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Environmental and Social Impact Assessment

(Fecal Sludge Management Subproject for Gambella Town)

[Final]

Second Urban Water Supply and Sanitation Project

May 2023
Addis Ababa

Financed By WORLD BANK

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ACRONYMS

ABR	Anaerobic Baffled Reactor
CBD	Central Business District
CBOs	Community Based Organizations
CR-WSP	Climate Change Resilience Water Safety Plan
CSE	Conservation Strategy of Ethiopia
EPA	Environmental Protection Authority
EPC	Environmental Pollution Control
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
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
GBV	Gender Based Violence
GEPA	Gambella Environmental Protection Authority
GoE	Government of Ethiopia
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
GWSSA	Gambella Water Supply and Sanitation Authority
HNAP	Health National Adaptation Plan to climate change
IFC	International Finance Corporation
MoWE	Ministry of Water and Energy
NGO	Non-government Organization
OP	Operational Policy
PAP	Project Affected People
PCT	Public and Communal Toilet
PPE	Proper care of Protective Clothing and Equipment
PT	Public Toilets
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SEP	Stakeholder Engagement Plan
SA	Sexual Abuse
STD	Sexually Transmitted Disease
ToR	Terms of Reference
TMP	Traffic Management Plan
UWSSP-II	2nd Urban Water Supply and Sanitation Program
WB	World Bank
WB's (EHS)	World Bank Environment, Health and Safety
WHO	World Health Organization
WASH	Water, Sanitation and Hygiene

DEFINITION OF TERMS

Aerobic digestion: A process which uses bacteria and oxygen to break down organic and biological waste.

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.

Basic sanitation: Use of an improved sanitation facility that is not shared with any other household.

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. Decomposition is an appropriate Fecal Sludge Management (FSM) solution and contributes to safely managed sanitation.

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

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

Direct pit: A pit that is directly under a latrine pan, whereby excreta fall directly into the pit.

Dry pit latrine: A type of latrine that does not require water for flushing. Excreta typically fall directly into the 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 Household: All members of a subproject affected household residing under one roof and operating as a single economic unit, who are adversely affected by the project or any of its components; it may consist of a single nuclear family or an extended family.

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.

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.

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: 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.

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: 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 or asset loss, which negatively impacts livelihood. These losses have to be compensated for so that no person is worse off than they were 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 loss 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.

Project brief: a summary statement designed to achieve specific objectives within a given area and the likely environmental impacts and mitigation measures thereto.

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. Depreciation of structures and assets should not be taken into account.

Resettlement Impact: The nature and value of livelihood loss caused by the acquisition of land or assets

Safely managed sanitation: Refers to the use of an improved sanitation facility, which is not shared with any other household, and where excreta are either: (1) treated and disposed in-situ (in the place where it is kept); or (2) transported and treated off-site; or (3) transported through a sewer to a treatment facility. Safely managed sanitation aims to ensure that the potential health and environmental risks associated with fecal sludge are minimized throughout the entire sanitation service chain.

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, the 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.

Subprojects: development of Public and Communal Toilets; and fecal Sludge Treatment Plant projects

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.

EXECUTIVE SUMMARY

INTRODUCTION

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 (CSA and ICF, 2017). One in three Ethiopian households has no toilet facility; defecate to bush/fields (39% in rural areas and 7% in urban areas) (CSA and ICF, 2017). Furthermore, according to the WHO (2014) estimates, diarrhea contributes to more than one in every ten child deaths in Ethiopia. The total population growth rate of Ethiopia is also 2.5% a year, with urban centers growing at a rate of 5.1% (Haddis et al., 2013).

Hence, to alleviate these problems and achieve the goal set in Ethiopia's Ten-Year Development Plan and Sustainable Development Goals (SDG), the Government of Ethiopia has successfully secured finance from the World Bank under the Second Ethiopia Urban Water Supply and Sanitation Project (UWSSP-II). The UWSSP-II is primarily intended to improve urban sanitation holistically and equitably in the urban space and provide assistance to improve operational efficiency in 22 Ethiopian cities.

Gambella city is one of the secondary cities benefiting from the portion of the finance secured under UWSSP-II (Component 2). The development objective of the project is to contribute to the improvement of the socio- economy for the residents of Gambella city by providing effective and efficient sanitation services. The project includes the development of communal and public toilets (impacts and its mitigation action including screening and preparation of ESMP for the PCTs are treated separately other than this ESIA) in the different parts of the Gambella to improve sanitation facilities in public areas, (e.g., markets and Mosques), residential areas with shortage of toilets (resettlement and slum areas); and the implementation of Public and Communal Toilets (PCTs) and the fecal Sludge Treatment Plant (FSTP) in the short-term (2021-2025) low-income communities that will improve the development of a sanitation for the city.

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 project aims to provide an insight of the possible environmental and social impacts which can occur due to the design, construction and operation of the proposed projects during different phases and the possible mitigation measures which can be adopted. In connection with this, the Ministry of Water and Energy (MoWE) signed consultancy service contracts with Motion Consultancy and Training PLC., to undertake the Environmental and Social Impact Assessment (ESIA) Study for the FSTP Construction project for Gambella Town.

The overall objective of the ESIA is to identify, predict and evaluate the potential beneficial and adverse impacts of the proposed project on the biophysical and socio-economic environment in and around the Gambella town in terms of magnitude, spatial extent, duration and significance. The study is also aimed to

provide recommendations for enhancing the beneficial impacts and mitigation measures for the adverse impacts as well as environment and social management and monitoring plans that would help implementation of the recommended enhancement and mitigation measures. The ESIA gives particular emphasis to the potential impacts on the quality of life of people living close to the proposed subprojects, the health and safety of those who will be involved in the construction and operation of the FSTP, and the surrounding natural and human environment. 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 activities;
- 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 the planning, construction, operation as well as the decommissioning of the proposed sub projects.

METHODOLOGY

The ESIA study methodology adopted screening to determine the extent of the project and desktop data search and analysis for the baseline bio-physical and social environmental parameters of the project area. In addition, the consultant worked with the project design group and was briefed and obtained design approaches to be used which informed the requirements of the environmental reporting process and for which excerpts have been obtained on salient design information. The Consultant engaged on multi-faceted stakeholder's consultation process, social and environmental surveys using structured questionnaires duly analyzed and key informant interviews to institutions and lead agencies and public consultation meetings. Based on these findings and expert judgement, 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.

The ESIA study, in this case, is aimed to contribute to the environmental and social management of the proposed FSTP subproject in Gambella city. Notably, the subprojects developers prepared ESIAs under the EIA proclamations [proclamation No.299/2002] which were verified and approved by the Federal and Regional Environment Protection Authority (EPA) during the preparation of the project in May 2022. This ESIA has been prepared according to an environmental and social management framework (ESMF) for UWSSP-II. The ESMF provides guidance for the environmental and social screening process and preparation of appropriate safeguards instruments for proposed investments.

POLICIES, LEGISLATIONS AND INSTITUTIONAL FRAMEWORK

Relevant National Policies and Strategies

The Constitution of the Federal Democratic Republic 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 enshrined in the Constitution's Articles 43 and 44. 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 as a result of state programs. Article 35 provides a foundation for the recognition and protection of women's rights and guarantees women an equal right 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. ESIA 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) include Water Resources, Wildlife, Population, Health, HIV/AIDS and Women Policies. Applicable strategies and programs include 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 Framework Legislations

The GOE has issued several Proclamations and Regulations that are aimed to foster 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 Proclamation lays down the institutional arrangements necessary to ensure environmentally sustainable management and development at Federal, Sectoral and Regional levels. It re-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 either by 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, as well as on the obligation to protect the environment of the Country and its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the violation of these standards a punishable act. 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); Public Health Proclamation (Proclamation No. 200/2000); Labor Proclamation (Proclamation No. 1156/2019); 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

Of the World Bank (WB) Safeguard Policies, OP/BP 4.01 Environmental Assessment (EA) is the most relevant. 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 ESIA. 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. Hence, following the contribution it will have to the environment itself and the society, the proposed subprojects fall under category B.

DESCRIPTION OF BASELINE CONDITIONS

Physical Environment

The Gambella town is characterized by a gently rolling topography, which has enabled expansion of the town in all directions. Elevation increases from the Baro River towards North, South and East directions. Measured elevation of the project service area varies from about 440masl near the Baro Bridge to about 525masl at the top of the Jajebe Hill.

The climate of Gambella is mostly humid. The region is mostly flat, with a humid, warm climate. The mean annual temperature of the Region varies from 17.3℃ to 28.3℃ and annual monthly temperature varies throughout the year from 27℃ to 33℃. The annual rainfall of Gambella city varies from 319mm to 1000mm with a mean annual value of 665.5 mm.

The geological formation of the Gambella area consists of gneisses & migmatite; metamorphosed volcano-sedimentary and hypabyssal rocks; intrusive and meta-intrusive rocks; Tertiary volcanic rocks and Quaternary formations. The main rock type in the project area is metamorphic rock, which outcrops mainly as gneiss, schist, grantoids gneiss and grantoids. Along the creeks and tributaries of the Baro River, such as the Jajjaba stream, weathering and fracturing is very common.

Baro River, which passes through the center of the town in the East-West direction, divides the town into two north and south halves of similar topographic pattern, both draining towards the river. In the same way, the Jajebe River that drains the North-Eastern part of the town and flows in the South-West direction, divides the northern half further into two.

Biological Environment

An observation-based biodiversity assessment was made in the proposed subproject sites. The proposed FSTP site has not been identified as an area of significantly sensitive natural vegetation cover. There are no sensitive natural habitats and wildlife or any other forms of protected areas at or in the vicinity of the project sites.

Socio-economic Environment

Gambella Town is the headquarters of the Gambella People's National Regional State at the crucial bridge across Baro River with total population was 74,102 in 2017 (CSA, 2013). Administratively, Gambella town is divided five Kebeles. Kebeles 01 - 04 are to the north of the Baro River while Kebele 05 is to the South where also the airport is located. Kebele 01 and 02 are to the East of the Jajjaba River tributary and host the largest and smallest proportion of the population at 25 and 15%, respectively. Kebeles 03 and 04 to the west of the Jajjaba River are divided by the Addis- South Sudan Road with Kebele 03 to the east and 04 to the west. Gambella town

None of the observed institutions and infrastructures is expected to be affected by the construction of FSTP. In fact, some vegetation is likely to be removed during the construction of PSTP.

DESCRIPTION OF THE PROPOSED SUBPROJECTS

According to Feasibility study, only 14% of the fecal sludge is considered safely managed while 86% is unsafely managed in the Gambella town. The safely managed fecal sludge in the town results from containment and disposal of sludge in lined and unlined pit latrines that are not emptied and do not pose risk to groundwater. Sludge in these facilities is considered contained and because it is not emptied, it is safely managed. In addition, there are no fecal sludge and wastewater treatment facilities in Gambella.

Gambella is among the twenty-two secondary cities in Ethiopia, which is selected to be one of the UWSSP-II Project beneficiaries. The objective of the sub-projects project is to contribute to the improvement of the socio- economy for the residents of Gambella city by providing effective and efficient sanitation services.

To achieve the goals delineated under the three-phase works, the following measures have been proposed:

- 5 communal and 5 public toilets in five Kebeles of the town is planned. One from each type were proposed to be constructed during the immediate phase (2021-2026).
- 1 fecal sludge treatment plant at the outskirts of Gambella, located in Abol Woreda, about 8 km from Gambella city. This plan will start during the immediate phase and continue to future and ultimate years (2021-2041).
- The following small-scale emptying equipment are proposed: Small vacuum tanker systems (5m^3 capacity, 2 in number), vacuum-Tugs 1,500 L capacity (3 in number), tractor 50 HP for towing vacuum-tugs (1 in number), and hand-powered pumps, e.g., "Gulper" pump (5 in number) for the immediate phase.

The treatment plant will be implemented in phase I and will be expanded in phases II and III. Along with the construction of PCT and FSTP, several vacuum trucks are proposed to be purchased in each phase.
The FSTP is planned to be constructed along with the old dumping site in Abol Woreda. The total land area allocated for FSTP is about 6 hectares at the outskirt of Gambella town towards Dambe Dolo. There is no

settlement close by the site or not used for crop cultivation. However, there are few trees and shrubs that need to be considered during the land preparation process. However, there is a storm water drain on the eastern boundary that can be used to drain the treated effluent. Therefore, it is important to develop appropriate designs that control unnecessary wash away of effluent to the environment.

Fecal Sludge Treatment Plant

As per the Feasibility Design, the planned FSTP consists of the following main components:

- Inlet Works: The inlet works comprise a tanker discharge bay; screens chamber; stainless steel bar screens; and a chute for delivering sludge at the bottom of the anaerobic pond.
- Biological Treatment Units: ABR with combination of facultative pond and maturation pond. The treatment process comprises inlet works (coarse screen). The collected leachate from ABR will be treated in a series of facultative and maturation ponds. Where, the main function of maturation ponds is destruction of pathogenic. They also carry out polishing of the wastewater to achieve the stands for BOD and suspended solids. The collected sludge from the ABR will be treated in the sludge drying beds. The dried sludge will be stored on open ground.
- Sludge Drying Beds: designed for the dewatering and stabilization of partially treated fecal sludge after accumulation in the ABR and anaerobic ponds. Further treatment of sludge is expected in the Drying Beds due to the extensive exposure to UV resulting in considerable pathogen reduction. Continuous dewatering and drying of the sludge are also expected to result in more rapid sludge stabilization.
- Site Works: include fencing, gate, and guard house, access roads, office, washing platform.

SUBPROJECT ALTERNATIVES

During the feasibility study, alternative sites and alternative technologies were assessed, analyzed, compared and selected. In this section, summary of the proposed alternative sites and technologies are summarized from the feasibility report. This ESIA and detailed feasibility and design studies were conducted in parallel and joint meetings and discussions were made with the parties involved in the feasibility study and sub projects design consultants.

Priority sanitation works proposes to further improve the sanitation service level in Gambella town by construction of five additional public and five communal toilets. Provision of these works considers the location of the toilets whose construction is ongoing. It also reviews the designs of the current construction to inform the proposed layout.

Site selection for the FSTP: there were two alternative sites proposed for the construction of FSTP and WWTP.

Six alternative FSTP technologies were reviewed and compared to select the best biological treatment technologies to process and dispose sludge are thickening (concentration), conditioning, dewatering, and drying applied as primary operations to remove moisture from sludge. The selection was based on technology availability, socio-economic and environmental benefits, cost effectiveness, easy to operate and maintenance and others other important factors which considers the local contexts. These are Anaerobic Baffle Reactor (ABR) with Facultative Pond and Maturation Pond; Anaerobic Pond (AP) with Facultative

Pond and Maturation Pond; ABR with Facultative Pond and Constructed Wetland; AP with Facultative and Constructed Wetland: ABR with Aerated Lagoon and Constructed Wetland; and AP with Aerated Lagoon and Constructed Wetland. These alternative technologies were evaluated and ranked based on technical feasibility, financial considerations, and environmental impacts, social and economic factors. According to the above evaluation criteria, the Anaerobic Baffle Reactor ABR with Facultative Pond and Maturation Pond 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 would be implemented in order to address the sanitation facility shortage in Gambella.

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. Stakeholder's consultations were carried out with different actors who have direct/indirect stake in the implementation of the proposed subproject. Accordingly, consultations were made with Gambella Water Supply and Sanitation Authority (GWSSA), Gambella Environmental Protection and Climate Change (GEPCC), Bureau of water and energy, Gambella Agriculture office under the mayor, Bureau of health, Land administration with the mayor office etc. the engineering stakeholders subproject identification and approval were officials comprised of heads of Environmental and Social Sections in the authorities. Also, grass-roots participation was done during the visit to the subproject sites over what shall be done where a wide cross-section of villagers and district leaders were consulted.

The findings of the consultations conducted with the above-mentioned actors reveal that all the stakeholders have interest in the implementation of the project. The main issues/concerns raised by the stakeholders and recommendations provided include the following:

- They agreed that there is some issue of land acquisition (there is shortage of land in the Gambella town for the construction of toilets) however, the municipality together with the GWSSA trying to find appropriate sites, including land of the FSTP construction,
- Odor and Aesthetic effects were not raised as a concern, if the toilets are managed properly. However, they raised some concerns from the previous similar projects. Some these toilets are not properly giving the intended services, not well managed and not fenced-lack of ownership was mentioned as key challenge,
- Dust pollution was not an issue, and
- Management of liquid waste and its impacts on villagers close to the site.

POTENTIAL IMPACTS AND MITIGATION MEASURES

FSTP construction project is proposed mainly to improve the quality of the social and natural environment of Gambella City. The existing sanitation situation in the town is very poor. 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 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 are identified. Adverse impacts are characterized by type, magnitude, nature, spatial extent and duration of impact, and assessed for significance.

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 for 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 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.
- Increased traffic 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.
- 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 moderate to high, short-term, reversible and direct adverse impacts. They can be minimized to acceptable levels by adopting appropriate mitigation measures including the following:

- Implement measures that will reduce dust emission including regular spraying of water on unpaved access roads, exposed earth and any stockpiles on site.
- Use updated technology or modern equipment in excavation works that will minimize dust generation from earthen materials and noise emissions and vibration.
- Regular inspections and maintenance of vehicles and equipment to reduce excessive exhaust emissions, and prevent fuel spills by filling fuel at only designated fuel stations.

- 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).
- Carry out noisy construction activities in the vicinity of sensitive areas during normal working hours only.
- Keep noise level near sensitive areas such as residential areas and camps below the WHO and Ethiopian maximum allowable noise level standards.
- Select the location of campsites in collaboration with local authorities to avoid environmentally or socially sensitive areas.
- 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 priority of job opportunities for the local people.
- Provide awareness education about HIV/AIDS, other STIs and preventive measures for project workers and local community, and avail protective materials.
- Implement other mitigation measures specified in this report.

Impacts during Operation Phase

Most of the beneficial impacts of the project will be harnessed during the operation phase of the FSTP. These include improving living conditions of Gambella residents through improved public health and sanitation facilities; Reduced cases of waterborne diseases such as cholera, typhoid, amoeba and diarrhea through provision of sanitation facilities due to improved hygiene.; Improved quality of health from proper management of fecal matter that would otherwise be dumped haphazardly and drain into rivers where others may become in contact; and increased agricultural products due to availability of manure. Potential adverse impacts during the operation phase include:

- Some offensive odor at and around the treatment plant sites mainly due to release of hydrogen sulphide resulting from anaerobic digestion.
- Pollution of ground water 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 FSTP.
- 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, exposure to hydrogen sulphide, which is a colorless and toxic gas, may pose health risks. In addition, operators of the treatment plants could be exposed to pathogenic

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.

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 around the treatment plants and planting trees to prevent spread of nuisance odor and improve aesthetic view of the treatment sites;
- 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;
- Constructing FSTPs foundation and direct influence areas with concrete lining to avoid leakage of wastewater through permeable soils and weathered and fractured rocks into the groundwater system;
- 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;
- Adopting effective and efficient housekeeping procedures;
- Regular facility maintenance and monitoring operational practices including process control and treatment, continuous process of the operation; and
- Implement other mitigation measures specified in this report.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This section provides an ESMP that comprises a specific plan of action for the proposed mitigation measures to ensure implementation of the “mitigation measures” to avoid or reduce adverse impacts and enhance positive impacts from the construction and operation of the proposed project components. ESMP is the key to ensure that the environmental and social quality of the project influence area does not deteriorate due to the implementation of the proposed development project covering all aspects of project implementation in its different phases. It is generally used as the basis for establishing the environmental and socio-economic behavior that the proposed project requires during its various stages including the decommissioning phase.

The ESMP for the proposed project consists of a set of feasible and cost-effective mitigation and institutional measures to be undertaken during the different phases of the project to eliminate or reduce to acceptable levels the adverse environmental and social impacts identified. It is prepared in such a way that it serves as a document that sets forth those practices which will be implemented to prevent, control, and mitigate significant negative environmental and social impacts arising as a consequence of the implementation of the proposed project. Hence, the ESMP is 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 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 works or providing supplies. It can be also used to prepare an environmental and social management system for the operational phase of the project.

ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Environmental monitoring is an important component of environmental management as it provides the basis for rational management decisions regarding impact control. Monitoring will provide the information necessary for feedback into the environmental management process including feedback about the actual environmental and social impacts of a project and will assist in identifying where additional mitigation effort or where alteration to the adopted management approach may be required.

The environmental monitoring plan is developed to provide a basis for evaluating the efficiency of the proposed mitigation measures and for updating the actions and impacts of baseline data. It also gives information for adoption of additional mitigation measures if the proposed measures are found insufficient. Thus, it avails information for management decisions taking in the different phases of the project.

Monitoring should be performed during all stages of the project (construction, operation and decommissioning) to ensure that the impacts are no greater than predicted, and to verify the impact predictions. The monitoring program will indicate where changes to procedures or operations are required, to reduce impacts on the environment or local population.

Implementation Arrangements and Capacity Building

GWSSA has an established position for an Environmental Officer and positions for sociologists which will provide oversight on the implementation of the environmental (ESIA) components of the program. It is further planned that oversight on environmental issues will further be supplemented through the recruitment of additional environment expertise by the supervising consultant 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 GWSSA and the bureau of Health. During the operation and maintenance of the FSTP works, the responsibility will be mainly under the GWSSA.

The environmental sustainability of the FSTP sub-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, it is vital that GWSSA allocate sufficient resources for training and capacity building. These efforts will not only benefit the authorities but will also build local capacity to undertake other development initiatives.

Budget Estimation

The estimated total budget for the ESMP, which is mainly for environmental monitoring programs and training required to implement the ESMP is about **9,317,000.00** Birr. It should be noted that most of the

recommended mitigation measures for identified impacts are assumed to be incorporated in the design when they require engineering interventions. In addition, as it is proposed on the feasibility study the treatment plant is to be implemented in Design Build and operate contract modality. Therefore, they 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

It is certain that implementation of the proposed subprojects of Gambella will be a major solution to minimize the prevailing poor sanitation related environmental pollution and its consequences in the town and downstream areas. The subprojects will serve as a very important intervention for the protection of the socio-economic and biophysical environment of the Gambella city. 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.

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. Hence, it is recommended that the enhancement and mitigation measures for the identified potential positive and negative impacts respectively are properly implemented. The benefits of implementing these measures by far outweigh the costs to be incurred. Furthermore, saving life supports environmental resources and ecosystems from further pollution and deterioration would be of paramount importance.

1. INTRODUCTION

Safe sanitation is indispensable for human health through preventing infectious diseases, promoting, and sustaining physical, mental as well as social well-being. It is also an important component in ensuring environmental well-being too. Sanitation is also a building block of development (WHO, 2018). Nowadays, wastewater management and fecal sludge management (FSM) is a global concern including improved sanitary facilities (for example toilets), particularly in low-income countries which predominantly rely on on-site sanitation technologies. That's why, in poor and growing urban areas of those low-income countries like Ethiopia, poor WWM and FSM represents a growing challenge; generating significant negative public health and environmental risks.

Any fastest-growing cities in the world face poor or lack of management in the sanitation sector, which encourages them to take firm action to revamp sustainable development goals. Fecal Sludge Management (FSM) is a major thrust area in sanitation and has recently been adopted as one of the viable and affordable solutions to make cities clean and healthy. Fecal Sludge is a mixture of human excreta, which consists of water, organic and inorganic matter including nutrients, whereas FSM is a set of scientific practices that ensures safe collection, transportation, treatment, and disposal of onsite collected excreta without polluting the environment (Ronteltap et al 2004).

Waste management services delivery is a big challenge in Ethiopia's big towns and other secondary towns such as Asossa, Gambella, and Semera-Logia, especially within the urban areas. Lack of or poor wastewater management system, fecal sludge and shortage of public and communal toilets also cause management problems if the management infrastructure is not adequate. Industrial effluent and diffuse release from agricultural activities are other forms of pollution to the environment. In the growing complexity of problems, precautionary measures such as environmental and social impact assessment (ESIA) of projects to ensure adequate waste management can work out to be more effective. To effectively manage the aforementioned social and environmental challenges, the Government of Ethiopia (GoE) with the financial support from the World Bank has planned to implement citywide wastewater management and fecal sludge management and the construction of public and communal toilets.

1.1. Background

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 (CSA and ICF, 2017). One in three Ethiopian households has no toilet facility; defecate to bush/fields (39% in rural areas and 7% in urban areas) (CSA and ICF, 2017). Furthermore, according to the WHO (2014) estimates, diarrhea contributes to more than one in every ten child deaths in Ethiopia. The total population growth rate of Ethiopia is also 2.5% a year, with urban centers growing at a rate of 5.1% (Haddis et al., 2013). This situation triggers the construction of PCT and fecal sludge management facilities in selected four towns of Ethiopia. Poor sanitation has long been regarded as a constraint to the regional social-economic growth in the city of Gambella like as many parts of the nation or any community.

In Gambella, the local administration (the municipality and GWSSA) is responsible for safe management of wastes generated from industries, businesses as well as households and need to organize private operators with suction trucks to empty septic tanks and latrines. These need a serious of awareness raising activities to improve the local attitudes of users on willingness to pay, the private operator is called to service several sites at the same time. As there is no appropriate site for disposal of the fecal sludge waste, the fecal waste is dumped in the fields where there is no proper and modern fecal Sludge Management system.

The construction and operation of the proposed development will improve Gambella's sanitary facility problems including its fecal sludge and therefore reduce the spread of diseases and pollution of ground and surface waters (evidence shows that the water quality of Baro and Jejebe River is deteriorating). It also increases hygienic conditions which will bring both social and economic advantages to Gambella city and its surrounding environment. Furthermore, the successful implementation of the FSTP and additional PCT will improve the link between the rural-urban communities.

1.1.1. Project Benefits

The project will enhance the proper management of fecal sludge and hygienic conditions in Gambella city. In addition, the project will create some jobs during the construction and operation of the facility for local workers and the community.

During the field survey and site study, five categories of sanitation problems were observed, discussed with the local administration, and identified for further analysis. The Gambella sanitation facility problems are deep-rooted and accumulated for a long time. These problems are also studied during the feasibility study by SEURECA Veolia JV Seureca East Africa Ltd & GENCON consultant in December 2021. The key sanitation problems are briefly presented below.

Generally, the problems vary from kebele to kebele. These are the shortage of private, communal, and public toilets; lack of proper sewerage and fecal sludge management systems; and problems with emptying services. The practice of Open defecation (ODA) is quite common in those open areas within the town. Whereas mismanagement of solid waste is a serious problem in all over the town, particularly following the main roads, main business areas (such as market area) and bus stations.

Unavailability of fecal sludge disposal site: This is a key challenge for Gambella city to properly manage fecal sludge wastes. The problem is complex and needs an immediate response from all relevant stakeholders with the consultation of the local community. It is dumped in an open dumpsite. Currently, Gambella has neither an operational fecal sludge treatment plant nor a dedicated sludge disposal site. In addition, Gambella does not have a system of emptying the toilet wastes. The Gambella town does not have vacuum trucks to collect the fecal waste from the households/institutions and transport to the dumping site.

Gambella city currently has only one sludge truck (vacuum truck) for emptying and transportation of sludge that is privately owned. The truck services large establishments such as hotels and offices, and some households. Most residents cover and abandon the toilets after filling.

Wastewater treatment and No sewer line: Mostly, sewage water consists of grey water and black water. Grey water is the waste water from washing either from bathing, dishes or laundry. Black water is the waste water from toilets. It is characterized by debris such as paper wrappings, sanitary products, soap residues, and dirt due to the chemical composition of the various waste materials. Plus, sewage water has a foul smell. Therefore, the wastes are not properly collected and managed in Gambella city.

The concern is that due to overpopulation in urban areas without proper planning, it has resulted in sewage pollution, which poses a threat not only to the environment but also to human health. It also affects biodiversity, aquatic life, agriculture, and is a major contributor to eutrophication and an increase in Biological Oxygen Demand (BOD) for example in the nearby Baro and Jejebe rivers.

In order to address the above-mentioned sanitation problems of Gambella city, a feasibility study was conducted with a detailed design. The project under UWSSP-II is addressing these public challenges, to solve the ongoing wastewater treatment and sludge treatment challenges, PCT, and related obstacles in the first phase (2021-2026). Therefore, the proposed project implementation sites have been evaluated against the environmental and social criteria for its eligibility and suitability for the proposed facility construction. The assessment was aimed at the analysis of the potential project impacts on the social and natural environment during construction and operation and to establish the baseline for future monitoring.

1.1.2. The Rationale of the ESIA Study

The ESIA process helps an organization or developer to identify critical environmental and social issues associated with a project and ensure that positive impacts are optimized while negative impacts are mitigated or minimized. An effective ESIA process can improve local community understanding of a project, thereby increasing the sustainability of the project. It is most cost-effective to carry out an ESIA prior to site development, to identify and resolve issues at an early stage by appraising options for development, because of a large amount of capital funding involved in developing or altering a site. Environmental and social assessments are also useful for the operational phase to identify areas for improvement and thus avoid site closure as a result of non-compliance. Thus, the purpose of conducting this ESIA study was to facilitate an evaluation of potential social and environmental impacts and its mitigation associated with the proposed works and in harmony with relevant stakeholders.

The Environmental and Social Impact Assessment Proclamation No. 295 of 2002 provides direction for ESIA in the country bringing together stakeholders across different sectors. The proclamation through its EIA outlines the procedures to be followed in undertaking the ESIA study for a development project.

1.2. Objectives of the ESIA study

The main objectives of the ESIA study as stated in the Terms of Reference (ToR) is to assess, identify and mitigate the potential adverse and localized environmental and social impacts of Gambella sanitation projects. It is to ensure that the planned sanitation scheme is environmentally sustainable, socially acceptable and will not cause serious adverse environmental and social impacts.

The objective of the report is, therefore, to provide an initial Environmental and Social Impact Assessment to identify important environmental and socio-economic issues arising from the proposed works, especially

during the construction and operation phases of the proposed FSTP and to prepare a corresponding Environmental & Social Management Plan. The specific objectives of the ESIA are to:

- Identify key environmental and social issues related to the proposed project, their impacts, and mitigation if negative.
- Generate baseline information of the biophysical, socio-economic and cultural attributes of the project area
- Compile an Environmental and Social Management Plan comprising environmental and social management measures as well as mechanisms for their implementation and its compliance monitoring in order to minimize the project's negative impacts and enhance the positive aspects.
- Anticipate, avoid, minimize or offset the adverse significant biophysical, social and relevant effects of the subproject activities.
- Enable information exchange, notification, and consultations between stakeholders.
- Propose effective Grievance Redress Mechanism (GRM) considering the nature of the project.

1.3. Scope of the ESIA

This ESIA was conducted in Gambella city of Ethiopia on the FSTP subproject developments. The assessment referred to the rules and standards stipulated by the government of Ethiopia's ESIA (EIA) guidelines, directives, legislation, and World Bank safeguards policies and legislations as deemed necessary.

In accordance with the ESIA ToR, the consulting team conducted a series of reviewing of relevant policies, legislation, and relevant document including a feasibility study on the proposed project activities and its technologies, collecting, verifying, and constituting environmental and social safeguards and compliances, grievance redress approaches and protocols in line with the ESIA. A conventional and contemporary collection, coding, and analysis of all generated data were employed during the analysis and evaluation of the ESIA. The scope of this report is limited to outlining the overall activities in terms of how, what, when, and who of the ESIA study should be conducted of the assessment in the selected sub-project sites. During the ESIA assessment, analysis, and presentation the following major aspects of the intended project were carefully examined:

- Outline the national policies, legislation, and administrative framework within which the environmental management of the proposed works will be carried out;
- Describe and evaluate the present baseline data and the relevant environmental characteristics of the area proposed for the development of the work;
- Identify, analyze and assess potential environmental and social impacts that will result from the proposed works, based on the proposed design;
- Stakeholder analysis, responsibility description, and assignment;
- Propose cost-effective mitigation measures for minimizing or eliminating adverse social and environmental impacts of the proposed works, including recommendations on design/technology changes if deemed necessary;
- Propose modalities and arrangements for collection of stakeholders' views ensuring participation of key public and community representatives;
- Prepare an environmental and social management plan for implementing the mitigation measures and recommend institutional administrative and management frameworks.
- Descriptions of the monitoring plan and developing monitoring strategy were specified; and

- Estimation of cost for proposed mitigation measures formulated.

1.4. Team in charge of the ESIA

The ESIA process comprised more than eight senior professionals with a range of backgrounds and a wealth of relevant experience. They all have a second degree or higher (MSC, MA, or PhD), and they have a combined experience of more than 15 years in environmental studies (ESIA, ESMP, Resettlement Action Plan (RAP), and EA) in general and in their particular fields of specialization in particular. Additionally, they are well-equipped to plan community and stakeholder consultations and discussions, conduct qualitative and quantitative data collecting, and analyze both qualitative and quantitative data. Appendix 8 presents the qualifications, experiences, and positions of the assigned staff.

2. METHODOLOGY OF THE ESIA STUDY

2.1. Approach

The overall approach used to carry out the ESIA study is based on the Ethiopian ESIA Guideline. Relevant studies, policies and guidelines were reviewed. Primary data was collected through field observation and beneficiary consultation. A field survey of the project sites of FSTP were conducted and potential environmental impacts of the expected project activities were identified, assessed and documented. Consultations were also conducted with key stakeholders and local community representatives pertaining to socio-economic and environmental matters. Obtaining experts' opinions and learning from previous experiences were also among other study approaches used.

2.2. Methodology

This ESIA study is based on the review of relevant previous studies, primary data collected through a comprehensive field survey in the project area, and consultations with project-affected communities, Woreda and Kebele administrators, key stakeholders, and relevant experts. Secondary data was gathered from various offices at regional and Woreda levels, as well as feasibility and design study reports. The detailed methodologies followed are explained briefly below.

The methodology used in this assessment is corresponding 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 (feasibility study), 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 (e. g. on air quality, soil, groundwater quality, and vegetation). Other methodologies used in this assessment include literature reviews, consultative meetings with respective offices including the Regional Office (EPA, Culture and Tourism, Health, Agriculture, women and children affairs, education, etc.), Woreda officials and village members and their respective leaders, and visual observations through familiarization visits in the project areas. To this effect, the steps adopted to prepare this ESIA study cover the following:

- Deskwork reviews and analyses,
- Fieldworks and
- Stakeholders' consultations

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

- To consult key stakeholders to gather their concerns about proposed improvement works and in particular how the surrounding communities will be affected by the project;
- To carry out additional information or data to supplement ESIA;
- To establish environmental conditions about in the proposed sites for proposed works;
- To assess the status of ecological and social receptors;
- To describe the project characteristics and affected environment of the improvement works;
- To assess and evaluate the potential environmental impacts resulting from the proposed sub-projects, especially within the zones of project influence;
- To identify mitigation measures for serious impacts; and
- To 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 environmental protection matters in general and the expected environmental impacts of the proposed development in particular. In addition, available documents on the previous studies of the proposed project, baseline of the social and environmental conditions of the project influence area, and other relevant data were collated and reviewed to obtain important data/ information for the project description. The feasibility study and design of the proposed project activities were reviewed to understand the method of delivering the project. The list of the documents reviewed is provided in the list of references.

2.2.2. Screening

Prior to the ESIA exercise, the Town WSSA had conducted environmental and social screening. Accordingly, the sub project is put under category B and require a lesser level of environmental investigations.

2.2.3. Scoping

The consulting team conducted scoping for the subprojects through following key actions

- identifying key environmental and socio-economic issues;
- physical inspection of the site and surrounding areas;
- Identifying possible environmental and socio-economic impacts through public participation and stakeholder consultation.
- Impact prediction and ratings,

Summary of scoping is presented in appendix 13

2.2.4. Field 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 at 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.

2.2.5. Stakeholders Consultations

Local communities, concerned officials, and professionals (social and environmental experts) at the region, Woreda, and city levels were contacted and consulted during the ESIA field survey. The information on the current waste management system concentrates on the limitations, the 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 socio-environmental impact analysis has taken these facts and viewpoints into account. The appendices of the document contain the minutes of the consultations held with the Woreda administration and the local people who live near the planned FSTP site. The meeting's minutes, which are included in Appendix 1, were written in the Amharic language.

The consultation process at the design stage is an initial consultation. More consultation is envisaged during the project's implementation and operation phases since the Government of Ethiopia and World Bank through the local administration encourages community discussions during the implementation of development projects.

The stakeholders for the proposed project were categorized as follows:

1. Regional level stakeholders - relevant policy and project implementers,
2. Authorities of Gambella city administration,
3. Authorities of Woreda and Kebeles administration ((upstream-downstream communities),
4. Local communities in the project implementation sites/Kebeles/villages,
5. Engineering team of the consultant

2.2.5.1. **Identification of interested parties**

Both, federal legislation and regulations and the WB Sustainability Guideline clearly state that public and stakeholder engagement is mandatory to give the opportunity to the public, stakeholders, and surrounding community to express their opinion in the project and gain knowledge about the project. This may also lead to altering or modifying the project design, location, etc. to consider the community needs and concerns.

To make sure that all concerned parties are involved in a public and community consultation process, meetings were organized by the consultant in collaboration with the project client (GWSSA). The outcomes and findings of the public consultation and community meetings were integrated into the Environmental & Social Management Plan; the meeting protocol was added as an appendix to this ESIA report.

As an initial step towards preparing a Stakeholder Engagement Plan (SEP), the Consultant has analyzed the relevant stakeholders to the project, who are considered to be affected or affect the project activities. The SEP shall be implemented during the construction and operation phases of the project, where the Contractor and Operator are responsible for ensuring its proper implementation. Moreover, a Grievance Mechanism (GRM) shall be put in place to allow the below-mentioned stakeholders in communicating their concerns regarding any project activity.

Table 1: List of concerned stakeholders

Group of Stakeholders	Stakeholders	Level of involvement
Local Residents	✓ Residents located near the FSTP facility to be constructed	Directly affected
Property-owner and landowners	✓ Individuals, legal entities, local administration holding land title documents ✓ Tenants or occupiers without formal rights	Directly affected
Public facility	✓ Educational facilities (none-existence) ✓ Religious entities (mosques/churches) ✓ Medical facilities (hospitals, clinics, medical centers) ✓ Utilities (electricity, water supply, road, telecommunication facility and others)	Indirectly affected
Business and Service Providers	✓ Shops, markets, supermarkets ✓ Petrol stations, car wash & service, others ✓ Restaurants ✓ Financial services (banks) (are not at a close distance)	Indirectly affected
Administrative Bodies and Authorities	✓ National and Regional Authorities ✓ Ministry of Water and Energy and regional bureaus ✓ Environmental Protection Authority and regional authority/bureau ✓ Gambella Water Supply and Sanitation Authority ✓ Regional authorities/bureaus ✓ Local authorities (district and Kebele administration) ✓ Gambella city administration	Indirectly affected, but may have influence over the implementation of the project
International donors	✓ World Bank	Indirectly affected, but may have influence over the implementation of the project
Bodies involved in Project implementation	✓ Construction contractor(s) (management, staff) ✓ Sub-contractor(s) ✓ Supervision contractor (the Engineer) ✓ Suppliers	Directly affected, but may have influence over the implementation of the project
Non-governmental Organizations (NGOs) and Community Based Organizations (CBOs)	✓ Specialized environmental and social organizations, NGOs-engaged in WaSH activities ✓ Experts on a national and international level	Indirectly affecting/affected
Community-based Organization engaged in waste management/ emptying/ handling transporting CBOs	✓ Specialized waste management at the local level ✓ Community based organization involved waste collection	Indirectly affected and/or has impacts on project success

2.2.5.2. Consultation Methods

Consultations were undertaken with community members and government officials at Kebele and Woreda levels to obtain the opinions and attitudes towards the proposed FSTP subprojects for Gambella city. Besides, different governmental offices (offices involved in environmental protection and safeguards) in Gambella town and its neighboring Kebeles were consulted to collect information and to share their feelings about the implementation of the proposed projects.

The consultation took place in collaboration with and facilitated by both the Woreda local authorities. The consultation participants were selected giving emphasis on their social status and representative views. Community elders also participated in the discussions. The discussions and inquiries made use of an open-ended checklist, as described below.

- Attitudes towards the project,
- Expected benefits from the project,
- Possible adverse impacts of the project and their mitigation measures to manage/ameliorate the negative impacts, and
- Participation and cooperation from the people to support the implementation of the proposed projects.

Figure 1: Opening meeting with GWSSA project staff (Gambella)

Figure 2: First meeting with key city administration stakeholders Gambella

Figure 3: Community consultation meeting in Gambella (Kebele 02 Ominga)

2.2.6. Use of Relevant Data Generated by other Disciplines

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

2.2.7. Identification and Analysis of Environmental and Social Impacts

Following the evaluation of the baseline conditions and analysis of stockholders' opinions, environmental impacts likely to result from the proposed waste management project were identified and their significance was evaluated. Impact significance was assessed quantitatively/qualitatively based on the magnitude of the impact, relative importance/ value of the affected environmental component, intensity and duration of the impact, and reversibility of the impact.

After the identification of potential impacts and evaluation of their significance, appropriate mitigation measures that can prevent, reduce, or offset the negative impacts to acceptable levels were identified and recommended. Finally, an ESMP that comprises the outline of significant environmental impacts and their corresponding mitigation measures and the responsible bodies for implementation and monitoring was prepared.

3. POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

The implementation of the FSTP subprojects have the potential to cause environmental and/or social impacts that shall be addressed in accordance with relevant Ethiopian legislations as well as the requirements of the World Bank Environmental and Social safeguards and standards. The sections below provide more details on the applicable legislative framework for the ESIA.

3.1. Relevant National Policies and Strategies

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

3.1.1. Constitution of the Federal Democratic Republic of Ethiopia

In consideration of the Constitution of Ethiopia of 1995, as amended to date, articles 44 states that every citizen is entitled to a healthy and satisfying environment, and that every person has the duty to protect and safeguard the environment.

To address the environmental concerns to be generated under the clean environment, Article 92 of the Ethiopian constitution further requires that any waste, especially from households and industries and any other dangerous waste, shall be collected, treated, and managed in a manner that does not degrade the environment to prevent, eliminate or reduce their adverse effects on human health, natural resources, flora and fauna and on the nature of the environment.

The Ethiopian Constitution also recognizes ownership of property and every person's right to private property (Article 40). The Constitution also provides that a law should be in place to specify modalities for the acquisition, transfer, and use of land. Thus, proclamation No: Proclamation 1161/2019 and regulation No 472/2020 relating to expropriation and compensation in the public interest, and which defines expropriation in the public interest as, 'an act based on the power of government, public institutions and local administrative entities with legal personality to remove a person from his/her property in the public interest after fair compensation. Further, 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'. These provisions will be applicable in the case of Project Affected Persons (PAPs) under this project and will to the extent possible be applied in consideration of the World Bank's requirement for full replacement costs for assets and property lost in the case of Bank-financed operations in line with Operational Safeguard 2 of the Banks Integrated Safeguards System. The constitution also states different treaties ratified by the Government of Ethiopia are parts of the Ethiopian legal system.

3.1.2. Policies

3.1.2.1. Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia (EPE) was approved by the Council of Ministers in April 1997. Its conceptual framework was based on the findings and recommendations of the National Conservation Strategy of Ethiopia (CSE). This policy document, along with CSE was developed with the assistance from

the International Union for the Conservation of Nature. EPE includes 9 policy objectives, 19 guiding principles, 10 sectoral policies (one of which is on Water Resources) and 10 cross-sectoral policies (one of which is on community participation and another on EIAs).

The goal of the Environmental Policy of Ethiopia is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. For the effective implementation of the Environmental Policy of Ethiopia, the policy encourages the creation of an organizational and institutional framework from Federal to community levels. The Environmental Policy of Ethiopia provides a number of guiding principles that require adherence to principles of sustainable development; in particular, the need to ensure that ESIA's:

a) Consider impacts on human and natural environments;
b) Provide for early consideration of environmental impacts in projects and projects design;
c) Recognize public consultation;
d) Include mitigation and contingency plans;
e) Provide for auditing and monitoring; and
f) Is a legally binding requirement.

3.1.2.2. Water Resources Management Policy

The overall goal of the policy is to enhance and promote all national efforts toward the efficient, equitable and optimum utilization of the available Water Resources of Ethiopia for significant socioeconomic development in a sustainable manner. The policy aims to ensure access to water for everyone fairly and in a sustainable manner, protect water resources and sources, and promote cooperation for the management.

The specific objectives of the policy include:

- Promote the development of the water resources of the country for the economic and social welfare of the people, on an equitable and sustainable basis;
- Allocate and apportion the water, based on comprehensive and integrated plans and optimum allocation principles that incorporate the efficiency of use, equity of access, and sustainability of resources;
- Manage and combat drought as well as other drought associated impacts, and disasters through efficient allocation, redistribution, transfer, storage, and efficient use of water resources; and
- Conserve, protect and enhance water resources and the overall aquatic environment.

The project proponent (GWSSE) is required to acquaint itself with the project management requirements and ensure appropriate monitoring based on the wastewater management and water management strategies of the country and the regional government requirements. The GWSSE should allocate sufficient resources including facilities and expertise on fecal waste management requirements to prevent further water pollution due to the waste management process including the proposed subprojects in the Gambella town.

3.1.2.3. National Health Policy

Ethiopia's health policy 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 priority areas of the policy are in the field of Information Education and Communication (IEC) of health to create awareness and behavioral change of the society towards health issues, emphasis on the control of communicable disease, epidemics, and on diseases that are related to malnutrition and poor living condition, promotion of occupational health and safety, the development of environmental health, rehabilitation of health infrastructures, appropriate health service management system, attention to traditional medicines, carrying out applied health research, provision of essential medicines, and expansion of frontline and middle level health professionals.

The Government in its Growth and Transformation Plan has reaffirmed its commitment to accelerate progress on maternal and child health and to reduce child and maternal mortality rates by expanding the provision of essential health and nutrition services to the poor.

To translate the health policy into action the Ministry of Health has developed every five years a Health Sector Development Program (HSDP). Currently it is implementing HSDP IV. HSDP lays an emphasis on service delivery and the quality of service, health facility rehabilitation and expansion, human resource development, pharmaceutical services; Information, Education and Communication (IEC), strengthening health sector management and management information system, monitoring, evaluation and research.

3.1.2.4. National Policy on Women

The National Policy on women was issued in March 1993 emphasizing that all economic and social programs and activities should ensure equal access for both men and women to the country's resources and in the decision-making process so that women can benefit equally from all activities carried out by the Federal and Regional Institutions. Among the main policy objectives is that laws, regulations, systems, policies and development plans that are issued by the government should ensure the equality of men and women and that special emphasis should be given to the participation of rural women.

Consistent with the above policy, Article 25 of the constitution guarantees all people's equality before the law, and prohibits any discrimination on grounds of gender. In addition, Article 35 reiterates principles of equality of access to economic opportunities, including the right of equality in employment and land ownership. The democratization process, the new constitution, the women's policy and the institutional set up have created a conducive atmosphere for the promotion and the advancement of women and the implementation of the plan of action. Accordingly, the proposed subprojects in Gambella town shall consider the equal economic opportunities while creating jobs and land acquisition process at various project implementations phases.

3.1.2.5. National Policy on HIV/AIDS

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 with the community. In addition, all the workers and contractors working in the proposed sub projects shall be treated fairly in accordance with the policy.

3.1.3. Strategies and Programs

3.1.3.1. Climate Resilient Green Economy Strategy

Ethiopia is experiencing the effects of climate change. Some studies indicate that by 2050 the temperature of the country could increase in the range of 1.7 to 2.1 degree Celsius unless appropriate mitigation measures are taken. This incidence would aggravate food insecurity, spread transmitted diseases in the form of epidemic, and cause degradation of land resources and destruction of infrastructures. Besides the direct effects such as an increase in average temperature or a change in rainfall patterns, climate change also presents the necessity and opportunity to switch to a new, sustainable development model. The Government of the Federal Democratic Republic of Ethiopia therefore issued the Climate-Resilient Green Economy strategy in 2011 to protect the country from the adverse effects of climate change and to build a green economy that will help to realize its ambition of reaching middle income status before 2025. In the long term, if climate change is not tackled, growth itself will be at risk.

Ethiopia is currently in a very strong position of having very low emissions per capita, huge renewable heat and electricity resources and the opportunity to address climate risks in the short term that result from outdated fossil fuel technology and seek clean and renewable alternatives. The Government has recognized this and plays a leading role in driving the climate resilient green economy agenda.

Target of the Plan: The Green Economy (GE) Strategy sets out the plans for developing a low carbon economy in Ethiopia. Detailed analysis showed that GHG emissions in Ethiopia would rise from 150 MtCO2e per year in 2010 to 400 MtCO2e in 2030 under a conventional development path („business as usual"). The GE Strategy identified and prioritized more than 60 initiatives, which together enabled the country to achieve the envisaged development goals while limiting GHG emissions in 2030 to 2010"s levels. These initiatives would save 250 MtCO2e per year.

Pillars of the Plan: The green economy plan is based on four pillars:

1. Improving crop and livestock production practices for higher food security and farmer income while reducing emissions;
2. Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks;
3. Expanding electricity generation from renewable sources of energy for domestic and regional markets; and
4. Leapfrogging to modern and energy-efficient technologies in transport, industrial sectors, and buildings.

The agriculture sector (including livestock farming, crop cultivation and forestry activities) in 2010 was the highest contributor to emissions, amounting to about 88% of total greenhouse gases (GHG) emissions. The sector presents the highest abatement potential for GHG emissions reduction; hence was identified as a

priority area that needs to be developed resiliently. The other sectors including Transport, Energy, Industry and Buildings each accounted for 3% of GHG emissions in 2010.

In 2010, the transport sector produced 5 MtCO2e representing 3% of total GHG emissions. Emissions from the transport are projected to reach 70 MtCO2e by 2030 under the business-as usual scenario. To reduce emissions from the sector, Ethiopia intends to expand its investments in improved transport systems such as rail transport that depends on clean and renewable energy sources; this measure is expected to contribute to a reduction of 10 MtCO2e emissions by 2030 (14% reduction to BAU). In addition, the country is making efforts to remove subsidies on fossil fuels thereby discouraging excessive consumption of fossil fuel in the transport sector. Ethiopia also plans to implement urban planning that prioritizes accessibility; hence minimizing emissions from motorized transport.

In the energy sector, the Ethiopian government commits to promoting the use of modern energy sources (such as Liquefied Petroleum Gas and electricity) for cooking; and reducing emissions from electricity generation by cutting down on fossil fuel usage and resorting to more renewable sources such as hydroelectric, geothermal, wind and solar sources.

3.1.3.2. Climate Resilience Strategy for Water and Energy

The Climate Resilience strategy sets out the implementation priorities for the Ministry of Water, Irrigation and Energy, building on the Green Economy Strategy. Climate resilience is the ability to cope with, and manage the change brought by weather stresses and shocks. A climate resilient economy is one in which the negative impacts of climatic variability and climate change are minimized and the opportunities realized so that the national growth and development objectives of the country are achieved and sustained. In light of this and given the key role of water and energy in the GTP, the Climate Resilience Strategy for Water and Energy has three objectives:

- Identify the economic and social impacts of current climate variability and future climate change on water and energy in Ethiopia (The Challenge).
- Identify priorities for the water and energy sectors to build climate resilience and reduce the impact of current climate variability and climate change (The Response).
- Map the necessary steps to finance and implement measures in the water and energy sectors to build climate resilience in Ethiopia (Implementation) and deliver an integrated Climate Resilient Green Economy.

The main sectors for which the climate resilience strategies concentrated are Power generation (Energy), irrigated agriculture and access to WASH.

When it comes to Access to Water, Sanitation and Hygiene, Ethiopia has the ambition of achieving universal access to water and sanitation as a central part of its poverty reduction ambitions. To this end, a sector wide approach has been developed under One WASH National Program through the Sanitation and Water for All Partnership. Based on the climate planning assumptions, there are three potential impacts on water:

- Reductions in seasonal rainfall reduce surface water flow and long-term reductions in rainfall can reduce groundwater levels.

- However, an increase in the intensity of rainfall can also increase groundwater recharge. Recent studies have shown that rainfall intensity is a much better indicator of groundwater recharge than overall rainfall.
- Temperature rises increase water needs and thermal stress. Increasing temperature also increases evaporation and transpiration, which reduces the amount of water available for productive use. The impacts of climate on sanitation and hygiene are less well understood at this stage, and have not been assessed.

The strategy emphasizes that access to WaSH is the best way of increasing climate resilience as it shifts people from vulnerable surface water sources to more resilient sources such as groundwater. Delivering universal access to WASH through the One WASH National Program is therefore a critical element of climate resilience. The strategies also provide guidance to climate resilience sanitation infrastructure development.

3.1.3.3. Health National Adaptation Plan to Climate Change

This document deals with the national climate adaptation strategies to mitigate the projected adverse effects of climate change and variability in the Ethiopian health sector. The plan outlines key areas of intervention, alongside the implementation strategy, to support realization of the overall goal of a climate resilient national healthcare sector.

3.1.3.4. Climate Change Resilience Water Safety Plan (CR-WSP) Strategic Framework

This framework provides the strategic blueprint to develop a climate orientated risk assessment and management approach for drinking-water supplies, from catchment to consumer. Considered global best practice, WHO advocates for the WSP approach as the most consistent means to ensure the safe and reliable supply of safe drinking-water. Adapted to the Ethiopian context, this strategic framework outlines a roadmap for the national scale-up of climate resilient WSPs.

3.1.3.5. Urban Wastewater Management Strategy

This strategy was issued by MoWIE in 2017. The purpose of this strategy is to provide a common understanding of the strategic vision to guide wastewater management partners towards an effective and coordinated response through prioritized interventions and targeted programs, whilst encouraging efficient and sustainable use of resources. The objectives of the strategy are geared with the development of strong wastewater management institutions, master plan preparation, implementation methods, protecting the environment from wastewater discharge, social and cultural sustainability, wastewater collection and treatment, wastewater collection transportation and treatment and reuse of treated effluent and sludge. The strategy has the following goals: -

- Develop strong wastewater management institutions at major towns and cities in regions;
- Prepare a national Waste Water Management System (WWMS) plan and management structure aligned with sustainable development goal (SDG 2016-2030) for provision of appropriate wastewater services;
- Protect the public from the potential harmful effects of wastewater through provision of a centralized, decentralized and onsite Urban Waste Water Management (UWWM) system as appropriate under population category of cities and town;

- Coordinate the national UWWM plan in protecting and maintaining safer environment by minimizing adverse environmental effects from wastewater discharge to the natural resources;
- Support cities and town utilities to work with the communities to provide social and cultural sustainability
- Develop sustainable management structure for wastewater collection, transportation and treatment actions.

Goals are identified in specific, measurable statements of what will be done to achieve the objectives within a particular time frame. In addition, under the strategy, set strategic actions include developing strong wastewater management institutions at all levels, sanitation master plan preparation, implementation of centralized, decentralized and onsite management systems, protecting the environment from wastewater discharge, social and cultural sustainability, wastewater collection transportation and treatment and reuse of treated effluent and sludge.

3.1.3.6. The Second Urban Water Supply and Sanitation Program (UWSSP), 2017 to 2022

UWSSP is a continuation and expansion of the World Bank long term engagement in the urban water supply and sanitation sector and supports the efforts of the government of Ethiopia to improve sanitation services in the urban areas. The basic implementation principles of this program are formulated in accordance with the One WASH National Program including: -

- Integrated city-wide approach to sanitation improvement with mix of service options to accommodate diverse needs in different settlement types: This principle aims to ensure a citywide approach, whereby all the residents of the town irrespective of their cultural and socioeconomic background and location are provided an affordable and appropriate mixed technology option. Mixed options approach provides a practical instrument to pick interventions according to specific contexts and capacities. This approach demands a city-wide sanitation improvement to integrate conventional and non-conventional systems used by different service providers to manage waste holistically. A holistic approach demands strategic technical engagement to manage waste using the different options and technologies starting from the point of waste generation up to its final disposal or reuse;
- A stepped approach to give opportunity for towns to create enabling environment prior to pursuing sanitation infrastructure investment: This principle will also create a sense of competition amongst the implementing units to perform timely while at the same time guaranteeing that the investments will bring the intended outcome and impact;
- Developing a suite of services in every city to collect, transport, treat and dispose/reuse liquid wastes: This principle recognizes the need to provide funds for the development of infrastructure for entire the sanitation service chain: collection, transportation, treatment and disposal/reuse. This principle will address the existing gaps in practices in the urban waste water management; Promotion of public awareness and enhanced social engagement to recognize the need to create public awareness and knowledge amongst the society about the health benefits from proper handling of waste. Public awareness will enable them better understand their role and responsibilities in the sanitation chain and make informed decisions about their sanitation technology choice;
- High emphasis on improving efficiency of utilities, as it is not enough to focus on the supply aspect of the infrastructure but also on efficient use of available resources and water supply and waste water management systems at the utility level to achieve the desired results;

- Encourage and facilitate the involvement of the private sector through engaging them in the implementation of the project for provision of services, supply of goods and construction of work.

3.1.3.7. Integrated Urban Sanitation and Hygiene Strategy

The strategy was issued by the Ministry of Health (MoH) in 2016. The goal of the strategy is to mitigate the negative impacts of poor urban sanitation and hygiene on health, environment, society, education and the economy by promoting full sanitation and hygiene systems. The basic premise for the MoH to formulate this strategy were the issues around urban sanitation and hygiene which are complicated due to cross sectoral interventions and differences between towns. The implementation of the strategy will expect to have a positive impact upon the economy of the country, natural environment, health and wellbeing of all urban dwellers, including the most vulnerable ones. The strategy encourages all sanitation related interventions to be based on city and town development plans, taking advantage of economies of scale, sharing of best practices within the country, and involvement of the private sector and Community Based Enterprises (CBEs).

The strategic objectives of the strategy are to:

- To bring sustained behavioral change for better hygienic practices, installation of facilities and delivery and uptake of sanitation services by 2020.
- To ensure open defecation free cities and towns by 2020 from the current average of 6% to zero percent open defecation.
- To ensure that 100% of urban households in any given town or city have access to improved latrines or toilets by 2020.
- To increase the fecal sludge management systems capable of safely removing, treating and recycling fecal matter to 70% coverage by 2025 (interim targets of 30% by 2020).
- To install 1,000 decentralized wastewater treatment systems capable of treating liquid and fecal matter to a standard that can be directly and safely used in the immediate environment or following further conditioning in localized facilities by 2025 (interim target of 200 by 2020).
- To Reduce, Recycle or Reuse 50% of all solid waste generated in medium and large towns and cities by 2025 (interim target of 20% by 2020).
- To dispose of 100% of the remaining solid waste in controlled tipping and sanitary landfill sites that fully comply with 2014 Guidelines by 2030 (interim target of 50% by 2020).
- To ensure safe disposal of 100% health care waste from all health care facilities by 2025 (interim target of 95% by 2020).
- To enforce safe treatment, reuse or disposal of industrial liquid and solid wastes to ensure ecosystem, agricultural and human protection from all industries by 2035 (interim target of 30% of all industries by 2020).
- To strengthen sector performance through formation of a „‟coordination body” that will be managed and financed so as to direct capacity building efforts towards participating individual or clustered municipalities, utilities and contractors. Such a coordination body to be fully established by 2020 (interim coordination mechanism 2016).
- To leverage and increase effective utilization of resources for accelerated and cost-effective implementation of the IUSHSAP.
- To establish an effective and reliable monitoring system and sanitation database by 2020.

3.1.3.8. 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, 2005) and the national water sector strategy (developed by the Ministry of Water Resources) in placing greater emphasis on „on-site" hygiene and sanitation. The primary focus is on blocking feces from entering the living environment through the safe management of feces, hand washing at critical times and the safe water chain from source to mouth. It places responsibility for improving „on-site" household hygiene and sanitation firmly in the hands of the household with the direct support of the health extension worker and other resources at community level.

The strategy is harmonized with the Health Sector Development Program which places a strong focus on high impact, broad reach, and public health interventions. The strategy has a set of guiding principles for interpretation at the different levels of administration. It is designed to serve a number of purposes. These include to foster convergence among stakeholders and provide a working tool for advocacy Provide a dynamic framework for planning, implementation and monitoring.

Understanding the appropriate technical options people want, can afford and will use is a central pillar of the strategy. The construction of appropriate demonstration facilities at schools, health centers and markets present one opportunity for testing technologies. Promotion will be a central theme and the success of promotional methods and messages (based on understanding and research into behaviors) could be measured in terms of: Increased knowledge and understanding of the linkage between improved sanitation and hygiene and health leading to: Behavioral transformation - improved personal and food hygiene, sanitary excreta management practices with particular emphasis on young children A willingness to pay for some form of sanitation and hygiene improvement with a minimum of capital subsidies (except in special circumstances).

Such changes would be motivated by informed decisions, wider social change, peer pressure and a developing sense of national sanitation and hygiene awareness.

The overall objective of the strategy is progressive individual and collective behavior change which leads to 100% sanitized households within 100% sanitized communities, woredas, regions and zones, and ultimately within a 100% sanitized Ethiopia. Thus, the consultant assumes that the current subprojects will contribute to the national hygiene and sanitation strategies.

3.1.3.9. WASH Implementation Framework

The WaSH Implementation Framework (WIF), prepared to achieve the targets of the Growth & Transformation Plan, represents the collective efforts of the Ethiopian WaSH sector and acts as the guiding document for all WaSH implementation in Ethiopia. The WaSH Implementation Framework (WIF) provides the framework and guidelines for implementing the National WaSH Program based on Growth Transformation Plan (GTP) and WaSH Universal Access Plan (UAP) – undertaken by rural and urban communities throughout Ethiopia and supported and facilitated by governmental agencies, civil society organizations, the private sector and Development Partners. The WIF aims to create an integrated One WaSH Program, led by the government of Ethiopia, to ensure that the targets, set out in the Growth and Transformation Plan (GTP), are achieved. The programming and financial input of all WaSH stakeholders is

harmonized, and ultimately channeled through a single Consolidated WaSH account (CWA), in effect ending separate and disparate Development Partners financed projects. The National WaSH Program is based on the Memorandum of Understanding (MoU) signed by the Federal Ministries of Water & Energy, Health, Education and Finance & Economic Development. Four of the significant features of the WaSH program as per this Framework are Integration; Alignment; and Harmonization and Partnership.

On Integration, the WaSH program encompasses water supply, sanitation & hygiene and WaSH in schools and health facilities (Institutional WaSH) in a single program, aimed at integrating safe water use with good sanitation and hygiene practices at the community level. The structural arrangements recommended for WaSH are designed to build synergy among the sectors through coordinated and collaborative planning, implementation, monitoring, reporting and evaluation of program results. While there are certain mandatory structures, regions are free to design their own structures as long as these are capable of integrated planning, implementation, monitoring and reporting. Mandatory structures are: federal WaSH structures; and Woreda WaSH Team (WWT).

To harmonize, one of the major aims is to move away from discrete WaSH projects, with the attendant disadvantages in terms of planning, skill and resource allocation, towards a fully programmatic approach. Ideally, this would lead to: one WaSH Plan, one WaSH Budget, one WaSH Report; implying a one WaSH Program. One consolidated WaSH account has been established into which all Development Partners" contributions are deposited and from which WaSH activities and investments are supported. On Alignment, major Development Partners and the government have agreed that the WaSH program will be using the country system and the program will be aligned with:

- Policies, priorities and strategies of the pertinent Ministries as outlined in their respective Sector Development Plans
- Administrative systems, standards and procedures of the Federal and Regional Governments of Ethiopia

For Partnership, it is an evolving feature in terms of scope and level of commitment. The scope has been enlarged to include the four Ministries and the commitment has been increased to engage with Civil Society Organizations (CSOs) and the Private Sector as significant partners. This entails the GWSSE to commit itself towards achievement of the national WaSH strategies through the implementation of the proposed subprojects in Gambella town.

3.1.4. Environmental and Social Legislations/Proclamations

3.1.4.1. Proclamation on Establishment of Environmental Protection Organs

The objective of this Proclamation (No. 295/2002) is to assign responsibilities to separate one organization for environmental development and management activities on 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. It also empowers every competent agency to establish or designate an environmental unit (Sectoral Environmental Unit) that shall be responsible for coordination and follow-up so that the activities of the competent agency are in harmony with this Proclamation and with other environmental protection requirements. 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.

As per the Proclamation No. 295/2002, each Regional State shall establish an independent regional environmental agency or designate an existing agency 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 agencies 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 environmental agencies shall prepare reports on the respective state of the environment and sustainable development of their respective states and submit them to the EPA.

For Gambella, the Environmental Protection Authority is responsible for environmental protection matters in the Region. The Authority is responsible for the review and approval of ESIA of development proposals under the mandate of the Regional Government and for the follow-up of the implementation of ESIA recommendations of such proposals. Therefore, project proponents in the Region should operate in close cooperation with the Authority to ensure that the adverse environmental effects of sanitary facility development proposals are properly identified, and their mitigation or management actions incorporated in the project design or planning and implemented at the right time. Like the federal level, an Environmental Impact Study Report should be prepared by the project proponents and examined, commented and approved by the Authority.

3.1.4.2. Environmental Impact Assessment Proclamation: General EIA Guidelines 299/2002

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 infrastructures activities likely to negatively impact the environment.

As the project must be undertaken in accordance with requirements and guidelines for the environmental impact assessment process in Ethiopia, the project shall be submitted to EPA for review and approval before implementation. Subsequently, an EPA certificate will be issued to the project. The ESIA process included consultations with relevant agencies and stakeholders, including project beneficiaries, staff of EPA,

the Water Supply and Sanitation Authority, Environmental Committees at all local government levels in the project beneficiary towns as well as in Gambella city, lead agencies, experts from different institutions, NGOs, and the public in general.

The aim of this Proclamation (Proc. No. 299/2002) is to make 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 Proclamation elaborates on considerations with respect to the assessment of positive and negative impacts and states that the impact of a project shall be assessed because of the size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans-regional context, duration, reversibility or irreversibility or other related effects of a project. Categories of projects that will require full EIA, not full EIA or no EIA are provided (Schedule I, II and III). To implement the requirements of this Proclamation, the EPA has issued a Procedural and Technical EIA Guidelines, which provide details of the EIA process and its requirements.

According to the EPA Guideline, proposed projects are assessed and classified as one of the following schedules:

- **Schedule 1:** Projects which may have adverse and significant environmental impacts, and may, therefore, require full EIA;
- **Schedule 2:** Projects whose; type, scale, or other relevant characteristics have the potential to cause some significant environmental impacts but are not likely to warrant a full EIA study.
- **Schedule 3:** Projects that have negligible direct environmental impacts hence do not require environmental impact assessment.

Therefore, the current project activities fall under schedule II that can cause some significant social and environmental impacts but are not likely to warrant a full EIA study.

Like other projects, this project has to be initiated by ESIA to have minimal environmental damage. As a result of this, the subproject will have strong legal standing; a wider global market will be insured; the proponent will have an insight for the pros and cons of the project plus the impacts on the environment by the upcoming subprojects/ project activities. Hence, the project proponent should be committed to abide by the ESIA procedural guideline to achieve the above-mentioned benefits and objectives.

3.1.4.3. Proclamation on Environmental Pollution Control

This Proclamation, Proc. No. 300/2002, is mainly based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment of the Country. Its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed and to the violation of these standards a punishable act. The Proclamation states that the "polluter pays" principle will be applied to all persons. Under this Proclamation, the EPA is given the mandate for the creation of the function of Environmental Inspectors. These inspectors (to be assigned by EPA or regional environmental agencies) are given the authority to ensure the implementation and enforcement of environmental standards and related requirements. It emphasizes the protection of the

environment, in general, and the safeguarding of human health and wellbeing, as well as the maintaining of the biota and the aesthetic value of nature. It is promulgated with a view to eliminating or, when not possible to mitigate pollution as an undesirable consequence of social and economic development activities.

The proclamation addresses the management of hazardous waste, municipal waste, and other related industrial and household wastes, and establishment of environmental quality standards for air, water, and soil, and the monitoring of pollution. In this connection, the proclamation provides a basis from which the relevant environmental standards are applicable to Ethiopia, and violation of these standards is a criminally punishable offense. Thus, the proper installation of fully functioning, FSTP is mandatory for the construction and the responsibility of the regulatory bodies such as GWSSA and Gambella EPA.

The project might release various pollutants that have an adverse impact on the environment and workers. The project proponent should allocate enough money, facilities and employee environmentalists to implement technologies for better waste treatment and management. This proclamation also helps the project proponent to ensure occupational health and safety of customers and workers.

3.1.4.4. Public Health Proclamation, Proclamation No. 200/2000

The government of Ethiopia issued a public health proclamation in March 2000. It is that the issuance of public health law is an important step for the promotion of the health of the society and for the creation of a healthy environment and for the present and future generations.

The health Policy is linked to a decentralization of the health system and inter-sectorial collaboration. It emphasizes the need for the promotion of occupational health and safety and the development of environmental health. Its provisions for ‘accelerating the provision of safe and adequate water for urban and rural populations’, ‘developing safe disposal of human, household, agricultural and industrial wastes and encourages recycling’, and ‘developing measures to improve the quality of housing and work premises for health’. The Health Extension Program, a community-based approach to deliver health promotion, disease prevention, and selected curative health services at the community level, is one of the government’s primary vehicles to drive the improvement of sanitation at the Kebele level. Of the 16 packages being delivered by extension workers, seven cover hygiene and environmental sanitation.

The project might release various pollutants that have an adverse impact on human health and workers. The project proponent should allocate a sufficient amount of money, facilities and expertise on environmental health to implement technologies for better waste treatment and management. This proclamation also helps the project proponent to ensure occupational health and safety of customers, farmers, and workers.

3.1.4.5. Solid Waste Management- Proclamation (Proclamation No. 513/2007)

The objective of the solid waste management proclamation is to enhance capabilities to prevent the possible adverse impacts while creating economically and socially beneficial assets out of solid waste. The proclamation states that solid waste management action plans designed by, and implemented at, the lowest administrative units of urban administrations can ensure community participation and it is essential

to promote community participation in order to prevent the adverse effects and enhance the benefits resulting from solid waste. The Proclamation has also listed the management of different solid wastes such as glass containers and tin cans, plastic bags, used tires, food-related solid wastes, construction debris, and demolition wastes.

This proclamation came into force with the objective of implementing effective solid waste management in the country. The Proclamation recognized the existing solid waste management problems in the country and emphasizes the need to prevent environmental pollution that may result from the disposal of solid waste. The EPA is responsible for initiating and overseeing the implementation of overall policies, strategies, and guidelines on solid waste management. Regional environmental agencies are also responsible for drawing out their plans as regard to the implementation of the Proclamation and monitoring its efficacy.

The Proclamation promotes community participation to prevent adverse effects and enhance benefits resulting from solid waste. It provides the preparation of solid waste management action plans by urban local governments. Article 5.1 of the proclamation states that urban administrations shall ensure the participation of the lowest administrative levels and their respective local communities in designing and implementing of their respective solid waste management plans. In Article 5.1 each region or urban administration shall set its own schedule and, based on that, prepare its solid waste management plan and report of implementation.

The project proponent is required to acquaint itself to the project management requirements and ensure appropriate monitoring based on the regulation requirements. The project proponent should allocate sufficient resources including facilities and expertise on solid waste management requirements to abide by the regulations.

3.1.4.6. Proclamation on Ethiopian Water Resources Management

This Proclamation (Proc. No. 197/2000) was issued in March 2000 and provides legal requirements for Ethiopian Water Resources Management, Protection and Utilization. The aim of the proclamation is to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use are prevented, and that the management of water resources is carried out properly. As stated in the Proclamation, the Supervising Body (the Ministry pertaining to water resources at central level, or any organ delegated by the Ministry) shall be responsible for the planning, management, utilization and protection of water resources. According to Sub-Article 1 of the Article 11, no person shall perform the following activities without a permit from the supervising body without prejudice to the exceptions specified under Article 12:

- Construct water works.
- Supply water, whether for his own use or for others.
- Transfer water which he/she abstracted from a water resource or received from another supplier
- Release or discharge waste into water resources unless otherwise provided in the water resource management regulation.

As per this proclamation, whenever there is a need to prioritize the available water resources, first priority is given for domestic water supply, livestock watering and ecosystem conservation in that order of importance. Water resources rationing for development actions like irrigation, industry, power generation and construction was put at the tail of the list.

3.1.4.7. Proclamation on the Development, Conservation and Utilization of Wildlife

This Proclamation (Proc. No. 541/2007) was issued in August 2007 and it has the following 3 major objectives. These are:

- To conserve, manage, develop and properly utilize the wildlife resources of Ethiopia.
- To create conditions necessary for discharging government obligations assumed under treaties regarding the conservation, development, and utilization of wildlife.
- To promote wildlife-based tourism and to encourage private investment.

Wildlife conservation areas to be designated and administered by the Federal Government and by regions as well as that will be administered by Private Investors and by Local Communities are clearly indicated under this proclamation. Hunting Permit and Collection of Wildlife or Wildlife Products for Scientific Purposes is also receiving enough attention. Wildlife related economic activities such as wildlife resources-based tourism and trading in wildlife and their products is also the attention of this proclamation.

The segregation of powers and duties of the Ministry (Ministry of Agriculture and Rural Development), Regions, and wildlife anti-poaching officers are made clear here. There is also a provision for penalty considerations and the power to issue regulations and directives.

3.1.4.8. Proclamation on Forest Development, Conservation and Utilization

Proclamation No.1065/2018 was issued in 2018 to secure the Conservation, Development and Utilization of Forests. The previous proclamation, Proclamation No.542/2007 is repealed by this proclamation. The objectives of the forest development, conservation and utilization proclamation are:

- To promote the role of forest sector in arresting the adverse effects of climate change;
- To promote sustainable forest development, conservation and utilization which play a crucial role to halt environmental, social and economic problems caused by the high level of forest degradation;
- To benefit from the decisive role of forest in preventing soil erosion, desertification and loss of biodiversity;
- To balance the demand and supply of forest products, sustain agricultural productivity and thereby ensure food security;
- In addition to developing forest by state and private owners, to introduce community and association forest development;
- To classify forest into productive, protected, and exclusively protected forests on their environmental, social and economic significance;
- To enhance the environmental, social and economic benefits that may arise from multilateral and bilateral agreements; and
- To strengthen forest sector resources, research, education, investment, trade and information systems.

The proclamation classified forest ownership into four. These are private forest, community forest, association forest and state forest. The state forest is classified into productive forest, protected forest and preserved forest.

The proclamation among others prohibits cutting endangered indigenous naturally grown trees from state forest or those naturally grown in community forest. But the owner of the tree may utilize endangered tree species planted in his possession upon confirmation from the responsible authority. So, in this regard, the relevant stakeholder shall be involved in the site selection for FSTP in Gambella town (Abol area) that does not cause any permanent damages to the forest/natural resources in the surrounding environmental settings. However, there will be some damages to the local vegetation that need to be rehabilitated after project construction finishes and during the FSTP operation.

3.1.4.9. Proclamation on Research and Conservation of Cultural Heritage

Proclamation No. 209/2000 provides a legal framework for Research and Conservation of Cultural Heritage. The Proclamation establishes the Authority for Research and Conservation of Cultural Heritage (ARCCH) as a government institution with a juridical personality. In addition, it has provisions for management, exploration, discovery and study of Cultural Heritage and miscellaneous provisions.

The Proclamation defines the objectives, powers and duties of the Authority (ARCCH). It also has provisions on Management of Cultural Heritage. Among these are provisions on Ownership and Duties of Owners, Classification, Registration, Conservation and Restoration, Removal, the Use, and Expropriation of Cultural Heritage, Preservation of Cultural Heritage Situated on Land given in Usufruct, and Establishment of Museum.

Furthermore, the Proclamation provides Articles on Exploration, Discovery and Study of Cultural Heritage. Article 41 is on Fortuitous Discovery of Cultural Heritage and Sub-Article (1) states that, any person who discovers any Cultural Heritage in the course of an excavation connected to mining explorations, building works, road construction or other similar activities or in the course of any other fortuitous event, shall forthwith report same to the Authority and shall protect and keep same intact, until the Authority (ARCCH) takes delivery thereof. Connected to this, Sub-Article (2) states that, the Authority shall, upon receipt of a report submitted pursuant to Sub-Article (1) hereof, take all appropriate measures to examine, take delivery of and register the Cultural Heritage so discovered.

Under Miscellaneous Provisions, the Proclamation states that, any person who holds permit to conduct construction works in a reserved area [an area declared to be containing an assemblage of immovable Cultural Heritage or an archaeological site] and who discovers Cultural Heritage in the course of construction activities shall stop construction and shall forthwith report same in writing to the Authority.

3.1.4.10. Proclamation on Classification of Cultural Heritages into National and Regional Cultural Heritages

Projects and other infrastructures development are required to observe the protection and conservation of the Cultural Heritages as defined by law (Proclamation No. 839/2014) by focusing on the following specific thematic areas.

- Sets criteria for Classification of Cultural Heritages;
- Provides for the Procedures and Management of National and Regional Cultural Heritages; and
- Provides for the Establishment of the Cultural Heritages Classification Council.

3.1.4.11. Wildlife protection proclamation of Ethiopia

The Wildlife Policy was developed in 2006 by the Ministry of Agriculture and Rural Development. The prime objective of the policy is to create a conducive environment for the preservation, development and sustainable utilization of Ethiopia's wildlife resources for social and economic development and for the integrity of the biosphere/biodiversity. It covers a wide range of policies and strategies relating, amongst others, to wildlife conservation and protected areas with four categories from the highest protection ranking 'National Park', followed by 'Game Reserve' and 'Sanctuary' to 'Controlled Hunting Area'.

The wildlife proclamation was enacted in August 2007 as "Development, Conservation and Utilization of Wildlife Proclamation No.541/2007" to approve the development conservation and utilization of wildlife in Ethiopia. Hence, this legal enactment is an input and it is appropriate to enhance the contribution of the wildlife sector towards poverty reduction strategy by maximizing the economic and social benefit to be derived from the wildlife resource (FDRE, 2007). 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.

The designated FSTP sites are not under the category of any of the above wildlife conservation areas and do not have any impact on the wildlife and their natural habitats.

3.1.4.12. Ethiopian building code: Proclamation no. 624/2009

This proclamation determines the minimum national standard for the construction or modification of buildings or alteration of their use in order to ensure public health and safety; and will apply in urban centers that have 10,000 or more dwellers. It regulates the design, material used and other minimum standards to guide and control public safety. Control and regulate the materials intended for use and stored on site or incorporated in the works, to be removed from the sites or the works, ban the use of improper materials.

The regulation also gives attention to the surrounding economic and public movement: any building shall be designed and constructed in such a way that it shall not impair the safety of people moving around, other constructions and properties, excavation related to a building is likely to impair the safety or stability of any property or service. The owner of the site shall take adequate precautionary measures to ensure that the safety and stability of such property or service is maintained.

This Code applies to building construction, maintenance, renovation, demolishing and other associated activities to all Classes of Buildings stated in Ethiopian Building Proclamation. This Code covers the Health and Safety precautions for the most common construction activities. If a building construction involves special method/s of construction, the builder needs to come up with the associated Health and Safety precautionary measures for such method/s. The occupational health and safety requirements specified in

this document are only the minimum requirements. It is necessary to consider these national building codes at various phases of the proposed subproject construction.

3.1.4.13. Ethiopia's Regulations on Public Consultation

The Constitution recognizes the participation of local communities to give their pre-informed consent regarding development endeavors to be implemented in their milieu and share benefits from it as stated in its article 43 (sub-article 2, 3 & 4). Article 43 proclaims the Right to Development, where peoples' right to:

- Improved living standards and to sustainable development; participation in national development in particular, to be consulted with respect to policies and projects affecting their community; and
- Enhancement of their capacities for development to meet their basic needs, are boldly recognized.

The regulation was well applied in engaging the concerned public and government stakeholders during ESIA document development and shall be approved by the respective regional and/or federal authority.

3.1.4.14. Land Laws-Expropriation and Payment of Compensation (Proclamation 1161/2019 and regulation No. 472/2020

This proclamation is the most central legislation concerning land expropriation in Ethiopia. The proclamation is a federal legal document; hence it can have regional and city administration varieties in the different regions. The proclamation gives all the basic guidelines for the expropriation process, compensation, and for what purposes expropriation can be done. "A Woreda or an urban administration shall, upon payment in advance of compensation in accordance with this Proclamation, have the power to expropriate rural or urban landholdings for a public purpose where it believes that it should be used for a better development project to be carried out by public entities, private investors, cooperative societies or other organs, or where such expropriation has been decided by the appropriate higher regional or federal government organ for the same the purpose. Hence, the process of expropriation and Grievances, as a result, shall be studied.

Concerning the compensation, the government has developed a regulation (Regulation 472/2020) which defines in detail how compensation for the expropriated property should be calculated. If the Proclamation 1161/2019 answers the question "What shall be compensated?" The Regulation 472/2020 answers.

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 years (article 8(1)). The value of the land is not compensated. This is because all land is government owned by the government (public), thus there is no private ownership of the land and no landowner who is eligible for compensation. Ideally the landholder should be compensated with replacement land for the land lost in the expropriation process.

3.1.4.15. Labor Law/Proclamation 1156/2019

The Labor Proclamation (which was revised in 2019) provides the basic principles, which govern labor conditions taking into account the political, economic, and social policies of the federal government, and in conformity with the international conventions and treaties to which Ethiopia is a signatory. The

proclamation under its Part Seven, Chapter One, and Article 92 deal with occupational safety, health and working environment, prevention measures, and obligations of the employers. Accordingly, the Proclamation obliges the employer to take the necessary measures for adequate safeguarding of the workers in terms of their health and safety. Moreover, the Occupation Health and Safety Directive (MOLSA, 2003) provides the limits for occupational exposure to working conditions.

According to the proclamation, the employer shall also pay the entire amount of the wages earned by or payable to the workers. Payment of such wages should be done at the end of a month or based on the agreement between the parties. The intended ESIA will try to assess the availability and level of labor required for the proper execution of the project and associated measures that need to be taken into account in safeguarding the socio-cultural component of the area.

3.2. World Bank Environmental and Social Safeguard policies

3.2.1. 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. The World Bank Operational Policy 4.01 requires EA of projects proposed for Bank financing to ensure that they are environmentally sound and sustainable, and thus to improve decision-making.

Environmental assessment is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, setting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. 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. EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements. The Bank does not finance project activities that would contravene such country obligations, as identified during the EA. EA is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project.

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 upon 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 ifs potential adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats are less adverse than those of Category A projects. 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 is likely to have 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 FI if it involves an investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The World Bank Safeguard Policies are Operational Policies (OP) and Bank Procedures (BP) approved by the Board for addressing environmental and social issues within the Bank's supported development projects. The UWSSP-II was rated Environmental Risk Assessment Category B and trigger three environmental and social safeguard policies, which are: Environmental Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12); and Physical Cultural Resources (OP/BP 4.11). The same policies will apply to the Sub-Project activities under the proposed FSTP constructions.

This policy requires environmental and social impact assessment (ESIA) of projects/to ensure that they are environmentally sound and sustainable. The ESIA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the sub-projects under the core urban sanitation infrastructure component. The environmental and social impacts are anticipated to come from the implementation of subprojects activities by the contractor. The ESIA process will lead in the preparation of an ESMP for proposed project activities in Gambella city. The ESMP set 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.

3.2.2. Physical Cultural Resources (OP/BP 4.11)

The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical 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. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

3.2.3. Involuntary Resettlement (OP/BP 4.12)

WB Involuntary Resettlement Policy OP 4.12 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 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 lose or is denied or restricted access to economic resources including tenants, encroachers, squatters should either be compensated for use of the land or assisted to move. The UWSSP-II project will apply both WB requirements and the Ethiopian government's guidelines regarding compensation and resettlement of PAP, and where there are gaps between these two, the most stringent policy will prevail.

Significant efforts are to be made in the design and screening stages of sub-projects to avoid impacts on people, land, and property, including as far as possible people's access to natural and other economic resources, possible. However, the FSTP subproject in Gambella are not expected to cause any involuntary resettlement except the FSTP affects some crop fields owned by individuals that required compensation for lost livelihoods.

Under WBs ESF issued in 2020, ten (10) Environmental and Social Standards have been identified to outline the requirements for the "Borrower" relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. Such standards will support the "Borrower" in achieving good international practices within the scope of environmental and social sustainability; fulfilling national and international E & S obligations; promoting non-discrimination, transparency, participation, accountability, and governance, and enhancing sustainable development outcomes of projects through ongoing stakeholder engagement.

3.2.4. General Environmental Health and Safety (EHS) Guidelines

The General EHS Guidelines 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 be applicable to this program, along with the mentioned legislation outlined in this chapter. 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

3.3. Comparison between Ethiopian and World Bank Policies

Project Categorization in World Bank and Ethiopian legislation are more or less similar. In both policies environmental screening is the requirement to identify whether the project is subject to environmental impact assessment or not. Screening processes in both cases address the need for further EA and its level and scope. However, 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 potential significant adverse impacts that demand a full-fledged ESIA. Though there is a slight

difference that in some cases schedule 1 projects as per Ethiopian policy could fall under category B of the World Bank.

Schedule 2 and Category B projects are more or less similar in their definitions; both categories refer to projects with less impacts 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 ESMP, an ESIA or the implementation of mitigation measures in the context of an environmental and social screening process.

However, the Ethiopian guidelines do not make provisions for the screening of sub-projects of a smaller scale than those listed in Schedules 1 and 2, and which may have negative localized impacts which will require mitigation. Therefore, Categorization of treatment plants has been screened based on the WB policy and it has been classified under category B.

3.4. Gaps between the National and the World Bank OP 4.12

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 not compatible with the Bank's OP 4.12 provisions. Table 2 below compares Ethiopian Law on land acquisition and World Bank's operational policy and recommended measures to address the gaps:

Table 2: Comparison of Ethiopian Legislation and World Bank's Operational Policy

Theme	World Bank's Safeguard Policies Applicable	Ethiopian Legislation	Comparison	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 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 that is decided to be expropriated to the urban or rural land administration office on the time schedule of the office. These give entitlement only to those who have formal legal rights over	According to World Bank OP4.12, eligibility for compensation is granted to "affected parties". Ethiopian Legislation only grants compensation to those with lawful possession of the land, and as per Proclamation No 456, those with traditional possession i.e., Communal lands. It therefore does not recognize those without a legal right or claim as eligible for compensation	Eligibility criteria for compensation and assistance shall be in line with the WB eligibility to benefits.

Theme	World Bank's Safeguard Policies Applicable	Ethiopian Legislation	Comparison	Measures to Address the Gaps
		their land holdings (properties).		
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 program, 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.	The guideline has clearly articulated the role of the PAPs, project proponent, the Commission, consulting firms, Regional Environmental Agencies and interested parties. It also shows how stakeholder analyzed and prioritized. The guideline has incorporated consultation with "hard to reach" group and individuals, issues to be considered to enhance women`s contribution in the consultation process. Furthermore, public consultation plan should describe the means of notifying and informing and informing the public about the proposal and ESIA process, beginning at an early stage and continue with updates on the progress of the ESIA study and feedback on community concerns and accepts consultation is ongoing and at different stage of ESIA process which also include other safeguard documents. Documents. Above all the guideline has provisions for vulnerable groups.	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 to vulnerable groups	Livelihoods and living standards are to be restored in real terms to pre-displacement levels or better. OP 4.12 further requires	There are no specific laws or regulations specifying support for livelihood restoration and transition and moving allowances. Ethiopian law makes no	Ethiopian policy and legislation would need to be aligned with the Banks policy to effectively Guarantee the rights of all affected persons by involuntary resettlement.	Additional support may be needed for vulnerable groups. Vulnerable groups in the

Theme	World Bank's Safeguard Policies Applicable	Ethiopian Legislation	Comparison	Measures to Address the Gaps
	attention to be given 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.	specific accommodations for potentially vulnerable groups such as women, children, the elderly, ethnic minorities, indigenous people, the landless, and those living under the poverty line.	Vulnerable groups are at highest risk or prone to experience negative effects due to resettlement and should receive special consideration during the preparation of a resettlement policy framework.	project area will be identified and the support need specified in RAP or LRP.

3.5. Multilateral Environmental Agreements

There are quite a number of multilateral agreements in the environment sector to which Ethiopia has become a party. These agreements form part of the body of laws of the country as per Article 9 of the Ethiopian Constitution and are hence important to be considered when checking for the compliance of economic activities with laws in force in Ethiopia. Some of the main Multilateral Environmental Agreements (such as UNFCCC, UNCCD, and UNCBD) are briefly stated below.

3.5.1. United Nations Convention on Biological Diversity (UNCBD)

Ethiopia has ratified this Convention by Proclamation No. 98/94, on May 31, 1994. The Convention has three goals: (i) the conservation of biodiversity; (ii) the sustainable use of the components of biodiversity; and (iii) the fair and equitable sharing of the benefits arising from the use of genetic resources.

3.5.2. United Nations Convention to Combat Desertification (UNCCD)

This Convention has been ratified by Ethiopia in 1997 through Proclamation No. 80/1997. The objective of the Convention is to combat desertification and mitigate the effects of droughts in countries experiencing serious drought and/or desertification, particularly in Africa.

3.5.3. United Nations Framework Convention on Climate Change (UNFCCC)

Ethiopia has ratified the Convention through Proclamation No. 97/1994 on May 2/1994. This Convention takes into account the fact that climate change has trans-boundary impacts. Its basic objective is to provide for agreed limits regarding the release of greenhouse gases into the atmosphere and to prevent the occurrence or minimizes the impact of climate change.

3.5.4. Stockholm Convention on Persistent Organic Pollutants

Ethiopia has ratified this Convention by Ethiopia by Proclamation No. 279/2002, on July 2, 2002. The Convention aims to ban the use of persistent organic pollutants (POPS). Originally, the POPs Convention contained 12 chemicals that were slated for total elimination or decreased use in industrial and agricultural

processes. The list is expanding as parties to the convention ascertain the POPs character of other chemicals through the evolution of knowledge and experience. This convention will support the implementation of the POPs free waste treatment and management strategies during the proposed subproject operation in Gambella town's sanitation subprojects, which helps to protect the human health and their environment.

3.5.5. Convention on the Protection of World Cultural and Natural Heritage

Each state which is party to this convention recognizes that the duty of ensuring the identification, protection, conservation, preservation and transmission to future generations of the culture and natural heritage situated on its territory, belongs primarily to the state. Ethiopia has ratified this convention in 1997.

3.5.6. The Vienna Convention on the Protection of the Ozone Layer

The basic objective of the Convention is to combat the negative impact on the environment and human beings resulting from ozone depleting substances by reducing the amounts released and eventually banning their commercial use through internationally agreed measures. The Montreal Protocol entered into force in 1989 to facilitate the implementation of the convention.

Ethiopia ratified and become a party to the Vienna Convention and the Montreal Protocol in January 1996. The National Meteorological Services Agency has been mandated for the coordination and supervision of implementation of this convention.

3.5.7. Convention on International Trade in the Endangered Species of Fauna and Flora (CITES)

Ethiopia ratified the convention in 1989. It provides an international umbrella for management and control of trade in endangered fauna and flora. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. It is initiated because of the crosses-borders nature of the trade in wild animals and plants, which necessitates international cooperation to safeguard certain species from overexploitation. CITES provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES is implemented at the national level. The implication of this convention for the current subprojects is to ensure that any activities of the subproject shall not interfere with the convention and be respected by the construction enterprises.

3.5.8. Basel and Bamako Conventions

Both of these Conventions have been acceded to by Ethiopia. The agreements regulate the trans-boundary movement of hazardous waste for the purpose of reclamation, or final disposal. In the preparation of this proposed project, these international agreements that Ethiopia signed will be considered when it deems necessary at various phases of the subproject intervention in Gambella town.

3.6. Administrative and Institutional Framework

The FDRE Environmental Protection Authority (EPA) is an autonomous public institution of the Federal Government of Ethiopia entrusted with the protection and conservation of natural resources in Ethiopia. The general role of the EPA is to provide for the protection and conservation of the broad environment,

through formulation of policies, strategies, laws and standards, which foster social and economic development in a manner that enhances the welfare of humans and the safety of the environment.

The Gambella EPA is responsible for environmental protection matters in the town. The Bureau is responsible for the review and approval of ESIA of development proposals under the mandate of the Regional Government and follow up of the implementation of ESIA recommendations of such proposals. Therefore, project proponents in the Region should operate in close cooperation with the Bureau to ensure that the adverse environmental effects of development proposals are properly identified and their mitigation or management actions incorporated in the project design or planning and implemented at the right time. Similar to the federal level, an Environmental Impact Study Report should be prepared by the project proponents and examined, commented and approved by the GEPA.

4. DESCRIPTION OF BASELINE CONDITIONS

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

4.1. Physical environment

The Gambella People's Regional State (GPNRS) is located south west Ethiopia between the geographical coordinates 60 28'38" to 80 34' North Latitude and 330 to 350 11’11" East Longitude, which covers an area of about 34,063 km2 about 3% of the nation.

The Region is bounded to the North, North East and East by Oromia National Regional State, to the South and Southeast by the Southern Nations and Nationalities People's Regional State and to the Southwest, West and Northwest by the South Sudan. Topography is an integral part of the land surface. It influences soil formation, drainage, runoff, erosion, exposure, accessibility etc. The topography of the region is divided into two broad classes, i.e., the Lower Piedmonts between 500 to 1900masl and the Floodplains of below 500m contours.

The small state, which covers an area of 25,274 square km along the southern Sudanese border, essentially comprises lush, humid lowland draining into the Baro River, an important tributary of the Nile River. Relatively remote and undeveloped, Gambella region supports a predominantly rural population of roughly 406,000 ethnically varied people. A fair amount of wildlife - lion, elephant and buffalo as well as various monkeys and antelope - persists in Gambella region. Gambella town had a total population of 74,102 in 2017 (CSA, 2013).

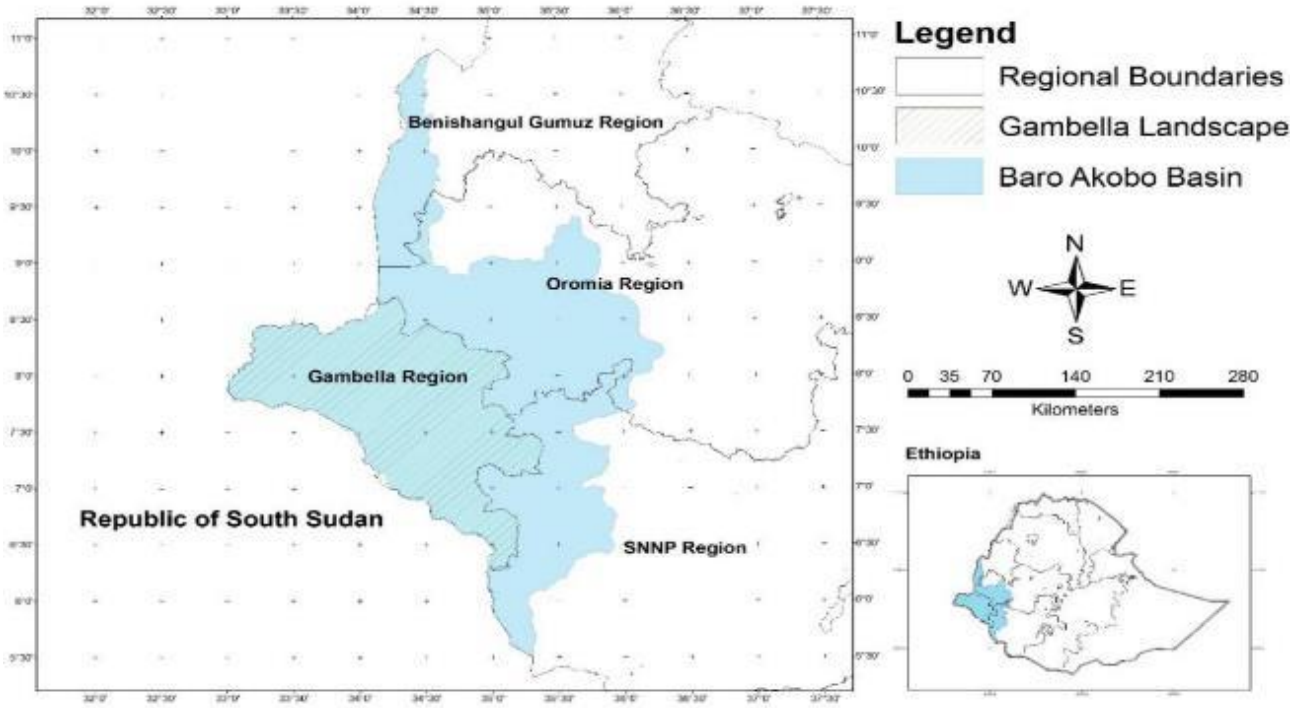

Figure 4: Baro-Akobo Basin of the Gambella regional state

4.1.1. Climate

The climate of the GPNRS is formed under the influence of the tropical monsoon from the Indian Ocean. The region is characterized by high rainfall in the wet period from May to October and has little rainfall during the dry period from November to April. According to the Ethiopia agro-ecological classification, the climate of Gambella is mostly humid lowland climate. The region is mostly flat, with a humid, warm climate. The annual climate for 17 years is 615.9 mm, with an average of 21.12℃ low and 35.9℃ high. July is the coldest month whereas March is the hottest month, with mid-day temperatures exceeding 31℃. Daily high temperature is above 29 ℃. In the warm season, from February to March, temperatures above 35℃. The mean annual temperature of the Region varies from 17.3℃ to 28.3℃ and annual monthly temperature varies throughout the year from 27℃ to 33℃. The absolute maximum temperature occurs in mid-March and is about 45℃ and the absolute minimum temperature occurs in December and is 10.3℃.

The annual rainfall of the Region in the lower altitudes varies from 900-1,500mm. At higher altitudes it ranges from 1,900-2,100mm. The annual evapo-transpiration in the Gambella reaches about 1,612mm and the maximum value occurs in March and is about 212mm.

Rainfall is the most important climatic factor. The annual rainfall of Gambella city varies from 319mm to 1000mm with a mean annual value of 665.5 mm. The rainy period extends from April to September with a slight decline in June. The maximum rainfall occurs in April and the minimum in January. The rainy season extends from July to October. Generally, the climate of Gambella city and its surroundings have warm climatic conditions and experience two distinct wet and dry seasons.

4.1.2. Topography

The town is characterized by a gently rolling topography, which has enabled expansion of the town in all directions as shown on the figure below. Elevation increases from the Baro River towards North, South and East directions. Measured elevation of the project service area varies from about 440masl near the Baro Bridge to about 525masl at the top of the Jajebe Hill.

Baro River, which passes through the center of the town in the East-West direction, divides the town into two north and south halves of similar topographic pattern, both draining towards the river. In the same way, the Jajebe River that drains the North-Eastern part of the town and flows in the South-West direction, divides the northern half further into two.

4.1.3. Geology and Soils

Geological mapping conducted by Ayalew and Moore (1989) indicated that the Gambella area is underlain by

1. Gneisses & migmatite;
2. Metamorphosed volcano-sedimentary and hypabyssal rocks;
3. Intrusive and meta-intrusive rocks;
4. Tertiary volcanic rocks and
5. Quaternary formations.

There is a predominantly north-south structural orientation in the area with general sub-parallelism of layering and metamorphic foliation. Linear features mainly stretching lineation defined by deformed clasts, minerals and mineral aggregates plunge shallowly to north and south throughout the region. Late brittle deformation resulted in numerous lineaments, mainly east-west-trending which are recognizable in the topography. Some of these are shown as faults because they clearly offset bedrock contacts and/ or are occupied by brecciated zones; the nature of the others is more conjectural.

The Gambella Town area has alluvial sediments with trachyte-syenite, basalt and metamorphic (Precambrian basement) rocks are the main rock types. Alluvial deposits cover areas along tributaries of the Baro River, confluence areas with Baro River and on plain lands as recent deposits which is assumed to be a product of denudation. These are generally classified as Elluvial-deluvial-colluvial and proluvial sediments (Selkhozpromexport, 1990cited by SWS Consultancy, 2018). In some localities, the thickness of these alluvial deposits is estimated to be not less than 30 m.

The main rock type in the project area is metamorphic rock, which outcrops mainly as gneiss, schist, grantoids gneiss and grantoids. Along the creeks and tributaries of the Baro River, such as the Jajebe stream, weathering and fracturing is very common. However, due to the nature of the basement rock, this weathering and fracturing is not expected to penetrate further deep. Some of the streams are formed following the fault and fracturing lines.

4.1.4. Water resource

As the region occurs in the lower Baro-Akobo basin (figure 4), it is endowed with rich water resources. A number of major rivers flow across the region and to neighboring countries. For example, Baro is a transboundary navigable river, which divide the Gambella town into two and flows to South Sudan. Gambella Town is endowed with large and numerous surface and ground water resources that include major rivers, streams and springs. The town is located within the Baro/Akobo River catchment which is the third largest river system (basin) in Ethiopia. The Baro River cuts through Gambella Town in a North West direction. The river divides the town into two with Kebele 01 to 04 to the north and Kebele 05 to the south requiring a 300 m long interconnecting bridge. As Baro River passes Gambella Town, it is 300 mm wide with depth ranging between 3.0 to 5.0 m (SWS Consultancy, 2018).

The Baro River flows a total length of 306 km from its source in the highlands of the Oromia region to the Baro-Pibor in the Republic of South Sudan before joining the White Nile. The river drains a total of 41,400 km2 area watershed. It is reported that during rainy seasons in the months of June to September, Baro River alone contributes to 10% of the flow at Aswan Dam. The river attains its peak discharge in September and minimum flow in April. The annual average runoff from the river is about 241 m3/s. The recorded minimum and maximum flows of the river at the gaging station near Gambella town are 3 m3/s and 1462.3 m3/s, respectively. SWS Consultancy (2018) estimated the 95% exceedance flow at 0.95 m3/s, which was well above the 0.36 m3/s estimated water demand for 2040.

Jajebe River, a major tributary of Baro River flows through the town in a South Westerly direction separating Kebele 01 and 02 from 03 and 04. The river confluences with Baro River next to the Town Centre just upstream of the Baro River Bridge.

Figure 5: Barao (left) and Jajebe (right) rivers in Gambella town

4.1.5. Noise and Vibrations

Most of the FSTP areas experience 'typical' noise and vibration levels which are generated from normal human activities and vehicles (e. g. 'Bajaj'). Noise and vibrations from the project activities are considered to be very low given the small number of physical activities present.

Road traffic noise levels are considered below 75 to 80 dB (A), and the range of densely traveled roads as established by WHO (1999) is representative of urban city areas. This is due to the location of the PCT project site on the main road.

Considering the envisaged FSTP construction and further development of the surrounding residential area some noise and/or vibrations may be generated by the construction works itself. However, the scale of noise and vibrations is limited and insignificant to the direct neighborhood of the construction site and of temporary character.

4.1.6. Air Quality

In general air quality is influenced by anthropogenic activities distinguishing two main sources, namely mobile and stationary sources associated with the project activities. Excavation and vehicle activities are major sources of ambient air pollution arising from the project activities during construction. In addition, the exhaust from the vehicles during the construction is a short-term source of ambient air pollution with insignificant levels. However, during operation, there will be no potential sources of ambient air pollution except evaporation of liquid wastes with some toxic materials.

Emissions to the ambient air from vehicles may include pollutants particulate matter (PM), Carbon dioxide (CO_2), Nitrous oxide (NOx) as well as Sulphur oxide (SOx). Prolonged exposure to these activities poses the risk of acute respiratory infections. However, these toxic substances will not be released in a significant amount since the construction phase takes only a few months.

Similarly, the main pollutants from exhaust emissions from motor vehicles include Hydrocarbon and Benzopyrene, Phosphorus, Carbon monoxide, Sulphur oxides, and Nitrous oxide. Exhaust emissions are highest in urban centers and along the major highways and vary according to periods of peak traffic flow. However, FSTP sites are not subjected to such congestion during construction and operation phases.

4.2. Biological Environment

This Gambella Landscape represents one of the most bio-diverse areas in Africa, forming the transition between Guinea – Congolian and Somali – Maasai Biomes (including Afro-montane Forests). This unique and little-known wilderness area shares the second largest terrestrial mammal migration in the world with Southern Sudan, namely that of the White-eared-kob (an antelope species). Gambella region also harbors populations of elephant, Nubian Giraffe, buffalo, Roan antelope, waterbuck, reedbuck, and numerous smaller mammals. Carnivores are well represented, and lion, hyena and wild dog have been documented.

The proposed FSTP site is close to natural vegetation and used as an open dumping site. The surrounding environment is enclosed by natural vegetation with various species of natural forest. There are no natural streams or water sources close to the proposed FSTP site.

Considering the natural biological environment, the flora and fauna information at the concerned site 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.

4.2.1. 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 as identified to occur on the study site. There are no sensitive bird species that would occur in the vicinity of each of the sites. Most of the immediate habitat surrounding the proposed development is vacated. No drainage lines transverse the site and do not pose any significant risk in terms of potential impacts during construction and operational phases to surface water resources and wetland ecosystems. Therefore, the conservation issue is insignificant, and the project can have minimal or no impact on local fauna and flora.

The sub-project areas and their vicinity are poorly endowed with wildlife resources. Most of the proposed sub-projects are situated in areas which have no wildlife resources of conservation interest. At the urbanized municipal center there are virtually no game species whereas there are reports that migratory hyenas are occasionally seen in the peripheral areas. The ecological setting of the larger part of the municipality does not allow wildlife game species to flourish. The habitat for wildlife has been significantly modified because of human activities of agriculture, deforestation, and nearby urbanization. Therefore,

there is a poor presence of wildlife in the area. As such, there are no known rare or endangered species in the municipality and its vicinity (e. g. by IUCN categories).

4.2.2. Conservation Areas

The proposed sub-project development areas have no forest reserves, no National Parks, or any form of the conservation area as defined in the National Wildlife Policy.

4.3. The Human Environment (socio-economic settings)

4.3.1. Administrative Context

Gambella Town is the headquarters of the Gambella People's National Regional State and its largest town. It sits at the crucial bridge across the Baro River. Consequently, it hosts Regional Offices for all Regional Government functions. The town administration also has a large number of offices. Data obtained from the Town Administration indicated that a large number of heads of household are government employees making administration the main economic activity.

Administratively, Gambella town is divided into five Kebeles. Kebeles 03 and 04 are to the north of the Baro River while Kebele 05 is to the South where also the airport is located. Kebele 01 and 02 are to the East of Jajebe River tributary and host the largest and smallest proportion of the population at 25 and 15%, respectively. Kebeles 03 and 04 to the west of Jajebe River are divided by the Addis- South Sudan Road with Kebele 03 to the east and 04 to the west.

4.3.2. Socio-Economic Environment

Given the fact that employment in the formal sector has been increasing recently in addition to agriculture, the main economic activity in the region. The income-generating activities of a bigger part of the municipal population are mainly through petty businesses and few practices farming activities, hence, a majority of the municipal population has low income. The state's population is engaged predominantly in farming, civil service, and commerce.

The majority of the town's population is driving their livelihoods by undertaking small and medium trades. The major undertakings in Gambella city include small-scale trading and micro enterprises, hotels, retail trading, cereal marketing, flour mills, and clothes making, etc. As such, business activities are the main source of cash income for Gambella. A significant number of municipality residents are employed in large-scale farms (as workers), and the remaining earn livelihoods as daily laborers, from pensions and other activities. Regarding industrial activities, there are small-scale manufacturing and processors such as tubes and bricks, grinding mills, woodworks, metal works, and bakeries. Other business establishments and service providers in Gambella, which are expected to be potential sources of wastes, include hotels, bars, and restaurants, fuel stations, over shops, small-scale processors (woodwork, metalwork, and flour mills), garages, banks, abattoirs, small industries, stadiums, etc.

A large number of the Gambella Town residents derive their livelihood by operating small and medium size businesses. These include small scale shops, Bajaje and micro enterprises, hotels (81), bars and restaurants (68), fueling stations (6), shops (2,428), garages (29), banks (13), cloth making (weaving and sewing) and livestock products marketing. Industry in Gambella Town is in its nascent stage. Nevertheless, there are

several small-scale industries that include flour mills, cloth making, small scale manufacturing, grinding mills, wood works, metal works, and bakeries.

Currently, Gambella Town has a number of hotels of which the better known is the Hotel Baro Gambella, the Grand Resort Hotel and Metadel Hotel. With the construction of the Gambella Airport, travel to Gambella has been made convenient. The Gambella Region is endowed with various natural tourism potentials such as water bodies (lakes, rivers, waterfalls, and wetlands), mountains, natural bridges, caves, valleys, landscapes, and fauna and flora. These attractions coupled with diverse wildlife that are common in the region such as elephants, Nubian giraffes, and buffaloes make the region suitable for the development of tourism and the hotel industry. The following are the major tourism resources:

- Baro River, which crosses Gambella Town supports different species of birds on the river bank and a variety of fishes such as the Nile perch, tilapia, catfish, star fish, and golden fish. It has remarkable tourism potential similar to beach tourism, fishing, bird-watching, boat services and swimming.
- Jejebe Hill that is located in Gambella town provides an excellent view of the whole of Gambella town. It also serves as a spiritual site for the Ethiopian Orthodox Church with the Abun-Aregawe church located on top of the Hill.
- Gambella National Park (GNP) lays between the two major Rivers Baro and Gilo in the central lowland plain in the six Woredas of Abol, Abobo, Gog, Jor, Itang and Jikawo; it is known as one of the richest biomes, which conserves a diversified assemblage of fauna and flora species.
- Lake Nyimulu which is also known as Amphibian Lake because it was used for keeping different amphibian and reptile species is located in Itang at Ebango kebele 28 km from Gambella town.
- Lake Thatha that is located in Anywaa Zone, Gog Woreda at Thatha kebele 119 km from Gambella town is known for its different species of fishes and colorful birds.
- Other lakes and rivers such as Oyjer lakes, Burey Lake, Lake Wahigan and Gilo River which are tourism attractions; Alwero River, which is among the major permanent rivers in the Region is rich in different species of fish and supports livelihoods of the local community.

Other major natural tourism potentials include Dike Waterfall, Deretek Waterfall, Jay Waterfall and Waki Waterfall together with Majang Forest Biosphere Reserve, which is endowed with astonishing fauna and flora species, waterfalls, lakes, valleys, spectacular landscapes, and cliffs.

4.3.3. Health

Gambella Town has one (1 No.) Primary hospital is located in Kebele 02, two (2 No.) government health centers, 19 private clinics and one (1) government clinic. All private clinics have water, sanitation and hygiene facilities. In addition, the government and private health facilities have hand washing facilities near toilets, though less in number and mostly malfunctioning. Four diseases of the top ten diseases contribute a high burden to health services in the town; namely, Malaria, non-bloody Diarrhea, Typhoid and Infections of the skin and subcutaneous tissue are directly induced from poor sanitation/hygiene in the town. These diseases are contributed by inadequate access to WASH facilities, high population growth, and poor access to health services.

Poor water supply, sanitation and hygiene conditions are believed to contribute to wide disease outbreaks, such as acute watery diarrheal, as well as the spread of antimicrobial-resistant pathogens. Accordingly,

improved water supply, sanitation and hygiene in health-care facilities are urgent needs and should be considered as a strategic investment in the town.

4.3.4. Education

Education services in Gambella town are provided by both the Government and the Private Sector. There are eleven (11) primary schools, three (3) high schools, one (1) preparatory school and one (1) university in the town. Based on data obtained from Gambella Education Office (June 2020), education coverage is about 100% for the 2020 Academic Year and the town education service is getting more established from year to year following the development of the town. The education level of the Gambella town residents are composed of Illiterates 16% and population who are attained different school levels from read and write to different certification level are 84% (figure 6).

According to the Gambella Education Office, about 18,647 students are attending primary and secondary school education, of which 46% are female. Moreover, there are 473 male and 345 female teachers working in different schools. The enrolment rate is high due to accessibility and efforts made by different stakeholders. The enrolment ratio gap between boys and girls has also been narrowed.

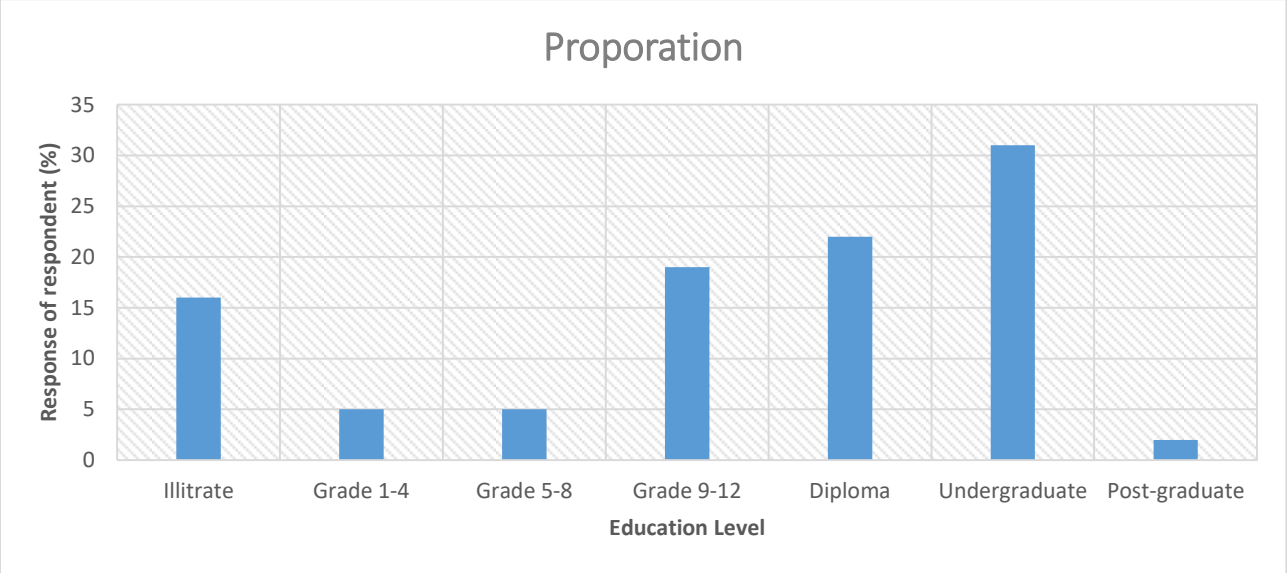

Figure 6: Education status of the Gambella city (source feasibility study)

4.3.5. Water Supply

Gambella city is dissected on both sides of the Baro River by many small perennial and seasonal streams, which ultimately join the Baro River. There also are numerous springs in the city that form a critical source of water for the residents. Most of the area around Gambella city is covered by crystalline basement rock with only shallow weathering, as observed in the drilled borehole log reports, is not deep. Unless a fault structure is intersected. Jajebe River, a major tributary of Baro Rivers flows through the city in a South Westerly direction separating Kebele 01 and 02 from 03 and 04. The river confluences with Baro River next to the city Centre just upstream of the Baro River Bridge. Therefore, it is important to give due attention during construction and operation.

Water supply services in Gambella Town are provided by the Gambella Water and Sewerage Agency. The existing water supply system comprises a river intake on Baro River about 400 m upstream of the Baro Bridge, raw water pumping station, raw water rising mains, conventional water treatment works, treated water rising mains, reservoirs and distribution System. Because of a rapid increase in the population of the town coupled with technical problems, the water supply system was upgraded in 2015 to 10,000 m^3/day. However, during the dry season, the suction pipe at the intake plunges into accumulated river bed sediment making abstraction of raw water difficult. Consequently, the water supply averages 6,840 m3/d, which is insufficient to meet the current water demand estimated in this study as 8,600 m^3/d.

The water intake is situated about 400 m upstream of the Baro River Bridge. It comprises a platoon suspended in the river by a hinged intake structure. The raw water is pumped using centrifugal pumps through a 250 mm diameter pumping main to a 10,000 m^3/d capacity conventional wastewater treatment plant located 2.6 km north of the intake.

There is a network of water supply connections in the town. However, the town lacks sanitation services composed of a central sewer system and septic tank system which empties their septic tanks using a private sludge emptier. Gambella town has no central sewer system and houses are not connected to any sewer system and do not have flush toilets with septic tanks; these houses use pit latrines.

4.3.6. Transportation

The road network in the town is characterized by asphalt, gravel and cobblestone roads that interconnect different parts of the city. The town is easily accessible from Addis Ababa via the main asphalt road through Jimma and Metu Towns. Gambella is connected to the nearby towns through an all-weather gravel road.

Land transport facilities (such as bus, minibus and trucks etc.) are the main transport facilities in the town. Bajaji is the main transport facility used within Gambella town. The town has a domestic airport, Gambella Airport, with a 2.5 km long runway 18 km south of the Town. Hence, 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.

4.3.7. Telecommunications

The town has a telecommunication network that is supported by analogue and digital telecommunication services and mobile service. According to the town telecommunication branch office, there is a plan to expand and upgrade telecommunication infrastructure. It is expected that the current effort to connect Ethiopia with broadband fiber Optics network will also benefit Gambella Town.

4.3.8. Power Supply

Gambella Town is supplied with electricity from the national grid through a substation. All residences, commercial units and institutions are connected to the power supply system and have access to electricity. However, there is frequent power interruption and efforts are underway to upgrade the substation's capacity.

4.3.9. Existing Waste Management Practice

4.3.9.1. Solid Waste Management

The major sources of solid waste in Gambella city could be categorized into domestic, commercial, institutional, municipal, and construction and demolition. The predominant quantities of solid waste generated in the city are from domestic and commercial followed by others.

In Gambella, solid waste collection systems are not properly planned to effectively utilize available resources. Less than half of the generated solid waste is collected and almost all the collected solid waste is dumped haphazardly in a crude manner. The current solid waste collection practice in Gambella city includes communal containers, curbside truck collection and in some areas of the town door- to-door collection is used. The other major solid waste contribution comes from the streets and open markets of the city where different inorganic and organic material like vegetables, fruits, chat, etc. are generated daily in huge quantities. Solid waste collection containers in the city are not transported and emptied daily bases except the market area. Unfortunately, this service is performed very inefficiently and in an unhygienic manner. No evidence that the collected wastes are used as inputs for various economic production such fertilizers and biogas etc. in the town.

4.3.9.2. Wastewater Management

Gambella Town has no centralized waterborne sanitation. Consequently, it relies entirely on On-site sanitation. One of the major concerns for Gambella city, poor liquid waste management, is threatening public health in addition to menacing the natural environment. Grey water and black water are the two main types of waste water, which are being generated in Gambella town from households, commercial entities, health facilities, hotels, public and non-public institutions, industries, and community gathering places. Both on-site and off-site management of wastewater requires improvement and needs new installation. Liquid waste management of the city is carried out by the general services of the municipality. The city has only 1 vacuum truck for dislodging.

To alleviate this sanitation problem, efforts to plan and implement wastewater management, including rehabilitation and construction of communal latrines and effective fecal sludge management have been put in place by different organizations. Despite all efforts made to alleviate the sanitation problem, wastewater management is still posing threats. The study indicated that there are no central wastewater treatment sites and a centralized sewer system.

Improved pit latrines are the dominant type of toilets at 40.3%, with Kebele 02 having the largest proportion at 71%. The more hygienic and less odorous ventilated impounded pit (VIP) latrines, are only 5.9% indicating the need for significant improvement in the type of toilets. Kebele 01 has a disproportionately low toilet coverage resulting in the highest percentage of households, 67% practicing open defecation. Consequently, the Kebele will require significant attention for improvement of the toilets.

The existing public and communal toilets, which are pit latrine types, are not enough to provide services for the city given its size, commercial importance, and high level of interaction. Gambella has five public toilets under construction, each having 4 cubicles making a total of 20 cubicles which are not enough to meet people's public toilet needs. Only 3 of the communal toilets are under construction where the community members are not satisfied with their current sanitation facilities in Gambella. The shortage of public and

communal toilets are also key challenges for management of the toilets. According to the Ethiopian Demographic and Health Survey (EDHS) 2016, only 20.1% of the urban population had access to improved sanitation facilities.

4.3.9.3. Fecal Sludge Management

It is known that the provision of toilets and septic tanks is not by itself the end of the proper management of generated wastes in the town. Fecal sludge is formed through the process of decomposition of fecal matter in the pits of latrines and septic tanks. Currently, the city of Gambella doesn't have a properly designed and constructed fecal sludge treatment system.

5. DESCRIPTION OF THE PROPOSED SUBPROJECTS

5.1. Overview of UWSSP-II project

Ethiopia's rapid urbanization is putting stress on the already inadequate water supply and sanitation system in urban areas. The capacity of urban centers to adequately dispose of wastewater is low, exposing natural resources to pollution and posing a risk to human health. In line with this, the Government of Ethiopia has successfully secured finance from the World Bank under the Second Ethiopia Urban Water Supply and Sanitation Project (UWSSP-II). The UWSSP-II is primarily intended to improve urban sanitation holistically and equitably in the urban space and provide assistance to improve operational efficiency in 22 Ethiopian cities.

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 other 21 secondary cities[1]". This objective will be addressed through the following three major components: (i) sanitation and water supply services improvement in Addis Ababa; (ii) sanitation and water supply services improvements in selected secondary cities; and (iii) Project management and institutional strengthening.

Gambella city is one of the secondary cities benefiting from the portion of the finance secured under Component 2 of UWSSP-II. The development objective of the sub project is to contribute to the improvement of the socio- economy for the residents of Gambella city by providing effective and efficient sanitation services.

5.2. Subproject Location

Gambella is the Capital City of Gambella People's Region, one of the 11 regional states in Ethiopia as shown in the Figure 7. It comprises five Kebeles and close to Ethiopia's border with South Sudan about 750 km from Addis Ababa. Gambella is located at 8°15'N and 34°35'E, and an altitude of 526masl.

Gambella town has a total area of about 16.49 km^2 that extends on both sides of the Baro River and the city is characterized by a gently rolling topography, which has enabled expansion of the town in all directions. Elevation increases from the Baro River towards North, South and East directions. Measured elevation of the project service area varies from about 440masl near the Baro Bridge to about 525 masl at the top of the Jajebe Hill (field measurement).

Concerning its administrative structure, Gambella city is divided into 5 urban Kebeles. It sits at the crucial bridge across the Baro River. Consequently, it hosts Regional Offices for all Regional Government functions. The town administration also has a large number of offices. Data obtained from the town Administration/municipality indicated that a large number of heads of household are government employees making administration the main economic center. Administratively, Gambella town is divided into five Kebeles. Kebeles 01 - 04 are to the north of the Baro River while Kebele 05 is to the South where also the airport is located. Kebele 01 and 02 are to the East of Jejebe River tributary and host the largest and smallest proportion of the population at 25 and 15%, respectively. Kebeles 03 and 04 to the west of Jejebe River are divided by the Addis-South Sudan Road with Kebele 03 to the east and 04 to the west.

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

The location of Gambella city with its drainage system is shown in the Figure below.

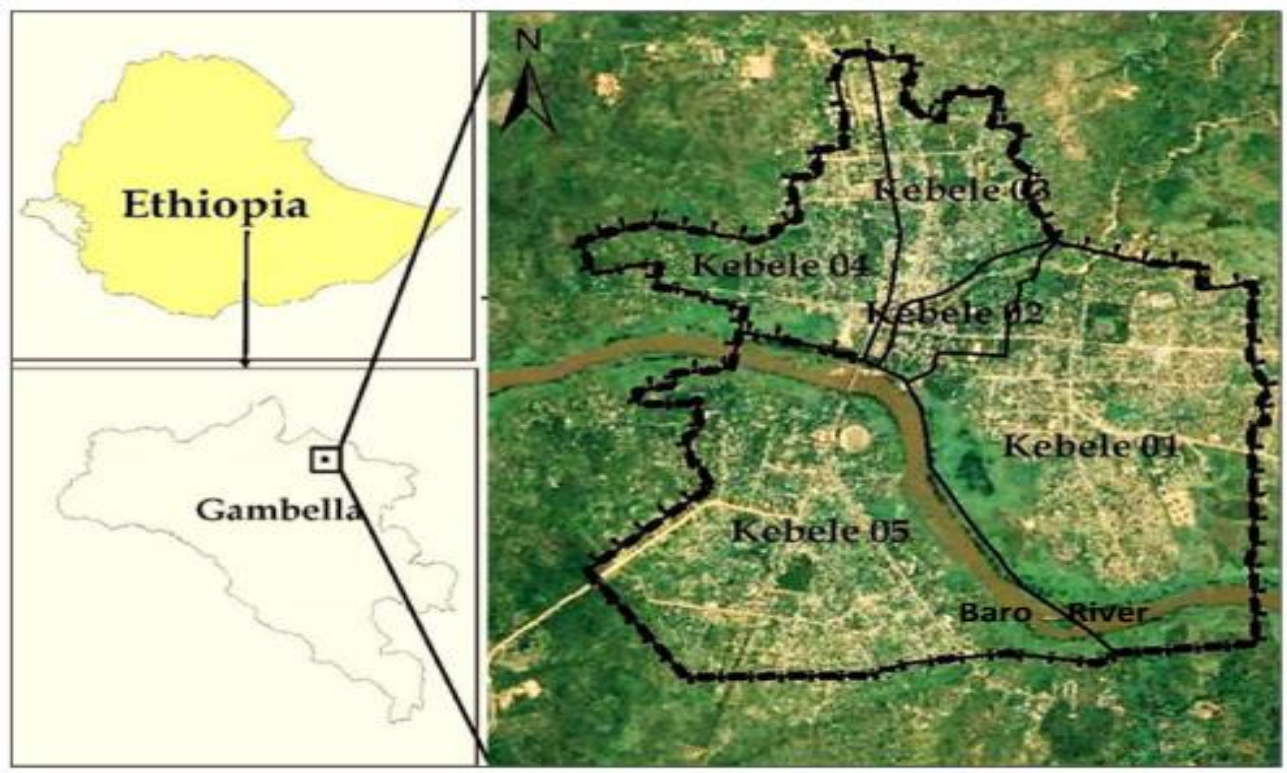

Figure 7: Gambella city with its Kebeles

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

5.3. Overview of Gambella town sanitation situation

Communal toilets are located in low-income settlements especially for the population living in congested areas where the residents cannot afford to build individual toilets or have limited space. Four communal toilets of corrugated iron sheet and concrete floor slab and vent pipes, construction each with two cubicles were constructed in 2020. Kebele 01 public toilet that is operated by the youth as an income generating venture is the only one in service; the others lack operators.

One public toilet was also constructed at the main bus station. It is a ventilated impounded pit latrine consisting four corrugated iron sheet cubicles on a concrete floor slab.

The main market has a large number of traders and a continuous flow of buyers. It has no public toilets, which forces traders to go home for toilet use or request use of toilets in restaurants. The market area is congested with hardly any space available for construction of public toilets.

The commercial center for Kebele 05 South of Baro River that hosts about 35% of the population is around the junction of Abobo Airport Road and the Road to Addis Ababa. The center has mixed activities ranging from government offices including the mayor's office, Supreme Court and Regional Water and Health offices to private offices, microenterprises and markets. It lacks toilet facilities for day traders, shoppers and visitors. Similar to the main market, public toilets with waterborne sanitation would be recommended. Nevertheless, immediate provision of pit latrines would mitigate the current situation.

Gambella town currently has only one sludge truck for emptying and transportation of sludge that is privately owned. The truck services large establishments such as hotels and offices, and some households. Most residents cover and abandon the toilets after filling.

Because most of Gambella Town utilizes pit latrines, most of the liquid waste treatment takes place within active and abandoned pits. However, the Town has a designated disposal site for emptied fecal sludge shown in Figure that is located 7 km north of the Town on the road to Dembi Dolo. The City Administration usually charges the operators a tipping fee for emptying services of about 20% of the 2,500 Birr cost per trip, which works out to 500 Birr per trip.

Figure 8: Existing Fecal Sludge Disposal Site in: (Left) Dry Season, (Rift) Wet Season

The fecal sludge disposal site comprises a dug-out basin about 1.5 m deep. The facility has a gravel access road but lacks other facilities such as fencing, gate, inlet structure and screens, outlets and sludge drying beds. Currently, the disposal facility is unattended.

The disposal facility facilitates biological breakdown or waste matter by natural process, infiltration of wastewater into the ground and drying of sludge by evaporation. The facility is not engineered and therefore, none of the current processes is supported by available technology.

According to Feasibility study, it indicates that only 14% of the fecal sludge is considered safely managed while 86% is unsafely managed. The safely managed fecal sludge in Gambella town results from containment and disposal of sludge in lined and unlined pit latrines that are not emptied and do not pose risk to groundwater. Sludge in these facilities is considered contained and because it is not emptied, it is safely managed.

5.4. Description FSTP Subproject

The development objective of the current project is to contribute to the improvement of the social economy for the residents of Gambella city by providing effective and efficient sanitation services. The overall objective of the project is to improve and increase access to improve sanitary conditions through constructing FSTP to ensure a sustainable waste management system. Other objectives will include improving the hygiene and public health conditions and reducing the deterioration of the quality of the environment and water resources. The scope of this ESIA is to determine the environmental and social impacts of the proposed sub projects during all the implementation phases. Specifically, the city is to benefit from the following project scope.

Table 3: Proposed sanitation infrastructure project phases/horizons (2021-2041)

S/N	Horizon	Intervention	Unit	Quantity
1	2021-2026	Communal toilets	#	16
		Public toilets	#	6
		Vacuum trucks (10m^3)	#	2
		Fecal sludge treatment plant	#	1
2	2026-2031	Rehabilitation of FSTP	#	1
		Capacity building and awareness	#	10
	2031-2041	Sewer line (all works)	Meter	NA
		WWTP	#	1

NA=Not available

As per feasibility study, the proposed Fecal Sludge Treatment Plant site is located 8 km north of the town Centre on the road to Dembi Dolo, at Abol woreda at Coordinates 8° 18’ 36” N, 34° 33’ 02’’ E (Figure 8). The site is at the same location as the current open fecal sludge disposal site. However, it will cover a larger area of 6 Ha. The site includes a seasonal waterway to which the effluent, if any, can be drained.

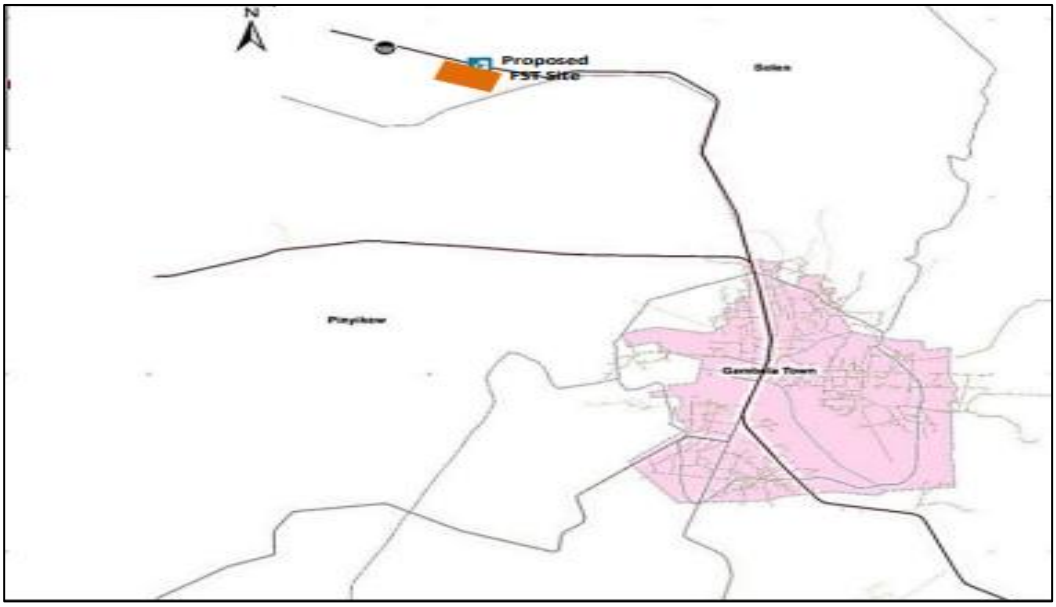

Figure 9: Location of Proposed Fecal Sludge Treatment Works

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

Fecal sludge management is a set of scientific practices that ensures safe collection, transportation, treatment, and disposal of onsite collected excreta without polluting the environment. The FSTP site was

evaluated against the following criteria: distance from the residence/rural villages, distance from the center, from the water bodies, conservation areas, intact natural forest and wildlife protected areas. In addition, the ESIA consultant also considered the previous practices of the site which can be transformed into a modern sanitary site. It is also important to consider the slope of the site which is not exposed to heavy flooding. However, it is important to note that the site needs careful planning and implementation of the proposed sub projects. There are multiple number of fecal sludge treatment technologies available, and each technology has different field of application. Treatment technology was chosen based upon the desired product. Selected technologies have been discussed below.

The purpose of fecal sludge treatment is the processing of the sludge to allow for safe discharge of the liquid component and valorization of the stabilized solids. 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 sludge drying for the solids and lagoons and constructed wetlands for the liquid component. Fecal sludge treatment takes place in a series of steps that can be classified as: Receiving; Pretreatment; Solids/liquid separation; Liquid (effluent) treatment; and Solids Treatment. For each of the steps there is an array of technologies that can be utilized.

Generally, the Gambella city has faced the following key sanitary service challenges as identified by the engineering consultant.

1. Inadequate containment facilities lead to open defecation,
2. Lack/shortage of fecal sludge emptying and transportation facilities,
3. Lack of proper sewer lines to remove industrial, business, and household wastes,
4. Lack of fecal sludge treatment and waste treatment facilities.

Thus, to improve on safe management of fecal intervention measures are required to address the identified constraints. The proposed fecal sludge treatment plant has the following key components to address the above sanitary challenges.

Proposed FSTP: For Gambella town appropriate technologies are considered by including

- the remote location of Gambella from major cities where skills, services and equipment are available,
- low levels development that limits funds for operation and maintenance,
- proposed site is not on a power grid,
- availability of ample land, and
- Mixture of aged and fresh sludge.

Although there are many different technologies that can be used to treat septage, only a few are appropriate for a particular city or town because of its unique setting, resources availability and constraints. Therefore, the available technologies should be screened for the specific conditions prevailing in a city or country.

According to the “Feasibility Study & Design Report for Gambella”, ranking of alternative treatment configurations for Gambella town have been screened and evaluated in different criteria. The following

sludge treatment options are ranked by considering key technology aspects including technology viability and affordability. Moreover, the ESIA team further evaluated the feasibility of the technologies in terms of socio-environmental viability and contribution to the clean city development and social development. Finally, the end use of the fecal sludge product considered for using to produce other byproducts such as composting, energy recovery, and treated waste water for irrigation.

1st. ABR + Facultative Pond + Maturation Pond

2nd. Anaerobic Pond + Facultative Pond + Maturation Pond,

3rd. ABR + Facultative Pond + Constructed Wetland

The screened technologies comprise two each for Solid Liquid separation/Anaerobic processes, Primary liquid treatment and Secondary effluent treatment and only one, Sludge drying beds, for Solids treatment. To assist in making informed decisions on selection of the most appropriate treatment process, these technologies are evaluated for each treatment step and for different treatment configurations.
The proposed FSTP comprises the following components: 1) Inlet Works, 2) Biological Treatment Units, 3) Sludge Drying Beds, and 4) Site Works.

5.4.1. Inlet Works

The inlet works will comprise 1) a tanker discharge bay, 2) screens chamber, 3) stainless steel bar screens, and 4) a chute for delivering sludge at the bottom of the anaerobic pond. Exhaust vehicles shall empty into the tanker discharge bay which will comprise a rectangular paved area with raised walls on three sides to contain any splattering from the tanker at the time of discharge.

The screens will be raked manually onto perforated steel plates where the screenings will be allowed to dewater. Screenings/solid wastes will be placed on trays to dry and disposed through burial in excavated trenches within the treatment plant. A stand pipe will be provided at the inlet works to allow for hosing of all septage spillage to maintain cleanliness while flushing the waste downstream through the inlet works. The inlet works are designed for maximum fecal sludge flow, which is expected to occur in 2031.

5.4.2. Discharge Bay

The discharge bay is designed to allow emptying of the sludge without spilling over, by providing a wide emptying space with side walls that also holds the sludge to allow flow through the screens. The floor is sloped at 5% towards the screen's chamber. The bay will be cleaned by hosing for which a standpipe is provided.

5.4.3. Screens

Two sets of screens are provided, a coarse and fine screen. For design, a sludge truck with a volume of 10 m3, is assumed to discharge in 10 min. The minimum flow velocity through the screens is taken as 0.6 m/s. The coarse and fine screens are designed with 50- and 10-mm openings, respectively and 10 mm bars. The larger required screen area of 0.06 m2 is adopted for the design.

5.4.4. Biological Treatment

Anaerobic Baffle Reactor (ABR) with Facultative Pond and Maturation Ponds: The first option, Anaerobic Baffle Reactor (ABR) with combination of facultative pond and maturation pond, require a small footprint and have eliminated the need for a separate settling tank, they maintain passive operation and low construction and operating cost; however, they will need to be desludged periodically. This option includes the following treatment facilities:

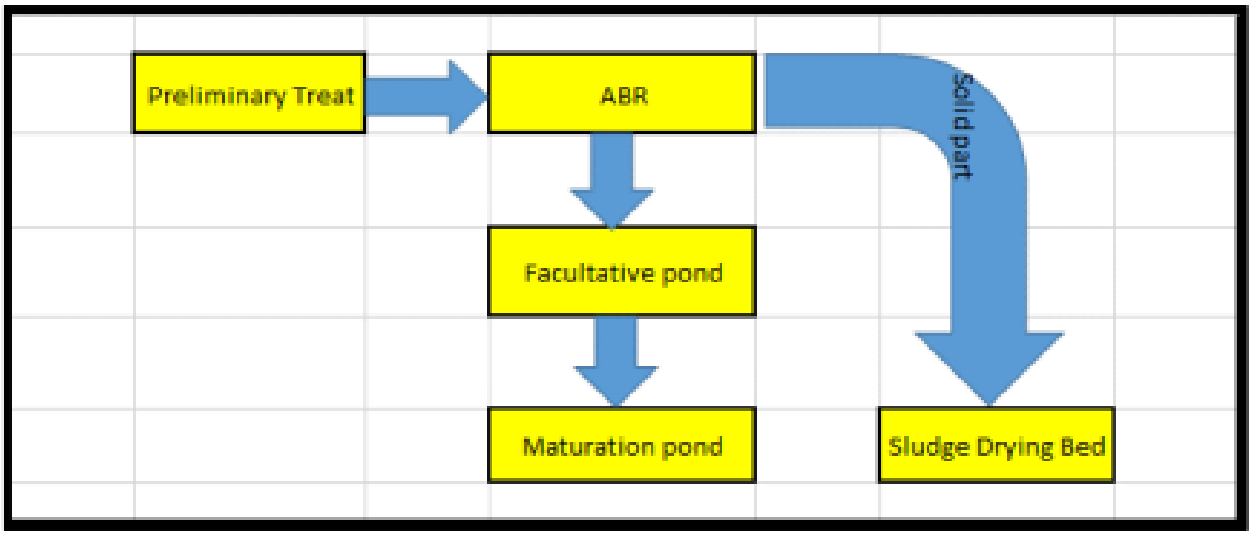

Figure 10: Layout of ABR with Facultative and maturation treatment system
Source: Final Feasibility Study and Preliminary Design Report (March 2022)

Preliminary treatment: Preliminary treatment involves removal of trash, debris, fats, oil, and grease (FOG) found in raw sewage. It is designed to prevent potential damage to equipment, upsets subsequent treatment processes and, in some cases, improves the effectiveness of downstream processes. Pre-treatment processes involve use of gravel and stone traps, screens, grit chambers, and FOG removal technologies.

Coarse Screens: Manually raked screens are the simplest option for coarse screening. The spacing between bars on a coarse screen is usually between 2-10mm. The coarse 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 standard practice however is to have the screen bent over at the top so that the trash can be raked up into a trough to avoid having a hinge that can fail. Mechanically raked screens can be used in cases where supply of spare parts and skilled labor for operating and maintaining these systems is available. Also, adequate supply of wash water will be required for regular cleaning of the mechanized rakes

Liquid part of the fecal sludge: ***Anaerobic baffled reactor***: 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

Table 4: Design of Anaerobic Baffled Reactor (ABR)

	Parameter	Decision criteria	Provided

	Parameter	Decision criteria	Provided
1	Inflow (m3 /day)		78
2	No. of streams		2
3	Capacity per stream (m3 /day)		39
4	Hydraulic retention time (HRT) (day)	Minimum 8hrs 2-3 days	2
5	Volume of each stream (m)		78
6	Depth (m)		1.8
7	Plan area per stream (m)		43.3
8	No. of Up-Flow Chambers	3-6	6
9	Length of each Chamber (m)		
10	Width of each Chamber (m)		
	Overall ABR Dimensions		00
11	Up follow velocity of wastewater	<06m/h	0.375 ok
12	Solids Retention time	30-60 days	60 days
13	Assumed influent BOD		3,600 mg/l
14	Optimal Performance	BOD removal up to 90% E. Coli Removal- 1 log	80%
15	Effluent BOD (mg/l)		360

Facultative ponds; Facultative ponds are the simplest form of secondary treatment. Its main purpose is to remove organic material and solids but they can also remove ammonia that is incorporated into biomass (Mara, 2004). When used in fecal sludge and septage treatment, they will normally follow anaerobic ponds. The upper layers of facultative ponds are aerobic, with oxygen introduced through atmospheric oxygen diffusion and algal photosynthesis. Anaerobic conditions prevail near the bottom of ponds while intermediate levels may be intermittently aerobic and anaerobic, depending on the time of day and whether or not photosynthesis is occurring.

Table 5: Design of Facultative ponds

S/N	Parameter	Provided
1	Overall Capacity (m^3 /d)	78
2	No. of streams	2
3	Capacity of each stream (m^3 /day)	39
4	Surface Loading λv (kg/ha/day) 350	350
5	Influent BOD (g/m3)	360
6	Pond Surface Area (m^2)	557
7	Water Depth (m)	2.5
8	Mid-depth Area (m^2)	557
9	Side slope	1:2.5
10	Freeboard (m)	0.5
11	Crest level dimensions (m)	**23 x 40**
12	Bottom dimensions (m)	13 x 30
13	Retention Time (d)	21.4
14	Effluent BOD (mg/L)	96.2

Maturation pond: Maturation ponds normally follow facultative ponds and are designed for pathogen removal. Their shallow depth, typically 1−1.5 m, allows sunlight to penetrate to the bottom of the pond and inactivate pathogens. The sunlight also encourages photosynthesis, and aerobic bacterial and algal growth. Fecal coliform concentrations are normally used as a proxy for the presence of specific pathogens as they

are relatively easy to measure. Since their main purpose is to remove pathogens rather than reduce the organic and suspended solids loads, maturation ponds must follow processes that have already removed BOD and TSS. Ponds should have a length-to-width ratio of at least 2:1 and up to 10:1. Higher ratios provide better model plug flow conditions (Mara, 2004). Ponds can be constructed with vertical concrete walls but the more normal practice is to provide sloping sides, as already described for facultative ponds. Baffles can be used to prevent short-circuiting, but the more normal procedure is to provide several ponds in series, since this maximizes pathogen removal.

Table 6: Design of Maturation Ponds

S. N	Parameter	Design criteria	Details
1	Overall capacity	-	78 m^3/d
2	Number of streams	-	2
3	Capacity of each stream	-	39 m^3/d
4	Number of bonds in each stream	-	3
5	Influent BOD	-	96.2 g/m^3
6	Retention time per pond	-	7 days
7	Pond volume		273 m^2
8	Freeboard		0.5 m
9	Pond depth		1.5m
10	Top length		23
11	Side slopes	-	1:2.5
12	Mid depth length (m)		16.75
13	Mid depth width (m)	-	10.87m
14	Top width (m)		17.11
15	Overall dimension	-	10X10
16	Effluent BOD	<30	14.1 mg/L
17	Effluent coliforms)		202 coliforms/100ml

***Sludge 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 evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates. 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. 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. The inlet should be equipped with a splash plate to prevent erosion of the sand layer and to allow for even distribution of the sludge.

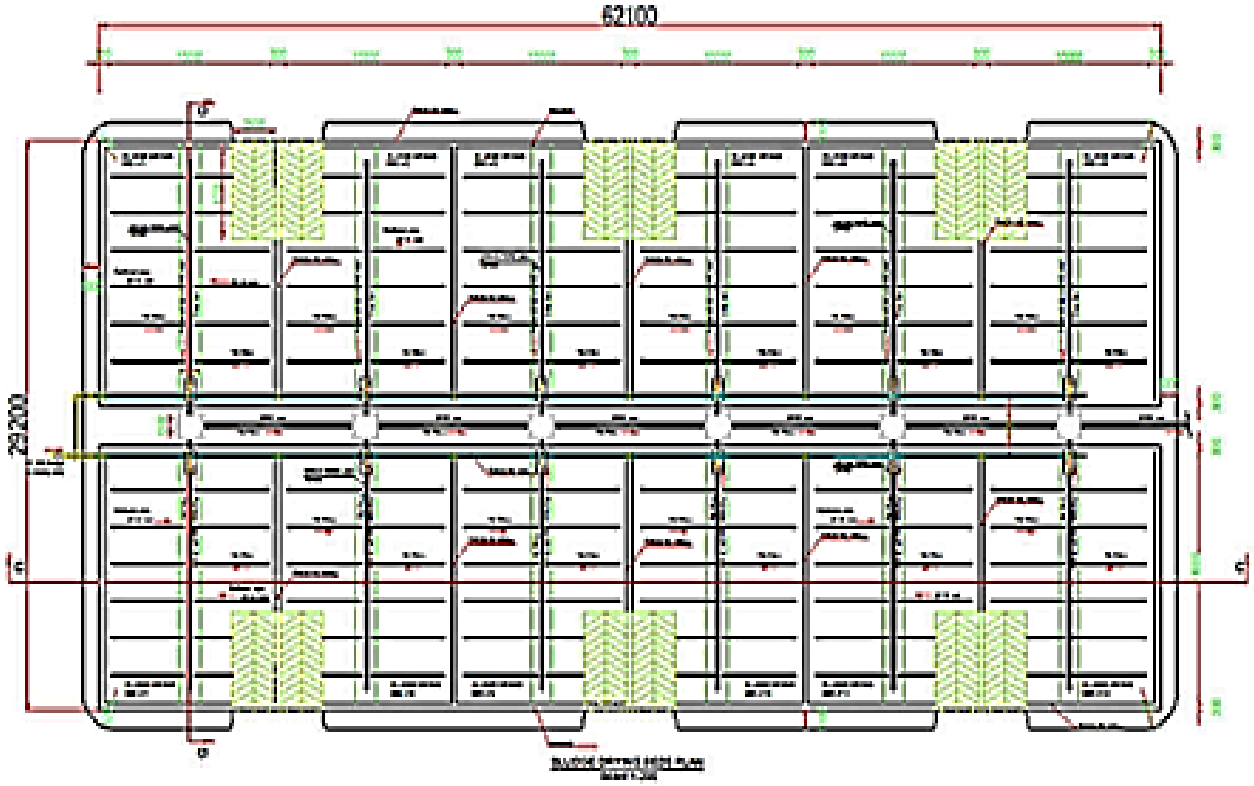

Figure 11: Plan of Proposed Sludge drying Beds
Source: Final Feasibility Study and Preliminary Design Report (March 2022)

Sludge Drying Beds have been provided for the dewatering and stabilization of partially treated fecal sludge after accumulation in the ABR and anaerobic ponds. Further treatment of sludge is expected in the Drying Beds due to the extensive exposure to UV resulting inconsiderable pathogen reduction. Continuous dewatering and drying of the sludge are also expected to result in more rapid sludge stabilization.

The ESIA team has come up with the idea of designing the sludge drying beds to be solar drying systems. Drying bed is usually designed using concrete and the top of the bed is covered by transparent material to allow the passage of sunlight. This is basically a greenhouse structure where sludge is stored and kept for drying 10–20 days depending on solar intensity and length. The system is usually designed to operate in both batch and continuous mode with control airflow, temperature, ventilation facility which affect the evaporation efficiency (Chaisar and Garg, 202). The main advantages of this system are low investment, less energy input, high dewatering efficiency, etc. Drawback of this system is more space requirement and mechanical system required for turning the sludges. But it is also an opportunity for creating huge jobs for local peoples. Therefore, the ESIA consultant highly recommends to use solar energy source to run the FSTP. In addition, the team has advice to develop an energy recovery system from the wastewater.

Liquid Percolate: The percolate from the sludge drying beds from the under-drainage system, will be conveyed by gravity to the facultative pond.

Storage: The stabilized, dried and treated sludge will be manually scooped from drying beds and stored in a roofed storage area, before its final disposal or reuse as manure. The soil of the storage areas will be laid with a 1% slope towards the central drainage, in order to collect the eventual drainage water and direct it towards the screens. The storage area can be used also for screened material disposal and sand deposit for bed restoration and other matters needed for work.

Sludge Reuse and Disposal: Sludge produced during the fecal sludge treatment process requires handling either for disposal or valorization.

For Gambella town, plausible disposal and reuse paths are: Agricultural use; Biomass products (small scale); Landfilling; and Energy source for future energy intensive industries.

Landfilling is a disposal process with no valorization and therefore the least attractive. However, as the most assured management method against contamination, it is provided by allocating space within the treatment site for landfilling. It is recommended that the other methods especially, agricultural use be aggressively promoted for recovery of nutrient, energy and inert material as well as reduce the demand on landfilling.

It would be a cheaper alternative for farmers to use sludge as organic fertilizers to increase their production that using manufactured fertilizer/inorganic fertilizers. However, for the Gambella Region, sludge fertilizer would be a new material, which would require significant promotion for acceptability. It is anticipated that initially, there would be low uptake of the sludge by farmers because of a lack of knowledge on the nature of the sludge and the general feeling that sludge fecal material presents unknown health hazards. Accordingly, public awareness efforts will be necessary to convince the farmers to adopt it as a fertilizer.

The requirements for nitrogen and phosphorus in agricultural land are usually met with domestic sludge at a dosing rate of around 30 tons/ha every 10 years or 3 tons/ha/yr. The spreading is performed every 4 years on every field depending on the type of culture, and the quality of the sludge. However, this dosing rate should be checked against the regulation and practices on maximum cumulated loads of heavy metal over a certain period of time.

Site Works: The site works at the treatment plant include Fencing, gate and gate house, Access roads, Office, Washing platform. The works are described in the following sections.

Fencing, Gate and Gatehouse: A concrete posts chainlike perimeter fence 1.8 m high 700 m long is provided to keep out intruders and livestock from the site. It will have three lines of barbed wires at the top to discourage jumping over. The gate will be 7 m wide steel with two swings. A gatehouse is provided for the person manning the gate.

Office Building: A small office building comprising an office for the operator and recordkeeping and a store. Because the site is remotely located and off grid, only portable laboratory equipment is proposed which shall be kept at the Sanitation section of the utility.

Ablution block: The ablution block will comprise two toilets for use by the workers, sludge truck drivers and crew and visitors.

Clean Water Tank: It is proposed to provide a 10 m^3 water storage tank placed on a 3 m high reinforced concrete tower to store water for use at the site. The water will be supplied by the utility water browsers. The ablution block will comprise of two toilets for use by the workers, sludge truck drivers and crew, and visitors.

Access roads and Parking: Access roads will be provided for access of sludge trucks to the discharge bay, and sludge drying beds. Compacted sub-base and base layers with cobblestoned finish are proposed. The road area is estimated at 2100 m^2.

Vehicle Washing Area: There will also be an additional paved area to be used for tanker washing. The paved areas shall be sloped towards a common outlet leading to a constant velocity channel preceded by a coarse screen. The former is to facilitate grit removal while rags will be trapped in the latter. A washing area is provided to getlid off any sludge material on the sludge trucks. The area will be paved in 200 mm thick reinforced concrete. It will be drained into the biological treatment units. The washing area is estimated at 70 m^2.

Source of Energy for FSTP: The ESIA team is also considering solar power as sources of energy for running the FSTP. The solar energy can be used for lightning, for running the treatment plant, and drying the sludges.

5.5. Cost Estimation

The estimated cost of the fecal sludge treatment plant components is indicated in the following tables

Table 7: FSTP construction cost estimation (source: feasibility study)

Item No.	Description	Units	Quantity	Rate (ETB)	Amount (ETB)
1	Anaerobic Baffle Reactor (ABR)	Item	1	1,912,500	1,912,500
2	Facultative Ponds	Item	1	2,250,000	2,250,000
3	Maturation Ponds	Item	1	1,350,000	1,350,000
	Total	5,512,500			

Table 8: Cost Estimate for Sludge Drying Beds

Item no.	Description	Units	Quantity	Rate (ETB)	Amount (ETB)
1	Excavation	Item	1	765,000	765,000
2	Floor Slab	Item	1	3,825,000	3,825,000
3	Walling	Item	1	2,835,000	2,835,000
4	Sand and Gravel Layer	Item	1	2,295,000	2,295,000
5	Covered Storage	Item	1	450,000	450,000
	Total	10,170,000			

Table 9: Cost of Site Works

Item no.	Description	Units	Quantity	Rate (ETB)	Amount (ETB)

Item no.	Description	Units	Quantity	Rate (ETB)	Amount (ETB)
1	Fencing, Gate & Gatehouse				
	i. Chain link fence and posts	m	700	2,250	1,260,000
	ii. Gate including pillars	Item	1	135,000	135,000
	iii. Gatehouse	m2	15	22,500	337,500
2	Office Building	m2	35	22,500	787,500
3	Ablution block	m2	20	22,500	450,000
4	Clean Water tank and Tower -	Item			180,000
5	Access roads	m2	2100	360	756,000
6	Washing bay	m2	70	2,250	157,500
7	E&M – solar lighting, hosing equipment -	Item			675,000
	Total				4,761,000

6. SUBPROJECTS ALTERNATIVE ANALYSIS

During the feasibility study, alternative sites and alternative technologies were assessed, analyzed, compared and selected. In this section, the ESIA consultant summarizes the proposed alternative sites and technologies in consultation with the feasibility report and design study consultants. This ESIA was prepared in parallel with detailed feasibility and design study and joint meetings and discussions with the parties involved in the feasibility study and sub projects design consultants.

6.1. Alternative sites for FSTP

The selection of a site for developing an FSTP for Gambella is one of the most important decisions to be made by the GWSSA and the city administration in developing and implementing its fecal sludge waste management plan. A poorly chosen site is likely to require unnecessarily high expenditure on waste transport, site development, site operations, or environmental protection. It may also cause long-term political problems from public opposition. The existing master plan of the town has not designated a site for fecal sludge waste disposal site so far.

Consequently, the Consultant team (engineering) in consultation with the Client, particularly the GWSSA, and the city administration and local woreda administration, conducted an exhaustive field visit to the potential site. Accordingly, the site in Abol woreda, about 8 km from Gambella city on the way to Dembi Dolo, is selected for FSTP. The site has been evaluated by the ESIA team during the field visit. The ESIA team finds out that the selected site is appropriate to the construction and operation of the FSTP with appropriate mitigation measures for any negative impacts.

The assessment stressed on the following points.

- From the point of view of selecting the most degraded area under no/little economic activity;
- From the perspective of optimizing site selection with the rehabilitation of degraded area with the development of FSTP 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. Repeated field visit and the study was conducted to select the environmentally, geographically, technically, and economically most viable site for the FSTP.

Selection of the FSTP location has been done by applying the criteria listed above. However, the decision was not passed on the selected site. During FSTP site selection, various options have been considered. The fact that the selected location is located on land that did not require resettlement and acquisition of the farm land, and the fact that it is located downwind from the town for most of the year, and still is easily accessible, indicates that few other options would offer a better choice. By the time that the ESIA study started the site had not been selected delineated, and there the team did not observe any contagious land situation in the surrounding areas. Other criteria were, the selected FSTP site is less conflicting with the local community but needs proper management.

6.2. Alternatives for FSTP technologies

As outlined in the feasibility study, the methodology and approach used to select the most appropriate process technology for the new proposed FSTP focused on the principal methods used to process and dispose sludge are thickening (concentration), conditioning, dewatering, and drying applied as primary operation to remove moisture from sludge. This involves looking at various possible alternative technologies, designs, and layouts. The main technological aspect considered during the design of the project was the gradient factor; the objective was to ensure that it was cost effective, easy to manage and have less social and environmental impacts. Therefore, the ESIA team has carefully evaluated the FSTP alternative technologies. The team has evaluated the technologies based on the following key criteria.

For Gambella town considerations for appropriate technologies should:

i. Provide biological treatment for the fresh sludge: - It excludes solid Liquid separation only systems for untreated sludge such as gravity thickener, sludge separation chambers, and sludge drying beds
ii. Have low capital and operating cost: - excludes mechanical dewatering, thermal drying, trickling filters
iii. Have minimum mechanization: - excludes fines screens, trickling filters. mechanical dewatering, oxidation ditch
iv. Require minimum external energy input: - excludes mechanical processes and pumped system
v. Be compatible with the available skills: - excludes gravity thickeners, fine screens, oxidation ditch and composting

As outlined in the feasibility study, the concept design was guided by the requirement to select a low-cost option for fecal sludge treatment. This ruled out the construction of a conventional but costly underground FSTP system. No other technical alternatives have been considered by the ESIA study team.

The table below summarizes the treatment methods that could be considered for Gambella town. The anaerobic pond and anaerobic baffle reactor (ABR) achieve both solid-liquid separation and biological treatment; therefore, they are considered for the first treatment steps. Aerated ponds, although mechanized, are considered because of the possibility of using solar energy that is plentiful throughout the year.

Table 10: Screened fecal Sludge Treatment Alternatives for Gambella towns

Solid Liquid Separation /Anaerobic Process	1st Stage Liquid Treatment	2nd Stage Liquid Treatment	Solids Treatment
Anaerobic Ponds	Facultative Pond	Maturation pond	Sludge drying Bed
Anaerobic Baffle Reactor (ABR)	Aerated Lagoon	Constructed wetlands	

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

The screened alternative technologies comprise two each for Solid Liquid separation/Anaerobic processes, Primary liquid treatment and Secondary effluent treatment and only one, Sludge drying beds, for Solid's

treatment. To assist in making informed decisions on selection of the most appropriate treatment process, these technologies are evaluated for each treatment step and for different treatment configurations.

Evaluation Criteria: The result of the screening of the treatment technologies is a prioritized list of technologies as presented in the table above, from which the best ranked and applicable technology is selected for the sanitation management. Appropriate evaluation criteria were applied for each level of treatment. The criteria generally included technical feasibility, financial considerations, environmental impacts and social economic factors as previously discussed. Each of the evaluation criteria were assigned pre-weighted maximum scores within which the various technologies were scored. The evaluation is presented in the following subsections.

Evaluation FSDT Technologies: The following tables give the evaluation of the Solid Liquid separation/Anaerobic processes, Primary Liquid Treatment and Secondary Liquid Treatment.

6.2.1. Solid Liquid separation/Anaerobic processes

Evaluation criteria for Anaerobic Solid Liquid separation process and respective score is presented in the table below.

Table 11: Evaluation Criteria - Solid Liquid separation/Anaerobic processes

S/N	Criteria	Score	Anaerobic Pond	Anaerobic Baffle Reactor (ABR)
1	Construction	20	16	12
2	Equipment	5	5	5
3	Land	10	6	10
4	BOD Removal	20	15	18
5	Solid Removal	10	9	8
6	Energy Requirement	5	5	5
7	Operator Skill	5	5	4
8	Labor	5	4	4
9	Desludging/Re-planting	10	4	4
10	Odor Problems	10	5	10
	Total	100	74	80

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

6.2.2. Primary Liquid Treatment

Evaluation criteria for Primary Liquid Treatment and respective score is presented in the table below.

Table 12: Evaluation Criteria - Primary Liquid Treatment

S/N	Criteria	Score	Facultative Pond	Anaerobic Lagoon
1	Construction	20	18	12
2	Equipment	20	20	8
3	Land	10	4	8
4	BOD Removal	10	7	9
5	Pathogen removal	10	8	6
6	Energy Requirement	10	10	4
7	Operator Skill	10	10	6

8	Labor	5	5	3
9	Spare parts	5	5	4
	Total	100	87	60

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

6.2.3. Secondary Liquid Treatment

Evaluation criteria for Secondary Liquid Treatment and respective score is presented in the table below.

Table 13: Evaluation Criteria -Secondary Liquid Treatment

S/N	Criteria	Score	Maturation Pond	Constructed wetland
1	Construction method/costs	20	17	8
2	Equipment	5	5	5
3	Land	5	4	3
4	Pathogen removal	20	18	15
5	Ammonia Removal	10	5	8
6	Solid Removal	10	6	8
7	Energy Requirement	5	5	5
8	Operator Skill	5	5	4
9	Labor	5	5	4
10	Desludging/Pre-planting	10	8	5
11	Mosquito breeding	5	2	5
	Total	100	80	70

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

6.2.2.1. Ranking of Alternative Treatment Configurations for Gambella Town

Ranking of Alternative Treatment Configurations is presented in the table below

Table 14: Ranking of Alternative Treatment Configurations for Gambella Town

S/N	Treatment configuration	ABR	AP	FP	MP	CW	AL	Average	Rank
1	ABR + Facultative Pond (FP) + Constructed Wetland (WC	80	-	87	-	70	-	**79**	**3**
2	Anaerobic Pond (AP) + Facultative + Constructed Wetland	-	74	87	-	70	-	**77**	**4**
3	ABR + Facultative Pond + Maturation Pond	80	-		80	-	-	**82**	**1**
4	Anaerobic pond + Facultative + Maturation Pond	-	74		80	-	-	**80**	**2**
5	ABR + Aerated Lagoon + Constructed Wetland	80	-		-	70	60	**70**	**5**
6	Anaerobic pond + Aerated Lagoon + Constructed Wetland	-	74		-	70	60	**68**	**6**

Source: Final Feasibility Study and Preliminary Design Report (March 2022)

As can be seen from the table 14 above ABR + Facultative Pond + Maturation Pond, Anaerobic Pond + Facultative Pond + Maturation Pond and ABR + Facultative Pond + Constructed Wetland are the top three ranked alternative options of the FSTP.

6.3. 'No sub-project' option

The "no action" option was one of the many choices provided and examined in the comprehensive ESIA in order to meet the program objectives. Technical, economic, environmental, social, and climate risk comparisons were made amongst the alternatives, taking into account the public's concerns as expressed during public discussions. In order to reduce the requirement for compensation, the project alignment was assessed to look into alternative FSTP sites where needed. Doing nothing will jeopardize or delay the long-term city development plan since a good sanitation system is important for maximizing the effects of other development measures and elevating the city's reputation.

Under the Do-Nothing Alternative, no FSTP will be built and operated, and the insanitary conditions associated with the dispersal of raw untreated fecal sludge on lands surrounding the town will continue. The do-nothing alternative would mean that land and water and ultimately the surrounding environment will continue to be polluted and loaded with untreated fecal matter and potential disease vectors. The system released the untreated micro-nutrients (mainly nitrogen and phosphorus) into the natural environment. Furthermore, discharge of these two nutrients through the wastewater into the watercourse causes the increase in concentration of nitrogen and phosphorus compounds, which subsequently leads to the problem of eutrophication.

This FSTP project in Gambella town is expected to: improve sanitation and public health in the urban setting. The municipal population is growing fast amid the absence of adequate and quality fecal sludge infrastructure. Thus, choosing the 'no project' option is, from the economic perspective as well as health and social considerations, the following benefits will be realized: i) improved sanitation; ii) enhance modern FSM; iii) employment; and iV), low incidence of pollution, diseases, and accidents. For this subproject, the alternative of "no-project" will increase the risks of poor public health and environmental degradation. Hence, the 'no sub-project' option is not a viable alternative.

7. CONSULTATION PROCESS

The public consultation process in Gambella town was conducted in accordance with the Ethiopian Environmental Impact Assessment Regulation of 299/2002. Importantly, the stakeholders were given information about the improvement works and allowed to give their concerns or opinions about the planned works. Public consultations were made so as to:

- Provide clear and accurate information about the Project to communities living in the subproject area, especially along with the proposed road sub-projects in order to obtain feedback/valuable suggestions directly from impacted communities on their preferred mitigation measures;
- Promote understanding through the active engagement of individuals, groups, stakeholders, and organizations who have a stake in the sub-project and its outcomes. Public consultation plays a critical role in raising awareness of the impacts of the new developments;
- Share information with stakeholders on proposed improvement works, implementation schedule, and expected impact on the physical, biological, and socio-economic environment of the sub-project;
- Understand stakeholder concerns regarding various aspects of the subprojects and the likely impacts in different phases of construction and operation;
- Share experience from the implementation of previous GWSSA works particularly how impacts were mitigated and;
- How best to enhance people's participation and involvement.

During the preparation of the ESIAs, extensive consultations were conducted. In general, Communities were given some detailed information about the project through presentations by the consultant team. The presentations highlighted the project background, objectives, expected upcoming activities, and potential socio-economic and environmental impacts. After the presentations, the community was given an opportunity to give their views, comments, and queries. Questions were answered, clarifications offered and their recommendations received. Consultations were held on 03-05 May 2022 and attended by staff in charge of infrastructure in all sectors where the project will be implemented. Meetings were chaired by ketena leaders and GWSSA representatives.

For Gambella FSTP several stakeholder engagement activities were conducted, including higher officials, public hearings, and bilateral meetings with institutional stakeholders.

In addition to the higher officials, public hearings were also conducted on May 4 and 5 2022 with the Gambella town city administration and its offices which consists of environment and land, Health, Education, Women and children affair, finance, GWSSA, and others relevant key stakeholders who involved in the process.

Local residents were consulted, and meeting was conducted by a team of consultants on between 03 and 06 May 2022. ESIA presents issues raised by the community during the consultations, but key issues included, among others, issues of jobs, FSTP management and proper use and, and whether communities would benefit from the project (in terms of jobs).

The people in the project impact areas of influence have also been approached with Key informant interviews and focus group discussions. For the fecal sludge components, discussions and interviews were

conducted with the local authorities, and stakeholders, as well as with temporary workers in the existing open dumping sites.

7.1. Consultation with Woreda administration

All members of consultation meetings were very interested to participate in discussions and in discussions sharing their views and opinions on the points of matters raised. The discussion took place in the Gambella Mayor Office, Regional bureau of water and energy, and office of GWSSA. All participants in the meeting have discussed and forwarded their opinions on the issues of the implementation of the proposed FSTP projects planned for phase one. They discussed in detail the expectations of the people from the proposed project, the possible adverse impacts and their mitigation measures, and the role of the local administration plays in the implementation of the project. The attitudes of the administration and the residents towards the realization of the proposed FSTP projects were discussed.

All participants of the meeting have mentioned that the city's residents have serious sanitary challenges. The city administration tried to convince and raise awareness about nature and type the project. In general, the city administration tried to provide lands (it is yet specifically delineated for the upcoming PCT projects) for the FSTP at Abol woreda some 8 Km away from the city of Gambella. However, the meeting participants raised the issue of safe disposal of the fecal sludge and proper treatment in order to ensure the health of the resident and the environment. Further, they discussed the management issues and site selection should be fair and equally serve the local communities. There is an agreement between the project client and the local administration and thus with the local community. According to the Gambella administration and the local community the allocated lands for FSTP are owned by the Abol woreda administration. During the community consultation, none of the participants were raised about land and any damaged property. But their concern is finding the right land without displacing and damaging the properties.

7.2. Consultation with the local communities at the project intervention site

The participants of the meeting include kebele officials and community elders. Before the start of the official discussion, the study team briefed the participants about the proposed FSTP and Gambella city sanitation problems and about the proposed project activities within the time horizon. Then after, 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.

Participants of the consultation were assigned a chairperson of the kebele to lead the discussion and the kebele secretary to take the minutes of the discussion.

Major issues raised by the participants of the meeting were:

- Occurrence of bad smells;
- Prevalence of diseases (due to pests and other insects);
- Concerns regarding their culture: the toilets need to consider the male and female separately;
- Proper management of constructed toilets;
- Some also raised the issue of sustainability and proper management by city administration and the municipality.

The participants of the consultation meeting never raised property issues and nothing to compensate. The problem of nuisance odor needs to be properly addressed during the project design and construction phase.

The consulted community members explained that they do not have problems owning the project. Other possible impacts discussed during the consultation were the problem of drainage and erosion from the proposed project implementation. The proposed mitigation measures for the foreseen impacts include;

- Fencing the compound so that keep the property safe and durable;
- Install proper management plan to keep the facility clean and sustain; and
- Create an employment opportunity for the local people.

Finally, they concluded that they would support the project and participate in its implementation with full heart if they are sure that they will get the expected benefit from the project.

7.3. Consultation with governmental stakeholders at Gambella city

The Socio-Environmental Impact Assessment Team has consulted different government stakeholders at the mayor office, in Gambella. The objectives of the consultation are to discuss the issues of the project and to identify the possible solutions and mitigations measures for the problems that would be caused due to the project intervention in Gambella city. All the consulted organizations were very cooperative to share their concern and information about the project. These organizations include:

- Gambella Water Supply and Sewerage Agency
- Gambella Water and Energy Bureau
- Gambella city administration agriculture office
- Health Department of Gambella city
- Gambella city Women and Children Affairs
- Gambella municipality
- Gambella Urban development and construction.

The outcome of the discussions is briefly presented below:

- The project is critical and needs to be urgently started its construction and designed in such a way to ensure the health of the public. The implementation of this project is critical to bring about sustainable development and ensuring equitable share considering the interests of all stakeholders;
- The sanitation and FSTP are long-standing problems of the city of Gambella (since it uses an open fecal sludge disposal site), that need to engage all stakeholders in the design, implementation, and operation.

One of the mechanisms to disclose the project is conducting public consultation with the project affected people and relevant stakeholders. The public consultation is part of the ESIA study and it should be conducted at various levels of the project study. Public consultations at these levels of the study are vital to disclose the type and nature of the project to directly affected people and to incorporate the public's concerns, feelings, and advice in the design of the project. Projects designed through such public participation will be well recognized by the public and induce a feeling of ownership. Timely disclosure of the project to the public is also important to empower communities and involve them in the project implementation process. This eventually will make the project sustainable and socially acceptable.

As part of the ESIA study, the socio-environmental impact assessment team conducted public consultations and discussions with different stakeholders. During the discussions, we learned that there was a different level of knowledge and understanding about the proposed project among the local people and even the administration. For example, some of the existing public toilets were leased to private investors and changed into other businesses. As a result, they were curious to know the details of the project and its benefits to them. Moreover, we feel that further discussions and consultations between GWSSA (Gambella city administration since the site boundary is beyond Gambella city) and local communities at the FSTP site would be important to disclose the project and incorporate their needs in the project implementation

7.4. Consultation findings

Main issues raised and how they are addressed in the program design and in the ESIA in general. The outcome of the consultation meeting in particular the concerns is provided in Table 15 below.

Table 15: Issues and Concerns as rose during stakeholder meeting for proposed work

Stakeholder	Subproject impacts/concern raised	Mitigation suggested
Institutional stakeholders	Project delay, appropriate Lack of coordination	Improve project communication and capacity of the client and its stakeholder's coordination system
Woreda stakeholders	Impacts on the existing land use	Promote appropriate rehabilitation for degraded lands due to the project
Community	Impacts on their livelihood, nuisance odor, aesthetic value deterioration, poor management of FSTP	Proper management, provides the toilets with the water system/lines
Key informants	Issue of water for the constructed toilets, proper management of communal toilets	Establish a management committee in consultation with the Kebele administration and supply all the toilets with water supply system and raised water collection ranker

7.5. Public Disclosure

Start of the project study has been disclosed to PAPs and relevant stakeholders through a series of consultations made at City administration and Kebele levels. Through these consultations, project information (including purpose, project type, project location) and the ESIA requirements was disseminated to the stakeholders and PAPs. This helped to gain feedback and concerns that need to be addressed during the project planning, construction and implementation processes. This draft ESIA report has been prepared taking into account all the feedback from stakeholder and PAPs consultations. In accordance with the World Bank policy on access to information, disclosure of relevant project information needs to be posted on the World Bank external website to receive the opinion and suggestions of civil societies, academics, and other professionals as well.

7.6. Stakeholders Engagement Plan (SEP)

For establishing successful and positive relations between the Project and its stakeholders including the communities to be affected from the Project, the Stakeholders Engagement Plan needs to be prepared.

The project proponent has to conduct public and stakeholder consultation starting from the project inception to the completion of the project. So far, a number of public consultations have been conducted during the project identification, scoping and ESIA assessment phases and more consultations should be

continued during the construction phase of the project to settle any issues related to construction activities and interaction of construction workforce with local community. Hiring a community liaison officer from local community/project woreda or Kebele would facilitate consultation and grievance redressing processes during the construction phase. Public consultation sessions should involve Woreda and Kebele officials, community elders, women representatives, and representatives of youth and NGOs if available. All the consultation should be minted and properly filed.

Consultation is expected to continue in the subsequent phases of the project. The essential objectives of the consultation and Stakeholders Engagement can be defined as:

- Identifying relevant stakeholders to be engaged in consultations.
- Creating an open dialogue with the communities being affected from the Project and all the related stakeholders.
- Informing the disadvantaged groups, understanding the opinions of these groups and ensuring that they actively participate in opinion exchange activities.
- Increasing the social benefits of the Project and preventing or mitigating the negative social impacts.
- Informing all the stakeholders about the project in a timely and clearly understandable manner.
- Monitoring the concerns and information requirements of the communities being affected by the Project.
- Providing an open communication between the Project owner and the project-affected people and other stakeholders).
- Providing timely and correct information about the project and its progress to all the stakeholders including project-affected persons, related institutions, local and government authorities,
- Ensuring that all the related stakeholders and the project-affected persons attend the meetings.
- Giving priority to the project-affected persons while hiring workforce from the local community.
- In case of any planned interruption or unplanned damage at the infrastructure of the nearby residential locations during construction, notifying the public and the relevant institutions for reaching a solution within the shortest time possible.

SEP will encourage keeping record of all the complaints, concerns and feedback received regarding the Project and ensure resolution of any reaction, disagreement or disputes related to the Project impacts via an open communication method. It will help to establish an internal formal grievance mechanism for complaint resolution. It will contribute to caring for life and property safety during construction works & ensure the continuity of the good relations with the local community.

Whenever stakeholder's consultation required, stakeholders can be approached through existing administrational structures such as through Woreda Administration, Kebele administration and project sub city administration. Future consultation can be initiated by the community or by project proponents or by other stakeholders depending on the issue to be discussed.

8. IMPACT IDENTIFICATION, ANALYSIS AND POSSIBLE MITIGATION MEASURES

8.1. General considerations

This part of the report addresses potential impacts associated with the proposed subproject and measures for avoidance, reduction or restoration of the negative impacts and enhancing (improvements) of positive effects of the subprojects. For the assessment of the socio-environmental impacts of the proposed subprojects, 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.

Any impact analysis should be viewed in light of available data and information on the baseline environment, an appropriate description of the project, and subsequent positive and negative changes that are anticipated as the result of project implementation.

8.2. Impact Identification

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

Identification of 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.

8.2.1. 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/ GWSSA/ Woreda Council / 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, Gambella Region Urban development and construction, Health bureau, education, culture and tourism, women and children affairs, and Districts/ Municipal Environment Management Committees, village Committees, and GWSSA.

8.2.2. 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. However, the proposed sanitation subprojects will not have permanent impacts to the local community in terms of resettlement.

Table 16: Shows estimated temporal boundaries of the project.

Project phase	Duration
Construction	Up to 2 years
Operation	20 years
Decommissioning	After facility operational lifetime

8.2.3. 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 boundaries 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 to business; traffic accidents; spread of communicable diseases such as COVID-19/ 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 regional, district/ Municipality, and village administration levels. In addition, regional land administration and environmental protection, the Vice President's Office/ GWSSA may all have input regarding land ownership and construction permits and issues.

8.3. 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. Thus, in this chapter, the impacts that are expected to result at each stage of the subproject activities are elaborated and analyzed in relation to their implementations, operation and decommissioning phases.

Impact significance of each identified impact was decided by expert's judgment based on past experience, field observation and outcome of consultation with stakeholders. 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 and Matrix of Potential impacts against classification and significance for the fecal sludge treatment plant is provided in table 17 below.

Table 17: Provides the detailed classification of impacts

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 short period of time
		Medium term	The impact shall last medium period
		Long Term	The impact shall be permanent
Reversibility	Can the influence of the impact be removed once the impact end 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 18: Prediction and significance of potential impacts of FSTP subproject 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.	Soil compaction and erosion		X		X			X		X		X			X				X	
2.	Pollution of surface water		X		X		X			X		X			X				X	
3.	Impact on flora and fauna		X			X	X			X						X			X	
4.	Risk of flooding, erosion, landslide		X		X		X			X		X			X				X	
5.	Noise dust and vibration		X			X		X		X									X	
6.	Ambient air pollution		X	X			X			X		X			X			X		
7.	Traffic congestion and accident		X		X		X			X		X			X			X		
8.	Occupational Health and safety of workers		X		X			X		X								X		
9.	Public Health impact (HIV AIDS/ STDs)		X		X			X		X			X					X		
10.	GBV/SA		X		X			X		X			X						X	
11.	Impact on archaeological & cultural heritage sites		X	X				X		X	X		X		X				X	
12.	Security risk		X		X		X			X		X			X				x	
13.	Job creation	X				X				X			X						X	
14.	Skill transfer to local workers	X			X					X			X					X		
15.	Indirect job opportunities for coffee and tea venders	X			X					X		X						X		
	OPERATION PHASE																			
1.	Odor (Foul smell) at the site and surrounding environments		X			X		X		X			X		X				X	
2.	Ambient air pollution		X		X		X			X				X	X				X	
3.	Risk of flooding, 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
	landslide																			
4.	Impact on public health		X		X			X		X	X		X			X			X	
5.	Occupational safety		X		X			X		X						X				
6.	GBV/SA		X		X			X		X			X						X	
7.	Security risk		X		X		X			X		X			X				x	
8.	Job creation	X								X	X			X						X
9.	Compost generation from sludge	X								X				X						X
	DECOMMISSIONING PHASE																			
1.	Air and Noise pollution		X			X	X			X			X		X				X	
2.	Soil compaction and erosion		X		X			X		X									X	
3.	Impact on water bodies		X	X			X			X			X		X			X		
4.	Spoil disposal		X							X								X		
5.	Health impact		X		X					X									X	
6.	GBV/SA		X		X			X		X			X						X	
7.	Loss of Job opportunity		X		X					X										

8.4. Positive Impacts and Enhancement Measures

The most significant benefit derived from these subprojects 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 Gambella city targeted by each subproject. This then has much broader implications in terms of better economic productivity, and it will contribute to boosting development, particularly in the tourism sector for which reliable and affordable sanitation and hygiene facilities are essential.

The subprojects will result in many socio-economic and environmental benefits for Gambella city and for those in their peri-urban areas. It is expected that the project will result in better access to safe sanitation and hygiene facilities and treatment units leading to an improved standard of living in terms of reduction of diseases (such as pathogenic), access to basic services as well as the creation of temporary/permanent employment during construction and operation. Not last longing negative environmental or social impacts are expected from this activity as it does not involve permanent changes in the socio-economic and environmental settings except for a few households who lose some of their plots. It will mainly benefit the poor in the city areas by providing access to clean and affordable sanitation and hygiene facilities.

The fecal sludge component will contribute to alleviating the impacts of the existing open dumping and uncontrolled fecal waste disposal into the environment, which include nuisance odors, poor aesthetics, and risk of groundwater pollution, among others.

The impact analysis presented above identified positive impacts of the proposed Subproject activities. The positive impacts have been ranked depending on their anticipated impacts during the construction, operation, and decommissioning phases. The potential positive impacts are more or less the same for all subproject developments. The identified impacts and their enhancement measures are briefly described in the sections below

8.4.1. Job creation

The construction, operation, and decommissioning of the subproject 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. Indirect job opportunities like coffee and tea selling around the construction site, mainly by women, is another benefit of the project, particularly during the construction phase. 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. Low job creation is expected during the decommissioning phases, while high amounts of job creation is predicted to occur during the construction and operation phases.

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

8.4.2. Health

The implementation of the proposed subprojects will prevent any health related-problems, particularly from outbreaks of waste-related diseases (such as cholera dysenteric disease caused by poor sanitation). Health reports from the Regional Health Bureau indicate that sanitation and hygiene related diseases are a major health problem in the Region. According to the Gambella Region Health Bureau, diarrhea, bacterial intestinal infection, and typhoid fever were ranked among the top ten diseases that caused morbidity. Moreover, Health bureau experts who participated in the consultations disclosed that the existing practice of disposing of fecal sludge in undesignated and uncontrolled locations is unacceptable from a health point of view. The proposed Subprojects will positively contribute towards improving the environmental sanitation and community health in Gambella.

Enhancement measures: Health advantage from treating the fecal sludge would be enhanced by creating awareness among the users on clean and polluted water as well as its advantage and disadvantage. Advising residents to organize an environmental health committee and follow up their environmental sanitation status. Provision of health centers by responsible government offices in areas where there are no health facilities. It is clear that treatment alone cannot make the environment clean. Proper solid waste collection, treatment and disposal would enhance the benefits to be obtained from the treatment process. 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 of FSTPs' residues. This can be implemented in collaboration with the Gambella region water and energy and agriculture and natural resource bureaus.

8.4.3. Production of Compost/Fertilizers

Dewatering sludge removed from the FSTP process can be utilized for fertilization and conditioning of the soils in the immediate irrigated agriculture area and far beyond downstream and upstream. Biodegradable materials removed in the process can be given to the agricultural sector for natural fertilizers to be used in place of other products that may be more harmful to people and the environment. In addition, the Gambella town (agriculture), water and energy office, can mobilize resources to take advantage of FS wastes to generate biogas for households and institutions. The good learning and collaboration point will be Gambella's University, biogas infrastructure. In this regard the related office will collaborate with the institutions in the Gambella town to convert the wastes into biogas. Motion consultancy and Training is ready to advice on the design and development of both 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 biogas to fuel their houses would enhance the benefit and help to generate income (establishing small enterprises that prepare marketable compost). Producing marketable compost will enhance the benefit and generate income to the concerned authority. This needs to closely work with the regional bureau of agriculture to ensure the quality of compost prepared.

8.4.4. Supplementary measures

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

- **Capacity Building:** The other broad area of intervention required to enhance the identified positive impacts is conducting capacity-building programs within GWSSA and municipality. The implementation of training and capacity-building programs would serve the sustainability of the project.
- **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. Seeing that waste is an inherent part of the production system, the "Waste is Resource /Wealth" approach must be viewed as an important waste management principle.
- Awareness raising on construction, proper utilization and maintenance of sanitation and hygiene facilities: Community's awareness on construction and proper utilization of the sanitation and hygiene facilities and services is low. In addition to hardware components, integrating hygiene promotion and awareness creation activities will enhance the positive impacts or results of the proposed subprojects.
- Give priority to job opportunities for the local people in general and for the women and disabled community groups in particular.

Table 19: 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 job training and capacity building, it is possible to enhance job opportunity for the project affected people. Recruit local labor in consultation with project administration office	Construction Contractor	GWSSE/ Supervisory Consultant SC	construction phase	Not require
	Give priority of skilled and unskilled job for project affected people. Provide on job training to build the capacity of workers.	GWSSA/FSTPs Management	Labor office	Operation phase	500,000
Improvements on public health	Creating awareness among the users on clean and polluted water as well as its advantage and disadvantage. Advising residents to organize environmental health committee and follow up their environmental sanitation status. Responsible governmental office should provide health centers in areas where there are no health facilities. Promote proper solid waste collection, treatment and disposal system to supplement the benefit obtained from treatment.	Gambella Health Office	Community Health Promotion Office	Operation phase	Cost for establishing health facilities like health center is part of the Government budgets.
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 to GWSSE.	GWSSE/FSTPs Management in cooperation with Agriculture Offices	Gambella EPCC, Agriculture and natural resource department		Part of the FSTPs operation budget

8.5. 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 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 impacts areas that are of concern for the implementation of the subprojects and their proposed mitigation measures are presented below:

8.5.1. Construction phase

Soil Compaction and Erosion: 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 clearing, stripping of topsoil, excavation in soil, and loading of spoils and hauling of the same to disposal sites; these activities would involve operation of heavy-duty equipment and dump trucks. These undertakings have the potential to cause soil compaction as well as damages to soil structure and expose the soil to runoff water erosion. This will increase the risk of soil erosion and silt transport to rivers, streams and other watercourses.

In addition, there will be a risk of soil contamination from leakages of hazardous substances such as fuel and oils from equipment and vehicles. Soil pollution could also occur due to spillages of toxic substances (fuel, lubricants, and oil) resulting from poor handling of the substances especially during maintenance of machinery and vehicles can contaminate the soil.

The impacts on soils are predicted to be moderate, localized and temporary and reversible without applying any mitigation measures.

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 exposure of soil to runoff water erosion.
- Careful removal and proper stockpiling of the topsoil removed from the sites, and re-using it for site restoration when construction works are ended.
- Reduce the time-exposed surfaces or excavated soils remain bare following completion of works and implement restoration measures such as re-vegetating exposed areas as quickly as possible.
- Refilling the trenches and other excavated/exposed places soon, covering with topsoil, leveling to surrounding landscape
- If a temporary access road is constructed, scarify and loosen the compacted soil when use for the access road is completed or no more needed
- Prevent environmental pollution by hazardous substances such as fuel, oil, cement sludge, and detergents through proper storage and handling of the substances. Among the precautions to be taken is that the Contractor shall install drip pans and fuel funnels at dispensing points of fuels and lubricants. Oil exchange should be taken 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.
- If temporary access road is constructed, scarify and loosen the compacted soil when use for the access road is completed or no more needed.
- Construction sequencing, locating stockpiles away from watercourses, and disposing of grit, screenings, and sludge from existing lagoons in a landfill.

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). Release of solid and liquid wastes from construction camps has the potential to affect the surface and groundwater quality. In addition, spillages of hazardous substances such as fuel and oils from workshops may affect the water quality of nearby streams.

The impact on surface water bodies before mitigation measures is anticipated to be moderate, while the impact on groundwater is rated to be low.

Mitigation Measures

- Perform excavation works and earth moving activities during the dry season only thereby minimizing erosion or transport of excavated materials by runoff water-to-water bodies.
- Prevent environmental pollution by hazardous substances such as oil, fuel, cement sludge, and detergents through proper storage and handling of these substances. Among the precautions to be taken is that the Contractor shall install drip pans and fuel funnels at dispensing points of fuels and lubricants. Oil change should be taken 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.
- Locating storage areas and compounds away from watercourses if any,
- Appropriate storage of fuel and materials,
- Properly collect used oil and other chemicals and safely dispose of them through accredited oil reprocessing or disposal agency or in other manner approved by the Supervision Engineer.
- Adopt good site management that considers good pollution prevention measures such as locating storage areas and compounds away from watercourses, appropriate storage of fuel and materials, providing suitable facilities for workers, disposing of waste according to approved waste management plan (avoid open waste disposal practices).
- Providing suitable facilities for workers

Impacts on Vegetation and Flora: The construction of the proposed subproject is not expected to cause significant adverse impacts on vegetation and flora. There are only two types of perennial trees that would be affected by the subproject development, namely the mango tree and chat/khat. In general, the impact on flora during the construction phase is considered as moderate, localized and temporary.

Mitigation measures

- Provide alternative land in the nearby area if applicable to support the livelihood of the affected persons;
- Pay appropriate cash compensation for project-affected trees and/or crops.
- Demarcation and fencing off the construction areas
- Prohibit poaching and killing of wildlife by the workforce backfilling of trenches and other excavated areas and grading to the natural topography.
- Awareness creation for the project personnel.
- Compensatory plantation program at least saplings of 10 seedlings for each tree felled (staggered to follow Civil Works) including 3 years of maintenance

Risk of flooding, erosion, landslide: During construction phase the damages from flooding, erosion and landslides in the surrounding of the FSTP infrastructure is less in its occurrence, the impact is less adverse, unlikely, reversible, of moderate significance, and short-term. However, a precautionary action shall be taken before the start of the construction and site preparation works should be promoted to avoid any unforeseen risks of flooding/erosion and landslide.

Mitigation measures

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

- Pre-preparation for the waste way/flood ways in the project construction area and providing appropriate waterways or not blocking the natural waterways.
- Removing/clearing any materials including soils and other construction materials from the natural waterways.
- Providing awareness to the construction site manager and the employee on flood/erosion and landslide management as appropriate.

Noise and Vibration Impact: Similar to air pollution, noise pollution is one of the adverse impacts of construction activities that involve operation of vehicles and heavy equipment. Especially, high noise levels above WHO and Ethiopian noise standards can cause health impact on recipients. The Ethiopian noise standard for day time at residential areas is 55 dB and for night time it is 45 dB. The long-term exposure to noise level above this standard at residential areas is expected to cause health impact.

The activities that are expected to generate significant noise and/or vibration include:

- Operation of the traffic that will deliver construction materials to and from the lay down areas and to site;
- Excavation works to construct the proposed treatment plants;
- Excavation and materials moving activities;
- Drilling of pipe jacking to install underground pipes;
- The activities involved in the production of concrete pipes; and
- Operation of quarries to extract rocks and production of the aggregates required for concrete works.

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

Mitigation Measures

- Carryout noisy construction activities in the vicinity of sensitive areas during normal working hours only;
- Use update technology or modern equipment in excavation works that will minimize noise emissions and vibration.
- Keep noise level near sensitive areas such as residential areas, heath facilities, schools, religious sites and camps below the WHO and Ethiopian maximum allowable noise level standards;
- Provide ear protection equipment (earplugs) for workers in vicinity of noise emissions;
- Incorporate low-noise equipment in the design and/or locate such mechanical equipment in properly acoustically lined buildings or enclosures.
- Conduct situation assessment before starting excavation works where there are sensitive buildings, fences and houses near the subproject sites,
- Use machineries that will not produce heavy vibration, If the houses, fences and buildings are cracked or damaged by the excavation work, the contractor has to fix the damage or pay compensation for the PAPs, include a clause in the contract document that clearly indicates the contractor's responsibility to fix any damage caused by the activities

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

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

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

Mitigation measures

- Implement measures that will reduce dust emission including regular spraying of water on unpaved access roads, exposed earth and any stockpiles on site, and where feasible, covering stockpiles on site with plastic materials.
- Use update technology or modern equipment in excavation works that will minimize dust generation from earthen materials.
- Regular vehicle inspections and maintenance of equipment and vehicles to reduce excessive exhaust emissions.
- Minimize excavation and earth moving to only what is required for the specific nature and type of construction.
- Limit stockpiling of excavated topsoil to the maximum of 2m height.
- As much as possible use paved roads. and
- Limit speed of vehicles to 30km/hour on unpaved access roads especially near sensitive areas (residential and business areas, social services, religious places).

- Use dust collectors or water spray systems as appropriate to prevent high dust emissions from stone crushing or batch plant operations at PSTP.

Traffic Accident Risks: During construction, there will be increased traffic volume on the roads along the construction of FSTPs and commensurately this may result in increased traffic accident risks to 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 about traffic safety and traffic 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.

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 the 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 traffic 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 discipline for the drivers.
- Sensitization of the nearby communities about the increased traffic. Provide awareness education for the nearby residents in traffic safety measures at public meetings, social gatherings, schools, mosques and churches, etc.

Occupational Health and Safety Impact: Large scale construction work by its nature is a hazardous job, and hence it requires adopting appropriate occupational health and safety measures. There could be safety risks related to storage and use of hazardous chemicals and explosives. Moreover, there might be accidents of various nature to project workers. Furthermore, dust and exhaust emissions may affect the respiratory tract of project workers and local people exposed to such emissions. The impact on the health and safety of project workers, local people and users of the existing roads or paths affected during construction of FSTPs is anticipated to be a moderate to high, short term to long term and direct adverse impact.

Mitigation measures

- Take maximum care and minimize accident risks by applying internationally accepted standards and recognized occupational health and safety guidelines.
- Provide a Healthy and Safety Plan prior to the commencement of works to be approved by the resident engineer
- There should be safety policy clearly displayed on the site.

- Take appropriate care in storing and using hazardous chemicals and explosives and provide training to workers in handling hazardous chemicals.
- Provide first aid kits at workshops, construction worksites, and inside vehicles.
- Provided 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, create awareness on safety issues and strictly inspect proper use throughout the construction phase.
- Appropriate signs must be erected on the site to warn workers and visitors
- Conduct general medical check-ups for recruits and subsequently, conduct periodic medical check for all employees and take appropriate action and keep all records.
- Hung-up fire extinguisher bearing detailed information about its status at appropriate places.
- All personnel, vehicles, and machinery should be covered under an appropriate Insurance System.
- Carefully record and keep all incidence 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.
- Provide awareness creation on safety procedures and HIV/AIDS and avail healthcare services.
- Provide temporary toilets and bathrooms for the construction workers at the work sites.
- Regularly spray water in dusty roads and work areas. and
- 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 Infections (STIs): As it is well-known, large scale 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 group of the population, mobile and are partly because they are forced to live in hotel rooms or in construction camps.

It is obvious that the presence of a large number of workforces at construction sites attracts sex workers to the area and also entices young girls from the locality to go into the business. Hence, this makes the project area highly vulnerable and easily exposed to the spread of STIs and HIV/AIDS transmitting factors.

Mitigation Measures

- Contractors should assign experienced HIV/AIDS sub consultant to handle the issues related to HIV/AIDS awareness and prevention.
- Launch awareness and education campaigns about HIV/AIDS and STDs among the construction workers and community to make them informed. This has to be done on the one hand by the contractor's sub consultant and on the other hand by the local health institutes along the project road targeting especially women and sex workers.
- 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. To prevent young and school age people, schools should include information campaigns and/or special training.
- Town administrations and health offices, HIV/AIDS Prevention and Control Office, Elders, and NGOs operating in the area need to work jointly to create positive impact and bring major attitudinal and behavioral changes.

Gender and Gender Based Violence/SH Risks: Experiences from different infrastructure projects show that there is lack of knowledge and understanding on Gender issues and GBV/SH and SEA by Contractors, consultants and construction workers. Due to this, female construction workers could face difficulties in their work places, such as, GVB and sexual harassment. Hence, there is a potential that gender abuse might occur during the construction of the proposed projects through unequal distribution of work, sexual harassment, discrimination against women, and unequal pay for women, among others. This impact is rated to be low for the reason that contractors are expected to include gender specialists among the workforce to create awareness to prevent GBV/SH and SEA.

Mitigation measures

- Create awareness among workers on the GBV/SH to the staff/workers.
- Prepare and implement code of conduct that sufficiently addresses gender and sexual harassment issues. strictly forbid sexual harassment /GBV and to be signed by all workers including international workers if involved and subcontract workers
- Include in the employment contract for the construction workers that any GBV and sexual harassment against women workers will lead to administrative measures and legal actions.
- Take appropriate actions on workers violating the CoC.
- Design gender core labor standards and employment and contract procedures, and design gender responsive workers manuals.
- Assign women in works that do not affect their biological condition.
- Provide and avail a separate sanitation facility for women at construction camp
- Provide women workers with appropriate type of safety equipment and protective materials.
- The Contractor should ensure that women are paid equal for equal work with their male counterparts.
- Provision of gender disaggregated bathing, cloth changing areas & sanitation facilities.
- Include gender expert among the consultant's team to follow up Gender mainstreaming activities.
- Ensure that women construction workers do not face GBV and sexual harassment.
- Ensure equal pay for women and men for equal job.
- Assign gender specialist at construction site to aware and prevent GBV and sexual harassment

Security risk: although it will not be a serious problem security risk is one of the potential risks in the proposed project area and should be put into consideration. However, there will be few insecurity cases that need to take a precautionary action at various project phases including construction. If the risks of the security raised, it might affect the construction of the FSTP infrastructure and may cause delay of the project, quality of construction and environmental problems. The level of security risk in the project site could be moderate, reversible and short time.

Mitigation measures:

- Proper consultation with local authorities and community about the existing situation.
- Appropriate training on security issues and potential risk management including reporting to appropriate authority.
- Establish and collaborate with the local security guards and police.

Impact on Cultural, religious and Archaeological Sites: According to site observations, around the proposed subproject location there is no cultural and archaeological site.

Mitigation measures

Use of chance find procedures by the contractor. See Appendix for" Chance Find" procedures.

8.5.2. Operation Phase

Odor (Obnoxious smell): The frequent dumping of truckloads for fecal sludge may cause bad smell in and around the FSTP. However, as the FSTP is located outside the town amidst farmland, an obnoxious smell from the treatment plant area is expected to be of moderately significant.

Mitigation measures

- Create awareness to the FSTP works and even to the local community on proper management precautionary action.
- Regular facility maintenance and monitoring operational practices including process control and chemical treatment, continuous process of the operation; avoidance of pools of dirty stagnant waters and spills.
- 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.
- Adopt effective and efficient housekeeping procedures (regular cleaning of the grit and screenings).
- 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.
- Planting relevant plant species around the FSTP in the buffer zone

Ambient air pollution: The inherent presence of multiple contaminants (CH4, CO2, and H2S) in biogas requires an effective purification or use as a source of energy. Actually, these gases 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. Therefore, it is better to adopt treatment process such as alkaline, oxidation and chemical precipitation treatments in the FSTP in Semera town to reduce nuisance and bad odors. A more elegant strategy is to regulate key operational parameters (such as PH, temperature etc.) and suppress sulphate-reducing bacteria to restrict or eliminate H2S formation.

Biotechnologies based on hydrogen trophic such as (decarbonation) CO2 reduction to CH4 (power-to-gas), algal–bacterial symbiosis, or chemo lithographic H2S oxidation (desulphurization) can be implemented depending on the GWSSE capacity to reduce their impacts.

There are two technologies for H2S removal. The first is post-treatment which is efficient and could induce an addition cost to the treatment. The second alternative is pre-treatment process is a simple and potentially low-cost strategy. It removes significant amount of H2S from the sludge/anaerobic digester by

reducing H2S formation during anaerobic digestion. It is a mechanism by which, Sulphur in the substrate is removed by precipitation prior to anaerobic digestion, thus can reduce Sulphur content in the sludge/substrate, followed by liquid–solid separation and the suppression of sulphate-reducing bacteria.

Mitigation Measures:

- Regular monitoring of the ambient air including measuring H2S presence in air,
- Control an aerobic digester parameter (pH, Temperature, oxygen level etc.) for H2S producing bacteria/microorganism (creating unfavorable environment),
- Changing redox potential, which helps in reducing or oxidizing capacity of anaerobic digestion system.
- Planting relevant plant species around the FSTP in the buffer zone

Risk of flooding, erosion, landslide: the damages from flooding, erosion and landslides to the FSTP structure and associated infrastructure in the proposed FSTP area is expected to be less. It is adverse, unlikely, reversible, moderate, and medium. However, a precautionary activity shall be made to avoid any unforeseen risks of flooding/erosion and landslide. The following activities shall be considered to avoid and protect the infrastructure from risks of flooding, erosion and landslides.

Mitigation measures

- Protecting the FSTP surroundings with appropriate protection walls based on the slopes and topographic gradients.
- Promoting plantation in areas surroundings the FSTP with appropriate forest and vegetation that helps to protect the risks from flooding, erosion and landslides.
- Training the FSM unit staff on handling these risks.

Impact on water and soil bodies: The waste is treated inside properly designed units. Neither the sludge nor the drained water will be allowed to leave the FSTPs without proper treatment. For these reasons the impact of FSTPs is rated as very high positive for downstream areas and would minimize the existing uncontrolled discharge of wastewater into the water bodies. However, if there is leakage or overflow, the contamination risk will be high. The heavy metals in the treated wastewater may have potential human and environmental health impacts. The proposed FSTPs will have the capability to retain a significant amount of such contaminants, but 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 FSTPs. However, as some of them are persistent in both aerobic and anaerobic biodegradation processes of treatment, 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

- Seal the foundation of treatment plants and influence areas with concrete lining to avoid leakage of wastewater through permeable soils and weathered and fractured rocks into the groundwater system
- All pipe work and fittings should be a class A rating more than the maximum pressure attained in service including any surge pressure.
- Ensuring that the facility's effluent complies with the national effluent standards.
- Dispose sludge with dangerous substances only in a designated sanitary landfill

- Close monitoring of the facility to ensure it functions as planned; this involves monitoring of ground and surface waters in the surroundings of the FSTP.

Impact on downstream and riverine flora: During the operation phase aquatic plants, riverine trees and shrubs will get better water for their growth that is free from toxic substances. By using treated water, it will be possible to develop riverside green areas and botanical gardens. This impact is beneficiary impact and rated as very high. However, if the treatment plant releases for some unforeseen reasons any untreated or practically treated waste effluent into downstream rivers, it would adversely affect the riverine and aquatic plants. This impact is less probable and rated to be low significance.

Mitigation measures

- Monitor the proper functioning of the treatment plant,
- Regularly check the effluent quality for its compliance with acceptable effluent discharge standard,
- Whenever the quality of effluent fails to meet the standard, stop discharging the effluent into receiving streams and rivers
- As appropriate, 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: The overall impact of properly operating the treatment plant on fauna is highly positive. However, 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.

Impact on Aesthetic value: During the operation sludge, drying beds and stabilization bonds may have a negative impact on aesthetics of the surroundings. This impact is long term and irreversible but its significance is medium if it is the operation and mitigation measures are implanted properly.

Mitigation measures

- Plant trees around the treatment plant and buffer zone.
- Keep the buffer zone and open areas within the treatment plant neat all the time.

Occupational Safety: Hydrogen sulfide is a colorless, toxic gas with a characteristic rotten egg odor. It is considered a broad-spectrum poison, meaning it can poison several different systems in the body. Breathing very high levels of hydrogen sulfide can cause death within just a few breaths. Loss of consciousness can result after fewer than three 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

- Adherence to national rules and regulations
- Appropriate warning signs shall be placed in areas where accidents are expected to occur
- Provision and use of protective wears
- Strict prohibition of operation of equipment by unauthorized personnel
- Operators shall be provided with regular medical check-up 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.
- Special working schedule to workers who are working in hazardous environment which includes high temperature to minimize impacts on their health
- Emergency plan and medical help to be made available to workers working in hazardous condition like sludge removal from sludge beds etc.

Health impact and risks

a) Health impact on people contact with sludge:

It is understood that sludge should be removed from the treatment system from time to time to give the way for fresh sludge. This partially dried sludge should be collected and dumped at appropriate areas or converted into useful products; otherwise, its impact on human health and environment would be adverse.

Partially dewatered or dried sludge is reached in pathogenic organisms such as bacteria, virus, eggs and cysts of nematodes, cystoids, jardia and amoeba. This shows that negligently handled sludge cake could impose adverse health impacts on nearby residents and workers involved in day-to-day operation of the system.

Die-off or survival of excreted pathogens is an important factor influencing transmission of disease. In principle, all pathogens die off upon excretion. Prominent exceptions are pathogens whose intermediate stages multiply in intermediate hosts such as Schistosoma, which multiply in aquatic snails and are later released into the water body. Some bacteria (Salmonellae & Shigellae have the potential to multiply outside the host primarily on food and at warm temperature. The pathogens have varying resistance against die-off, and worm eggs are among the more resistant with Ascaris eggs surviving longest in the extra-intestinal environment. The main factors influencing die-off are temperature, dryness and UV-light. The survival rate of pathogens can also vary depending on the media they are attached. For example, the survival duration of pathogens usually longer in soils than in crops.

Mitigation measures

- Provide awareness training to the facility operators on the handling and management of the system and potential dangers. Equip the operators with the necessary precautionary measures (including reporting system) for any pathogenic incidents during the operation of FSTP.

- Carefully handle fecal sludge.
- Use of protection clothes such as gloves and masks and good hygiene (washing hands after work etc.).
- Most important is that workers be aware of the nature of the health risks to which they are exposed and that they know how to protect themselves.
- Training of staff and targeted information may therefore be the most successful measures.
- Department of GWSSA dealing with sludge should introduce rules for use of protection by their staff and care should be taken to enforce those rules.
- Site shall be entirely fenced and access to site restricted to employees having received the adequate training.
- Restricting access to the site for unauthorized users

b) Health impact from use of untreated fecal sludge in agriculture

Fecal sludge is a good organic fertilizer and soil conditioner and therefore frequently used in agriculture. If the sludge is not adequately treated, pathogenic organisms contained in the sludge are dispersed on the fields. Here they can infect the farmers working on the fields as they permanently enter in contact with the contaminated soil and usually do not use protection measures. Bacteria and worm eggs may also attach to the plants and infect consumers if the crops are eaten raw and are not thoroughly washed.

Mitigation Measures

- Create appropriate awareness on preparation and utilization composts from such sources.
- Fecal sludge should always be treated prior to its use in agriculture. Treatment has then to provide sufficient pathogen reduction in the sludge to guarantee the safety of its use. The most resistant organisms in treatment are eggs of parasitic worms, in particular those of Ascaris lumbricoides. These eggs can only be destroyed by exposure to temperatures above 60°C, by desiccation at moisture contents lower than 10%, or by awaiting the natural die off after at least ½ year.
- Use thermophilic composting. If composting is well done (the substrate has the right composition, moisture content and aeration are optimized) the temperature in the heaps usually rises above 55°C for several days and all pathogens are destroyed.
- 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. However, in cities like Gambella area, for a storage of sludge for long time is scarce.
- Sun drying of sludge can enhance the pathogen destruction during storage and therefore increase the security of this method. To enhance the effect of sun drying, construct a separate sun drying floor, preferably concrete and coat with black color or lay black plastic so that it could absorb much solar energy that increases the temperature and kills most of the pathogens.
- ***Avoid Use of untreated sludge for growing food crops****:* Agricultural use of fecal sludge for non-food crops can be possible without prior disinfecting treatment. In this way, the health risks for consumers can be excluded. However, the farmers handling the fecal sludge are still at risk. Therefore, it is important to not use untreated sludge for growing food crops. Particularly, abstain from irrigating edible vegetables & crops with untreated sludge water or percolated water from the drying Bed. Irrigating edible crops and vegetables with untreated sludge would directly result in the transmission of intestinal nematode and bacterial infections.

- ***Avoid 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 Taenia saginata (Cysticercus bovis). Therefore, avoid cattle from feeding contaminated grasses or grasses grown through irrigation with untreated fecal sludge;
- ***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. Hygienic education should be targeted on all aspects of hygiene and sanitation. Particularly, promote hand washing with soap after any contact with fecal sludge. If any person is proven to be infected, he should go to health facilities and consult health experts or health doctors.

c) Non-Pathogenic Health Risks

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. Eventually, these chemicals accumulate in soils and water and directly or indirectly affect human health through various routes or through the food chain. Further non-pathogen risks result from impurities of non-biodegradable origin such as Glass splinters or other sharp objects contained in the sludge. Such impurities can affect health by physically piercing or cutting those who could be involved in the manipulation of the waste. Also, health risks due to the attraction and proliferation of rodents and other disease carrying vectors are common features of improperly managed sludge treatment and dumping sites. Due to the smell, several rodents, flies, some birds (vultures), hyena, and dogs will be attracted to the area and increase the routes of contamination and disease transmission.

Mitigation Measures

- Avoid use of percolated liquid from the sludge dry bed for irrigation or any use before adequately treating and disinfecting;
- Create awareness among these people who are potentially exposed to the direct and indirect health impact of the sludge;
- Fence the FSTP compound to prevent the entrance of dogs and other nocturnal animals; and
- Keep the area clean and attractive so that flies and rodents could not be attracted.

Gender and Gender Based Violence (GBV)/Sexual exploitation Abbus (SEA) Risks: During Operation phase there might be risk of Gender Based Violence (GBV)/ Sexual exploitation Abbus (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 subproject through unequal distribution of work, sexual harassment, discrimination against women, and unequal pay for women, among others.

Mitigation measures

- 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 code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all workers including international workers if involved and subcontract workers, and
- Ensure equal pay for women and men for equal jobs.

Security risk: Although it is not a serious problem security risk is one of the potential risks in the proposed project area and needs to be put into consideration. If the risks happen, it might affect the proper functioning of the FSTP and may cause social and environmental problems. The level of security risk in the project site could be moderate, reversible and short-time.

Mitigation measures:

- Proper consultation with local authorities and community about the existing situation.
- Appropriate training on security issues and potential risk management including reporting to appropriate authority.
- Strong collaboration with local security organs.

8.5.3. Decommissioning phase

At the end of the design life of the FSTPs, GWSSA could upgrade or decommission the treatment plants. Most probably upgrading the system will be expected. If the treatment plants are decided to be decommissioned, impacts associated with disposal of contaminated soils from the treatment plant sites and solid waste generated from the demolishing of treatment plant structures would be the expected impacts. The following 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 release of dust and other pollutants embedded in the demolished structures. This impact is temporary, local and a 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, it would be necessary to remove contaminated soil from the treatment site and dispose at designated disposal sites. 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. However, 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 its downstream. Downstream reservoirs would be exposed for eutrophication and hyper eutrophication and fish and other aquatic organisms would be killed.

Mitigation measures

- 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.
- Avail advanced treatment plants that technology of the time offers before decommissioning the one at hand.
- Reclaim polluted soil with appropriate technologies such as phytoremediation.

Site Reclamation: The treatment plant sites should be reinstated after the plants stop their function. In order to make the site productive, properly planned reinstatement work needs to be conducted by the project owner or subcontracted entities. All the unwanted structures should be removed and disposed of at a designated waste disposal landfill. The reinstated area could be developed as a recreational site or assigned for other development purposes. Site reclamation work is very essential and highly positive. However, if the reinstatement work is not conducted properly, the area would be lost and the value of the land would be undermined.

Mitigation measures

- Properly reinstate the abandoned treatment plant sites,
- After reinstatement, GWSSA could use the area for other purpose, or
- Develop the areas for recreational park or plant trees to increase the aesthetic value of the area or handover to the nearby community in consultation with their respective Woreda administrations so that they can develop what they think important for the community,
- Integrate with the micro-watershed management system.

Impact of Spoil Disposal: Spoil from demolishing of structures and scraped contaminated soil has to be dumped at a designated spoil dump site. If the spoil is simply dumped at an unauthorized area, it will adversely affect the environment and cause loss of valuable land. This impact is expected to be low since the amount of spoil materials to be generated during the decommission phase is not big in quantity.

Mitigation measures

- Properly collect all the debris generated while demolishing the structures and transport to the authorized disposal site,
- Scrap any contaminated soils from the demolished treatment site and safely collect and transport to the authorized waste disposal site or authorized sanitary fill site,
- Reinstate the treatment plant site including tree plantation unless the site is reserved for other construction purposes. Or integrate it with the micro-watershed management system in collaboration with the bureau of agriculture and natural resources.

Soil Compaction and Erosion: Potential impacts on soils during the project-decommissioning phase include soil compaction and soil erosion. Among the activities that would affect the soil resources loading of spoils and hauling of the same to disposal sites; these activities would involve operation of heavy-duty equipment and dump trucks. These undertakings have the potential to cause soil compaction as well as damages to soil structure, expose the soil to runoff water, and wind erosion. This will increase the risk of soil erosion and silt transport to rivers, streams, and other watercourses as well as air pollution. These impacts on soils are predicted to be moderate, localized and temporary.

Mitigation measures

- 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 machineries at only designated parking areas.
- Disposing of grit, screenings, and sludge from existing lagoons in a landfill.

Loss of Job Opportunity: During decommissioning of the treatment plants, previous jobs which were enjoyed by a large number of 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.
- Put in place another treatment plant before the decommissioning of this one to skew the lack of irrigation water at the downstream areas who were using treated effluent for irrigation purposes.

Health Impact: Expansion of HIV/AIDS and other STDIs is expected to be very low during the decommissioning phase of the project. Hence, except commonly used care and precautions no additional measures are required.

In addition, health impacts associated with dismantling of concrete structures and reinstatement of the area could occur. In addition, 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 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.

Gender and Gender Based Violence/SH Risks: Gender and gender-based violation and sexual harassment is expected to be very low 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 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 in works that do 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 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

Environmental and social management plan is the key to ensure that the environmental quality of the project area does not deteriorate due to the implementation of the proposed development subprojects. ESMP is generally used as the basis for establishing the environmental behavior that the proposed project requires during its various stages including the decommissioning phase.

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 stages, offset them, or reduce them to acceptable levels. The plan will also include the actions needed to implement these measures. The ESMP identifies 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. Mitigation plan is a key to ensure that the environmental qualities of the area will not deteriorate due to the implementation of the subprojects. The mitigation plan covers all aspects of implementation of the project in its different phases related to environment and health.

The purpose of the ESMP is to describe in detail the necessary actions to be taken to ensure that serious impacts will be mitigated. Where impacts cannot be mitigated, compensation will be paid, as well as any environmental enhancement activity that will be required to offset, where possible, those impacts that cannot be mitigated.

This ESMP provides a schedule for the implementation of recommended mitigation activities. Table 20 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 ESMP identifies measures to address any potential environmental and socio-economic impacts that might occur during the implementation of the FSTP.

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 full integration 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;

i. 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 to be given to associated wastes and dust emitted in the process,
ii. Materials stores that will comprise fresh materials and used items. Each category will be moved safely out of site ensuring minimal or no impacts to the related environment and social setting,
iii. 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.
iv. 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 FSTP developmental works.

Table 20: Environmental and Social Management Plan for proposed subprojects

Sr. 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)	• Limit land clearing and excavation works only to what is necessary and carry out the works in the dry season only to reduce exposure of soil to runoff water erosion. • Careful removal and proper stockpiling of the topsoil removed from the sites, and re-using it for site restoration when construction works are ended. • Reduce the time-exposed surfaces or excavated soils remain bare following completion of works and implement restoration measures such as re-vegetating exposed areas as quickly as possible. • Refilling the trenches and other excavated/exposed places soon, covering with topsoil, leveling to surrounding landscape • If a temporary access road is constructed, scarify and loosen the compacted soil when use for the access road is completed or no more needed • Prevent environmental pollution by hazardous substances such as fuel, oil, cement sludge, and detergents through proper storage and handling of the substances. Among the precautions to be taken is that the Contractor shall install drip pans and fuel funnels at dispensing points of fuels and lubricants. Oil exchange should be taken 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. • If temporary access road is constructed, scarify and loosen the compacted soil when use for the access road is completed or no more needed. • Construction sequencing, locating stockpiles away from watercourses, and disposing of grit, screenings, and sludge from existing lagoons in a landfill. • Ploughing the compacted areas to restore and improve infiltration into the soil and reduce water runoff.	• Construction Contractor	GWSSA/Supervisory Consultant SC regional land administration, Bureau of agriculture	Throughout Construction phase	Part of the construction and supervision cost to be covered by the contractor and consultant

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
2.	Impact on water bodies	• Perform excavation works and earth moving activities during the dry season only thereby minimizing erosion or transport of excavated materials by runoff water-to-water bodies. • Prevent environmental pollution by hazardous substances such as s through • proper storage and handling of oil, fuel, cement sludge, and detergent • Install drip pans and fuel funnels at dispensing points of fuels and lubricants. Oil change should be taken 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. • Locating storage areas and compounds away from watercourses if any, • Appropriate storage of fuel and materials, • Properly collect used oil and other chemicals and safely dispose of them through accredited oil reprocessing or disposal agency or in other manner approved by the Supervision Engineer. • Adopt good site management that considers good pollution prevention measures such as locating storage areas and compounds away from watercourses, appropriate storage of fuel and materials, providing suitable facilities for workers, disposing of waste according to approved waste management plan (avoid open waste disposal practices). • Providing suitable facilities for workers	• Construction Contractor •	• Supervisory Consultant EPCC, Bureau of water and energy, GWSSA	Throughout construction phase	Part of Contractor's Contract
3.	Impact on flora and fauna	• Provide alternative land in the nearby area if applicable to support the livelihood of the affected persons; • Pay appropriate cash compensation for project-affected trees and/or crops. • Demarcation and fencing off the construction areas • Prohibit poaching and killing of wildlife by the workforce backfilling of trenches and other excavated areas and grading to the natural topography. • Awareness creation for the project personnel. • Compensatory plantation program at least saplings of 10 seedlings for each tree felled (staggered to follow Civil Works) including 3 years of maintenance	• Construction • Contractor	• Supervisory Consultant Ethiopian Wildlife commission Gambella branch, Bureau of agriculture •	During construction	Part of the construction and supervision cost to be covered by the contractor and consultant

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
4.	Risk of flooding, erosion, landslide	• Implementation of flood, erosion and landslide protection measures • Provide sufficient awareness raising training and emergency management strategies • Regular monitoring and taking the necessary action against the wrong activities that exposed the site the risks	• Construction • Contractor, construction supervisor	• GWSSA, Bureau of agriculture and natural resource,	Construction	Part of construction
5.	Noise and Vibration	• Carryout noisy construction activities in the vicinity of sensitive areas during normal working hours only; • Use update technology or modern equipment in excavation works that will minimize noise emissions and vibration. • Keep noise level near sensitive areas such as residential areas, heath facilities, schools, religious sites and camps below the WHO and Ethiopian maximum allowable noise level standards; • Provide ear protection equipment (earplugs) for workers in vicinity of noise emissions; • Incorporate low-noise equipment in the design and/or locate such mechanical equipment in properly acoustically lined buildings or enclosures. • Conduct situation assessment before starting excavation works where there are sensitive buildings, fences and houses near the subproject sites, • Use machineries that will not produce heavy vibration, If the houses, fences and buildings are cracked or damaged by the excavation work, the contractor has to fix the damage or pay compensation for the PAPs, include a clause in the contract document that clearly indicates the contractor's responsibility to fix any damage caused by the activities	• Construction • Contractor	• Supervisory Consultant (SC) • regional and Gambella land administration and bureau of agriculture, EPCC, Health office	Throughout Construction phase	Included in the contract for the Contractor & SC
6.	Ambient Air pollution due to dust, exhaust emissions generated by the construction activities	• Implement measures that will reduce dust emission including regular spraying of water on unpaved access roads, exposed earth and any stockpiles on site, and where feasible, covering stockpiles on site with plastic materials. • Use update technology or modern equipment in excavation works that will minimize dust generation from earthen materials. • Regular vehicle inspections and maintenance of equipment and vehicles to reduce excessive exhaust emissions. • Minimize excavation and earth moving to only what is required for the specific nature and type of construction. • Limit stockpiling of excavated topsoil to the maximum of 2m height.	• Construction Contractor	• Supervisory Consultant (SC) • regional and Gambella land administration and bureau of agriculture, EPCC,	Throughout Construction phase	Included in the contract for the Contractor & SC

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		• As much as possible use paved roads. and • Limit speed of vehicles to 30km/hour on unpaved access roads especially near sensitive areas (residential and business areas, social services, religious places). • Use dust collectors or water spray systems as appropriate to prevent high dust emissions from stone crushing or batch plant operations at PSTP.		Health office		
7.	Traffic congestion and accident	• Develop and strictly implement and follow up a well-designed work program and traffic management plan (TMP) that would consider local conditions like the 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 traffic 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 discipline for the drivers. • Sensitization of the nearby communities about the increased traffic. Provide awareness education for the nearby residents in traffic safety measures at public meetings, social gatherings, schools, mosques and churches, etc.	• Construction Contractor	• Supervisory Consultant, GWSSA Traffic management office of the town, community	During construction	Part of the construction and supervision cost to be covered by the contractor and consultant
8.	Occupational Health and safety	• Take maximum care and minimize accident risks by applying internationally accepted standards and recognized occupational health and safety guidelines. • Provide a Healthy and Safety Plan prior to the commencement of works to be approved by the resident engineer • There should be safety policy clearly displayed on the site. • Take appropriate care in storing and using hazardous chemicals and explosives and provide training to workers in handling hazardous chemicals. • Provide first aid kits at workshops, construction worksites, and inside vehicles. • Provided workers with appropriate PPE such as hand gloves, eye	• Construction Contractor	• Supervisory Consultant Health office, labor office, EPCC, local community	During construction	Part of the construction and supervision cost to be covered by the contractor and consultant

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		goggles, safety shoes, reflective vests, helmets, etc., based on their work condition as much as possible, create awareness on safety issues and strictly inspect proper use throughout the construction phase. • Appropriate signs must be erected on the site to warn workers and visitors • Conduct general medical check-ups for recruits and subsequently, conduct periodic medical check for all employees and take appropriate action and keep all records. • Hung-up fire extinguisher bearing detailed information about its status at appropriate places. • All personnel, vehicles, and machinery should be covered under an appropriate Insurance System. • Carefully record and keep all incidence 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. • Provide awareness creation on safety procedures and HIV/AIDS and avail healthcare services. • Provide temporary toilets and bathrooms for the construction workers at the work sites. • Regularly spray water in dusty roads and work areas. and • 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)	• Assign experienced HIV/AIDS sub consultant to handle the issues related to HIV/AIDS awareness and prevention. • Launch awareness and education campaigns about HIV/AIDS and STDs among the construction workers and community to make them informed. • Provided condoms at a subsidized rate or for free to construction workers. Should include information campaigns and/or special training. • Town administrations and health offices, HIV/AIDS Prevention and Control Office, Elders, and NGOs operating in the area need to work jointly to create positive impact and bring major attitudinal and behavioral changes.	• Contractor & • Health Office	• Supervisory Consultant & Health office	• Prior to start & during • construction	Part of the construction and supervision cost to be covered by the contractor and consultant

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
10.	Gender Equity, GBV/SEA and Sexual Harassment	• Create awareness among workers on the GBV/SH to the staff/workers. • Prepare and implement code of conduct that sufficiently addresses gender and sexual harassment issues. strictly forbid sexual harassment /GBV and to be signed by all workers including international workers if involved and subcontract workers • Include in the employment contract for the construction workers that any GBV and sexual harassment against women workers will lead to administrative measures and legal actions. • Take appropriate actions on workers violating the CoC. • Design gender core labor standards and employment and contract procedures, and design gender responsive workers manuals. • Assign women in works that do not affect their biological condition. • Provide and avail a separate sanitation facility for women at construction camp • Provide women workers with appropriate type of safety equipment and protective materials. • The Contractor should ensure that women are paid equal for equal work with their male counterparts. • Provision of gender disaggregated bathing, cloth changing areas & sanitation facilities. • Include gender expert among the consultant's team to follow up Gender mainstreaming activities. • Ensure that women construction workers do not face GBV and sexual harassment. • Ensure equal pay for women and men for equal job. • Assign gender specialist at construction site to aware and prevent GBV and sexual harassment	Contractor	• Supervisory Consultant • Office of Women, Children and Youth Affairs. Local community (GRC)	• Prior to start & during construction	Part of the construction and supervision cost to be covered by the contractor and consultant
11.	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 Regional EPCC/Gamblla environment office • Culture and sport	During • constructi on	Part of the construction and supervision cost to be covered by the contractor and consultant
12.	Security risk	• Abide to the rule of working procedure and respect the benefits of the locals	Construction contractor,	• EPRA, Municipalit	• Construc tion	Part of the construction

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		• Create awareness about the important of the project and collaborate with the local peoples • Collaborate with the security services and police at local and regional level	GWSSA	y		contract and management
	Operon phase					
1	Odor/obnoxious smell from the TPs and from open manholes)	• Create awareness to the FSTP works and even to the local community on proper management precautionary action. • Regular facility maintenance and monitoring operational practices including process control and chemical treatment, continuous process of the operation; avoidance of pools of dirty stagnant waters and spills. • 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. • Adopt effective and efficient housekeeping procedures (regular cleaning of the grit and screenings). • 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. • Planting relevant plant species around the FSTP in the buffer zone	• Facility manager	GWSSA, EPCC, Health office	Throughout the operation phase	Part of the FSTPs operation budget
2	Ambient air quality (including emission of biogas-CH4, CO2, H2S, etc. into the atmosphere]	• Proper maintenance of the facility, including avoidance of pools of dirty stagnant waters and spills. • Operate equipment at optimum/design conditions, • Regular facility maintenance and monitoring operational practices including process control and chemical treatment, continuous process of the operation • 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. • Proper monitoring of the digester and implement GAS reduction technologies as indicated.	• Facility manager	GWSSA, EPCC, Health office	Throughout the operation phase	Part of the FSTPs operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		• Plant appropriate trees at the boundaries of the site to improve the aesthetic value of the areas, to absorb air pollutants from the air, and to serve as a windbreak as well as to increase the biodiversity of the area.				
3	Risk of flooding, erosion, landslide	Provide sufficient awareness raising training and emergency management strategies for FTP workers • Regular monitoring and taking the necessary action against the wrong activities that exposed the site the risks	• Bureau of agriculture and natural resource, EPCC,	GWSSA, Bureau of agriculture and natural resource, EPCC,	operation period	Part of contract and FSTP operation budget
4	water and soil bodies	• Seal the foundation of treatment plants and influence areas with concrete lining to avoid leakage of wastewater through permeable soils and weathered and fractured rocks into the groundwater system • All pipe work and fittings should be a class A rating more than the maximum pressure attained in service including any surge pressure. • Ensuring that the facility's effluent complies with the national effluent standards. • Dispose sludge with dangerous substances only in a designated sanitary landfill • Close monitoring of the facility to ensure it functions as planned; this involves monitoring of ground and surface waters in the surroundings of the FSTP	• GWSSA • Facility manager	GWSSA Gambella region Water and Energy Agriculture office	During design & Construction and operation of TPs	Part of the FSTPs operation budget
5	Downstream and riverine flora	• Monitor the proper functioning of the treatment plant, • Regularly check the effluent quality for its compliance with acceptable effluent discharge standard, • Whenever the quality of effluent fails to meet the standard, stop discharging the effluent into receiving streams and rivers • As appropriate, promote integrated watershed management schemes around the FSTP which enable to reduce any potential spillover of the liquid wastes into the natural environment.	• GWSSA • Quality Control	• GWSSA, • Env. Prot. Office, Wildlife office/culture and tourism office, office of agriculture/bureau	Throughout the operation phase	Part of the FSTPs operation budget
6	Fauna	• Proper quality control of "treated" wastewater and sludge before releasing • Develop green belt around the treatment plant sites to compensate trees removed during the construction phase and to increase the aesthetic view of the treatment plant sites as well as to sequestrate	• GWSSA • Quality Control	• GWSSA, • Env. Prot. Office, • Wildlife office/cultu	Throughout the operation phase	Part of the FSTPs operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		GHG gasses and to absorb bad odor and noise pollution. • Control any accidental spill of untreated or partially treated wastewater into environment.		re and tourism office, office of agriculture/ bureau		
7	Occupational Safety	• Adherence to national rules and regulations • Appropriate warning signs shall be placed in areas where accidents are expected to occur • Provision and use of protective wears • Strict prohibition of operation of equipment by unauthorized personnel • Operators shall be provided with regular medical check-up 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. • Special working schedule to workers who are working in hazardous environment which includes high temperature to minimize impacts on their health • Emergency plan and medical help to be made available to workers working in hazardous condition like sludge removal from sludge beds etc.	• GWSSA • Facility manager	GWSSA, G-EPCC, local community	Throughout the entire operation phase	Part of the FSTPs operation budget
8	An Aesthetic view	• Plant trees around the treatment plant and buffer zone • Keep the buffer zone and open areas within the treatment plant neat all the time	• GWSSA • Facility manager	GWSSA, culture and tourism	Throughout the entire operation phase	Part of the FSTPs operation budget
9	Health Impact on people handling the sludge	• Careful handling of fecal sludge: • Use of protection clothes such as gloves and masks and a good hygiene (washing hands after work etc.). • Most important is that workers be aware of the nature of the health risks to which they are exposed and that they know how to protect themselves. • Training of staff and targeted information may therefore be the most successful measures. • GWSSA dealing with sludge should introduce rules for use of protection by their staff and care should be taken to enforce those	• GWSSA • Facility • manager	GWSSA, Health office, EPCC	Throughout the entire operation phase	Part of the FSTPs operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		rules				
10	Health impact from use of untreated fecal sludge in agriculture	• Fecal sludge should always be treated prior to its use in agriculture. Treatment has then to provide sufficient pathogen reduction in the sludge to guarantee the safety of its use. The most resistant organisms in treatment are eggs of parasitic worms, in particular those of Ascaris lumbricoides. These eggs can only be destroyed by exposure to temperatures above 60°C, by desiccation at moisture contents lower than 10%, or by awaiting the natural die off after at least ½ year. • Use thermophilic composting. If composting is well done (the substrate has the right composition, moisture content and aeration are optimized) the temperature in the heaps usually rises above 55°C for several days and all pathogens are destroyed. • Storage of sludge over a period long enough to allow natural pathogen die off (minimum 6 months) is the other possibility to disinfect sludge without using expensive technologies. However, in Gambella for storage of sludge for long time might scarce. • Sun drying of sludge can enhance the pathogen destruction during storage and therefore increase the security of this method. To enhance the effect of sun drying, construct a separate sun drying floor, preferably concrete and coat with black color or lay black plastic so that it could absorb much solar energy that increases the temperature and kills most of the pathogens. • Avoid Use of untreated sludge for growing food crops • Avoid use of percolated liquid from the sludge dry bed for irrigation or any use before adequately treating and disinfecting; • Create awareness among these people who are potentially exposed to the direct and indirect health impact 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.	• GWSSA • Facility manager	GWSSA, Agriculture Bureau and office, EPCC	Throughout the entire operation phase	Part of the FSTPs operation budget
11	Gender and Gender Based Violence/SH/SEA Risks	• Provide and avail a separate sanitation facility for women and men at the treatment plants, • Provide women friendly safety equipment and materials, • Assign women in works that do not affect their biological condition, • Ensure that women workers do not face GBV and sexual harassment,	• GWSSA • Facility manager	GWSSA, Women and children, Health, EPCC, police department and	Throughout the entire operation phase	Part of the FSTPs operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		• Incorporate measures to be taken against those workers who commit GBV and sexual harassment, • 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 job.		community		
12	Security risks	• Abide to the rule of working procedure and respect the benefits of the locals • Create awareness about the important of the project and collaborate with the local peoples • Collaborate with the security services and police at local and regional level	• Regional police commission, GWSSA, Municipality	Security and police, GWSSA, Municipality	Operation phases of the project	Part of the municipality budget
	Decommissioning					
1.	Air pollution	• Systematically demolish structures considering reuse of materials for other use. • Wet the materials before demolishing to suppress release of dust. Avoid burning of any material.	GLWSSE	Gamblela Regional state EPA	Decommissioning	Part of the Municipality/ WSSE operation budget
2.	Impacts on Soil and Water Bodies	• Remove all the contaminated soil from the treatment plant site and dispose 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.	GLWSSE	Gamblela Regional state EPA and Water and Irrigation Bureaus	Decommissioning	Gambela WSSE operation budget
3.	Site Reclamation	• Properly reinstate the site of abandoned fecal sludge treatment plant • After reinstatement, SLWSSE could use the area for other purpose. or • Develop the areas for recreational park or plant trees to increase the aesthetic value of the area or handover to the nearby community in consultation with their respective Woreda administrations so that they can develop what they think important for the community. • Integrate with the micro-watershed management system.	GLWSSE	Gambela Regional state EPA, Health Bureau	Decommissioning	Municipality/ WSSE operation budget
4.	Impact of Spoil Disposal	• Properly collect all the debris generated while demolishing the structures and transport to the designated disposal site. • Scrap any contaminated soils from the demolished treatment site,	GLWSSE		Decommissioning	Municipality/ WSSE operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		safely collect, and transport 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 resource.				
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 machineries at only designated parking areas. • Disposing of grit, screenings, and sludge from existing lagoons in a landfill.	GLWSSE	Gambela Regional state EPA and Agriculture Bureau	Decommissioning	Municipality/ WSSE operation budget
6.	Loss of Job Opportunity	• Give job priority 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 link with appropriate government agency and financial sources	GLWSSE	Labor and Labor Affair bureau	Decommissioning	Municipality/ WSSE operation budget
7.	Health Impact	• 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.	GLWSSE	Gambela regional state Health Bureau	Decommissioning	Municipality/ WSSE operation budget
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 in works that do not affect their biological condition. • Ensure that women workers do not face GBV and sexual harassment.	GLWSSE	EPA and Gambela women and social affair	Decommissioning	Municipality/ WSSE operation budget

Sr. No	Issue/ Main impacts	Proposed Mitigation measures	Responsibility		Timing of Execution	Cost Estimate (Eth. Birr)
		• Incorporate measures to be taken against those workers who commit GBV and sexual harassment. • 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 job.				

10. ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Issues that will be monitored during the development of the provincial water supply and sanitation utilities, capacity development and project management include:

- The development of utility environmental management plans, water quality monitoring plans, occupational health and safety plans, leakage monitoring plans, energy, and chemical management plans.
- 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 GWSSA and other relevant stakeholders.
- Capacity building of the existing environmental and social safeguards of the GWSSA 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. Therefore, this is a supplement ESIA according to the aforementioned regulation. The objectives of environmental monitoring upon executing activities are to:

- Monitor the effective implementation during the construction and operation 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. The system shall acquaint itself with national climate change adaptation and mitigation strategies including climate resilient WASH policy and emission reduction from waste.

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

Tables 21 below provide the monitoring indicators and monitoring activities at various phases. Monitoring plan: As the Executing Agency, GWSSA will bear overall responsibility for monitoring the implementation of the ESMP. In addition, the relevant Gambella town and Abol woreda 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 regional and Federal EPCC, 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 is on track. The individual ESIAs and ESMPs have identified areas for monitoring by the Authority, the contractor(s), and the Supervising Consultant(s). Key aspects of the monitoring program will include, among others; water quality monitoring, especially with respect to effluent discharged from FSTP and receiving waters, sound operation of wastewater and 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 which 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 21: Environmental and Social Monitoring Plan

S/N	Issue/ Subproject main Impacts	Monitoring Indicators	Monitoring Party	Monitoring Frequency	Method of Measurement	Budget Estimate
	CONSTRUCTION PHASE					
1.	Impacts on soils and landscape quality	• Evolution of erosion signs (sheet erosion, gully formation, siltation in nearby water courses or drains). • Length/ area of trenches and other exposed surfaces properly refilled, leveled to surrounding landscape and replanted with appropriate plant species following completion of woks to minimize soil erosion, slope failures or to improve the quality of the affected landscape. • Area of land affected due to exploitation of quarries and borrow sites and area reinstated after exploitation has ceased. • Incidence of soil pollution by spillage of hazardous substances	Supervisory Consultant (SC) GRC Agriculture and natural resource department, local land administration and local community	Minimum twice per month during the construction contract period	Visual observation, area measurement	250,000
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 GWSSA	As required	Visual observations, water quality analysis in laboratory or using field kits	350,000
3.	Impacts on air quality	• Dust levels or incidence of dust pollution in the construction areas & rate of application of dust suppressants (spraying water) on dusty areas. • Use of dust collectors or water spray systems in stone crushing or batch plant operations. • Noise and exhaust emission levels generated by construction vehicles and equipment. • No. of complaints due to nuisance noise or dust pollution.	Supervisory Consultant (SC) Regional EPCC, water and energy bureau/office	As required	Visual observations & Recording of case	250,000
4.	Impacts on flora and fauna	• Area of vegetation cleared for the project within the boundary of the Jiren State Plantation	Supervisory Consultant	As required during the	Visual observations,	300,000

S/N	Issue/ Subproject main Impacts	Monitoring Indicators	Monitoring Party	Monitoring Frequency	Method of Measurement	Budget Estimate
		• Number of trees/land area replanted and survived to replace the trees removed and the plantation affected. • Number of wild animals killed during the construction works.	GWSSE, Wildlife Enterprise Gambella EPCC	contract period	surface area measurement & Recording of trees affected & Animal fatalities	
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 the 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 kit	Supervisory Consultant, Municipality Traffic management	Once per day or as required construction works are ongoing at road crossings or pedestrian access	Visual observations	100,000
6.	Impacts on public health	Number of awareness raising and education campaigns about HIV/AIDS given for project workers and vulnerable local population.	SC, Health Office Local community	As required	Communication with the implementers & Interviewing the vulnerable groups	350,000
7.	Gender and Gender Based Violence/SH/SEA Risks	• GBV Action Plan • Mitigation plan for GBV occurring at the community level as a result of project implementation • Discrete GBV reporting pathway • Number of GBV cases at the community level that receive survivor-centered referral and care • Number of trainings on GBV	Contractor(s) & Supervision GBV Expert (GRC), Health office and local police	during the contract period	-Discrete GBV reporting pathway -Training participant list on GBV	250,000
	OPERATION PHASE					
1.	Odor	• Intensity of odor and spatial coverage around the treatment plant and nearby surrounding areas	GWSSE, GEPCC	Whenever there is compliant from the affected people	Visual observations & Recording of cases	150,000
2.	Sludge water	• Proper functioning of the installed drying lagoons as	GWSSA	As required	Visual	300,000

S/N	Issue/ Subproject main Impacts	Monitoring Indicators	Monitoring Party	Monitoring Frequency	Method of Measurement	Budget Estimate
	treatment & disposal of the cake	thickeners for sludge water. • Proper disposal & control of the dewatered sludge at the properly located dumping/landfill site	GEPCC		observation	
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 Escherchia coli (E. coli) – an indicator of fecal contamination	GWSSA, Gambella region water and energy Health office	Twice/yr 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 GWSSA operation cost and cost of regulatory body
4.	Public health & Environmental sanitation issues	• Number or availability of adequate drainage facilities for disposal of wastewater. • Wastewater disposal situation by the local people using available facilities	Municipality GWSSA Health office GEPCC Local community	As required	Visual observations, review of drainage plans & documents	Part of the regular budget of regulatory body
5.	Operation and Maintenance of the FSTP 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	GWSSA, regional water and energy bureau	Monthly	Performance reports	Part of GWSSA regular maintenance cost
6.	Total	Total monitoring costs				2,300,000

10.1. Institutions for the Implementation of the ESMP

It is recognized that effective environmental and social management will only be achieved only if it is undertaken as a fully integrated part of the overall project management. In order to effectively implement a comprehensive ESMP, the coordination of efforts of the various Federal and Regional Agencies is necessary with a concept comprising three sub-components, namely:

- A clear framework of inter-organizational coordination measures;
- A specific information strategy; and
- A tailored capacity building program.

The key organizations for the implementation of the ESMP during the construction phase are Construction contractor; Supervision consultant; GWSSA and the bureau of Health. The actual physical implementation works are carried out mostly at this stage.

Mitigation measures proposed for socio-economic issues like compensation to damaged properties, lost/ degraded plots of land should be handled by a committee, composed of representatives of all stakeholders, including GWSSA, local government administrative organs, NGOs, and the affected group.

Environmental issues during the operation phase of the sub projects shall be handled by the owner of the infrastructure (GWSSA), the relevant department of GWSSA and Gambella Environmental Protection Authority. The staff of GWSSA from the relevant department or a designated unit in the department should acquire basic knowledge of the environmental management activities to effectively assume the responsibility. Training of personnel is, therefore, essential.

Regarding GWSSA, it has an established position for an Environmental Officer and positions for sociologists which will provide oversight on the implementation of the environment (ESIA) and social (RAP) components of the UWSSP program. Accordingly, SLWSSE shall fill the said positions prior to initiation of the subproject physical activities. It is further planned that oversight on environmental issues will further be supplemented through the recruitment of additional environment expertise by the supervising consultant once the project commences.

The responsibility for implementing the ESMP of the supplement ESIA during construction will be of the contractor, GWSSA and the bureau of Health. 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 GWSSA.

The main responsible institutions for implementation, coordination and administration of the Environmental management plan set out in this ESMP is summarized in Table below.

Table 22: Institutions Responsible for the Implementation of ESMP

Stakeholders	Roles and Responsibilities
Gambella City Administration	Allocate Budget to the Client project office and monitor its utilization; Monitor the implementation and operation of the proposed project; Coordinate the activities of the Kebele Administrations for the successful implementation of the project including the resettlement process.
GWSSA	Responsible for the implementation of the proposed project as proponent; Coordinate the efforts of the different organizations responsible for the management and monitoring plan; Follow-up the rehabilitation of the affected part
GEPCC	Provide technical advice about environmental protection during the project implementation; Audit the project from an environmental protection point of view
Gambella region water and energy	Provide technical advice (2nd UWSSP) and capacity building and monitoring. The bureau will participate in monitoring during water quality measurement.
The World Bank	Finance the project as per the agreement Monitor and evaluate the progress of the work and check the correct use of the allocated fund Demand work progress reports on the implementation of the project
Contractor	The Contractor has to prepare Construction's ESMP and implement it. 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 GWSSA 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.

10.2. Training Programs and Capacity Building

The environmental sustainability of the FSTP sub-projects are 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, it is vital that GWSSA allocate sufficient resources for training and capacity building. These efforts will not only benefit the authorities but will also build local capacity to undertake other development initiatives.

The institutional capacity to implement, enforce and monitor the subproject environment and health was assessed based on the technical, financial, and physical capability of the Community leaders and GWSSA. They are responsible for carrying out ESMP and monitoring activities. 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 GWSSA is found to have a limited institutional capacity to implement the provisions of the ESMP, especially regarding the FSTP management sub-project. Although general awareness on environmental issues exists within the steering committee stakeholders and GWSSA professional 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., CBOs, relevant government officials, community leaders, GWSSA management team. The GWSSA environmental and social experts should be exposed to short-term training in the management of environmental and social issues. 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. Training programs are developed and shall be delivered to the project developer for the implementation of environmental safeguards of the proposed subprojects.

Following training needs assessment; specific and tailored training will be developed and agreed upon by the developer and key stakeholders for implementation of safeguards in the course of project implementation.

- Target groups for the training: GWSSA Civil and Sanitary Engineers, Environmental, Community development 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 on a yearly basis and their content updated and adapted to implementation issues. Training frequency and the content will be reviewed in the course of the sub project's operation lifespan depending on needs or technical requirements.

Table 23: Training Programs for Capacity Building and associated costs

Target Group	**GWSSE Staff, MoWE, Health officers, EPCC, and other relevant stakeholders**	**estimated Cost in birr**
Training title	Environmental supervision, monitoring and reporting	600,000
Participants	Environmental staff and social workers of WSSE and other stakeholders who are going to engaged in the management and monitoring (total 15 participants)	
Training frequency	Soon after project effectiveness but at least 2 weeks -1 month before the start of subprojects work. In-service /refresher training during operation.	
Time	Training twice a year, and then to be repeated on a yearly basis 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	
Responsibilities	WSSE with the facilitation from the MoWE environmental and social safeguard specialists	
Training title	Implementation of mitigation measures	500,000
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	

Target Group	GWSSE Staff, MoWE, Health officers, EPCC, and other relevant stakeholders	estimated Cost in birr
	• Preparation and submission of reports • Other areas to be determined • Grievance handling and reporting • GBV reporting	
Responsibilities	WSSE with facilitation from the MoWE	
Target groups	Local communities/ stakeholders, WSSE, Health Officers and, municipality, urban infrastructure technicians/ Engineers/EPCC	
Training title	Environmental sanitation and safety	500,000
Participants	Representatives of community and/or worker leaders (as appropriate) (up to 30 participants)	
Training frequency	Bi-yearly or every 6 months for the first two years	
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	WSSE and another relevant stakeholder	
Subtotal 1		1,600,000
Training title	Customer service management:	450,000
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)	
Responsibilities	WSSE and another relevant stakeholder	
Training title	Safety measures for proper FS emptying	500,000
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	WSSE and another relevant stakeholder	
Training title	Operation and maintenance of treatment plant	750,000
Course content	Treatment plant operation principles, operation and maintenance procedures, and treatment processes	
Target group	Head of Core Process FSTP Team Leader FSTP operators	
Responsibilities	WSSE and another relevant stakeholder	
Training title	Leadership and communication	570,000
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	WSSE and another relevant stakeholder	
Subtotal 2		2,270,000
Total estimated cost		3,8700,000

10.3. ESMP Cost Estimates

Environmental and social management/monitoring is essential for ensuring that identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated at an early stage (before they

become a problem), and the expected project benefits are realized. Thus, the aim of an ESMP is to assist in the systematic and prompt recognition of problems and the effective actions to correct them, and ultimately good environmental performance is achieved. Since the cost of most of the proposed mitigation measures will have been included in the main engineering Bills of Quantities and therefore need not be included in the Environmental mitigation costs.

To support this, the ESIAs have provided a budget estimate for ESMP implementation, and this will be included in the overall project implementation budget. These costs will also include the cost of supervision for implementation of mitigation measures. These costs will be added to the Bill of Quantities as the Environmental Mitigation Costs.

Thus, the overall cost, i.e., including mitigation and monitoring as detailed in table 24 below becomes about ETB **9,317,000.00.**

Table 24: Summary of Budget Estimate for ESMP, Monitoring and Training

No.	Component	Project phase	Unit/Reference	Estimated cost in ETB
1.	**ESMP**			
	Buffer zone protection for intake site	Throughout all phases	Lump sum	700,000.00
	Implementation of replanting program to compensate for trees or plantation forest lost	construction phases	Lump sum	550,000.00
	HIV/AIDS awareness and prevention	construction phases		150,000.00
2.	**Environmental and Social Monitoring Costs**			
	Air quality monitoring (instrumentation)	Throughout all phases	Table 23	200,000.00
	Noise quality monitoring (instrumentation)	Throughout all phases	Table 23	50,000.00
	Water quality monitoring (instrumentation)	Throughout all phases	Table 23	150,000.00
	Monitoring costs stakeholder and E&S	All phases	Table 21	2,300,000
3.	**Training cost including skill development**			3,870,000.00
	Enhancing beneficial impacts (training)	All phases	Table 19	500,000
	SUBTOTAL			8,470,000.00
	Contingency 10%			847,000.00
	TOTAL			**9,317,000.00**

10.4. Grievance Redressing Mechanisms

A grievance redressing mechanism (GRM) is expected to outline procedures to respond to project-related grievances in an efficient and effective manner. As per OP 4.12 of the WB, GRM should be accessible and appropriate to bring about remedial measures for complaints. Appropriateness and accessibility basically signify the need to have a workable GRM arrangement tailored to 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 so as 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 it also has strong bearing on the project implementation progress, as PAPs grievances tend to thwart timely accomplishments of project activities. For the project at hand, a grievance redress committee needs to be established that consists of members from project administration office, PAPs, elders/religious leaders and local NGOs.

Procedure

- Complainants can log/file their complaint(s) in written form, verbally, through telephone call, text message or any means of channels convenient to them.
- Complaint to be registered in a standard format prepared for the same purpose.
- The filed complaint(s) need to be itemized, clear and concise with remedial suggestions
- Present the form for the relevant designated officer (first contact point, in this case secretary of the Grievance Redress Committee-GRC)
- Address of the PAP or PAPs (Telephone, Kebele, etc.)

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 project owner /client
- Feedback from the project owner to be communicated
- Feedback /or GRC committees‟ decisions should be communicated to the PAP(s) at a maximum of 30 working days.
- Amicable dispute settlement continues to be explored
- In case amicable arbitration not working, PAP (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 it also takes into account 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.

The following steps will be followed in order to achieve consensus for any grievance related to any aspect of the project.

- PAPs can complain orally or in writing to the established GRC. If it is an oral complaint, the GRC must record the complaint in writing and must respond to the complaint within one week.
- If PAPs are not satisfied with the respondent, PAPs can appeal to the court for a final decision.

10.5. 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 purpose of the Code of Conduct is 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. More specifically, 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 his/her 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 risk to health; wearing required personal protective equipment;
    - using appropriate measures relating to chemical, physical and biological substances and agents; and
    - Following applicable emergency operating procedures.
- Report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her 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 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 the age of 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 on 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's personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.
- The contractor shall require all employees and the employees of sub-Contractor to individually sign the Code of Conduct, 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.

11. LIMITATION OF THE ASSESSMENT

Even though some progress is made regarding ESIA on the various projects in the country, there are lots of issues to be done more to realize objectives of the ESIA in developing countries like Ethiopia. Lack of similar study alike UWSSPII sub projects in the country is others limits that might affect the quality of the ESIA study. The following limitations have been made/identified during the assessment process and in the compilation of this ESIA Report:

- Getting sufficient and reliable primary and secondary data of the baseline for the existing socio-economic activities.
- Lack of systemic networking among concerned government organizations so as to accomplish the study as per the guideline of ESIA.
- The duration allotted for the specific task was short and more secondary data were used to analyze the impact.
- Unavailability or lack of previous works on similar sub project in the country.
- Insecurity situation in some parts of the project intervention areas which forced the study team to shorten the field stay time and ground works.

The limitations listed above can be taken as the drawback for systematic, complete and scientific analysis of the environmental and social impacts of the sub-project.

The implication of these identified gaps is that the limitations should be considered in decision making though the impact assessment could only indicate the most likely cause of the subproject activities on the social and environmental aspects. The limitation can be avoided if more time is given for the task so that more primary site-specific data can be included in the study.

12. CONCLUSION AND RECOMMENDATIONS

12.1. Conclusions

The lack of Gambella town PCT and FSTP is the bottleneck for the development of Gambella. The present coverage of the proposed projects of the town is a great contribution to the overall sanitation improvement of the naturally endowed, tourist destination Gambella town. Gambella town does not have any central sewer lines, WWTP and properly designed FSTP which cannot accommodate the high volume of sewage waste as a result of which sewage overflows onto streets and into the watercourses. Septic pump-out trucks do not access all areas and its service is limited to certain households and businesses, with high volume customers. Sewage from septic tanks and latrines continue to pollute groundwater and surface water. There are uncontrolled and open wastewater disposal, open defecation practices close to rivers and wetlands within the town is a common practice in some sites (e.g., under the Baro bridge in the main line). The situation is affecting the public health and the aesthetics of the town. Considering all this condition of the city an installation and improvement (if any) of wastewater and fecal sludge management system (wastewater and fecal sludge treatment plants and collection system) is indisputable, in addition to the improving PCT and construction of the new facility.

It is therefore planned to install a new fecal sludge treatment plant, and construction of several PCT at three project phases. The new FS treatment plants will be installed in newly designated lands, (at Abol woreda) and ten PCT within the town center with high population and busy streets. In order to maintain current treatment as well as future goals ARB, maturation pond, drying bed for FSTP are recommended. In the first phase, the new FST plant will have a capacity to treat 78m^3/d during phase I.

The selected technology for the fecal sludge treatment plants allows the proper management and creates new capacity to the municipality and opportunity. The selection of the treatment technology was carried out based on construction and operation cost, space requirement, ease of operation, etc. The appropriateness of the sanitation facilities and technologies have been critically evaluated against available alternatives. Accordingly, the selected treatment technology is appropriate to the local context.

The EIA study results show some limited negative environmental implications of the project activities, the proposed works will have high socio-economic benefits to the residents of Gambella town and project intervention Kebeles (PCT in all 5 Kebeles and FSTP in Abol woreda-8 km away from Gambella town). 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. Effects in the construction phase include effects on ambient air quality due to dust, noise pollution, soil erosion, poor solid waste disposal, and storm water. In addition; interference to business and residential access, occupational health, and spread of social diseases e.g., COVID-19 risk may result from project activities.

Many of the adverse environmental and socio-economic impacts in the FSTP sites are minor and can be easily mitigated. The identified “major impacts” are all subjective which may happen under rare conditions, as in case of negligence, accident, etc. These also have appropriate mitigation measures and are indicated in the ESMP.

It is, therefore, concluded that effective implementation of the proposed subprojects works will mitigate the predicted impacts to non-harmful or near non-harmful levels. Their implementation should be adequate and timely. The ESMP has been prepared as shown in chapter 9. Overall, the anticipated positive impacts will outweigh the negative ones by far. In particular, sanitary facility improvement decreased the socio-environmental impacts of the poor sanitary facility hence increasing social development and welfare for the community of the municipality.

Predicted impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this ESIA. Gambella water supply and sanitation agency 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.

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

- Proper design to accommodate measures for storm water effects and soil erosion, and slopes destabilization during FSTP construction.
- Measures to safeguard job opportunities and gender balance during both construction and operation of subprojects.
- 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 COVID-19 prevalence.
- Monitor compliance to environmental, health, and safety measures.

In general, the ESIA study indicates that the implementation of the project is expected to have enormous significance. The positive impacts by far outweigh the negative impacts. 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 will also create short and long-term employment opportunities and potentially enable the reuse of the treated wastewater for agriculture and industrial purposes and allows to the production of biogas for energy and organic fertilizer (compost) from the by-products of wastewater/fecal sludge treatment process in the future.

The project is important and timely to reduce the problems associated with the disposal of fecal sludge in the town of Gambella. The project will certainly play an important role in bringing about a more ecologically, socio-culturally and economically sustainable and equitable environment in the Gambella town.

12.2. Recommendations

Overall, the ESIA shows that the benefits of the Gambella FSTP construction project 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 “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 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 audit of the project activities. This should be filled up by the environmental expert of the contractor and should be verified by the Gambella People Regional EPCC.

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APPENDIXES

Appendixes	Appendix title	Appendix Attachment
1	Minutes of community consultation	 Minutes_Gambella city administration.do
2	Lists of participants	 List of consultative participants.docx
3	Primary data collection checklist	 Primary data collection checklist a
4	Secondary data collection Checklists	 Secondary data collection Checklists
5	Checklist and Formats	 Other checklist and Formats.docx
6	Ambient Factors	 Environment-Ambie nt Factors.docx
7	Global Positioning System Points	 Selected communal and public toilets w
8	The ESIA Team	 The ESIA Team.docx
9	Environmental and Social Clause for Construction Contractor	 Environmental and Social Clause for Co
10	Chance Find Procedure	 Chance Find Procedure.docx
11	Grievance Documentation Forms	 GRM Form.docx
12	GAP	 Gender Action Plan.docx
13	Scoping checklist	 Scoping Checklist-Gambela.c

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MINISTRY OF WATER AND ENERGY

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