be low significance.

Mitigation measures

- Monitor the proper functioning of the treatment plants
- Regularly check the effluent's quality for their compliance with acceptable effluent discharge standards;
- Whenever the quality of effluent fails to meet the standard, stop discharging the effluent into receiving streams and rivers;
- Promote integrated watershed management schemes around the FSTP, which enable to reduce any potential spillover of the liquid wastes into the natural environment.

Impacts on Fauna: if improperly treated wastewater is released to rivers, it may affect bird species resting near the rivers through contaminants production and reduce the necessary nutrients available for their growth and development due to eutrophication and hence birds' variety and number will reduce. Bird species and

some domestic animals living in the surrounding of the FSTPs, such as horses, cows, and oxen, may be affected by the discharge of improperly treated wastewater and sludge production from the FSTPs. This problem is improbable, of low significance and of long-term duration in the sense that the risk is always there, but reversible.

Mitigation measure

- Ensure proper quality control of "treated" wastewater and sludge before releasing.
- Control any accidental spill of untreated or partially treated wastewater into the environment.
- Install a regular monitoring system on the quality of water discharged.

Health impact and risks

- Partially dried sludge adversely impacts human health and the environment. Partially dewatered or dried sludge is rich in pathogenic organisms such as bacteria, viruses, eggs, and cysts of nematodes, cystoids, 'jardia', and amoeba. Hence, negligently handled sludge cake could impose adverse health impacts on nearby residents and workers involved in the day-to-day operation of the system.
- Using untreated fecal sludge in agriculture as fertilizer may infect farmers in contact with this inadequately treated dried sludge.
- Bacteria and worm eggs may also attach to the plants and infect consumers if the crops are eaten raw and are not thoroughly washed.
- Inadequately treated sludge can also affect the quality of grazing lands as well as the health of cattle grazing around.
- Chemical contamination is another potential health risk associated with fecal sludge. Contamination of soil and water can be easily possible by chemical constituents embodied in the fecal sludge, particularly heavy metals
- Further non-pathogen risks result from impurities of non-biodegradable origin such as Glass splinters or other sharp objects contained in the sludge
- Health risks due to the attraction and proliferation of rodents and other disease-carrying vectors are also common features of improperly managed sludge treatment and dumping sites. Due to the smell, several rodents, flies, some birds (vultures), monkeys, hyena, and dogs attracted to the area, increase the routes of contamination and disease transmission.

Mitigation measures

- Provide awareness training to the facility operators on the handling and managing the system and potential dangers. Equip the operators with the necessary precautionary measures (including a reporting system) for any pathogenic incidents during the operation of FSTP.
- Use of protective clothes such as gloves and masks and good hygiene (washing hands after work, etc.).
- The department of GWSSS dealing with sludge should introduce rules for use of protection by their staff, and care should be taken to enforce those rules.
- Create appropriate awareness of preparation and utilization of composts from such sources.
- Fecal sludge should always be treated prior to its use in agriculture.
- Storage of sludge over a period long enough to allow natural pathogens to die off (minimum 6 months) is the other possibility to disinfect sludge without using expensive technologies.
- Avoid the Use of untreated sludge for growing food crops: Particularly, abstain from irrigating edible vegetables & crops with untreated sludge water or percolated water from the drying bed.

- Avoid the Use of untreated sludge for growing cattle feed: Cattle grazing on pasture irrigated or contaminated fields with raw sludge could be heavily infected with the larval stage of the tapeworm Taeniasaginata (Cysticercusbovis).
- Hygienic Education and Treatment: Good personal hygiene breaks the direct contact routes by which pathogens are transmitted, and the full impact of the measures described above will only be achieved if they are accompanied by efforts to improve hygiene.
- Create awareness among these people who are potentially exposed to the direct and indirect health impacts of the sludge.
- Fence the area to prevent the entrance of dogs and other nocturnal animals. and
- Keep the area neat and attractive so that flies and rodents could not be attracted.

Public health impacts /Mosquito breeding and disease transmission

As indicated socio economic baseline malaria is one of the major diseases in Gondar city. If the project is not properly managed the waste treatment pond may be favorable environment for Mosquito breeding and disease transmission which may aggravate the already infested area. However, with proper mitigation measure the impact is localized, and moderate but long term.

Mitigation measure

- Put in place various control measures to ensure that environmentally sound measures are taken to ensure that the plant produces no adverse effect on transmission rates of mosquito- transmitted diseases such as malaria.
- The ponds to be properly maintained to ensure that the ponds do not become mosquitoes breeding site

Occupational Health and Safety: Workers may be affected from handling of partially treated dry sludge as indicated in the previous section and the gas emission from the treatment plant. Hydrogen sulfide is toxic gas with a characteristic rotten egg odor can poison several different systems in the body. Breathing very high levels of hydrogen sulfide can cause death within just a few breaths. Exposure to lower concentrations can result in eye irritation, a sore throat and cough, shortness of breath, and fluid in the lungs. Long-term, low-level exposure may result in fatigue, loss of appetite, headaches, irritability, poor memory, and dizziness.

The OSHA permissible exposure limits for hydrogen sulfide are 10 ppm (time-weighted average) and 15 ppm (short-term exposure limit). Other potential health and safety impacts include accidents and plant malfunctions. The probability and impact of the following events were categorized; Spills, Process Upset, Natural Hazards, Power Failures, Fires, Injury/Death. The impact is adverse, possible, reversible, of moderate significance, and long-term.

Mitigation measures

- Appropriate warning signs shall be placed in areas where accidents are expected to occur.
- Provision and use of protective wear.
- Strict prohibition of the operation of equipment by unauthorized personnel.
- Operators shall be provided with regular medical check-ups and safety training at least on every six months
- Regular checking of the adequacy of the facility, particularly when beds are (nearly) full and during the rainy season.
- Timely heightening of the bund surrounding the facility and / or increasing the bed capacity.

Gender and Gender Based Violence (GBV)/Sexual Exploitation Abuse (SEA) Risks: During the Operation phase, there might be risk of Gender Based Violence (GBV)/ Sexual exploitation Abuse (SEA) at different infrastructure projects sites due to lack of knowledge. Hence, there is a potential that gender inequality might occur during the operation of the FSTP through the unequal distribution of work, sexual harassment, discrimination against women, and unequal pay for women, among others.

Mitigation measures

- Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all employees.
- Provide and avail a separate sanitation facility for women and men at the treatment plants.
- Provide women-friendly safety equipment and materials.
- Assign women to works that do not affect their biological condition.
- Ensure equal pay for women and men for equal jobs.

Impact on Aesthetic value: During the operation, the FSTP will impact Aesthetic values /visuals from the waste stabilization ponds.

Mitigation measures:

- New housing developments should be limited in the safety area zone around the FSTP.
- Planting of High trees in the safety zone and around the fence.
- Keep the buffer zone and open areas within the treatment plant neat all the time.

8.4.3. Decommissioning phase

At the end of the design life of the FSTPs, GWSSS could upgrade or decommission the treatment plants. Most probably, upgrading the system will be expected. If decided to decommission treatment plants, impacts associated with the disposal of contaminated soils from the treatment plant sites and solid waste generated from the demolishing of treatment plant structures would be expected. At the end of their design lifetime, if the waste treatment plant is decommissioned, the following impacts are predicted to occur:

Air pollution: During the decommissioning, structures installed to aid the treatment plants will be dismantled and demolished, which will cause release of dust and other pollutants embedded in the demolished structures. This impact is temporary, local and of low significance.

Mitigation measures

- Systematically demolish structures considering reuse of materials for other use.
- Wet the materials before demolishing to suppress release of dust.
- Avoid burning any material.

Impacts on Soil and Water Bodies: During the decommissioning phase, there will be large amount of spoil from demolishing of structures and scraped contaminated soil that would pollute the soil and water resources including ground water. The effect is of medium significance. However, decommissioning of the sites without availing a better substitute for the treatment of ever-increasing waste water would adversely affect the soil and water resources of the area and it's downstream.

Mitigation measures

- Properly collect all the debris generated while demolishing the structures and transport to the designated disposal site
- Remove all the contaminated soil from the treatment plant site and dispose of it at a designated waste disposal site or at sanitary landfill.
- Level the ground in such a way that it will be used for other purposes.
- Reclaim polluted soil with appropriate technologies such as phytoremediation.

- Avail advanced FSTP that technology of the time offers before decommissioning the one at hand.
- Properly reinstate the abandoned fecal sludge treatment plant site.
- After reinstatement, GWSSS could use the area for other purposes.
- Plant trees to increase the aesthetic value of the area or handover to the nearby community in consultation with their respective city /Kebele administrations so that they can develop what they think important for the community.

Health Impact: the health impacts associated with dismantling of concrete structures and reinstatement of the area could, health impact from the removal process of contaminated sludge and soil could adversely affect the workers involved in demolishing works.

Mitigation measures

- Create appropriate awareness before starting the operation to the local community and local administration including (agriculture, water and energy and health offices).
- Plan the decommissioning work ahead of time to avoid sudden stop of the treatment plant before completely treating the influent reached to the treatment plant.
- Provide appropriate PPE for the workers to be involved in decommissioning works.

Loss of Job Opportunity: During decommissioning of the treatment plants, previous jobs which were enjoyed by skilled and unskilled workers during the operation phase will not be continued. This loss of jobs would adversely affect workers and their families who were dependent on it for their livelihood.

Mitigation measures

- Give job priority in other related projects.
- Secure pension benefit if the age of the job loser is in the set range of pension.
- Organize, train and promote to establish their own small-scale enterprises through the facilitation of loan or financial support. Create links with appropriate government agencies and financial sources.

Gender and Gender Based Violence/SH Risks: Gender and gender-based violation and sexual harassment are expected to be low to moderate during the decommissioning phase of the project. This is because the number of workers expected to be involved in the decommissioning phase activities will be few.

Mitigation measures

- Provide and avail a separate sanitation facility for women and men.
- Provide women friendly occupational health and safety equipment and materials.
- Assign women in works that do not affect their biological condition.
- Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all employees.
- Ensure equal pay for women and men for equal jobs.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP for the proposed project consists of a set of mitigation and institutional measures to be taken during the implementation and operation phases to eliminate the adverse environmental and social impacts identified and predicted in the previous sections, offset them, or reduce them to acceptable levels. The plan will also include the actions needed to implement these measures. The ESMP identifies and describes in detail feasible and cost-effective measures that will reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient. The mitigation plan covers all aspects of implementation of the project in its various phases related to environment and social health.

This ESMP provides a schedule for the implementation of recommended mitigation activities. Table 24 presents identified impact mitigation measures proposed in the ESIA, for the implementation arrangements, including responsibilities for implementation, the time frame, and the budgetary implications.

The objective of this ESMP is to ensure the integration of environmental and social requirements and proposed mitigation and monitoring measures into the construction contractor's obligations. The ESMP shall be fully integrated into the construction activities, hereby addressing the responsibilities of the construction contractor (the contractor), the Engineer, and the Employer. Furthermore, an ESMP has been developed for impacts resulting from the operational phase, which shall be fully integrated in operational activities. Responding adequately to the nature of the envisaged FSTP construction, the ESMP is referring to the following issues:

- Environmental and Social Mitigation Measures during Construction and operation
- Environmental and Social Quality Monitoring during Construction and operation
- Obligations, roles, and responsibilities amongst concerned parties.

Due to the long-term life of the intervention facilities and related components, a decommissioning assessment will be undertaken at least 1 year before the process for any of the components commences, following a notice to decommission. The decommissioning process will be guided by a comprehensive decommissioning plan developed through the decommissioning audit process. However, the following features will need to be decommissioned upon completion of the works.

1. The contractor's camp and installations that will need to be removed without compromising on the safety and general welfare of the immediate residents. Special care is to be given to associated wastes and dust emitted in the process.
2. Materials stores that will comprise fresh materials and used items. Each category will be moved safely out of the site ensuring minimal or no impacts to the related environment and social setting.
3. Wastes and debris holding sites will be cleared with maximum re-use of the debris either on surfacing the passageways or other grounds such as schools and church compounds.
4. Under normal circumstances, the project will be maintained and sometimes rehabilitated. During rehabilitation, a new ESIA can be instituted or an environmental management plan can be prepared depending on the degree of rehabilitation.

The following table shows environmental and social management plans for proposed works for FSTP

Table 24: Environmental and Social Management Plan for Proposed Project

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
CONSTRUCTION PHASE						
1.	Impacts on soils (soil erosion, compaction & contamination)	– Limit land clearing and excavation works only to what is necessary and carry out the works in the dry season only to reduce soil exposure to runoff water erosion. – Remove all the contaminated soil and waste from the existing bonds and sludge drying beds and dispose of it at designated waste disposal sites or sanitary landfills; Careful removal and proper stockpiling of the demolished structures, topsoil removed from the sites and re-using it for site restoration when construction works are finished. – Reduce the time-exposed surfaces or excavated soils remaining bare following completion of works and implement restoration measures such as re-vegetating exposed areas as quickly as possible. – Prevent environmental pollution by hazardous substances such as fuel, oil, cement sludge, and detergents through proper storage and handling. – Install drip pans and fuel funnels at dispensing points of fuels and lubricants. – Oil exchange should take place only in the pre-prepared workshop area. – Washing of vehicles and machinery should only be conducted in the workshop area and never done in rivers and open soils. – Use only existing roads to the extent possible, and do not drive through farmlands or unpaved soil. – Park all the vehicles and machineries at only designated parking areas. – Construction sequencing, locating stockpiles away from watercourses, and disposing of grit, screenings, and sludge from existing lagoons in a landfill.	Construction Contractor	- GWSSS - Supervisory Consultant (SC), - regional & Gondar land administration Office and agriculture Office	Throughout Construction phase	Part of the construction and supervision cost to be covered by the contractor and consultant
2	**Risk of flooding and landslide**	– Providing appropriate waterways or not blocking the natural waterways. – Removing/clearing any materials from the natural waterways, including soils and other construction materials. – Providing awareness to the construction site manager and the employee on flood/erosion and landslide management as appropriate.				

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		– Provision of well-designed and constructed culverts and side ditches for the access roads to minimize potential erosion				
3	**Impact on water bodies**	– Perform excavation works and earth-moving activities during the dry season only – Minimize land clearance and earthworks to the imperative area necessary for the project works. – Minimize soil erosion by refilling the trenches and other excavated/exposed places soon, and establishing protective cover such as appropriate grasses and other vegetation – Locating storage areas and compounds away from watercourses. – Providing suitable facilities for workers, – Properly collect and dispose used oil and other chemicals – Install drip pans and fuel funnels at dispensing points of fuels and lubricants. – Oil exchange should take place only in the pre-prepared workshop area. – Washing of vehicles and machinery should only be conducted in the workshop area and never done in rivers and open soils – Providing suitable facilities for workers	Construction Contractor	- Supervisory Consultant - Water and energy bureau, - EPA Gondar	Throughout construction phase	Part of Contractor's Contract
4	**Noise Impact**	– **Carry out** noisy construction activities near sensitive areas during normal working hours; – Provide ear protection equipment (earplugs) for workers in the vicinity of noise emissions; – Use types of machinery that will not produce heavy vibration.	Construction Contractor	– Supervisory Consultant (SC), – Environmental protection agency (Gondar, ARS)		
5	**Impacts on Ambient Air Quality**	– Regular water spraying on unpaved access roads, exposed earth, and any stockpiles on site. – Minimize excavation and earth moving to only what is required for the specific nature and type of construction. – Limit stockpiling of excavated topsoil to a maximum of 2m height. – As much as possible, use paved roads	Construction Contractor	Supervisory Consultant (SC), Environmental protection agency	Throughout Construction phase	Included in the contract for the Contractor & SC

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		– Limit the speed of vehicles to 30km/hour on unpaved access roads, especially near sensitive areas (residential and business areas, social services, religious places		(Gondar, ARS)		
6	**Impact on flora and fauna**	– Planting of appropriate trees (10 seedlings per removal of a single tree), which are friendly to the environment, including watering and protection of seedlings until it reaches to 1.5 meters height. – The selection of appropriate tree species and locations of planting shall only be done in consultation with the concerned environmental protection/ natural resource management Offices	Construction Contractor	– Supervisory – Consultant – wildlife authority/ agency	During construction	-Part of the construction and supervision cost to be covered by the contractor and consultant and Birr **300,000.00** replanting
7	**Occupational Health and** safety	– The contractor (s) to take maximum care and minimize accident risks by applying internationally accepted standards and recognized occupational health and safety guidelines; – The contractor takes appropriate care in storing and using hazardous chemicals and provides training to workers in handling hazardous chemicals; – Conduct daily health and safety toolbox meeting to create awareness of employees on various safety issues. – Prepare and distribute an Emergency Response Plan (ERP) to site workers. – Provide first aid training to workers. – Provide first aid kits at workshops, construction worksites, and inside vehicles; – Provide workers with appropriate PPE such as hand gloves, eye goggles, safety shoes, reflective vests, helmets, etc., based on their work condition as much as possible and strictly inspect proper use throughout the construction phase; – Hung-up fire extinguisher bearing detailed information about its status at appropriate places; – Appropriate signs must be erected on the site to warn workers and	Construction Contractor	– Supervisory – Consultant – GWSSS – Health office	During construction	Part of the construction & supervision cost to be covered by the contractor and consultant

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		visitors. – All personnel, vehicles, and machinery should be covered under an appropriate Insurance System; – Carefully record and keep all incidences of injuries and accidents including date, time, and place of occurrence, level of injuries, resources damage, people injured/dead, major causes for the accident, measure taken, etc.; – Introduce a traffic management plan with speed and traffic regulation through the neighboring areas by using appropriate traffic signs.				
9	Health impact (HIV/AIDS/ STDs)	– Launch awareness and education campaigns about HIV/AIDS and STIs among the construction workers and community to make them informed. – Condoms shall be provided at a subsidized rate or for free to construction workers and health facilities must be supported with a supply of condoms. – Town administrations and health offices, HIV/AIDS Prevention and Control Office, Elders, and NGOs operating in the area need to work jointly to create a positive impact and bring major attitudinal and behavioral changes.	Contractor & GWSSS	Supervisory Consultant & Health office	Before start & during construction	Part of the construction and supervision cost to be covered by the contractor and consultant 60,000.00 for awareness creation
10	Gender Equity, GBV/SEA, and Sexual Harassment	– Provide awareness on the GBV/SH to the staff/workers; – The Contractor is required to design gender core labor standards and employment and contract procedures, and also design gender-responsive workers manuals. – Prepare and implement code of conduct among others strictly forbid sexual harassment /GBV and to be signed by all workers – Provide and avail a separate sanitation facility for women at construction camp; – Provide women-friendly safety equipment and materials; – Assign women in works that do not affect their biological condition; – Assign gender specialist at the construction site to aware and prevent GBV and sexual harassment – Ensure equal pay for women and men for equal jobs	Contractor	Supervisory Consultant Office of Women, children and Youth Affairs GRC	Before start & during construction	Part of the construction and supervision cost to be covered by the contractor and consultant
11	Traffic Accident	– Develop and strictly implement and follow up a well-designed work program and traffic management plan (TMP) that would consider local	Construction Contractor	Supervisory Consultant,	During constru	Part of the construction

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
	Risks	conditions like normal traffic and socio-economic conditions. – Provide necessary information such as speed limits, hazard locations, sensitive sites (e.g., schools, religious areas, health centers, etc.) by putting appropriate signs and hazard markings. – Assign traffic regulators or police to control traffic flows at critical sections or periods where/when traffic safety is a significant issue. – Provide awareness training for operators of equipment and construction vehicles in traffic safety measures. – Establish speed limits and controls for construction vehicles and create discipline awareness for drivers. – Provide awareness education for the nearby residents in traffic safety measures at public meetings, social gatherings, schools, mosques churches, etc. – Ban use of substances and alcohol while at work.		traffic office of the town	ction	&supervision cost to be covered by the contractor &consultant
12	Impact on archaeological & cultural heritage sites	– No known archaeological sites are expected on-site; however, if encountered, the Contractor/ Supervising Consultant is to inform the local authority for further action. – Apply the chance finds procedure.	Construction Contractor	Supervisory Consultant, culture and tourism bureau	During construction	Part of the construction & supervision cost to be covered by the contractor &consultant
OPERATION PHASE						
1.	Displacement or relocation of houses	– Undertake ARAP with independent consultant and provide appropriate compensation as per the Ethiopian law.	Gondar city Municipality	GWSSS	Before start of Operation	Part of Municipality budget
2.	Ambient air quality (Odor/obnoxious smell from the TP and from open manholes)	– Regular facility maintenance and monitoring operational practices including avoidance of pools of dirty stagnant waters, spills, process control and chemical treatment, continuous process of the operation – Covering swampy parts of the settlement and drying beds with a layer of earth or sand. – Control an aerobic digester parameter (pH, Temperature, oxygen level, etc.) to reduce odor – Cover tanks or installation of exhaust hoods. – Operate equipment at optimum/design conditions. – Operate especially the secondary treatment processes at optimum	Facility manager	GWSSS EPA(Gondar town)	Throughout the operation phase	Part of the FSTP operation budget

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		condition. – Plant layers of shrubs and trees along the periphery and provide adequate stack height to exhaust emissions. – Provide adequate buffer zone, particularly along the major windward.				
3.	Soil pollution	– Dispose of sludge with dangerous substances only in a designated sanitary landfill – Prohibit the use of untreated dry sludge for fertilizer	GWSSS Facility manager	GWSSS Gondar town and agriculture and natural resource offices	Throughout the entire operation phase	Part of the FSTP operation budget
4.	Water Bodies	– Close monitoring of the facilities to ensure their functions are as plane and no leaked is observed this involves monitoring ground and surface waters in the surroundings of the FSTP. – Ensuring that the facilities' effluent complies with the national effluent standards.	GWSSS Facility manager	GWSSS, Gondar town EPA, and water & energy offices	During design, construction and operation of TPs	Part of the FSTP & operation budget
5.	Fauna & Flora	– Monitor the proper functioning of the treatment plants – Regularly check the effluent's quality for their compliance with acceptable effluent discharge standards; – Whenever the quality of effluent fails to meet the standard, stop discharging the effluent into receiving streams and rivers; – Promote integrated watershed management schemes around the FSTP, which enable to reduce any potential spillover of the liquid wastes into the natural environment. – Control any accidental spill of untreated or partially treated wastewater into the environment	FSTP & Quality Control	– GWSSS, – Env. Prot. Office (both city administration and region)	Throughout the operation phase	Part of the FSTP operation budget
6.	Health Impact on people handling and use of untreated fecal sludge in agriculture	– Provide awareness training to the facility operators on the handling and managing the system and potential dangers. Equip the operators with the necessary precautionary measures (including a reporting system) for any pathogenic incidents during the operation of FSTP. – Use of protective clothes such as gloves and masks and good hygiene (washing hands after work, etc.). – The department of GWSSS dealing with sludge should introduce	GWSSS Facility manager	– GWSSS – Health office	Throughout the entire operation phase	Part of the FSTP operation budget

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		rules for use of protection by their staff, and care should be taken to enforce those rules. – Create appropriate awareness of preparation and utilization of composts from such sources. – Fecal sludge should always be treated prior to its use in agriculture. – Storage of sludge over a period long enough to allow natural pathogens to die off (minimum 6 months) is the other possibility to disinfect sludge without using expensive technologies. – Avoid the Use of untreated sludge for growing food crops: Particularly, abstain from irrigating edible vegetables & crops with untreated sludge water or percolated water from the drying bed. – Avoid the Use of untreated sludge for growing cattle feed: Cattle grazing on pasture irrigated or contaminated fields with raw sludge could be heavily infected with the larval stage of the tapeworm Taeniasaginata (Cysticercusbovis). – Hygienic Education and Treatment: Good personal hygiene breaks the direct contact routes by which pathogens are transmitted, and the full impact of the measures described above will only be achieved if they are accompanied by efforts to improve hygiene. – Create awareness among these people who are potentially exposed to the direct and indirect health impacts of the sludge. – Fence the area to prevent the entrance of dogs and other nocturnal animals. and Keep the area neat and attractive so that flies and rodents could not be attracted				
7.	Public health impacts /Mosquito breeding and disease transmission	– Put in place various control measures to ensure that environmentally sound measures are taken to ensure that the plant produces no adverse effect on transmission rates of mosquito- transmitted diseases such as malaria. – The ponds to be properly maintained to ensure that the ponds do not become mosquitoes breeding site	GWSSS	City EPA and Health offices	Throughout the entire operation phase	Part of the FSTP operation budget
8.	Occupational Health and Safety	– Appropriate warning signs shall be placed in areas where accidents are expected to occur. – Provision and use of protective wear.	GWSSS Facility manager	– GWSSS – Health bureau and	Throughout the entire	Part of the FSTP operation

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		– Strict prohibition of the operation of equipment by unauthorized personnel. – Operators shall be provided with regular medical check-ups and safety training at least on every six months – Regular checking of the adequacy of the facility, particularly when beds are (nearly) full and during the rainy season. – Timely heightening of the bund surrounding the facility and / or increasing the bed capacity.		office	operation phase	budget
9.	Gender and Gender Based Violence/SH/SEA Risks	– Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all employees. – Provide and avail a separate sanitation facility for women and men at the treatment plants. – Provide women-friendly safety equipment and materials. – Assign women to works that do not affect their biological condition. – Ensure equal pay for women and men for equal jobs.	GWSSS Facility manager	– GWSSS – Women and children affairs	Throughout the entire operation phase	Part of the FSTP operation budget
10.	Impact on Aesthetic value	– Planting of High trees in the safety zone and around the fence. – Keep the buffer zone and open areas within the treatment plant neat all the time. – New housing developments should be limited in the safety area zone around the FSTP.	GWSSS Facility manager	– GWSSS	Throughout the entire operation phase	Part of the FSTP operation budget Birr 400,000.00 For buffer zone plantation
Decommissioning						
1.	Air pollution	– Systematically demolish structures considering reuse of materials for other uses. – Wet the materials before demolishing them to suppress the release of dust. – Avoid the burning of any material.	GWSSS	– Amhara Regional state EPA	Decommissioning	Part of the Municipality/ GWSSS operation budget
2.	Impacts on Soil and Water Bodies	– Remove all the contaminated soil from the treatment plant site and dispose of it at a designated waste disposal site or a sanitary landfill. – Level the ground so that it will be used for other purposes. – Reclaim polluted soil with appropriate technologies such as phytoremediation. – Avail advanced FSTP that technology of the time offers before decommissioning the one at hand.	GWSSS	– Amhara Regional state EPA and Water and Irrigation Bureaus	Decommissioning	GWSSS operation budget

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
3.	Site Reclamation	– Properly reinstate the site of the abandoned fecal sludge treatment plant – After reinstatement, SLWSSE could use the area for other purposes. or – Develop the areas for recreational parks or plant trees to increase the aesthetic value of the area or hand over to the nearby community in consultation with their respective administrations so that they can develop what they think is important for the community. – Integrate with the micro-watershed management system.	GWSSS	– Amhara Regional state EPA, Health Bureau	Decommissioning	Municipality/ GWSSS operation budget
4.	Impact of Spoil Disposal	– Properly collect all the debris generated while demolishing the structures and transport it to the designated disposal site. – Scrap any contaminated soils from the demolished treatment site, safely collect, and transport them to the designated waste disposal site or sanitary fill site. – Reinstate the treatment plant site, including tree plantation, unless the site is reserved for other construction purposes. Alternatively, integrate it with the micro-watershed management system in collaboration with the Bureau of Agriculture and Natural Resources.	GWSSS	–	Decommissioning	Municipality/ GWSSS operation budget
5.	Soil Compaction and Erosion	– Implement restoration measures such as re-vegetating exposed areas as quickly as possible. – Use only existing roads to the extent possible, and do not drive through farmlands or unpaved soil. – Park all the vehicles and types of machinery at only designated parking areas. – Disposing of grit, screenings, and sludge from existing lagoons in a landfill.	GWSSS	– Amhara Regional state EPA and Agriculture Bureau	Decommissioning	Municipality/ GWSSS operation budget
6.	Loss of Job Opportunity	– Give job priority to project workers in other related projects. – Secure pension benefit if the age of the job looser is in the set range of pension. – Organize, train, and promote to establish their own small-scale enterprises through the facilitation of loan or financial support. Create links with appropriate government agencies and financial sources	GWSSS	– Gondar town Labor and Labor Affair bureau	Decommissioning	Municipality/ GWSSS operation budget
7.	Health Impact	– Create appropriate awareness before operating with the local community and administration, including (agriculture, water & energy, and health offices). – Plan the decommissioning work ahead of time to avoid a sudden stop of the treatment plant before thoroughly treating the influent reached the treatment plant.	GWSSS	– Amhara regional state Health Bureau	Decommissioning	Municipality/ GWSSS operation budget

No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
			Implementation	Supervision		
		– Provide appropriate PPE for the workers to be involved in decommissioning works.				
8.	Gender and Gender-Based Violence/SH Risks	– Provide appropriate awareness training to the staff and local communities. – Provide and avail a separate sanitation facility for women and men. – Provide women-friendly occupational health and safety equipment and materials. – Assign women to works that does not affect their biological condition. – Ensure that women workers do not face GBV and sexual harassment. – Incorporate measures to be taken against those workers who commit GBV and sexual harassment. – Prepare and implement a code of conduct that, among others, strictly forbids sexual harassment /GBV and is to be signed by all employees. – Ensure equal pay for women and men for equal jobs.	GWSSS	– EPA and Gondar town women and social affair	Decommissioning	Municipality/ GWSSS operation budget

10. ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Issues that will be monitored during the development of the FSTP include:

- Waste water quality, occupational health and safety issues, leakage monitoring, energy, and chemical management.
- The development of a Gender Policy for the sector which will be based on gender assessment and intensive consultations with relevant stakeholders.
- Strengthening of the environmental and social safeguards of the GWSSS and other relevant stakeholders.
- Capacity building of the existing environmental and social safeguards of the GWSSS through increased the capacity of the Environmental Health and Safety Safeguards expert, social mobilization initiatives and effective communication.
- Inclusive hygiene promotion.

The environmental and social impact assessment requires the developer to prepare and undertake a monitoring plan and regular auditing. The objectives of environmental monitoring upon executing activities are to:

- Monitor the effective implementation during the construction and operation, decommissioning phases of proposed mitigation measures.
- Confirm compliance with environmental, public health, and safety legislation/regulations during construction.
- Control the risks and ecological/social impacts.
- Ensure best practices management as a commitment for continuous improvement in environmental performance.
- Provide environmental information to community/stakeholders.
- Provide early warning signals on potential environmental degradation for appropriate actions to be taken to prevent or minimize environmental consequences.

Recommendations for monitoring responsibilities and estimated costs have been included in the implementation of the ESMP.

Table 25below provides the monitoring indicators and monitoring activities at various phases. Monitoring plan: As the Executing Agency, GWSSS will bear overall responsibility for monitoring the implementation of the ESMP. In addition, the relevant Gondar city stakeholders shall be engaged as deemed necessary.

However, for day-to-day monitoring, it is expected that the supervising Consultant will hold the Contractor(s) accountable for all ESMP implementation requirements, including implementation of all approval conditions as stated in the approval. It is expected that the regional and Federal EPA (or appropriate regulatory body), as the agency responsible for the environment, will also conduct oversight monitoring on ESMP implementation as appropriate. The WB, on the other hand, will conduct routine bi-annual supervision missions to ensure all activities, including ESMP implementation, are on track. The individual ESIAs and ESMPs have identified areas for monitoring by the enterprise, the contractor(s), the Supervising Consultant(s), and other relevant stakeholders. Key aspects of the monitoring program will include, among others; water quality monitoring, especially with respect to effluent discharged FSTP and receiving waters,

sound operation of fecal sludge treatment plants, reinstatement of areas disturbed by earthworks, occupational health and safety aspects, and related construction-related accidents and protection of workers.

The key verifiable indicators that will be used to monitor the impacts will mainly include pollution (noise, soil, air-dust, waste), erosion and loss of resources, occupational and health safety, land use change, the spread and occurrence of diseases (Pathogenic and nonpathogenic-HIVE/AIDS, COVID-19, etc.) and accidents as well as job creation.

Table 25: Environmental and Social Monitoring Plan

S/N	Issue/ Project main Impacts	*Monitoring Indicators*	Monitoring Party	Monitoring Frequency	Method of Measurement/monitoring	Budget Estimate (in Birr) for monitoring
Construction Phase						
1.	Impacts on soils and landscape quality	– Evolution of erosion signs – Length/ area of trenches and other exposed surfaces properly refilled, leveled to the surrounding landscape, and replanted with appropriate plant species following completion of works. – Area of land affected due to exploitation of quarries & borrow sites and area reinstated after exploitation has ceased – Incidence of soil pollution by spillage of hazardous substances	Supervisory consultant and Gondar town Environmental protection office, land administration Office, Representative of the community	Minimum twice per month during the construction contract period	Visual observation, area measurement, Collaborative field visit and reporting the result	300,000
2.	Impacts on water quality; sedimentation, pollution by hazardous substances and wastes generated by the project	– Location/distance of the contractor's site facilities (camps, storage site, workshop/garage) from water bodies (min. of 1km is recommended). – Provision of a secondary containment system for fuel storage facilities. – Proper handling of hazardous substances (oil, fuel) and disposal system used oils. – Incidence of water pollution by spillage of hazardous substances. – Sediment load/turbidity of nearby streams & rivers.	SC GWSSS Gondar town EPA, Water, and Energy office	As required	Visual observations, water quality analysis in laboratory or using field kits, field visit and reporting the result	250,000
3.	Impacts on air quality and noise	– Dust levels or incidence of dust pollution in the construction areas & rate of application of dust suppressants (spraying water) on dusty areas. – Use of water spray systems in dusty areas. – Noise and exhaust emission levels generated by construction vehicles and equipment. – No. of complaints due to nuisance noise or dust pollution.	Supervisory Consultant (SC) Gondar town EPA, GWSSS	As required	Visual observations & Recording of case	220,000.00

S/N	Issue/ Project main Impacts	*Monitoring Indicators*	Monitoring Party	Monitoring Frequency	Method of Measurement/monitoring	Budget Estimate (in Birr) for monitoring
4.	Impacts on flora and fauna	– Area of vegetation cleared for the project within the boundary of the project site – Number of trees/land area replanted a survived to replace the trees removed and the plantation affected. – Number of wild animals killed during the construction works.	Supervisory Consultant Wildlife Enterprise ANRS EPA, Culture and tourism	As required during the contract period	Visual observations, surface area measurement and recording of trees affected & Animal fatalities, field visit and reporting the result	180,000
5.	Impacts on traffic mobility and safety issues	– Number of construction sites provided with appropriate signals to minimize obstruction to traffic mobility & safety hazards. – Number of risky construction sites prohibited for people and animals or fenced to minimize safety risks. – Timely collection and disposal of excess spoil materials, availability of adequate number of protective kits, and whether workers are using protective kits.	Supervisory Consultant, Municipality (traffic management office of Gondar town)	Once per day or as required	Visual Observations Collaborative field visit and reporting the result	180,000
6.	Impacts on public health	Number of awareness raising and education campaigns about HIV/AIDS for project workers and vulnerable local populations.	SC, GWSSS/ Representatives of the community	As required	Communication with the implementers &interviewing the vulnerable groups Collaborative field visit and reporting the result	250,000
Operation phase						
1.	Odor	– Intensity of odor and spatial coverage around the treatment plant and nearby surrounding areas – Implantation of buffer zone – Plantation of trees	GWSSS, Gondar EPA Community Representatives	Whenever there is a complaint from the affected people	Visual observations &Recording of cases Collaborative field visit and reporting the result	Part of the regular budget of the regulatory body
2.	Sludge water treatment &	– Proper functioning of the installed drying lagoons as thickeners for sludge water. – Proper disposal & control of the dewatered	GWSSS Health office	As required	Visual Observation	GWSSS operation cost and cost of

S/N	Issue/ Project main Impacts	*Monitoring Indicators*	Monitoring Party	Monitoring Frequency	Method of Measurement/monitoring	Budget Estimate (in Birr) for monitoring
	disposal of the cake	sludge at the properly located dumping/landfill site/ use for fertilizer	Water & Energy office Representatives of the community		Collaborative field visit and reporting the result	regulatory body; 300,000 monitoring cost
3.	Water quality monitoring	– Physical-chemical indicators such as PH, turbidity, total dissolved solids, electrical conductivity, nutrients (nitrate, phosphate), residual chlorine, etc. – Bacteriological indicators such as Escherichia coli (E. coli) – an indicator of fecal contamination	GWSSS Water and Energy Gondar EPA	Twice/year for nearby source water intake), once per month for treated water at WTP	Sampling & testing in laboratory or using field kits with portable incubators for microbiological testing	Part of GWSSS operation cost and cost of regulatory body and 250,000 monitoring cost
4.	Public health & Environmental sanitation issues	– Awareness created for the local community on use of waste water and dry sludge – Number or availability of adequate drainage facilities for wastewater disposal. – Wastewater disposal situation and use by local community – Checking the sanitation of ponds not favorable for malaria	Municipality GWSSS Health office Representatives of the community	As required	Visual observations, review of drainage plans & documents	Part of the regular budget of regulatory Body and 260,000 monitoring cost
5.	Operation and Maintenance of the TP System	– Adequacy of implementation of preventive and all unscheduled/ emergency maintenance work – Periodic housekeeping of the system – Allocation of human and financial resources for the preventive and unscheduled maintenance	GWSSS Gondar Town EPA Health Office	Monthly	Performance reports Collaborative field visit and reporting the result	Part of GWSSS regular maintenance cost and 250,000 monitoring cost
		Total monitoring costs for the planned activities				**2,500,000.00**

11. INSTITUTIONAL ARRANGEMENTS AND CAPACITY BUILDING

The project will use the existing institutional arrangements and a dedicated Project Implementation Team, who are employees of the executing agency (GWSSS). GWSSS has environmental and social safeguard officers (2 in number) which will provide oversight on the implementation of the environment (ESIA) and ESMP components of the project. It is further recommended that oversight on environmental issues will be supplemented through the recruitment of additional environmental expertise by the supervising consultant and the contractor once the project commences. In the interim, this staffing arrangement is deemed adequate.

The responsibility for implementing the ESMP of the supplement ESIA during construction will be of the contractor and GWSSS. The regional environmental authority is also mandated for the follow-up and compliance monitoring of the E&S-related aspects. During the operation and maintenance of the FSTP works, the responsibility will be mainly under the GWSSS.

The project's environmental sustainability depends on the capacity of institutions at all levels (i.e., staffing, training, and other necessary support services) to carry out the associated ESMP implementation work. Thus, GWSSS must allocate sufficient resources for training and capacity building. These efforts will benefit the authorities and build local capacity to undertake other development initiatives.

The institutional capacity to implement, enforce and monitor the project environment and health was assessed based on the technical, financial, and physical capability of the Community leaders and GWSSS. The findings indicated that these different groups have different capacity-building and training needs in terms of raised awareness, sensitization to the issues, and detailed technical training. The GWSSS is found to have a limited institutional capacity to implement the provisions of the ESMP, especially regarding the FSTP management project. Although general awareness of environmental issues exists within the steering committee stakeholders and GWSSS staff, focused training and capacity building would enhance the ESMP implementation capacity substantially on their part.

It is recommended that capacity-building interventions, including training, should take place at all levels, i.e., community-based organizations relevant to waste management, appropriate government officials (E&S, environmental protection, health, women and labor), community leaders, GWSSS management team. The GWSSS environmental and social experts should be exposed to short-term training in t environmental and social issues management. The training program for various role-players will include an orientation program on the ESMP, Environmental Assessment Processes, Participatory Methodologies, and Project Management and Monitoring. The training on ESMP may be integrated with the social framework and another related training program for cost-effectiveness.

Table 26: Institutions Responsible for the Implementation of ESMP

Stakeholders	Roles and Responsibilities
Gondar town Administration	Allocate Budget to the Client project office and monitor its utilization; Monitor the implementation and operation of the proposed project; Also involved in GRM
GWSSS	Responsible for implementing the proposed project as proponent; Coordinating the efforts of the different organizations responsible for the management and monitoring plan; and following up on the rehabilitation of the affected part. Coordination of stakeholders during monitoring of project activities at various phases.
Gondar city - EPA	Provides technical advice about environmental protection during the project implementation; Audits the project from an environmental protection point of view; monitoring the implementation of environmental and social mitigation actions.
Gondar city health office	Provides technical advice about social health issues such as HIV/AIDS, COVID-19, STDs, and others.
Gondar city Women and children social affair office	Provides technical advice about the social issues of GBV, child labor, etc., and monitoring at various phases.
Gondar city administration water and energy office	Provide technical advice (2nd UWSSP) and capacity building and monitoring. The bureau will participate in monitoring during water quality measurement.
MoWE	Technical advice and capacity building (2nd UWSSP).
The World Bank	Finance the project as per the agreement. Monitor and evaluate the work's progress and, check the allocated fund's correct use. Demand work progress reports on the implementation of the project.
Contractor:	The Contractor has to prepare and implement the Construction ESMP. To this end, the contractor should mobilize environmentalist, sociologist, health and safety expert, and gender specialist at construction site.
Supervision Consultant	The Consultant's EHS team, in cooperation with GWSSS social and environmental impact assessment & monitoring and evaluation sub-process, will conduct regular monitoring of the project activities and give advice and instruction to the Contractor to perform environmental, social, and health and safety issues as per the ESIA, ESMP, and financers environmental, social and health safeguard guidelines.
community	Engaged in monitoring the E&S through their representative

11.1. Training Programs

Training programs shall be developed and delivered to the project developer to implement for environmental safeguards of the proposed project.

Following the training needs assessment, specific and tailored training will be developed and agreed upon by the developer and key stakeholders for implementing safeguards during project implementation.

- Target groups for the training: GWSSS Civil and Sanitary Engineers, Environmental and social safety officers, Contractors, and community representatives in the project area.
- Training schedule: at least 1 month before construction starts.
- In-service and refresher Training: The training programs proposed below will take place every six months yearly, and their content will be updated and adapted to implementation issues. Training

frequency and the content will be reviewed during the project's operation lifespan depending on needs or technical requirements.

Table 27: Training Programs for Capacity Building and Associated Costs

Target Group	**GWSSS Staff, MoWE (regional water and energy bureau), Health officers, Regional EPA, and other relevant stakeholders**	**Cost estimation in birr**
Training title	Environmental supervision, monitoring and reporting	600,000
Participants	Environmental staff and social workers of GWSSS and other stakeholders who are going to engage in the management and monitoring (total 15 participants)	
Training frequency	At least 1 month before the start of project work. In-service /refresher training during operation.	
Time	Training twice a year, and then to be repeated every year until year three of implementation.	
Training content	• Public health and safety of FSTP management. • Social mitigations for environmental projects • Community participation in environmental supervision monitoring • Supervision of contractors, Subcontractors, and community representatives in the implementation of environmental supervision • Risk assessment, response, and control • Awareness creation • Public and communal toilet management approaches	
Responsibilities	GWSSS with the facilitation from the MoWE environmental and social safeguard specialists	
Training title:	Implementation of mitigation measures	400,000
Participants	On-site construction management staff; environmental and social safeguard staffs; village/group authorities.	
Duration	After bidding and determining based on needs	
Time	3 days of training for contractors and 2 days of training for others, to be repeated twice a year on an annual basis depending on needs	
Training Content	• Overview of environmental monitoring • Requirements of environmental monitoring • Role and responsibilities of contractors • Scope and methods of environmental monitoring • Response and risk control • Propagate monitoring forms and guide how to fill in the forms and risk report • Preparation and submission of reports • Other areas to be determined • Grievance handling and reporting • GBV reporting	
Responsibilities	GWSSS with facilitation from the MoWE	
Target groups	Local communities/ stakeholders, GWSSS, Health Officers and, municipality, urban infrastructure technicians/ Engineers/EPA	
Training title	Environmental sanitation and safety	480,000
Participants	Representatives of community and/or worker leaders (as appropriate) (up	

Target Group	GWSSS Staff, MoWE (regional water and energy bureau), Health officers, Regional EPA, and other relevant stakeholders	Cost estimation in birr
	to 30 participants)	
Training frequency	Bi-yearly or every 6 months for the first two-year GWSSS	
Time	One-day presentation and one-day on-the job training twice a year, to be repeated on as needed basis	
Training content	• Environmental and Social safeguards • Safety and health issues • Environmental Pollution risks and management • Management of environmental safety and sanitation on work sites • Mitigation measures at construction sites • Procedures to deal with emergency situations • Other areas to be determined	
Responsibilities	GWSSS and another relevant stakeholder	
Subtotal 1		**1,480,000**
Training title	Customer service management:	400,000
Course content	Marketing (promotion), customer handling, record keeping and reporting, financial management	
Target group	Head of Core Process, Fecal Sludge (FS) Emptying Customer Service Team Leader, Head of Finance Accountant (up to 20 participants) every year	
Responsibilities	GWSSS and another relevant stakeholder	
Training title	Safety measures for proper FS emptying	550,000
Course content	Training on risks, safety measures and good practices for FS sludge collection and conveyance	
Target group	Head of Core Process, FS Emptying Customer Service Team Leader Sludge Truck Drivers Sludge Emptying Crew	
Responsibilities	GWSSS and another relevant stakeholder	
Training title	Operation and maintenance of treatment plant	
Course content	Treatment plant operation principles, operation and maintenance procedures, and treatment processes	
Target group	Head of Core Process FSTP Team Leader FSTP operators	800,000
Responsibilities	GWSSS and another relevant stakeholder	
Training title	Leadership and communication	600,000
Course content	Training on group coordination, team leading and communication	
Target group	Utility Director General Head of Core Process, FS Emptying Customer Service Team Leader FSTP Team Leader Finance Team Leader	
Responsibilities	GWSSS and another relevant stakeholder	
Subtotal 2		**2,350,000**
Total estimated cost		**3,830,000**

11.2. ESMP Implementation Costs

Environmental and social management/monitoring is essential for ensuring that identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated early (before they become a problem), and the expected project benefits are realized. Thus, an ESMP aims to assist in the systematic and prompt recognition of problems and the effective actions to correct them, and ultimately, good environmental performance is achieved. To support this, the ESIAs have provided a budget estimate for ESMP implementation, which will be included in the overall project implementation budget. Thus, the overall cost, i.e., including mitigation, monitoring, and capacity building, as detailed in the Table below, is estimated to be about **ETB 8,369,000.0.**

Table 28: Summary of Budget Estimate for ESMP and Monitoring

	Component	Project phase	Unit/ Reference	Estimated cost in ETB
1	**ESMP**			
	Buffer zone protection for intake site	Throughout all phases	Table 24	400,000.00
	Implementation of replanting program to compensate for trees or plantation forest lost	construction phases	Table 24	300,000.00
	HIV/AIDS awareness and prevention	construction phases	Table 24	60,000.00
	ESMP enhancing beneficial impacts	All phases	Table 23	500,000.00
		Subtotal 1		**1,260,000**
2	**Environmental and Social Monitoring Costs**			
	Air Noise quality monitoring	Throughout all phases	Table 25	280,000.00
	Water quality monitoring	Construction and operation phases	Table 25	500,000.00
	soils and landscape quality	Construction	Table 25	300000
	flora and fauna	Construction	Table 25	180,000
	Monitoring Impacts on traffic mobility and safety issues	Construction	Table 25	180,000
	Monitoring Impacts on public health Environmental sanitation issues	Construction and operation phases	Table 25	510,000
	Sludge water treatment & disposal of the cake	Operation	Table 25	300,000.00
	Operation and Maintenance of the TP System	Operation	Table 25	250,000.00
		Subtotal 2		**2,500,000.00**
3	Training cost including skill development	All phases	Table 27	3,830,000.00
		Subtotal 3		**3,830,000.00**
	Subtotal 1+2+3			**7,590,000.00**
	Contingency 10%			**759,000.00**
			TOTAL	**8,369,000.00**

11.3. Grievance Redressing Mechanisms

A grievance redressing mechanism (GRM) is expected to outline procedures to respond to project-related grievances efficiently and effectively. As per OP 4.12 of the WB, GRM should be accessible and appropriate to remedy complaints. Appropriateness and accessibility signify the need for a workable GRM arrangement tailored to the local context. Without these main ingredients of GRM, complaint procedures will have no expected outcome in redressing grievances. In case of complaints by PAPs on project-related activities, the preferred way of settlement is through amicable means to save time and resources as opposed to taking the matter to formal courts.

To ensure that the PAPs have avenues for redressing grievances related to any aspect of environmental and social impacts, compensation, construction management negligence, and any other relevant project related matters procedures for the redress of grievances should be established for the project. The objective is to respond to the complaints of the PAPs efficiently, i.e., the mechanism to be easily accessible, transparent, and fair and to avoid the need to resort to complicated formal channels to redress grievances. Accessible and appropriate GRM not only helps to have more effective and efficient procedures but also has a strong bearing on the project implementation progress, as PAPs' grievances tend to thwart timely accomplishments of project activities. For the project, a grievance redress committee needs to be established that consists of members from the project administration office, PAPs, elders/religious leaders, and local NGOs.

During the consultation meeting with stakeholders, the ESIA team learned that **the** GRM structure is established at various levels and functioning well. As per the information from the vice Mayor of the town Gondar has the best experience in addressing any complaints, and most of the complaints from PAPs can be solved at the local levels.

The town has GRM at Keble, sub-city; city administration levels chaired by the head of the administration of the respective levels.

Procedure

- Complainants can log/file their complaint(s) in written form, verbally, through a telephone call, text message, or any means of channels convenient to them.
- The filed complaint(s) must be itemized, clear, and concise with remedial suggestions.
- Complainants should submit their complaint to the relevant designated officer (first contact point, in this case, the secretary of the Grievance Redress Committee-GRC).
- The secretary of the Grievance Redress Committee should register Complain in a standard format prepared for the same purpose.
- The format should include detail of the Address of the PAP or PAPs (Telephone number, kebele, etc.) and the remedial measure they require.

Obligation of the GRC

- Check the complaint is project-induced
- Registering all complaints and organize them properly (Secretary of the GRC)
- Forwarding the case to the committee
- If it is not settled by the GRC, inform/forward the same to the next step level GRM and amicable dispute settlement continues to be explored
- Feedback /or GRC committees' decisions should be communicated to the PAP(s) at a maximum of 7working days.
- In case amicable arbitration does not work, PAPs can use their own right in formal court procedures.
- As it has been repeatedly mentioned, the GRM should be based on the core principles of fairness, objectiveness, simplicity (localized and contextual), accessibility to PAPs, responsiveness, and efficiency. In addition, GRM should not only deal with compensation issues. Rather all other project–induced complaints partly listed above.
- Capacity building and awareness creation interventions for local-level GRC are essential. The project owner/client is expected to facilitate such training for better performance of the project at large.

11.4. Code of Conduct

The project shall develop and implement a Code of Conduct to deal with the environmental and social risks related to construction. The Code of Conduct shall be applied to all staff, laborers, and other employees at the construction site or any other places where construction-related activities are being carried out. It also applies to the personnel of each contractor, subcontractor, consultant, and any other personnel assisting the contractor in the execution of the Works.

The Code of Conduct aims to ensure an environment where unsafe, offensive, abusive, or violent behavior should not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation. The Code of Conduct should include the following core requirements applicable to the project workers.

Every person involved in the project activities should:

- Carry out their duties competently and diligently;
- Comply with this Code of Conduct and all applicable laws, regulations, and other requirements, including requirements to protect the environment, health, safety, and well-being of other contractor's personnel and any other person;
- Maintain a safe working environment including by:
  - ensuring that workplaces, machinery, equipment, and processes under each person's control is safe and without health risk; wearing required personal protective equipment;
  - using appropriate measures relating to chemical, physical and biological substances, and agents; andfollowing applicable emergency operating procedures.
- Report works situations that they believe are not safe or healthy and remove themselves from a work situation in which they reasonably believe present an imminent and serious danger to their life or health;
- Treat other people with respect and not discriminate against specific groups such as women,
- people with disabilities or migrant workers;
- Not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
- Not engage in Sexual Exploitation, which means any actual or attempted abuse of a position of vulnerability, differential power or trust for sexual purposes, including but not limited to profiting monetarily, socially or politically from the sexual exploitation of another.
- Not engage in Sexual Assault, which means sexual activity with another person who does not consent.
- Not engage in any form of sexual activity with individuals under 18, except in case of a pre-existing marriage.
- Complete relevant training courses that shall be provided related to the environmental and social aspects of the Contract, including health and safety matters and Sexual Exploitation and Assault (SEA).
- Report violations of this Code of Conduct. Any violation of this Code of Conduct by contractor personnel may result in serious consequences, including termination and possible referral to legal authorities.
- The contractor shall require all employees and the employees of the sub-Contractor to sign the Code of Conduct individually, and shall proactively address any breach to the Code of Conduct.

- A copy of the Code of Conduct in Amharic shall be displayed in a location easily accessible to workers.

12. CONCLUSION AND RECOMMENDATIONS

12.1. Conclusions

Lack of sufficient sanitary facilities and proper waste management in the town is the bottleneck for the town's development. This poor sanitary situation is affecting the town's public health and the aesthetics of the town. The present coverage of the proposed project of the city will greatly contribute to the overall sanitation improvement of Gondar town. Considering the existing poor and inadequate waste management in the city, the need for an improved fecal sludge management system (fecal sludge treatment plants and collection system) is indisputable.

The new treatment plant will be installed in the previously fecal sludge deposal site. The selection of the treatment technology was carried out based on simplicity of operation & maintenance, space requirement, etc. The appropriateness of the sanitation facilities and technologies has been critically evaluated against available alternatives. Accordingly, the selected treatment technologies are found appropriate to the local context. These technologies allow the proper management and create new capacity for the municipality.

The ESIA study results show limited negative environmental implications of the project activities. The proposed works will have high socio-economic benefits to the residents of Gondar city. The associated negative impacts will be significantly reduced or eliminated through careful engineering design, best construction practices, and effective implementation of mitigation measures. Specific mitigation measures have been suggested in this report to offset some of the inherent adverse impacts, especially those linked to the natural, human, and social environment. The construction phase's effects include ambient air quality due to dust, noise pollution, soil erosion, poor solid waste disposal, and stormwater. In addition, occupational health, and the spread of STDs such as HIV/AIDS risk may result from project activities.

Many of the identified adverse environmental and socio-economic impacts are minor and can be easily mitigated. The identified ‘major impacts may happen under rare conditions, as in the case of negligence, accident, etc., and would have appropriate mitigation measures and are indicated in the ESMP.

It is, therefore, concluded that effective implementation of the proposed project works will mitigate the predicted impacts to non-harmful or near non-harmful levels. Their implementation should be adequate and timely. Overall, the anticipated positive impacts will outweigh the negative impacts. In particular, sanitary facility improvement decreased the socio-environmental impacts of poor sanitary facilities, increasing social development and welfare for the municipality community.

Predicted impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this ESIA. Gondar Water Supply and Sanitation Service is committed to implementing all the proposed recommendations and further carrying out environmental auditing and monitoring schedules as well as enhancing the anticipated positive impacts, especially the creation of a healthy environment (social and natural environment).

The summary of recommended mitigation and management measures to minimize the potential impacts are:

- Proper design to accommodate measures for stormwater effects, soil erosion, and slope destabilization during construction of FSTP.
- Measures to safeguard job opportunities and gender balance during both construction and operation of project.

- Measures to encourage local employment.
- Mitigation measures against workplace health and safety.
- Measures against noise and dust effects.
- Management of traffic accidents.
- Measures against the possible increase of social diseases such as HIV/AIDS prevalence.
- Monitor compliance with environmental, health, and safety measures.

In general, the ESIA study indicates that the implementation of the project is expected to have enormous significance. The implementation of the project will improve the health and livelihood of the city residents and downstream users of polluted river waters as it reduces the prevalence of waterborne diseases and other diseases born due to poor sanitation. The project is important and timely to reduce the problems associated with the disposal and management of wastewater and fecal sludge in Gondar city. It will certainly play an important role in bringing about a more ecologically, socio-culturally, and economically sustainable and equitable environment in the project intervention sites.

The project will also create short and long-term employment opportunities and potentially enable the reuse of the treated fecal sludge waste for agriculture and allows the production of biogas for energy and organic fertilizer (compost) from the by-products of fecal sludge and wastewater treatment processes in the future.

12.2. Recommendations

Overall, the ESIA shows that the benefits of the FSTP construction in the town outweigh the adverse effects. The adverse impacts identified can be mitigated through implementing the proposed management and monitoring plans to acceptable limits. Therefore, it is recommended to implement the project with strict observation to the environmental and social management and monitoring plans. However, the project supervision consultant once mobilized should prepare a 'Construction Supervision Plan' before the beginning of construction works and this plan should be part of the contract. In addition, the environmental management plans should be made part of the contract documents of the contractor so that ESMP compliance is ensured. The ESMP recommends environmental monitoring at the different phases of the project. The monitoring should be conducted to check the efficacy of mitigation measures. An environmental checklist should be developed by the Environment and Safety Division for the daily environmental monitoring of the project activities. This should be filled up by the environmental expert of the contractor and should be verified by the Gondar town EPA.

Moreover, during the stakeholder consultation one of the main issues is the informal settlement around the FSTP hence, the city administration should take appropriate measure to stop settlements around the area. Inaddition,the GWSSS should construct concert fence and flood protection structure in the boundary with the solid waste disposal site to protect the FSTP from flood and impacts of solid waste transported by flood and wind.

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DEFINITION OF TERMS

Anaerobic digestion: A process which uses bacteria to break down organic and biological waste in the absence of oxygen.

An Impact: is the effect of any action that affects one or more elements of the natural, social or economic environment, either adversely or beneficially.

Containment/storage: Ways of collecting and storing (and in some cases treating in-situ) fecal sludge generated from a latrine.

Compensation: Payment in cash or in kind of the replacement cost of the acquired assets.

Cut-off-Date: The last date for establishing the eligibility of persons displaced by the project for receiving compensation and resettlement assistance. It is determined according to the procedures of the borrower government: usually the completion date of the census of project-displaced persons. In absence of such procedures, it is the borrower who will establish a cut-off date.

Decomposition: refers to a controlled method to treat fecal sludge whereby its components are broken down by aerobic and/or anaerobic digestion processes. Decomposition in this context can be successfully practiced when fecal sludge is contained (typically underground) for at least two years in an environment where liquids drain and remaining fecal sludge becomes dry. The end product after the decomposition process is called humus, which can then be used as a soil conditioner.

Drying beds: Method of treating fecal sludge off-site whereby sludge is spread out over a contained space to dry

Dry pit latrine: Type of latrine that doesn't require water for flushing. Excreta typically fall directly into pit.

Direct Impacts: Those impacts that are caused by the action and which generally occur at the same time and place as the action.

Displaced Persons: In the context of involuntary resettlement, displaced persons are those who are physically displaced (i.e., have been subject to relocation, loss of residential land, or loss of shelter) or economically displaced (i.e., have been subject to loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land; or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

Economic Displacement: Loss of land, assets, access to assets, income sources, or means of livelihood because of: (i) involuntary acquisition of land; or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

Encroachers: People who occupy the land beyond what they legally own. They are usually not entitled to compensation but are sometimes provided with assistance if they are found vulnerable. Loss of built-up structures, trees, crops, and other assets could be compensated.

Entitlement: Range of measures applied to displaced persons to restore their economic and social base: compensation, income restoration, transfer assistance, income substitution, and relocation.

Environment: The physical factors of the surroundings of the human beings including land, water, atmosphere, climate, sound, odor, taste, the biological factors of animals and plants, and the social factor of aesthetics and including both the natural and built environment.

Environment and Social Impact Assessment (ESIA): A systematic examination conducted to determine whether or not a project will have any adverse impacts on the environment.

Environmental Impact Study: means the study conducted to determine the possible environmental impacts of a proposed policy, project, or activity, and measures to mitigate any such impacts.

Environmental Monitoring: the continuous determination of the actual and potential effects of any activity or phenomenon whether short-term or long-term.

Fair compensation: is defined as 'an indemnity equivalent to the value the activities performed thereon given to the person to be expropriated and calculated in consideration of market prices as well as compensation for disturbance due to expropriation

Fecal sludge: Contents of an on-site sanitation facility (such as a latrine pit) typically comprising of excreta, flush water, and anal cleansing materials.

Fecal sludge management (FSM): Methods and processes to manage fecal sludge.

Leach pit: Latrine pit that facilitates the draining of liquids into the surrounding soil.

Latrine: A sanitation system that captures fecal sludge and contains it. Through this containment, a barrier is established to prevent contact between humans and potentially disease-causing microbes in fecal sludge. Numerous types of latrine systems, technologies, and configurations exist.

Human health hazards: Hazards associated with fecal sludge that may be related to its microbial, chemical or physical properties. Microbial hazards refer to the health risks associated with exposure to potentially harmful microbes. Chemical hazards can include exposure to cleaning agents and physical hazards, to dangerous labor or machinery.

Indirect Impacts: Those impacts that induce changes in the natural environment, population, economic growth, and land use, as a result of actions not directly linked to the project in question.

Involuntary Resettlement: Land/asset loss, which negatively impacts livelihood. Losses have to be compensated so that no person is worse off than before the loss of land and/or assets caused by the project.

Participation: A process through which stakeholders' influence and share control over development initiatives and decisions or resources that affect them.

Physical Displacement: Relocation, loss of residential land, or of shelter as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

Pollution: any direct and indirect alteration of the physical, thermal, chemical, biological, or radioactive properties of any part of the environment by discharging, emitting, or depositing wastes so as to affect any beneficial use adversely, to cause a condition that is hazardous or potentially hazardous to public health, safety or welfare, or to animals, plants or aquatic life, or to cause a contravention of any condition, limitation or restriction to a healthy environment.

Project: a set of planned activities to achieve objectives within a given area and time frame.

Proponent/Developer: means a person, group of persons, or agency developing a new project or proposing to extend an existing project which is subject to an environmental impact assessment process.

Meaningful Consultation: A process that: (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender-inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, sharing of development benefits and opportunities, and implementation issues.

Mitigation measures: Actions that reduce, avoid or offset the potential adverse environmental consequences of a project, and include engineering works, technological improvements, management measures, and ways and means of ameliorating effects to the environment and losses suffered by individuals and/or communities, including compensation and resettlement.

Rehabilitation: Compensatory measures provided under the World Bank Operational Policy 4.12 on Involuntary Resettlement and other than the payment of replacement cost of acquired assets.

Replacement Cost: Compensation for acquired housing, land, and other assets that are calculated at full replacement costs based on the following elements: (i) fair market value; (ii) transaction costs; (iii) interest accrued, (iv)transitional and restoration costs; and (v) other applicable payment if any.

Septic pit: A pit that is fully sealed (often using cement), connected to a latrine, and collects and stores fecal sludge. Given that pit is sealed, liquid cannot drain from the pit into the surrounding soil.

Scoping: is the early transparent process that identifies concerns, evaluates them, and organizes them by eliminating insignificant impacts and focusing on significant impacts for further assessment so that attention and therefore resources, can be effectively and efficiently utilized

Screening: Selection of actions or projects requiring Environmental and Social Impact Assessment (ESIA). Common methods for screening include project threshold, sensitive area criteria, positive and negative lists, and preliminary assessment/ IEE.

Significance: an expert evaluation/judgment of the magnitude of impact or the degree to which a proposed activity or project may (potentially) impact on the environment if implemented.

Significant effect: substantial/ potentially substantial, adverse changes in any of physical factors of the surroundings of human beings including land, water, atmosphere, climate, sound, odor, taste, biological factors of animals and plants, and social factor of aesthetics and includes both natural and built environment.

Significant Impact: Impact experienced by 200 people or more, involving: (i) physical displacement from housing; or (ii) loss of 10% or more of their productive assets or income-generating activities.

Stakeholders: those affected by the outcome of a project or can affect the outcome of a proposed either negatively or positively.

Squatters: People who unlawfully occupy land or a structure. If the occupation is well established before the dissemination of project details and the cut-off date and the occupying people are found vulnerable, they are eligible for compensation for the loss of any structure, trees, crops, and other assets that they will lose access to because of project implementation.

Treatment: A process that changes the physical, chemical and biological characteristics of fecal sludge so that it is converted into a product that is safer for end-use or disposal.

Vulnerable Groups: Households below the poverty line, women, children, elderly, people without legal title to assets (including land).

Waste: is a by-product of day-to-day activities or anything, which is no longer useful to someone and is disposed of. It is an unwanted or undesired material or substance that is thrown away.

APPENDICES

Appendixes	Appendix title	Appendix Attachment
1	Minutes of community consultation	 CC minutes.pdf
2	Lists of Stakeholder Consultation Participants	 list of Gonder cc participants.pdf  gondar city list of stakeholder consultati
3	Primary data collection checklist	 Checklist.docx
4	Secondary data collection Checklists	 Secondary data collection Checklists
5	Checklist and Formats	 Other checklist and Formats.docx
6	Ambient Factors	 Environment.docx
7	GRM form	 GRM Form.docx
8	GAP	 Gender Action Plan.docx
9	Environmental and Social Clause	 Environmental and Social Clause for Co
10	Chance find procedure	 Chance Find Procedure.docx
11	Brief summary of Scoping report	 Godar scoping.docx
12	Consultation with the religious leaders and management of church	 Minutes of Church Community.pdf
13	Response to Comments	 Reponse to Commnetts.docx

14	Team involved in ESIA study	Team involved in the ESIA Study.docx

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MINISTRY OF WATER AND ENERGY

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Prepared By: **Motion Consultancy and Training PLC**

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