ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT ON FECAL SLUDGE TREATMENT PLANT

JIMMA TOWN, OROMIA

Client: Ministry of Water and Energy

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LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
ABR	Anaerobic Baffled Reactor
BOD	Biochemical Oxygen Demand
CBE	Community Based Enterprise
COD	Chemical Oxygen Demand
CSA	Central Statistical Agency
CT	Communal Toilets
CTMP	Contractor's Traffic Management Plan
CWIS	City Wide Inclusive Sanitation
DAF	Dissolved Air Floatation
DEM	Digital Elevation Model
EA	Environmental Assessment
EFY	Ethiopian Fiscal Year
EHS	Environment, Health and Safety
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPO	Environmental Protection Office
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ETB	Ethiopian Birr
FDRE	Federal Democratic Republic of Ethiopia
FGDs	Focus Group Discussions
FSM	Fecal Sludge Management
FSTP	Fecal Sludge Treatment Plant
GHG	Green House Gases
GIS	Geographic Information System
GoE	Government of Ethiopia
GPS	Global Positioning System
GSEMC	Green Sober Environmental Management Consultant
JTPDO	Jimma Town Plan and Development Office
JTWSSSE	Jimma Town Water Supply and Sewerage System Enterprise
JIT	Jimma Institute of Technology
KII	Key Informant Interview
MoH	Ministry of Health
MoWE	Ministry of Water and Energy
NBP	National Biodiversity Policy
NPW	National Policy of Women

NUDP	National Urban Development Plan
OD	Open defecation
OHS	Occupation and Health Safety
OP	Operational Policy
PAPs	Project Affected Peoples
PC	Public Consultation
PCR	Physical Cultural Resources
PCT	Public and Communal Toilets
PPE	Personal Protection Equipment
PT	Public Toilets
PWD	Persons with Disability
RAP	Resettlement Action Plan
STD	Sexually Transmitted Disease
STT	Sludge Thickening Tank
SUWSSP	Second Urban Water Supply and Sanitation Project
ToR	Terms of Reference
WB	World Bank

EXECUTIVE SUMMARY

INTRODUCTION

In Ethiopia, people in many cities and towns lack access to adequate sanitation systems, consequently causing environmental and social problems (ESMF, 2017). This is the main reason why the Ethiopian government and the World Bank have launched the second Urban Water Supply and Sanitation Program (UWSSP-II). The UWSSP-II aims at increasing access to water supply and sanitation services in 22 secondary cities and Addis Ababa of Ethiopia.

Jimma is one of these secondary cities benefiting from the portion of the finance secured under UWSSP-II (Component 2). This project aims at development of Fecal Sludge Treatment Plant (FSTP) in the short-term (2023-2027) that will improve the provision of sanitation service for the town. Although this infrastructure development brings multifaceted benefits to the town, it may also bring adverse impacts on the environment and social aspects that need to be minimized and mitigated to make the project environmentally and socially acceptable. Hence, this study aims to provide an insight into the possible environmental and social impacts which can occur during design, construction and operation of the FSTP in Jimma City. It also forwards possible mitigation measures for the identified impacts. In connection with this, the MoWE signed consultancy service contracts with Green Sober Environmental Management Consultant (GSEMC), to undertake the Environmental and Social Impact Assessment (ESIA) Study for the above stated project in Jimma. The overall objective of the ESIA is to identify, predict and evaluate the potential beneficial and adverse impacts and propose mitigation measures of the FSTP on the biophysical and socio-economic environment in and around the town.

METHODOLOGY

This ESIA applied different methods to achieve its objectives. It collected and evaluated comprehensive socioeconomic and environmental baseline data. In line with the type of assessment, and nature of data sources, mixed approach was adopted. This mixed approach was selected due to the fact that the assessment was relatively complex and requires a more comprehensive understanding of the phenomenon being studied. In accordance with the EIA guideline of Ethiopia, the GSEMC utilized both quantitative and qualitative data from primary (FGD, KII and field observation) and secondary sources (literatures and feasibility and design study report). Environmental and socioeconomic data were described and explained at the required scale. Descriptive method is mainly adopted to describe the impact of the project on receiving biophysical, socio-cultural and economic environment. The impact and risk assessment was conducted using various methods, such as Checklists, Matrix method, and Expert judgment. Mitigation measures have been proposed to reduce or avoid the potential environmental impacts of the project. Project alternatives, changes to the project site modifications, use of alternative technologies, or operational measures have also been duly considered. Monitoring and evaluation method further includes developing a plan to monitor and evaluate the environmental and social impacts and implementation of the mitigation measures of the project over time.

Relevant National Policies and Strategies

The assignment, on top of studying the environmental and social impacts of the project, also reviewed relevant policies and strategies and other relevant legal frameworks of the Ethiopian Government, and the World Bank. Some of these policies, strategies and legal frameworks reviewed are: The Constitution of Federal Democratic Republic of Ethiopia (FDRE) adopted in 1995, provides the overriding principles and legal provisions for all legislative frameworks in the country; The Environmental Policy of Ethiopia issued in 1997, ESIA policies included in the cross-sectoral environmental policies; Other relevant policies issued by GoE such as Water Resources, Health, HIV/AIDS and Women Policies. Other applicable strategies and programs include Climate Resilient Green Economy Strategy, Urban Wastewater Management Strategy, Integrated Urban Sanitation and Hygiene Strategy, Environmental pollution Control Proclamation, Solid Waste Management proclamation, Hazardous Waste Management and Disposal Proclamation, Expropriation of Land, Payment of Compensation and Resettlement Proclamation, Labor Legislation proclamation, Cultural Heritage Conservation.

The World Bank's Safeguard Policies, like the Environmental and Social Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Indigenous Peoples (OP/BP 4.10); Physical Cultural Resources (OP/BP 4.11); Involuntary Resettlement (OP/BP 4.12); and Forests (OP/BP 4.36); are also among the most relevant documents which were thoroughly reviewed. As per the outcome of the screening, since the contribution/impact of the proposed FSTP will have on the environment and the society, the proposed subproject falls under category B.

DESCRIPTION OF BASELINE CONDITIONS

Physical Environment: Jimma Town is the largest urban center in south-western Oromia. It is about 352km rom Addis Ababa. The town is categorized as a special zone in the Oromia Region and is surrounded by the Jimma Zone. Geographically, the town is found in 7°40′N of latitude and 36°50′E of longitude. The precipitation pattern of the area is mono-modal with peak rainfalls of 213 mm in average in July (maximum) and with more than 200mm monthly rainfall between June to September. The average annual temperature of the town is 17^0C. The average annual wind speed of the town ranges between 2.88km/h in November and December to 7.2 km/h in March and the prevalent wind direction of Jimma town is to South West.

Biological Environment: The natural vegetation in and around the town is highly disturbed by human intervention for urbanization. Jimma is one of the most forested cities in Ethiopia by both exotic and indigenous trees species. The exotic tree species include perennial fruits and eucalyptus trees. The indigenous once include coffee bushes and shade trees such as Oak and Acacias. There are no sensitive natural habitats and wildlife or endangered species in the vicinity of the project site.

Socio-Economic Environment: Based on the projection of the 2007 Census report of Central Statistical Agency of Ethiopia (CSA) the population of Jimma town was estimated to 239,022 by 2021 of which 118,993 are men and 120,029 women. With an area of 114.5 square kilometers,

Jimma has a population density of 2,087 all are urban inhabitants. Jimma University Referral Hospital is the only teaching and referral hospital in the southwestern part of the country, providing services for approximately 15,000 inpatients, 160,000 outpatient attendants, 11,000 emergency cases and 4500 deliveries in a year from the catchment population of about 15 million people. Regarding sanitation services 72% of the households have private toilets, 21% have shared toilets of various standards and the remaining 7% households have no toilets. Fecal sludge from households, Institutions, commercial centers is collected by private and public enterprises and transported to an open dumping site located at 7.67^{o}N and 36.8^{o}E to west of the town around 6 Km from the town center near to Abba Jifar airport (just besides the proposed FSTP site).

DESCRIPTION OF THE PROPOSED SUBPROJECTS

The project covers nine Kebeles in which 32 communal and 23 public toilets are proposed to be constructed for disadvantaged and low income areas/households. The communal toilets directly benefit at least 423 households living in low income areas; and 135 of them are female headed households and 12 of them are People with Disabilities (PWDs) living in 32 underserved and low income areas covered by UWSSP-II. The public toilets, on the other hand, serve thousands of households as they are being constructed in markets and other densely populated areas. Currently, there is no Fecal sludge treatment plant in Jimma and hence vacuum trucks transport sludge to open dumping sites located at the periphery of the town. On the other hand, fecal sludge collected from Jimma University and staff condominiums are directly dumped into the waste stabilization pond constructed inside Jimma Institute of Technology waste stabilization pond.

Fecal Sludge Treatment Plant: The short-term interventions of the citywide inclusive planning targets the provision of sanitary facilities, creating awareness, and imparting appropriate health education to follow hygienic practices to protect public health and the environment. Besides the construction of toilet facilities, the town will have a fecal sludge treatment plant. For the construction of new fecal sludge treatment plant in the Short-Term Horizon, it is estimated that 76 m3/day (32,907 m3/year) of fecal sludge is generated from residential sources (Feasibility and Design Report, 2022). According to the Feasibility and Design report, three alternative design options were analyzed, compared and selected. The ESIA team has also agreed on the technologies selected by the design team through tripartite discussions on some variations. The treatment plant has units of Reception and screening chamber, Sludge Drying Beds (SDB), Constructed Wetland, Maturation Pond, and Extended Sludge Storage.

SUBPROJECT ALTERNATIVES

During the feasibility study, alternative sites and alternative technologies were assessed, analyzed, compared and selected. In order to ensure a healthy, safe and secure environment for all and to accommodate the ever-increasing population and urbanization, the no project option is the least preferred or viable alternative options. For site selection the design consultant used 3 stage assessment (preliminary screening, technical evaluation and site selection) techniques.

Three sites namely Near Gudeta Buka, Boye and Kofe were proposed for analysis. These sites were proposed by the participation of stakeholders and consultation of the city master plan. Topography, proximity to drainage line and land use situation of the sites were used as factors to select the best site for the project. Hence the site at Kofe kebele behind the Abba Jifar Airport at about 6 km in the southwest of the town along the road to Melko with available area amounts to 4 ha was selected by the feasibility and design consultant team. The Site is located on land that is being used by private land right holders, newly established cemetery and near to Jimma Aba Jifar airport. However, through tripartite discussion among ESIA team, design consultant and the client, it was agreed and the site has been modified. Moreover, agreement has been made on possible design modifications that may be needed and it could be fixed by the contract administration and supervising consultant during implementation of the project.

In the framework of project implementation alternative, the ESIA team assessed technological choices and evaluates their advantages and disadvantages. Fecal sludge treatment technique typically consists of 3 stages: primary treatment, where the solid and liquid components of the waste are separated, sludge treatment, and liquid or leachate treatment. Primary fecal sludge treatment technology options including unplanted drying beds, planted drying beds, up-flow anaerobic sewage blankets reactor, settling and thickening tank were discussed and analyzed.

Through multi-criteria analysis, the design consultant had proposed unplanted sludge drying bed and with constructed wetland without ARB. The sequence of the proposed fecal sludge treatment process was: Reception and screening chamber-SDB-Constructed Wetland-Maturation Pond-Extended Sludge Storage. At this point, the ESIA consultancy team and design consultant had agreed on the suggested method for treating fecal sludge in Jimma Town. These technological possibilities offered the possibility of successfully treating fecal sludge to generate leachate effluent that could be safely disposed of without damaging the environment or providing health risks to people. Sludge and leachate that would fulfill the minimal or indicative wastewater quality standard values described in the UWSSP II, ESMF/WBG EHSG can also be treated using the suggested fecal sludge treatment approach.

Regarding road accessibility, the newly selected site connects with earthen road to the junction of open dumping site from where all whether road connect to the asphalt road. An upgrading of the earthen road and maintenance of the all-weather road would be needed when commencing project implementation.

PUBLIC AND STAKEHOLDER CONSULTATION

The ESIA study has conducted public consultations (PC) with community members, project beneficiaries and interested stakeholders to present the subprojects' likely impacts and to seek their opinions, questions, concerns and suggestions over the proposed subproject components. The consultations were held from 22nd to 31st June 2023 with PAHs. Discussions were also made with households living on (impacted by) the proposed FSTP, Moreover, stakeholders from Jimma Town Water Supply Sewage System Enterprise (JTWSSSE) were consulted about the

subproject. People who have participated in the public consultations are residents of proposed construction sites, representatives of women and youths. Part of the land selected for FSTP construction is being used by residents in Kofe Kebele and besides. A consultation with six PAHs and representatives of the community was held on 23rd June 2023 at Kofe Kebele near project site and consensus was reached on their agreement on the project implementation if commensurate compensations are paid and land substitutions are made. Tripartite discussion was conducted among the design consultant, ESIA and MoWE on the project site that originally proposed site by the design consultant was slightly moved to reduce risks posed due its proximity to Jimma Aba Jifar airport and sloppy/steepness of the site.

POTENTIAL IMPACTS AND MITIGATION MEASURES

FSTP construction project is proposed mainly to improve the quality of the social and natural environment of the Jimma town. 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 and the environment, 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. Although this project clearly brings many positive changes, some negative impacts are expected to occur during the construction, operation and decommissioning phases of the project. Taking the receiving environment into consideration, the ESIA study identified major negative impacts during construction and operation phases and proposed key mitigation measures as follows:

Project activity phases	**Adverse impacts of the project activity**	**Mitigation measures**
Pre-construction, design and planning phase	Involuntary economic displacement of 7 PAHs from their own lands	• ARAP has to be conducted prior to any civil work of the project and PAP need to be properly compensated in cash and kind for the losses. • PAHs should directly involve in the entire ARAP study and make their own informed decisions; • Compensate those affected as per Ethiopian Proclamation No. 1161-2019 and World Bank safeguard policy on involuntary resettlement.
Construction phase	Clearance of natural and planation vegetation coverage in the project site	• Re-vegetation of ¼ of the area delineated and perimeters of the FSTP with indigenous type of tree species • Including outside of project site plant10 times more trees to replace lost during site clearance as much as practical once;
	Soil degradation, flooding, erosion and	• Store topsoil and subsoil removed from the site during site preparation properly for backfilling and reinstatement.

Project activity phases	Adverse impacts of the project activity	Mitigation measures
	loss of Top soil	• Contour temporary and permanent access roads / lay down areas so as to minimize surface water runoff and erosion. • Develop a stable landform that mirrors the pre-disturbed condition to minimize the risk of preferential erosion and therefore facilitate natural grass and bushes recovery. • Excess soil must be removed from the site timely (in hourly or daily bases as applicable) manner and deposited at an approved site; • Sheet and rill erosion of soil shall be prevented where necessary through the use of sandbags, diversion beams, culverts, or other physical means
	Air quality loss and noise pollution	• Construction workers will be made aware of the Ethiopian Ambient Environment Standard Guideline (2003); noise levels at construction sites or industrial areas should not exceed 75 dBA and 70 dBA during the day and night, respectively. • Contractor has to ensure that all construction equipment is properly maintained and fully functional. • Workers be provided with the necessary personal protective equipment (PPE) such as earmuffs, masks whenever needed and as found appropriate; and
	Alteration of natural drainage pattern	• Proper drainage channels shall be constructed within the construction site. • Drainage channels shall be installed in all areas that generate or receive surface water and channels shall be designed with regard to maximum expected volumes. • Integrated work of stakeholders to water shade management with careful planning and abatement of drainage lines are required.
	Slope failure and risk of landslide due to depth earth work	• Relatively very weak landform slopes should be protected using engineered structures (retaining walls), especially at the lower courses of the FSTP site; • Protect the susceptible areas of the project by using temporary or permanent drainage works; • Minimize the possible risk by undertaking all earthwork construction activities during the dry season; • The eroded channels will be backfilled and restored to natural contours.

Project activity phases	Adverse impacts of the project activity	Mitigation measures
	Traffic congestion affecting movement of people and other transport facilities	• The Contractor should provide temporary road signs or notices to indicate ongoing works; • The Consultant and Contractor should choose traffic routes to reduce the impact in the neighborhood and any sensitive areas.
	Water pollution due to leakage of oil, grease and fuel	• All construction equipment will be kept in good operating condition to avoid oil, grease or fuel leakages; • All routine maintenance of construction machinery and vehicles shall be carried out in a designated workshop or maintenance area with concrete hard standing surface and drainage to an oil interceptor. • All hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site and regular removal and disposal has to be done in accordance with the Ethiopian hazardous waste management regulation;
	Occupation health and safety risks related to construction activities and risk of accidents for surrounding community and animals	• The contractor shall prepare site specific health and safety management plan. • Qualified health and occupational safety officer will be recruited by the contractor to oversee OHS matters on a daily basis. • All construction workers will be oriented on safe work practices and guidelines (OHS) first and ensure that they adhere to them.
	Risk of impacts on Physical Cultural resources (PCRs)	• Chance Finds Procedure (CFP) has to be followed when an event of buried PCRs being unexpectedly encountered or "chance find" during construction phase of the project and duly reported to respected bodies.
Operation phase	Air emission and dust pollution	• Watering dusty roads during operation. • Using new vehicles and giving proper service to the trucks on regular basis to improve their fuel performance and reduce emission; and • Turn on generators only during power cut-offs period,
	Occupational health and safety adverse impacts	• Hire qualified and trained OHS and environmental health crew for regular monitoring and management FSTP. • Develop and work on EHS Plan including health and safety measures to avoid accidents and injuries during work at the FSTP.

Project activity phases	Adverse impacts of the project activity	Mitigation measures
		• The FSTP should be fenced, and signals put in place with security personnel to stop unauthorized people from accessing the site
	Pollution to water sources, channels and swampy lands	• Plant indigenous trees at the perimeter of the project area with varying heights thereby forming wind breakers in addition to masonry or brick fences; • Good site management of the operation must regularly ensure to avoid foul odors that would arise from improper functioning; • Use of Ferric chloride (FeCl3) which will be added to control the generation of hydrogen sulfide (H2S) the main source of odor in the sludge digestion process;
Decommissioning phases	Pollution of soil and water bodies	• Develop a decommissioning plan that outlines the steps and working procedures. • Engage local stakeholders including nearby residents, businesses, and community organizations in the decommissioning process to ensure their concerns are addressed. • Restore the project site into its original or to a condition that is acceptable to local stakeholders and regulatory authorities. • Monitor the decommissioned site to ensure that there are no potential environmental or health risks associated with the decommissioned plant.
	Occupational health, safety and Air pollution	• Recruiting a qualified health and occupational safety officer who will oversee OHS matters on site. • Proper induction of the workers prior to decommissioning commencement. • Providing training and education to workers on the proper use of equipment, PPE, and hygiene practices. • Provide appropriate, adequate PPE, such as gloves, masks, and protective clothing, OHS personnel protective gear to the employees.
	Socio economic adverse impacts on employee and dependents	• Based on their skill, knowledge, experience and interest, vulnerable community groups must be transferred to another secured job opportunity. • Providing adequate provident fund or pension for those who want to retire. • Providing retraining programs in new industries or skills opportunities for workers who have been impacted by the process.

Project activity phases	Adverse impacts of the project activity	Mitigation measures
		• Supporting workers to start their own businesses.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

ESMP is the key to ensure that the environmental and social quality of the project influence area so that it does not deteriorate due to the implementation of the proposed development project covering all aspects of project implementation in its different phases. 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 of the adverse environmental and social impacts identified. 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 contractor. It can be translated into project documentation and provide the basis for a legal contract that establishes responsibilities of the contractor. In turn, the contractor 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

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.

Institutional Arrangements

Depending on the size of the plant, the volume of treatment, and the necessary degree of ability, FSTPs may have a wide variety of personnel needs. It should be explicit about the duties and responsibilities of each employee member as well as the channels of communication. The key employee requirements which are essential for the long-term operation of FSTPs are Microbiologist, Chemistry, Public health, Sociologist, Water supply and environmental engineer, Electro-mechanical engineer and Mechanical technician. In Jimma city currently project coordinator, environmental and social safeguard specialist, financial specialist, procurement

officers, drivers and other the required staff are recruited under JCWSSE and on duty to implement the project.

The total number of budget proposed for the execution of the ESMP, monitoring plan, community mobilization and experts capacity building was Eth birr 14,890,000 (fourteen million eight hundred ninety thousand) with ±10 error based on the current market dynamics.

1. INTRODUCTION

1.1. Background

Ethiopia is one of the Sub-Saharan African countries with poor sanitation services, and rapid urbanization which is exacerbating this situation (Oliver, 2015). As a result, people in many cities and towns lack access to adequate sanitation systems, consequently causing environmental and social problems (ESMF, 2017). In addition, cities and towns have increased in size and number over the past 20 years. Such trends will result in an increase in the need for more basic urban services and infrastructure in the years to come, including adequate sanitation. Meeting this goal depends on the cities and towns' ability to meet urban standards of living that include improved sanitation. It is, therefore, based on the aforementioned considerations that the Ethiopian government and the World Bank have launched the second Urban Water Supply and Sanitation Program (UWSSP).

The second UWSSP aims at increasing access to water supply and sanitation services in 22 secondary cities and Addis Ababa. The project is intended to aid in the government's efforts to eliminate open defecation, raise the proportion of the population using a "safely managed" sanitation service, and improve current water supply services through increased operational effectiveness and expansion of water supply service to underserved areas. The project has three key components: i) Addis Ababa Sanitation and Water Supply Services Improvement, (ii) Secondary Cities and Towns Sanitation and Water Supply Services Improvement, and (iii) Project management and institutional strengthening and financed by the World Bank. However, Components 1 and 2 of the projects are identified as having some adverse environmental and social impacts that need mitigation actions. Soil erosion, soil and water pollution, a possible increase in malaria, loss of vegetation, traffic accidents, air pollution, the health and safety of people near construction sites, and the taking of land holding right of individuals are just few of the social and environmental impacts the project will have.

Therefore, the FDRE Water and Energy Ministry hired Green Sober Environmental Consultant Pvt. Ltd. Co. to conduct an ESIA on the fecal sludge treatment plant (FSTP) to be implemented in Jimma town.

1.2. Objective of the Environmental and Social Impact Assessment

1.2.1. General Objective

The main objective of the consultancy service is to carry out the environmental and social impact assessment on Fecal Sludge Treatment Plant (FSTP) construction, operation and decommissioning phases. It identifies, predicts and evaluates potential environmental and social impacts during the life cycle of the FSTP and recommends appropriate mitigation measures. Further, the assignment aims at preparing environmental & social management and monitoring

plans. Additionally, it targets to develop an indicative socio-economic survey for the preparation of the Abbreviated Resettlement Action Plan (ARAP) for potentially affected community.

1.2.2. Specific Objectives

- Examines the National and the World Bank environmental and social safeguard policies and regulations that will be triggered by the project activities
- Describes the views and concerns of the public and stakeholders towards implementation of the subproject.
- Establishes baseline features of the biophysical, socio-economic, and cultural attributes in the project influence area.
- Identifies and evaluates significant impacts (both beneficial and adverse) that occur due to the project implementation that require appropriate mitigation measures.
- Proposes specific mitigation measures for inclusion in the project detail design and management plan to reduce or avoid adverse environmental and social impacts.
- Conducts analysis of alternatives to the proposed sub-projects in terms of sites, technology, design, operation, including the "without project" scenario.
- Assesses and identifies capacity gap and proposes training and capacity building requirements for implementation of environmental mitigation and monitoring.
- Prepares Environmental and Social Management Plan.
- Undertakes cost estimation for each proposed mitigation measure and monitoring program.
- Develops a monitoring program that will be followed during the project implementation.
- Recommends environmental and social compliance requirements, design measures, and staffing that should be included in the works contract documents.

1.3. Project Scope

1.3.1. Scope of the Work

The scope of the ESIA includes field assessment and description of the physical, social and cultural environment of Jimma town in general and the project area in particular. Experts keen site observation, flora and fauna species composition and diversity identification, climatological data collection and analysis, site geology and geomorphology analysis, hydro-geological data collection and analysis, GIS based site physical environment, soil, cultural heritage and PAPs mapping are also part of the ESIA study. In addition, the scope includes conducting community consultation, key informant interview, house hold survey for PAPs. Moreover, impact identification, analysis and presentation of mitigation measures with management and monitoring plan for adverse impacts were prepared. Furthermore, the scope comprises suggestion of enhancement measures for positive impacts during project planning, construction, operation and decommissioning phases.

During the ESIA, the consultant has taken into account issues and concerns that arose during stakeholders and community consultations and incorporated these issues and concerns into the environmental and social analysis. One of the beneficial project impacts of UWSSP is the production of job opportunities for citizens during construction as well as operation phases and hence occupational Safety and Health of workers has given special attention.

Generally, scopes of works undertaken by the consultant include the following tasks:
Task 1: Description of the Proposed Sub-Project
Task 2: Review of Regulatory and Policy Framework
Task 3: Public Participation and Consultations
Task 4: Biological, physical, social, cultural and economic Baseline Conditions assessment
Task 5: Impact Identification, Characterization and Evaluation
Task 6: Setting of alternatives/options for comparison
Task 7: Impacts Mitigations and Management plan development
Task 8: Institutional arrangement, human resources, and capacity building plan development
Task 9: Grievance Redress mechanism

2. Approach and Methods

2.1. Approach/Design

The study required collection and evaluation of comprehensive socioeconomic and environmental data. In line with the type of assessment being conducted, and the nature of data sources being collected, the study adopted a mixed approach. This mixed approach was selected due to the fact that the assessment was relatively complex and requires a more comprehensive understanding of the phenomenon being studied. In accordance with the EIA guideline of Ethiopia, the GSEMC utilized both quantitative and qualitative data from primary and secondary sources.

Environmental and socioeconomic data were described and explained at the required scale. Descriptive method was mainly adopted to describe the impact of the project on receiving biophysical, socio-cultural and economic environment as they are. Descriptive assessment design sets out to describe and interpret what exists as it is. Moreover, as supplement, explanatory design was employed by professionals when elaboration and enrichment of socioeconomic, cultural and environmental issues on the ground is required.

2.2. Period of Field Data Collection and Site Visits

The required field data from Jimma town was collected from June 20th to 31st 2023. The team has also visit the town on October 26-27, 2023 for the second time for FSTP site survey and discussion with stakeholder team of experts were participated in collection of information from public, stakeholders, project owners, experts, different sites (such as water bodies) and proposed project sites.

2.3. Method of Data Collection and Analysis

The ESIA study comprised of wide variety of methods. Information related to biophysical, socio-cultural and economic environment of the proposed project were collected exclusively on environmental safety, social acceptance, and economic viability as key points of project implementation. Moreover, data related to vulnerable groups' management, land acquisition, access to job opportunities, compensation and relocation were also collected and examined. This ESIA study typically involved a range of methods including baseline studies, stakeholder engagement, impact and risk assessment, mitigation measures, and monitoring and evaluation.

Baseline studies: Baseline data collection was one source of information which involves collecting data on the current environmental and social conditions like data on the physical, biological, and social environment, as well as information on the existing land use, infrastructure, and other activities in the project area. This was used to establish a baseline against which the potential impacts of the project can be compared.

Impact and risk assessment: Impact assessment covers identifying and assessing the potential environmental and social impacts of the project. Impact and risk assessment is conducted using various methods, Checklists, Matrix method, and Expert judgment.

- Checklists are also used as a method to list potential environmental impacts that may be caused by the proposed project. The checklist is used to identify potential impacts and to determine the scope of the impact.
- The matrix assessment method was applied for assessing the potential environmental impacts of the project and to evaluate the significance of the impacts.
- Expert judgment was a method of obtaining opinions of experts in relevant fields, such as ecologists, hydrologists, environmentalists, sociologists and others to assess the potential environmental impacts of the proposed project.
- Geographic Information System (GIS) mapping is one of the methods applied for visualizing and analyzing spatial data. GIS is used to identify delineate areas that may be sensitive to the potential environmental impacts of the proposed project.

Stakeholder engagement: community members who were affected by the proposed project were consulted. This method was applied in order to assess and obtain their values, concerns and perspectives on the proposed project and its potential environmental impacts.

Mitigation measures were proposed to reduce or avoid the potential environmental impacts of the project. Project alternatives, use of alternative technologies, or operational measures were also duly considered to get the best from the interventions.

2.4. Sources of Data

Project linked data sources were obtained from both primary and secondary sources. Primary data sources used were focus group discussions (FGD), key informant interview (KII), stakeholder consultations and observation while secondary data were obtained from government statistics, institution reports, academic research, public records and others.

2.4.1. Field Surveys

Field survey was conducted to collect new information on the environmental setting, baseline conditions, and potential impacts associated with the proposed project. Depending on the parameter measured and project requirements; one can apply various field survey methods for the Environmental and Social Impact Assessment (ESIA) process. Collecting physical and biological data from the project site and surrounding areas were done by using direct observation, Stakeholder engagement and Geographical Information Systems (GIS) and remote sensing technologies.

2.4.2. Documents, Policies and Guidelines review

Review of relevant documents, policies, and guidelines were conducted to ensure that the proposed project is in compliance with the country's and the WB's legal and regulatory framework. Among others, some of the reviewed documents comprises of the feasibility study and design of the proposed project, country's Laws, policies, WB's safeguard policies, guidelines, government reports, academic publications, and others.

2.5. Data Collection Tools

Socioeconomic and environmental data were collected by pre-developed data collection instruments. This data collection instruments are presented as follow.

2.5.1. Survey Questionnaires

Survey questionnaires were designed to collect data at a particular point of time. Survey questionnaires are vital to describe the nature of existing conditions, to identify standards, and determine the relationships of specific events. Thus, these tools were used to acquire appropriate information about existing situation of the physical, social and cultural environment, and institutional issues. Office data collection questionnaire were also utilized to get data on demographic characteristics, human resources and capital, natural resources and settings, infrastructural facilities of the town, cultural and economic resources within and around the project site as a receiving environment.

2.5.2. Public Consultation Checklist:

Public consultation checklist was also one form of data collection tool. Representatives of local government (Kebele), community members composed of elders, the youth, women, religious leaders and vulnerable community groups which are found nearby of the project site were engaged in this event. Consultation was held by using checklist and data related to public views, concerns, questions and comments of local communities were documented through minutes. The consultation was freely carried out without any persuasion and interference to push the interests of the consultant or any other body's interest.

2.5.3. Focus Group Discussion (FGD):

FGD checklist was another data collection tool used to collect relevant data. In each FGD more than 8 individuals were participated. The moderator was responsible for asking open ended questions and guiding the discussion. Discussions were made on particular issues and information was documented through Minutes.

2.5.4. Key Informant Interview (KII):

KII is method used to collect in-depth data on a particular topic or issue by interviewing an individual who has specialized knowledge or experience relevant to the research question. Project related semi structured question items were prepared for the interviewee. Data was collected from project staffs by semi-structured interview guide designed to elicit detailed information on the project.

2.5.5. Informal Interview Guideline

Another data collection tool used in this study was a spontaneous and on-site informal interview guide. Though this tool, informative and suggestive data about individuals, local communities, households, kebeles and town officials was collected.

2.5.6. Observation

Observations were conducted in a natural environmental setting, such as project site, workplace and community. It was involved documenting the presence of sensitive ecosystems, wildlife habitats, or cultural heritage sites. By using experts' keen observation, GSEMC assessed the social settings, physical characteristics, economic activities, environmental features, plants and crops found in and around the proposed project sites. The observation activities were also supported by taking photographs.

2.5.7. Hand-Held GPS

A global positioning system (GPS) coordinate points of study site were collected for development of GIS based maps. This method was employed for identifying land use patterns, vegetation cover, or other environmental features. These data were then analyzed using various software tools, including ArcGIS for preparing different maps and other software used for various data analysis and visualization.

2.6. Impact Identification and analysis

The type and sources of collected data greatly vary based on the required analysis. Analysis was mainly done through the evaluation of baseline conditions; risk assessment and stakeholder's analysis. For each identified impact, risk assessment was done through quantifying the likelihood and severity of potential environmental, social, and economic impacts of the project. Significance of the predicted or identified impacts have been quantified and evaluated by considering the magnitude the effect and the sensitivity of the receptor. For the quantification and evaluation of impacts, checklists and interaction matrices were applied. After evaluation of impacts, appropriate and justified mitigation measures were forwarded for the negative impacts and enhancement measures were indicated for the positive impacts.

3. Policy and Legal Frameworks and Institutional Arrangement

The implementation of the FSTP subproject has 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. Subsections below provide more details on the applicable legislative framework for the ESIA.

3.1. Policy and legal Frameworks

3.1.1. Constitution of the Federal Democratic Republic of Ethiopia (FDRE)

The Constitution of the FDRE is the supreme law of the country, whose provisions must be complied with by all other policies, regulations and institutional frameworks. The Constitution of the FDRE (Proclamation No. 1/1995 as amended) is the foundation for human rights, and natural resources and environmental management. Concepts of sustainable development and environmental rights are enshrined in the constitution of the FDRE through articles 43 and 44. These articles state about, among others, the right to development and right to live in clean and healthy environment. Article 44(2) of the Constitution states that all persons who have been displaced, or whose livelihood that have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation including relocation with adequate State assistance. The government shall pay fair compensation for property found on the land but the amount of compensation shall not take into account the value of land. Moreover, the Constitution states that, without prejudice to the right to private property, the government may expropriate private property for public purposes subject to payment in advance of compensation commensurate to the value of the property (Article 40(8). Moreover, Article 43 (2), an article that deals with the rights to development, states that nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.

3.1.2. Environmental Policy and Strategies

To further amplify the Constitutional provisions on environmental protection, the Environmental Policy of Ethiopia was approved in 1997 (EPA, 1997). The policy goal is to improve the health and quality of life of the peoples of Ethiopia and to promote sustainable social and economic development through sound management and use of natural, human-made and cultural resources and the environment.

The policy seeks to ensure that essential ecological processes and life support systems are sustained, biological diversity is preserved and renewable natural resources are used in such a way that their regenerative and productive capabilities are maintained and where possible enhanced so that the satisfaction of the needs of future generations is not compromised; where this capability is already impaired.

3.1.3. Land Tenure Policy

The Constitution of the FDRE states that the right to ownership of rural and urban land, as well as all the natural resources, is exclusively vested in the State and People of Ethiopia. Article 40 of the Constitution indicates that land is a common property of the Nations, Nationalities and the Peoples of Ethiopia, and shall not be subjected to sale or to other means of transfer. The constitution of FDRE retained land under the control of the people and government of Ethiopia thus, prohibiting its buying and selling. Article 4(5) of the proclamation 94/1994 also deals with provision of land for the conservation, development and utilization of state forests or protected areas. However, this can be effective only after the consultation and consent of the peasantry and subject to the assurance of their benefits.

3.1.4. National and Regional Conservation Strategy

Since the early 1990s, the Federal Government of Ethiopia has undertaken a number of initiatives that aims to develop regional, national and sectoral strategies to conserve and protect the environment. Paramount among these was the conservation strategy of Ethiopia (CSE, 1996). This document provides a strategic framework for integrating environment into new and existing policies, programs and projects. It is also an important policy document, which views environmental management as an important component of development. It recognizes the importance of incorporating environmental factors into development activities from the outset.
The major environmental and natural resources management issues facing Ethiopia are well documented in the CSE (FDRE, 1997). The CSE sets out detailed strategies and action plans as well as the institutional arrangements required for the implementation of sectoral as well as cross-sectoral interventions for the management of Ethiopia's natural, man-made and cultural resources.

3.1.5. National Biodiversity Policy

The National Biodiversity Policy (NBP) was established in 1998 based on a holistic ecosystem approach to conserve, develop and utilize the country's biodiversity resources. The policy provides for guidance towards effective conservation, rational development and sustainable utilization of the country's biodiversity, and contains comprehensive policy provisions for the conservation and sustainable utilization of biodiversity. Integration of biodiversity conservation and development in federal and regional sectoral development initiatives, and mobilization of international cooperation and assistance, have been identified as the principal strategies for implementation of the policy.
This policy framework provides direction and regulatory tools on overall conservation and sustainable development of the country.

3.1.6. Ethiopia's Climate Resilient Green Economy (CRGE) Strategy

To cope with the prevailing environmental problems such as land degradation and climatic hazards (rainfall fluctuation, increasing temperature, flooding), and speed up its socioeconomic development, the Government of Ethiopia has crafted a climate-resilient green economy development strategy known as the CRGE. This development direction promotes environmental protection, reducing fossil fuel consumption which releases greenhouse gases into the atmosphere. With demand for energy growing with the increasing population, industrialization and urbanization, the government realized that harnessing clean and renewable energy sources such as wind, solar, hydro and geothermal energy sources was critical. It is indicated in the CRGE that these natural resources would deliver electricity at virtually zero Green House Gases (GHG) emissions. The generated electricity is a fundamental enabler of modern economic development, from powering cities and fueling industrial activity to pumping water for irrigation purposes in agriculture. The government also decided to increase its income through exporting electric power generated from clean sources to neighboring countries.

3.1.7. Ethiopian Water Resources Management Policy

The overall goal of water resources policy is to enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available water resources of Ethiopia for significant socioeconomic development on sustainable basis. The policy has three sub-polices: water supply and sanitation policy, irrigation policy, and hydropower policy. For this particular ESIA study Water Supply and Sanitation Policy objectives are summarized here under as follows:

The Water Supply and Sanitation policy objectives are provision of, as much as conditions permit, sustainable and sufficient water supply services to all the peoples of Ethiopia; satisfying water supply requirements for livestock, industries and other users as much as conditions permit; carry out operation and maintenance of all water supply and sanitation services in a sustainable and efficient manner; promoting sustainable conservation and utilization of the water resources through protection of water sources, efficiency in the use of water as well as control of wastage and pollution; creating sustainable capacity building in terms of the enabling environment, including institutions, human resources development, legislation and regulatory framework for water supply and sanitation; and enhancing the wellbeing and productivity of the people by creating conducive environment for the promotion of appropriate sanitation services (FDRE, 2010).

3.1.8. National Policy of Women

The National Policy of Women (NPW) was issued in March 1993. In this policy, it is indicated that government policies, laws, regulations, plans, programs and projects should be based on the following objectives: to ensure participation of women in the formulation of government policies, laws, regulations, programs and projects that directly or indirectly benefit and concerns

of women; to insure participation and involvement of women in implementation and decision-making processes; and to ensure equal access of men and women to the country's resources.

3.1.9. National Health Policy

Ethiopia had a low level of health coverage even in comparison with other Sub-Saharan countries. This is largely related to low levels of income and widespread poverty, low levels of education, nutritional deficiencies, poor environmental conditions, and inadequate access to health services.

Health Sector Development Plans and Strategies have been designed to implement the stated health principles within a defined period of time. The strategies include raising the awareness of personal and environmental health care and sanitation through Information, Education and Communication; control of disease; and promotion of primary health care through community participation.

3.1.10. 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.

3.1.11. Urban Wastewater Management Strategy

MoWE issued this strategy 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 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.

3.1.12. Integrated Urban Sanitation and Hygiene Strategy

The Integrated Urban Sanitation and Hygiene 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 premises for the MoH to formulate this strategy were issues around urban sanitation and hygiene, which are complicated due to cross-sectoral

interventions and difference 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 town 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).

3.1.13. Environmental Impact Assessment (Proclamation No, 299/2002)

Proclamation (No 299/2002) aims primarily at making the ESIA mandatory for schedule I and schedule II category projects and programs. The proclamation specifies that the proponent of the project must prepare the ESIA following the format specified in the legislation. The proclamation requires, among other things:

- Licensing agencies to ensure that the requisite authorization has been duly received prior to issuing an investment permit, a trade or operating license or a work permit to a business organization;
- Specified categories of projects to be subjected to an ESIA and receive an authorization from the competent or the relevant regional environmental agency prior to commencing implementation of the project;
- The authority or the relevant regional environmental agencies may issue an exemption from carrying out an ESIA in projects supposed to have an insignificant environmental impact;
- A licensing agency may suspend or cancel a license that has already been issued where the institution responsible for environment at the federal level or the relevant regional environmental agency suspends or cancels environmental authorization;
- Procedures that need to be followed in the process of conducting an environmental impact assessment are described in the Proclamation. Thus, a project developer is expected to act as follows: Undertake a timely environmental impact assessment; Identifying the likely adverse impacts, incorporating the means of their prevention; and submitting the environmental impact study report accompanied by the necessary documents to the institution responsible for environment at the federal level or the relevant regional environmental agency for review and approval.

Based on the EPA Guideline (2003) proclamation, projects need to be 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 ESIA;
- **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.

- Θ **Schedule 3**: Projects that have negligible direct environmental impacts hence do not require environmental impact assessment.

Accordingly, the Jimma town FSTP construction activities fall under schedule II (category B) as they can cause some environmental and social impacts.

3.1.14. Environmental Pollution Control Proclamation

Ethiopian environmental pollution control proclamations No-300/2002 proves that some social and economic development activities may cause environmental harm that could jeopardize production. Article 3/1 of the proclamation explains about environmental standards and simultaneously prohibits no person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standard. Article of 4 this same proclamation elucidates about management of wastes, chemical and radioactive substance by the producer.

3.1.15. Solid Waste Management Proclamation

The main objective of solid waste management proclamation (No 513/2007) is to enhance all stakeholders' capacity to manage the possible adverse impacts while creating environmentally, economically and socially beneficial resources out of solid waste.
In article 17(1), it is depicted that without obtaining authorization, a person who implements solid waste management project that requires special permit before its implementation as determined in a directive issued by the relevant environmental agency commits an offence and shall be liable according to the relevant provision of the Criminal Code. And in article 17(3) states that any manufacturer, importer or seller who violates the provision of this Proclamation commits an offence and shall be liable according to the relevant provision of the Criminal Code.

3.1.16. Hazardous Waste Management and Disposal Control Proclamation

The objectives of the Hazardous Waste Management, Disposal Control Proclamation (Proc. No.1090/2018) are to create a system for the environmentally sound management and disposal of hazardous waste and to prevent the damage to the human or animal health, the environment, biodiversity and property due to the mismanagement of hazardous waste. The law addresses the management of hazardous waste including the application of cleaner production principles to minimize hazardous waste, the responsibilities of hazardous waste Generator, transportation of hazardous waste, precautionary measures to be taken during transportation and storage of hazardous wastes, and reuse, recycle and disposal of hazardous wastes. In this proclamation wastewater in general term has been categorized as hazardous waste in Annex One of this Proclamation. In addition, any waste which has substances or wastes containing viable microorganisms or their toxins which are known or suspected to cause disease in animals or humans is also considered to be hazardous.

Under the proclamation, the hazardous waste generator shall have the responsibilities to collect, segregate and dispose or cause to be collected, recycled or disposed of hazardous waste by authorized body; ensure that the container of hazardous waste are properly packed and conspicuously labeled with Amharic and English languages or other languages of the country as may be necessary; keep record on the type and quantity of hazardous waste that exist at the temporary hazardous waste storage facility; and show the record at any time when requested by inspector, and not to store hazardous waste at a temporary storage facility for a period exceeding one month. The relevance of this proclamation for the subproject is that it is a legal base regarding the way of wastewater and sludge handling and management, and discharge to the environment as well as workers welfare.

3.1.17. Expropriation of Land, Payments of Compensation & Resettlement Proclamation

The Expropriation of Land holdings for Public Purposes, Payments of Compensation and Resettlement Proclamation (No. 1161/2019) has revoked proclamation No. 455/2005 and is applicable throughout the country in rural and urban centers on matters relating to land expropriation, payment of compensation and resettlement of landholders whose land is expropriated for public purpose. The Proclamation defines public purpose as a decision that is made by the cabinet of a regional state or town administration or the appropriate federal authority on the basis of approved land use plan / development plan / structural plan under the belief that the land use will directly or indirectly bring better economic and social development to the public.

3.1.18. Cultural Heritage Conservation

The objectives of the Research and Conservation of Cultural Heritage Proclamation No. 209 /2000 are among others to carry out registration and supervision of cultural heritage, to protect cultural heritage against man-made and natural disasters. There is an Authority for the Research and Conservation of Cultural Heritage accountable to the Minister of Culture.

3.2. World Bank Group Environmental, Health, and Safety Guidelines

The general approach to the management of Environmental, Health, and Safety (EHS) issues at the facility or project level is for the effective inclusion of EHS considerations into corporate and facility-level business processes in an organized, hierarchical approach that includes the following steps:

- Identifying EHS project hazards (threats to the human health and what they value) and associated risks as early as possible in the facility development or project cycle, including the incorporation of EHS considerations into the site selection process, product design process, engineering planning process for capital requests, engineering work orders, facility modification authorizations, or layout and process change plans;

- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks, and carry out specialized environmental management functions including the preparation of project or activity-specific plans and procedures that incorporate the technical recommendations
- Understanding the likelihood and magnitude of EHS risks, based on:
  - The nature of the project activities, such as whether the project will generate significant quantities of emissions or effluents, or involve hazardous materials or processes;
  - The potential consequences to workers, communities, or the environment if hazards are not adequately managed, which may depend on the proximity of project activities to people or to the environmental resources on which they depend.
  - Prioritizing risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment, focusing on the prevention of irreversible and / or significant impacts.
  - Favoring strategies that eliminate the cause of the hazard at its source, for example, by selecting less hazardous materials or processes that avoid the need for EHS controls. When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences, for example, with the application of pollution controls to reduce the levels of emitted contaminants to workers or environments.
  - Preparing workers and nearby communities to respond to accidents, including providing technical and financial resources to effectively and safely control such events, and restoring workplace and community environments to a safe and healthy condition.

The WB Guideline of EHS for wastewater and ambient water quality set standard for basic parameters for sanitary discharge limit (Table1).

Table 1) Indicative value for treated sanitary sewage discharges

Pollutant	Unit	Maximum value
pH	pH	6-9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50

Source: WB Guideline EHS (2007) standard of Wastewater and ambient air quality

Thus, it is important to comply with the required discharge limit for all effluent parameters during entire operation period which implies that it is possible to use the treated Fecal sludge for different purposes.

3.2.1. World Bank Safeguard Policies

WB has a number of Operational Polices (OP) to ensure that the environment & human populations are protected during the development process. Five of the ten WB safeguards Policies are triggered as part of implementation of the UWSSP II (Environmental Assessment (OP/BP 4.01), Safety of Dams (OP/BP 4.37), Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12) and Projects on International Waterways OP/BP 7.50). Besides, the World Bank Group (WBG) Environment, Health and Safety Guideline (EHSG) shall be applicable as deemed necessary. However, the following safeguards policies are more relevant and applicable as part of implementation of the proposed FSTP subproject activities; Environmental Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12); and Physical Cultural Resources (OP/BP 4.11).:

Environmental and Social Assessment (OP 4.01): This policy requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. According to the WB OP 4.01, EA, and the National EIA guideline (2003) the proposed project falls under category B. The proposed UWSSP II triggers the WB OP 4.01, Environmental Assessment Policy. Thus, according to the WB categorization, Jimma town FSTP was grouped under category 'B'.

Physical Cultural Resources (OP 4.11): The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources (PCR). 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.

Involuntary Resettlement (OP 4.12): This policy is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to bank appraisal of proposed projects. OP 4.12 is triggered as FSTP require land for its implementation and hence there could be involuntary resettlement of land that results in direct social and economic impacts such as relocation, loss of income, assets or access to asset.

3.3. Comparison of the World Bank Safeguard and National Polices

Summary of the Ethiopian and the World Bank safeguard policy comparison was indicated in Table 2.

Table 2) Ethiopian and the World Bank policy comparison

Theme	The Ethiopian legislations	WB safeguard OP	Comparison	Measures
Social issues in ESIA	EIA proclamation 299/2002 overlooked social issues. That is the proclamation title itself was written as "Environmental Impact Assessment (EIA)" not as Environmental and Social Impact Assessment (ESIA) and the public disclosure of the ESIA is not mandatory. Preliminary social screening was not stated.	The Bank's operational policy OP 4.01 gives impasses to both environmental and social impact assessment of programs or subprojects. It also made the public disclosure of category A & B ESIA is mandatory.	The EIA proclamation 299/2002 overlooked social assessment of subprojects and programs and public disclosure of the ESIA whereas the OP 4.01 give special focus for them	When the government legislation is found less stringent in addressing issues compared to the WB procedures, the safeguard policies of the WB will be applied
Eligibility for compensation	Proclamation No1161/2019, Article 8(1) allows landholders' to be eligible for compensation, when the 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. This gives entitlement only to those who have formal legal rights over their land holdings	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.	According to World Bank OP4.12 eligibilities for compensation is granted to all affected parties but the Ethiopian Legislation only grants compensation to those with lawful possession of the land is expropriated. It 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
Actions for livelihood restoration and assistance to vulnerable groups	There are no specific laws or regulations specifying support for livelihood restoration and transition& moving allowances. Ethiopian law makes no 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.	Livelihoods and living standards are to be restored in real terms to pre-displacement levels or better. OP 4.12 further requires attention to be given to the needs of vulnerable groups like people with disabilities below the poverty line, landless, elderly, women and children, indigenous groups, ethnic minorities and other disadvantaged persons	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. 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.	The treatment of the vulnerable groups should be in accordance with OP 4.11

3.4. UWSSP II Specific Legal Frameworks

3.4.1. Environmental and Social Management Framework (ESMF)

The overall objectives and purposes of the ESMF of UWSSP II can be summarized as follows:

- Review Ethiopia's environmental policies, legislation, regulatory and administrative frameworks in conjunction with the World Bank's ten safeguard policies. Where there are gaps between these policies make recommendations as to how to bridge these gaps in the context of the proposed project as appropriate;
- Develop a stakeholder consultation process that ensures that all key stakeholders, including potentially affected persons, are aware of the objectives and potential environmental and social impacts of the proposed project;
- Assess the current ability at the regional and/or town level to implement the recommendations of the ESMF, and make appropriate recommendations;
- Assess the potential environmental and social impacts of planned sector investments and rehabilitation activities in the urban areas;
- In light of the available information, develop an environmental and social screening process for the future rehabilitation and construction activities referred to above; and,
- Prepare an Environmental and Social Management / Monitoring Plan (ESMP), including monitoring indicators, for the UWSSP.

3.4.2. Resettlement Policy Framework (RPF)

The main objective of this RPF is to ensure adequate management of land acquisition process is done in accordance with the World Bank Operational Policy as well as the country's legal requirement and provide guidance for the preparation and implementation of Resettlement Action Plans (RAP) or Abbreviated Resettlement Action Plans (ARAP), depending on the conditions, for the subprojects of the UWSS-II Project. The RPF aims to ensure that any possible adverse impacts of proposed project activities are addressed through appropriate mitigation measures. It addresses issues of land acquisition, loss of property or access, or more of livelihoods resulting from implementation of the proposed project.

3.5. Administrative and Institutional Framework

The FDRE 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 FDRE 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 enhance the welfare of humans and the safety of the environment.

3.6. Oromia Regional State Environmental Protection Authority

Oromia Regional State EPA is responsible for environmental protection matters in the region. It has the mandate of enacting regional environmental proclamations, regulations, standards and guidelines. The Regional EPA is responsible for the review and approval of ESIA of development proposals under the mandate of the Regional Government. It is mandated to follow up construction and execution of the project at least in semiannual bases. It can conduct environmental and social safeguard audit every two year and give technical assistance and guidance to the zone and town administration environmental regulatory agencies.

3.7. Jimma Town Admiration Environmental Protection Office

Jimma Town Administration Environmental protection Office (EPO) is mandated to ensure concerned stakeholder involvement in the FSTP planning, construction and operation. Follow up of the implementation of ESIA recommendation becomes a joint responsibility of regional and Local EPA. Local EPA should follow up every quarter and compile progress report to the regional EPA.

4. SOCIO-ECONOMIC AND BIOPHYSICAL BASELINE

4.1. Description of Project area

Jimma is the largest town in south-western Oromia. Geographic location of the town is found in 7°40′N of latitude and 36°50′E of longitude. Prior to the 2007 census, Jimma was reorganized administratively as a special Zone.

The town has a long and fascinating history, stretching back to the Kingdom of Jimma, which was one of the most powerful and prosperous kingdoms in Ethiopia during the 19th century. Another important aspect of Jimma's heritage is its vibrant culture with diverse community of people, each with its own unique cultural traditions and beliefs. In addition, Jimma is also known for its thriving economy. The town is a hub of trade and commerce, with a thriving agricultural sector that provides much to the town's economic activity.

The major highway radiating from the city of Addis Ababa to the southwestern part of the nation crosses Jimma and gives it an advantage over the others. In addition, this town is connected to the rest of the nation through air transport.

The town has got the right to administer itself by Oromia regional state by decree no 65/1995 (proclaimed in 2003). Then it has made reform on its organization and establishes other sector offices in addition to the municipality.

According to Feasibility Study and Design Report (2022), the total area of the town is about 114.5 square km of which the built area is estimated to be 76 square km. and now administratively structured within 17 kebele administrations.

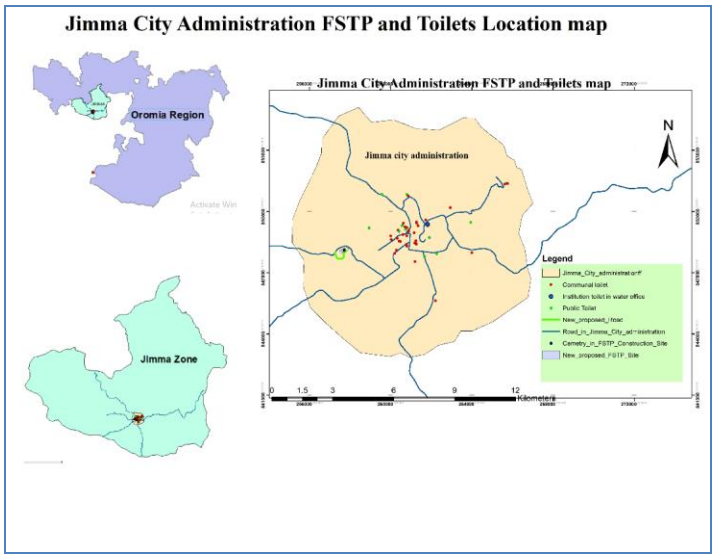

Figure 1) Map of Jimma town (Source: GSEMC, 2023)

4.2. PHYSICAL ENVIRONMENT

4.2.1. Rainfall

The analysis of 30 years' (1985 to 2014) rainfall record of Jimma town realizes a non-significant decreasing trend. The maximum annual rainfall of 2065.3 mm was recorded in 1988 and a minimum of 1144.4 mm was recorded in 2009 in the last 3 decades. The decreasing trend of annual rainfall amount in in the region has an implication of water resources scarcity in the long run. Therefore, water conservation measures such as protection of natural resources for increased infiltration and physical conservation measures should be practiced. Figure 3 shows the rainfall trends of Jimma town.

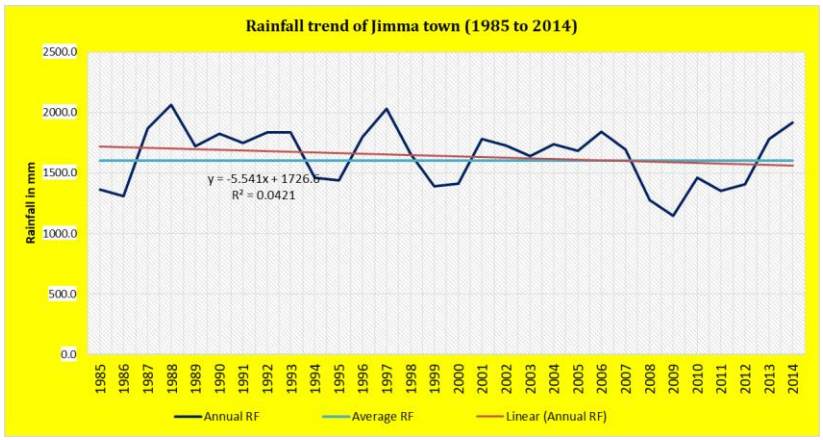

Figure 2) Rainfall trend of Jimma Town (Source: NMA and own computation)

4.2.2. Temperature

The average annual temperature of Jimma town is showing increasing trends with coefficient of determination (r^2) of 20.76%. In the period between 1985 and 2014 the maximum temperature range was 3.8^{o}c while the minimum temperature range was 3.1^{o}c. The increasing temperature will result in increasing rate of evapotranspiration leading to shortage of moisture or water availability for different uses and purposes in the town in the long run.

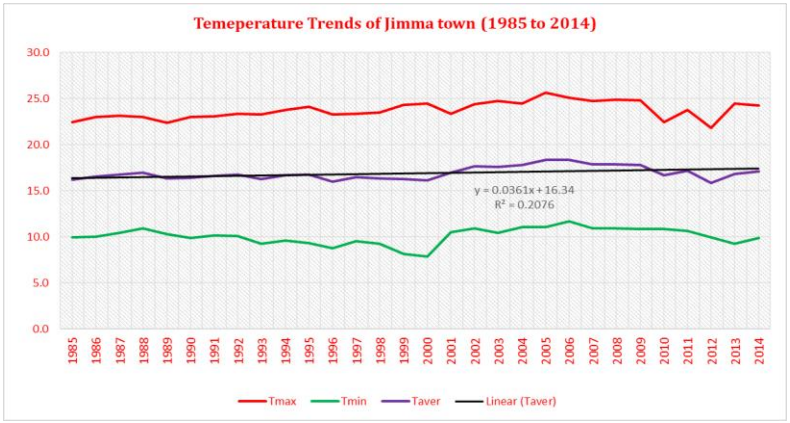

Figure 3) Temperature trends of Jimma

4.2.3. Monthly Climate

Water vapor pressure and wind speed: Water vapor pressure is the pressure at which the liquid water and its vapor are in equilibrium at a given temperature. When the vapor pressure reaches the atmospheric pressure, the liquid starts evaporating. At Jimma area the water vapor pressure is high between April and October indicating high level of humidity hindering vapor to scape to the air layer due to its colder temperature and lower wind speed that limits the spaces to consume more water vapor in these months (figure 5).

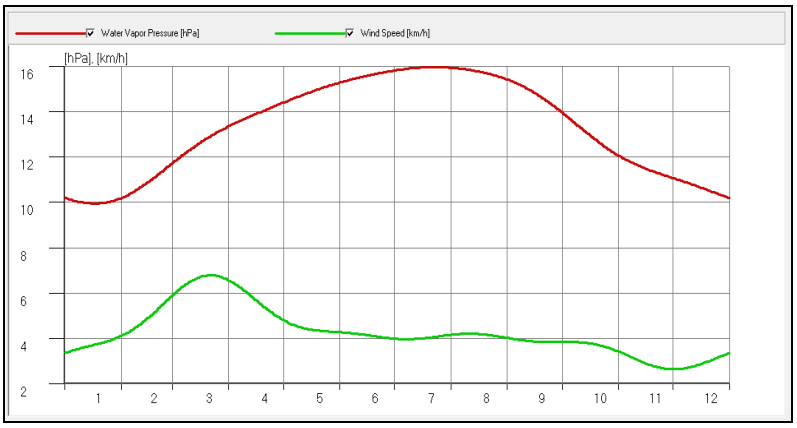

Figure 4) Water vapor and wind speed of Jimma area (source: FAO NewLocClim_10)

Sunshine hours and fractions: Sunshine duration is a climatological indicator and measure of cloudiness of an area representing duration of sunshine in given period. Solar fraction is the ratio of solar energy consumed by a system against solar energy provided by the solar system. Due to high cloud cover for more hours of the day, in Jimma area the sunshine is less than 6 hours per day between May and September. Similarly, the solar fraction is below 50% in the same months of the year (figure 6).

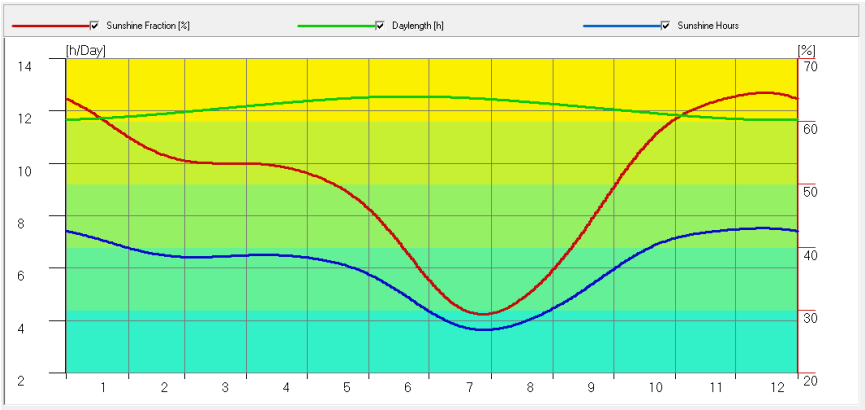

Figure 5) Sunshine hours and Solar fraction of Jimma (source: FAO NewLocClim_10)

Precipitation and Evapotranspiration: The precipitation pattern of the area is mono-modal with peak rainfalls of 213 mm in average in July (maximum) with more than 200mm monthly

rainfall between June to September. Regarding potential evapotranspiration of the area, it is almost lower than the actual precipitation from mid of April to mid of September that indicates the presence of surplus moisture for nearly 5 consecutive months (figure 7).

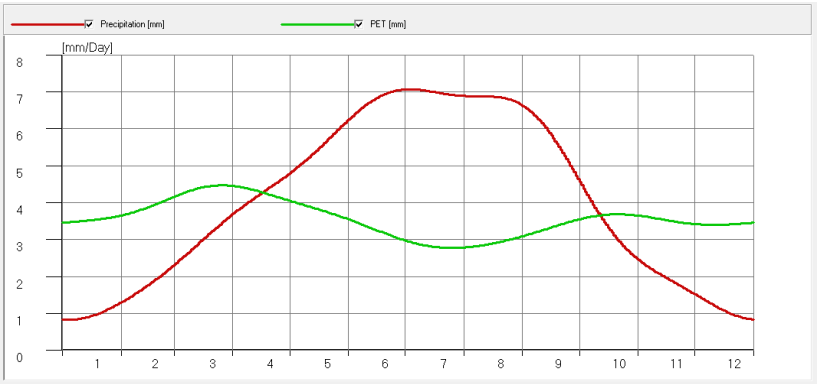

Figure 6) precipitation & evapotranspiration patterns of Jimma (source: FAO NewLocClim_10)

4.2.4. Wind speed and direction:

Wind speed and direction are detrimental factors for selecting and deciding several planning issues including waste treatment sites, tree planting pattern and building orientation to avoid or mitigate unwanted impacts affecting the dwellers. As data obtained from FAO NewLocClim_10 databases the average annual wind speed of the town ranges between 2.88km/h in November and December to 7.2 km/h in March. According to wind direction estimating tools, the prevalent wind direction of Jimma town is to south west. Therefore, the dominant wind blows to opposite direction of the major settlement area of the town.

4.2.5. Humidity

Humidity is the presence of water vapor in the atmosphere. The more water evaporates in a given area mean that the more water vapor rises into the air, and the higher the humidity of that area is. Hot places tend to be more humid than cool places because heat causes water to evaporate faster. According to the CLIMWAT2.0 tool of FAO (2006), the annual average humidity of Jimma town is 75%. The maximum humidity is recorded about 89% in July and the minimum is recorded 62% in January.

4.2.6. Topography

Topographically, Jimma town has attractive landscape and its elevation ranges between 1,694 and 2,152 above sea level with an average elevation of 1,780 m, and is located on the drainage basin of the Gilgel Gibe River. The central, southern and eastern parts of the town, which occupies the majority of the town, have relatively flat slopes of less than 2.5 % with an elevation of about 1,700 m. On the other hand, the northern and eastern parts are mountainous with an elevation of about 2,000 m above sea level (Feasibility Study and Design Report, 2022).

4.2.7. Geomorphology

According to Davidson, A., et al. (1976) the various landforms that developed in and around Jimma and surrounding areas is the result of the dissection of what was probably once a continuous North-East-rising plateau of sub-horizontal Tertiary volcanic rocks laying unconformably on crystalline basement. Jimma town is embraced by North-Westerly to North-Easterly trending arc-shaped chain mountains (medium highlands) running from West to East, South and South-Easterly to North-Easterly erected chained escarpments (horsts). The town is positioned on down-thrown wider "Caldera type" Graben with comprising lowered dissected and undulating table lands and ridges- reflecting the original topography being designed by more of basaltic and associated lava flows.

4.2.8. Slope

Due to the development and existence of sloping domes and elongated ridges the topography in Jimma town rather undulating. The ridging and doming model had been shaped more during the event of Jimma volcanic (composed of Rhyolites, Trachytes, Ignimbrites, Tuffs and associated basalts). The raised medium highlands comprise very steep slopes (no less than 70%) with gentle descending towards the transitional midlands to less than 3%. The undulating midlands usually exhibit gentle slopping and the valley bottom look fundamentally flat and due to very minimal slopes the drainage and rivers are flowing with very sluggish and reluctant velocity. In the project site the slope of the land reaches up to 12.9% that requires high earth work or cut to build relatively gentle slope for the proper operation of the plant.

4.2.9. Soil Types and Texture

Quaternary soil deposits of the study area include the insitu formed and reddish-brown residual soils overlying the underneath are mainly Jimma Basalts and other volcanic rocks. These soils are exposed in medium-highlands and transitional midlands. The alluvial deposits transported soils from the uplands and cover a majority of the study area. The alluvial deposit is mainly exposed following the central part of the town and extends north-south following the stream valleys. It is fine-grained, and reddish in color. Residual soils of the study area are derived from in-situ weathering of basaltic and ignimbrite rocks. This deposit relatively covers a large area along gently sloped topography. The thickness of this unit is greater than 10 m as it is observed along the road and stream cut exposure (Figure 8).

Figure 7) the Reddish-Brown Soil

4.2.10. Air Quality

No air quality tests have been done for Jimma town to date. However, it is believed that the town's air may be contaminated, primarily because of urban activities such as constructions, vehicle smoke, municipal and industrial wastes. Traffic movement is relatively large due to significant economic activities related to the cash crops and trade activities that may lead to release of air polluting chemicals. It is unlikely that the air quality will surpass WHO guidelines.

4.2.11. Noise Emission

The main sources of noise in the area are vehicles, enterprises and residences. The main route from Addis to south western Ethiopia cities accommodates traffic movements that may generate noise. There is also construction, small scale enterprises working on metal and wood works which can contribute for noise disturbances. However, it is unlikely that noise levels inside and outside of the town will exceed legal limits.

4.2.12. Geological Setup of Jimma Area

Generally, the study area is covered by the customarily known as Jimma Volcanics which mainly consists of the Quaternary soil deposits and different types of extrusive igneous rocks such as Rhyolites, Trachytes, Ignimbrite, tuff and associated Basaltic units.

4.2.13. Regional Geological Materials

1. Tertiary Jimma Volcanic

This rock unit is mainly exposed forming high standing cliffs toward the Northern and North-Eastern part of the Jimma area. It is fine-grained, light gray, and has a vesicular texture. It is slightly weathered and dominantly affected by horizontal and vertical joints. Some of the joints and vesicles of this rock are also filled with secondary materials such as quartz.

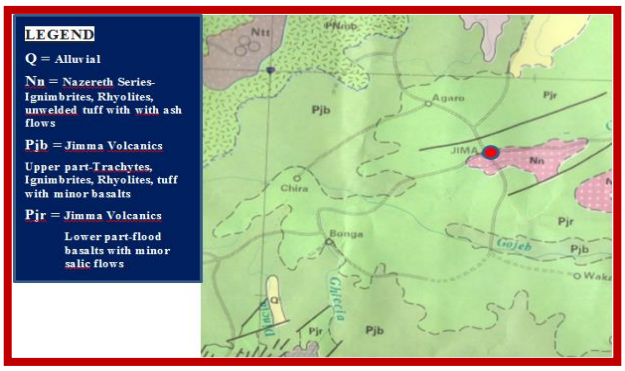

Figure 8) The geological Map of Jimma Area

4.2.13.1. Local Geological Formations

1. Top Insitu Formed Soils

The dominant soils deposited in and around Jimma town is the reddish-brown which is insitu formed as a result of mechanical and biological weathering from the underlying bed rock usually basalts.

2. The Alluvial Soils

The alluvial is a collective name which includes all the plastic and granular transported soils from the uplands down to valley bottoms. Alluvium is also sometimes called alluvial deposit. Alluvium is typically geologically young and is not consolidated into solid rock. Flood plain alluvium can be highly fertile, and supported some of the earliest human civilizations.

3. Basalts

The Jimma basalts are deposited in Jimma town as widespread. Basalts for low relief as it is originated from less viscous volcanic lavas. Basalts are widely used in Jimma as the main construction materials though lavas are a little bit difficult to shape them. The rock is usually affected by columnar joints which are rather easily exploited.

4. Ignimbrites

This rock unit is mainly exposed along the Eastern and North-Western parts of the Jimma town. It is slightly to moderately weathered and fractured and recognized by its dark grey color. In the Jimma area, this rock is currently being used as relatively the best shapeable masonry stone to build different types of civil engineering structures due to its workability.

5. Tuffs

Tuff rocks unit, which is a type of rock made of volcanic ash ejected from a vent during a volcanic eruption, is exposed in the Eastern part of the Jimma area. It is characterized by white color and a fine-grained texture. Due to the poor compaction and cementation of volcanic ash, this rock unit is weak and soft; and not suitable for constructions. In some areas, it is also found intercalated with basaltic rock.

4.2.13.2. Associated Geological Structures

Geological structures affect the stability of civil engineering structures constructed on discontinuous rock masses. The main geological structures observed in the study area are joints and straight faults. These were observed in all rock mass. Most of the faults and joints are vertically dipping with variable spacing, aperture, infill material, persistence, wall weathering, and roughness. The analysis of orientation data of joints using dips software showed that the rocks of the study area are dominantly affected by two major joint sets oriented in NE and NW, and one minor joint set oriented in N-S direction

4.2.13.3. The Engineering Properties of Jimma Geological Materials

The study conducted by Mekdes et-al (2022) identified different geological materials deposited at and around Jimma town. They discovered the existence of high plastic clayey soils and plastic silty soils underlain by highly weathered Ignimbrites, tuffs and Basalts. The reddish-brown residual soils cover most of the Jimma town.

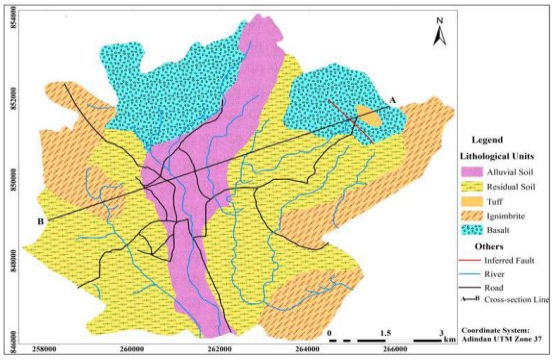

Figure 9) The Geological Map of Jimma Area

4.2.13.4. Geo-Hazard and Seismic of Jimma Area

The earth tremors and local earth movements can affect the FSTS infrastructures. Seismic shocks are concentrated along the Ethiopian Rift Valley system. As can be understood from figure_ Jimma town is just the transition of seismic radius towards stable land. Therefore, Jimma town and surrounding areas are at marginal boundary of seismic shocks.

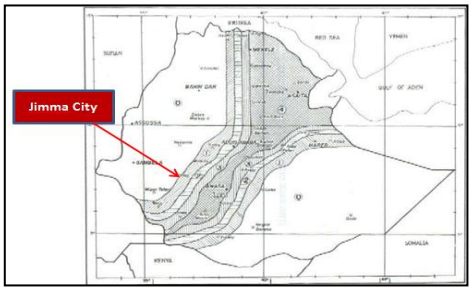

Figure 10) Jimma town at the marginal boundary of Seismic Map

4.3. Biological Environment:

4.3.1. Flora

The natural vegetation is highly disturbed through human intervention for urbanization. It is one of the most forested cities in Ethiopia by both exotic and indigenous trees species. The exotic tree species include perennial fruits and eucalyptus trees. The indigenous once include coffee bushes and shades trees such as Oak and Acacias.

The area delineated for the construction of fecal sludge is around 4 hectares of land occupied by plantations and wild species. None of the floral species observed in the fecal sludge treatment area are rare or endangered. The area is dominated by Psdium guajava (Guava, Zeituna) and Eucalyptus species. Some non-common and rarely observed fauna species include Ertthrina abyssinica (Flame tree, Korch), Syzygium guineense (Waterberry, Dokma), Croton macrostachyus (Broad lived croton, Bisana), Yeferenj Tid, Ricinus Communis (Gulo) and others.

Guava (Zeituna) is growing naturally in the project site; however, the community is harvesting and selling the fruits as source of livelihood. It is estimated that about 50% of the area is covered by this plant. Eucalyptus species is the second populous plantation in the project area. It is evident that the land owners are using it for generating income and supporting their livelihoods.

Figure 11) Partial view of existing Guava and Eucalyptus species in the proposed site

Invasive species like Lantana Camara (Yewof kolo) and Parthenium hysterophorus were also observed in significant number in the area. These invasive species are expanding in different parties of the country and replacing rangelands and crop areas.

Figure 12) *Partial view of existing invasive plant species in the project site*

4.3.2. Fauna

It is expected that the area will be populated by insects, small mammals such as mice, rats, moles and other members of the Rodent Family. Bird species were also observed at the site. Wildlife animals including Monkey, Ape, Hyena, and Pigs are reported by local community members.

Figure 13) Indicative picture of bird species and hyena underground shelter in the project area

4.4. Socio economic Environment

4.4.1. Demographic Characteristics

Based on the 2007 Census report, the Central Statistical Agency of Ethiopia (CSA) has projected the population of Jimma town to be 239,022 by 2021 of which 118,993 are men and 120,029 women. With an area of 114.5 square kilometers, Jimma has a population density of 2,087 all are urban inhabitants with average family size of 5, the town has a total household of 47,087 which requires reasonable sanitation services in public, community and household bases.

As indicated in the body of this report, Jimma is the largest town in the South Western quarter of the country. It is surrounded by cluster of settelements. The cluster of settlements is dominated by one single large town, i.e. Jimma, which exerts its influence over a widely dispersed network of intermediate towns. Its hinterland extends to sparely- populated areas in south - western Ethiopia. The National Urban Development Spatial Plan (NUDSP) envisions that, by 2035, the cluster will be transformed into a full-fledged urban cluster rapidly developing and well connected to other clusters in the country. It will encompass cities situated in Oromia (Agaro), South West Ethiopia Peoples Region (Bonga, Tepi, Dima, Mizan Teferi) and Gambella (Gambella) regions, which will be drawn closer to each other by their functional and spatial linkages.

4.4.2. Education

The education infrastructures include schools, academies, and public and private education institutions. Information from Jimma town education office indicated that there are 30 public and 66 private Kindergarten schools, 26 public and 28 private full primary schools (1-8) and 8 public and 7 private 9-12 grade schools in the town. Regarding number of students attending school, Jimma town education office reported that by 2014/15 the numbers of children attending kindergarten schools were 14,173 from which 3,796 were in public and 10,377 were in private schools; the number of students from grade 1 to 8 was 35,433 in public schools and 12,076 in private schools. Similarly, students from grade 9 to 12 were 15,051 in public and 1,134 in private schools. The numbers of students attending in private schools are decreasing with education grades advance to higher levels compared to the kindergartens.

Concerning water accessibility, among 26 public 1 to 8 grade schools 22 (85%) and from 28 private schools 26 (93%) have water supply at schools whereas from 8 grade 9 to 12 government schools, 7 have water access to use in the school. The available educational infrastructures have toilets for both students and teachers. Schools with water access have well improved toilets while those without water access have poor toilets. However, all toilets in the schools have not water tight septic tanks.

Table 3) Private or public schools with toilets and water consumption

Category of schools	Number of students		Is there latrine		Latrine (with/out septic tank)		M^3 Water use/month	Remark
	F	M	Yes	No	With	Without		
Private	5420	5435	✓			✓	210	Septic tank not water tight
Public	18069	16031	✓			✓	594	Septic tank not water tight
	23489	21466					804	

Jimma University is one of the largest and comprehensive research universities in Africa. The university has more than 4,000 staff members. The university is operating on five campuses. The university educates more than 43,000 students in 56 undergraduate and 103 postgraduate programs in regular, summer and distance education with more enrollments in the years to come. The numbers of students are increasing through time and hence the water consumption and waste production will also increase.

Table 4) Number of students both in public and private schools in the year 2014/2015EC

No	Kebele	KG	number of students		
			1-4	1-8	9-12
1	17	6,297	26,929	44,955	14,847

Source, Jimma/A/E/office, 2023

4.4.3. Health

In Jimma there are a number of health institutions including Jimma University teaching hospital providing both teaching and medical services. Currently it is the only teaching and referral hospital in the southwestern part of the country, providing services for approximately 15,000 inpatients, 160,000 outpatients, 11,000 emergency cases and 4500 deliveries in a year coming to the hospital from the catchment population of about 15 million people. There are about 273 health professionals with different education levels.

The study conducted by Danacho et al (2023) indicated only 13% of households in Jimma have access to safely managed sanitation services which may lead to series hygiene related health problems. In line with this report, the data obtained from Jimma health office indicated that typhoid and diarrhea are among the top 5 and 10 common diseases in the town. Danacho et al (2023) also stated the challenge in promoting resource-oriented sanitation options that the community relies on the community's perception of human feces reuse, which is completely unacceptable; failure to inter-collaboration among different sectors that are working differently for the same goal; the lack of a legal framework to standardize sanitation technologies in the current urban expansion processes.

During this ESIA survey, the study team recognized through FGD and interview with Jimma residents confirmed that the community were suffering from sanitation problems with regards to poor quality sanitation facility and sharing of the same facility with large number of families (e.g. in Mantina kebele 48 households with their family members are using a toilet with 12 holes constructed by Red Cross agency); and hence they are getting sick from hygiene related diseases such as thyroid, diarrhea and internal parasites.

4.4.4. Trade, Industry and Other services

Although agriculture (particularly coffee) is presently the main driver of the regional economy, Jimma and its surrounding has significant potential to diversify its economy. The cluster is

expected to continue to largely rely on agricultural production and will develop high-added value agro-processing due to its potential in agricultural production. It is thus expected to play a vital role in providing agricultural inputs to the Metropolitan Cluster and the country's export sector. Emerging sectors include in and around Jimma include:

Manufacturing: There is an industrial park being constructed in the town on 350 ha of land. It is a park dedicated to Agro-processing, Textile & Garment.

Mining: mineral resources have been identified nearby. Investors have started exploiting the coal resources around the town. In addition, there are also gold, iron and many more types of minerals in the nearby. These are expected to have impacts on the local, regional and national economy.

Trade has played a great role for economic growth. The biggest market days in the town are Thursday and Saturday. The main economic activity in the town is commerce and manufacturing enterprises. The local urban-rural exchange with Jimma and its surrounding has contributed significant business activity. Trade and commerce has the major employment in the town.

4.4.5. Water Supply

According to Jimma Town Plan and Development office (JTPDO) report (2023), history of modern water supply system of the town dates back to 1936. Till 1994 the town water distribution system was fed from five boreholes (two from Kitto wells namely plywood well and AADu wells), St. Gabriel springs, Jiren Springs and legahare springs. In addition, there were several wells which supply single users like Jimma Hotel and Jimma college of Agriculture. The current existing water supply source for the town is from Gilgel Gibe River with a weir intake structure constructed in 1994/95. The scheme was developed for design period of 10 years to serve projected population of 123,000 and hence the design period is over by two years ago. However, it has been estimated that the flow of the Gilgel Gibe river is adequate to supply the water demand of Jimma till the year 2035 considering 50% of the minimum/drought flow for downstream requirement (Feasibility and Design report, 2022). The water treatment plant was installed over a 10,000 m² of land, with a capacity of 34,000 m³/day. The existing average annual water production is 8.6 million m^3 and that of average available water for consumption is 6.9 million m^3.

4.4.6. Agriculture

Urban agriculture is one important economic activity from which a significant number of households support their livelihood. According to the Feasibility Study and Design Report (2022) of this project, the number of households currently engaged in different urban agriculture activities is estimated at 1904; out of which almost 85% are engaged in animal production (mainly dairy farm, fattening, poultry farm, apiculture) and the remaining in crop production.

The data obtained from Jimma town administration agriculture office (2023) indicated that the residents engaging in agricultural activities including crop production, animal husbandry and fish production are estimated to be 2482. From which 10% have landless, 11.7% have lands with less than 0.5 ha, 24.3% have lands with size between 0.5 and 1 ha, 28.8% have lands with size between 1 and 2 ha, 21.5% have lands with size between 2 and 5 ha and 3.3% have land size above 5 ha. Accordingly, among female headed land holders, 95.3% have obtained certifications while from male headed households 92.5% have received certificates. The major cereal crops under production in Jimma area includes maize, Teff, wheat, and sorghum with productivity of 42, 12, 36 and 25 Qt. /ha respectively. Irrigation agriculture is under practice on 251 ha of land in Gibe, Awetu, Qamo and Kitto kebeles of the town benefiting about 545 beneficiary households.

Livestock production activity is highly practiced in all 17 kebeles of the town with large livestock populations in Bore, Jiren, I/Bulla, Koffe, Hirmata Gibe and Ginjo kebeles (Table 5).

Table 5) Livestock population in 17 kebeles of Jimma

No	Kebele	Cattle	Goat	Sheep	poultry	(Bee hives)
	Bore	5400	2300	3300	11700	3600
	Jiren	4800	2200	3200	10900	4000
	I/bula	3700	2500	3100	10800	3800
	Kofe	2400	1700	1900	8000	2600
	H/gibe	1800	1100	1500	9000	3700
	Ginjo	600	102	200	3000	400
	B/Bore	1000	110	150	8000	800
	G/gudur	100	80	100	5000	0
	M/kochi	1200	100	150	7000	50
	S/samaroo	1400	300	500	8000	300
	A/Mandara	200	50	70	5000	50
	B/kito	800	80	100	4000	80
	B/addis	400	30	50	6000	60
	Mantina	600	20	30	4000	30
	Hermata	20	0	10	3000	0
	H/mantina	400	30	60	5000	30
	H/markato	500	40	60	6000	70
Total		**25,320**	**10,742**	**14,480**	**114,400**	**19,570**

Source: Jimma town Agriculture office, 2023

4.4.7. Tourism

Tourism is also an important economic activity in Jimma. It is the capital of a coffee-producing area, blessed with excellent tourist facilities and a warm location in the fertile western highlands. The last autonomous ruler of Jimma was King Abba Jiffar, whose impressive palace at Jiren, on the outskirts of the town, has been restored with partial funding from UNESCO. Other attractions include the daily central market, the ethnographic displays at the Jimma Museum, a nearby patch of forest

inhabited by the spectacular colobus monkey, and out-of-town Lake Boye with its resident hippos (Visitethiopia, 2023).

According to the data obtained from Jimma town's culture and tourism office, there are 169 Mosques, 17 Orthodox believers churches, 68 protestant believers churches and 12 other religion institutions. All these religious institutions provide religious services for the residents and serve also as tourist destinations. Sanitation facilities such as toilets are accessible in each of them with non-water tight septic tanks. Boye and Hora Dunge lakes, Awetu riverside development and Shenkore urban parks give Jimma additional natural attractions to draw tourists from inlands and abroad.

Jimma Museum, which is another tourist attraction site in the town, has various ceremonial dress, household utensils, valuable equipment and different historical articles of used during the regime of king Abba Jifar.

The presence of these natural gifts has made the town a tourist center and has been attracting both local and international tourists. Therefore, tourism is becoming an important sector contributing a great deal towards the economic development aspects of the town.

5. PROJECT DESCRIPTIONS

5.1. Overview of UWSSP-II project and Its Components.

The existing water supply and sanitation (WSS) system in urban areas of Ethiopia is under stress due to its rapid urbanization. Currently Urban areas have limited capacity to properly dispose of fecal sludge and wastewater, which puts human health at risk and pollutes the environment.

In light of these difficulties, the UWSSP-II is primarily designed to improve urban sanitation comprehensively and equitably in the urban environment and to offer help to increase operational effectiveness in 22 Ethiopian cities. Jimma town is among the secondary towns benefiting from the portion of the finance secured under the project.

The main aim of this project is to construct FSTP for Jimma that will increase safely managed sanitation services to the 258, 571 residents (of whom 51% - 130, 721 are female and 49% - 127, 849 are males).

5.2. Components of the Project

UWSSP-II financing from the World Bank was successfully negotiated with Ethiopian government and got into implementation. The development goal of the project is to expand access to improved water supply and sanitation services in Addis Ababa and 22 selected Secondary Cities while maintaining operational efficiency. The following three project components will contribute to achieving this goal:

- Θ Sanitation and water supply services improvements in Addis Ababa will finance the construction of sanitation facilities in various settlements and socio economic situations;
- Θ Sanitation and water supply services improvement in selected 22 secondary cities from all the regional states and Dire Dawa city administration; and
- Θ Project management and institutional strengthening component will help manage the project and strengthen their institutional capacity.

In urban areas like Jimma with a high rate of urbanization and rapid population increase, waste management is a severe problem. There is no waste water infrastructure (including FSTP) built for Jimma and onsite sanitation is the dominant waste management practices on which the community uses septic tanks and pit latrines to collect of the fecal sludge.

5.2.1. Short term interventions (5-years horizon: 2025-2030)

The short-term interventions of the citywide inclusive planning targets the provision of sanitary facilities, creating awareness, and imparting appropriate health education to follow hygienic practices to protect public health and the environment. The five-year implementation window for the short-term intervention was set between 2025 and 2030. This initiative's main objective is to end OD by building enough extra public toilets and communal toilets. In the short-term

intervention, different types of communal and public toilets and FSTP will be developed in Jimma town as part of UWSSSP-II.

5.2.2. Existing Fecal Sludge Dumping Site

Fecal sludge from households, Institutions, commercial centers is collected by private and public enterprises and transported to agricultural fields and abandoned land in the periphery of Jimma. The open dumping site located at 7.67^{o}N and 36.80^{o}E to west of the town around 6 Km from the town center is being used as an existing permanent dumping site. This location was a quarry site from where selected materials were extracted for the construction of Abba Jifar Airport. The area is still not fully rehabilitated and requires further restoration treatment.

On the other hand, fecal sludge collected from Jimma University and staff condominium is collected and transported by its vacuum truck and treated in the Jimma Institute of Technology (JIT) waste stabilization pond (Feasibility Study and Design Report, 2022).

Figure 14) Existing Fecal Sludge open dumping site photo left & google map right

The consultant team has recognized that the construction of fecal sludge treatment plant will improve the hygiene and sanitation status of the city.

5.3. Design of New Fecal Sludge Treatment Plant

There is no Fecal sludge treatment plant in Jimma and hence vacuum trucks transport sludge to illegal dumping sites located at the periphery of the town. Fecal sludge discharged through open ditches or land surface with no prior treatment is the cause of worsened environmental pollution by flowing down into the rivers or infiltrating into soil to end up polluting groundwater resources.

For the construction of new fecal sludge treatment plant in the Short-Term Horizon, it is estimated that 76 m^3/day (32,907 m^3/year) of fecal sludge is generated from residential sources (Feasibility and Design Report, 2022). According to the Feasibility and Design report, three alternative design options were critically analyzed and compared to select the most suitable

alternatives using environmental, social and economic criterion. Hence, the proposed and designed FSTP in Jimma is with several treatment units with a sludge drying beds (SDB). The components of the treatment plant include Reception and screening chamber, Sludge Drying Beds (SDB), Constructed Wetland, Maturation Pond, and Extended Sludge Storage (figure 16).

SDBs are the most widely used method for fecal sludge disposal. Sludge drying involves natural ways of drying to mechanical ways of removing water content. Sludge is applied to the sand bed and is allowed to dry by evaporation and drainage of excess water over a period of weeks depending on climatic conditions.

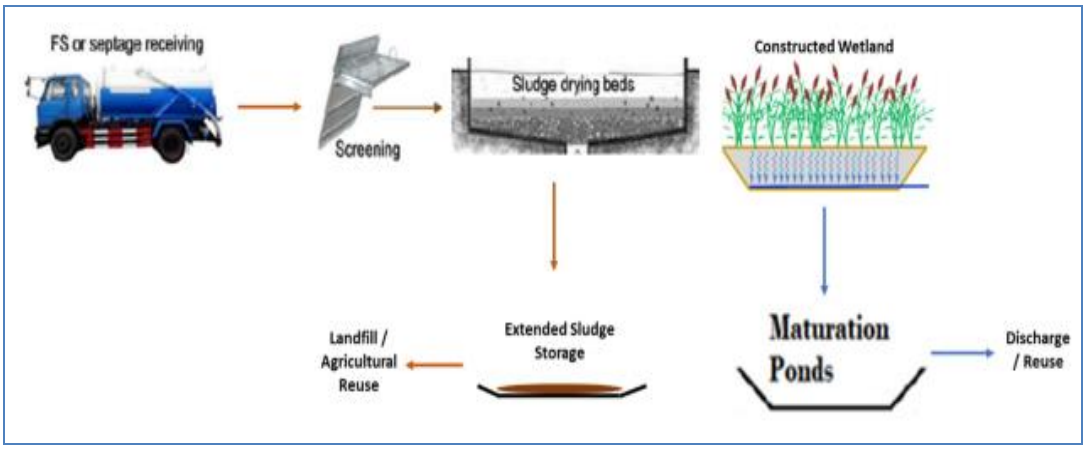

Figure 15) Flow chart of the selected FSTP (Source: Feasibility and Design Report, 2022)

5.4. Site and Current Situation of FSTP

5.4.1. Fecal sludge Treatment Plant Site

Location of FSTP: Site selected for the construction of FSTP by the design consultant was found at the outskirt of the town in Kofe Kebele which is one of the three rural Kebeles recently demarcated under the town boundary. It was located in 6 km distance from the town center. The land is rugged and near to an abandoned quarry site area which is covered by trees, plants and bushes. It was with close proximity to the Jimma city airport, and had an impact on the local cemetery.However, during the second-round tripartite consultation (in the presence of experts from MoWE, the ESIA and design consultants), an alternative site was chosen to construct the FSTP relatively on gentle slope to minimize landslide and flooding during either construction or operation work. Besides the dense natural forest between the airport and the newly proposed site can help wind break and buffer the area during operation of the FSTP. The site shift proposed by the ESIA consultant excluded the cemetery that was proposed by the design consultant. However, the new site takes extra government-owned land and the seven HHs (farmers) farming land. The new site has also increased the distance from the airport by about 400m away from the fence of the airport and 700m away from the takeoff site. In addition, the proposed new site helped to get gentle slope. It is located more than 500m away from residential area and it is free from any settlement. The area is occupied by natural grown Guava and other naturally grown

shrubs. Regarding road accessibility, the newly selected site connects with 1km earthen road to the junction of existing open dumping site from where 5 km all whether road connect to the asphalt road., but the upgrading of the existing road to gravel road can not cause any significant E&S impacts and risks.

Figure 16) Untreated sludge disposed on proposed FSTP site

Figure 18 shows the snapshot of Google map of the open dumping site with topographic profile.

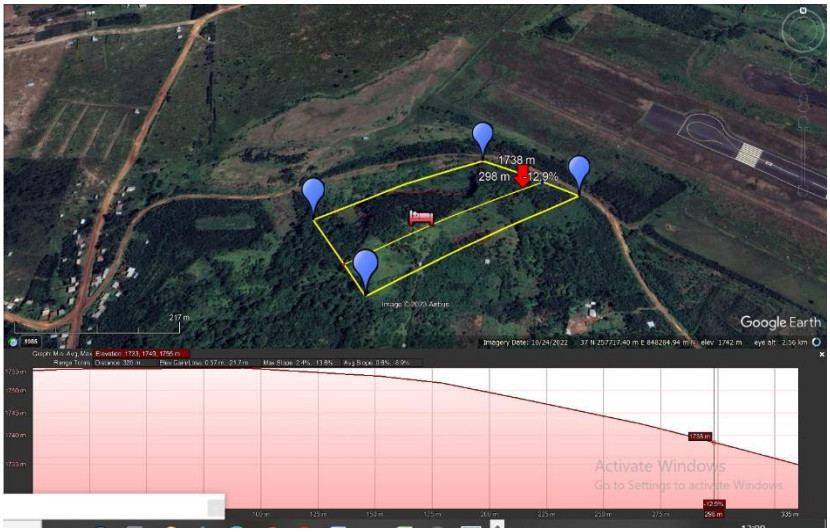

Figure 17) View of FSTP site proposed by feasibility and design team

Access to infrastructures: part of the proposed FSTP site has a road access which is a dry weather road used by sewer trucks while other parts of the site earthen road mainly used as foot path. In terms of utility access, there is a local electric distribution line which passes crossing the site but no water infrastructure around it.

Proximity to heritages and religious sites: There are no historically known heritages which have archeological, religious or historical importance around the site.

Figure 18) Partial view of a graveyard and a suspended hole found on the land proposed for FSTP site

5.5. Fecal Sludge Treatment Plant capacity

The planned short-term treatment interventions deal with the urgent work required for the functioning of the current Fecal sludge treatment plant (FSTP) in Jimma town. To better and more successfully treatment of fecal sludge (FS), the fecal sludge treatment process will be updated. During this project phase, it is anticipated that 76 m^3 per day of waste will be generated for the Short-Term Horizon.

The proposed FSTP will comprise of:

- Θ Receiving chamber and screening unit
- Θ Sludge drying beds
- Θ Extended sludge storage
- Θ Constructed wetlands and
- Θ Maturation ponds

5.5.1. Disposal standard

The only effluent standard that applies to Ethiopia is that of industrial wastewater effluent. For the purposes of this study, the international criteria for treated residential wastewater/fecal sludge effluent was referred. The Urban Water Supply and Sanitation Project Phase II: Environmental and Social Management Framework report and WHO/EPA guidelines served as the basis for the modification of the effluent standard for Jimma town. Table 1 in chapter 3 lists the effluent standard for treated wastewater from FSTP in Jimma town that are regarded as best practices for environmental protection based on the design consultant's experience with wastewater treatment worldwide:

5.5.2. Fecal sludge treatment

In the case of drying beds, further treatment is necessary in order to eliminate of pathogens in the dried sludge. While co-composting is the most suitable choice for the end product and reuse, mixing with lime is a cost-effective procedure. Co-composting allows the sludge to be stabilized

and the product can be reused as nutrient-rich soil amendment. Co-composting is far more expensive (since it requires mixing with organic waste), but it might be practicable if the finished product could be sold as fertilizer.

Leachate that has been collected from drying beds and drained through them has to undergo further treatment before it can be disposed of or utilized properly. An aerobic baffle tank reactor (ABR) reactor could be a cost-effective option if the facility is small in size. A Low-cost technology such as waste stabilization ponds or wetlands prepares the liquid for reuse in irrigation or aquaculture or for surface water disposal.

5.5.3. OPTIONS FOR DISPOSAL, RECOVERY / REUSE

Liquid Disposal options

To minimize and eventually restrict the uncontrolled discharge or dumping of untreated fecal sludge into the environment is one of the goals of this project. Both leachate discharges and other forms of reuse should be subject to standards. The possible disposal option of the treated wastewater/ leachate effluent can be:

- Θ discharged directly to the surface of water bodies (river);
- Θ collected to ponds/tanks/basins for later reuse;
- Θ Used for indirect or direct aquifer recharge, under certain conditions.

Solid matters Disposal options

Sludge from the treatment process, solid materials (screenings, grit, and grease), and processed fecal sludge can all be disposed of as part of the solid matter disposal. The screens, grit, and grease that are eliminated throughout the treatment procedure should be drained before disposal and should only be sent to a controlled landfill. It is strongly advised to reuse the sludge (fecal and/or biological) following treatment (dewatering, drying, stabilization, etc.). The sludge has extremely nutrient and calorific value; making immediate disposal of them is a waste of energy. When disposal is required, it should be regulated, watched over, and shielded from leaks in waterproof basins.

Treated Wastewater /leachate Reuse

The planned Jimma town FSTP processes transform the physical, chemical, and biological properties or composition of the plant influent (wastewater, fecal sludge, or supernatant) to make it safe for use. During project operation, it is highly advisable to stick to the UWSSP II ESMF wastewater effluent standard values.

Soil Conditioner (Organic matter) and Nutrient recovery

In Ethiopian soils, organic matter has been severely reduced. One of the most practical reuse techniques is the use of treated sludge, resulting in a win-win scenario by allowing for both the sustainable use of sludge and an increase in agricultural output. The cost of the treatment depends on its application and specifications; however, it is recommended as a workable option for much depleted soils. The price is reasonable, particularly in rural and semi-urban locations where the supply is nearby and there is plenty of room for stockpiling. Composting is the typical method used to produce organic matter from sludge. Both the fecal sludge and the biological sludge should be examined before being used for composting to ensure that the levels of heavy metals exceed the standard limits.

Compost production and use have a long history, especially in Asian nations. The end results of treated fecal sludge, however, are not subject to any guidelines in Ethiopia. Based on this, it is important to carefully analyze the current political/legal, social, technical, institutional, and economic environments that may have an impact on the operation of the co-compost plant and the market for co-compost before beginning a co-composting project in order to create a business plan and financial projections.

6. OUTLINE OF MAIN ALTERNATIVES

Project alternatives refer to different options that are available for achieving a particular outcome or objective. The aim of analyzing different project alternatives is intended to assess project feasibility options taking environment and social concerns as central point of view. This section evaluates available options to the proposed action, so as to arrive at the most environmentally friendly alternative, which maximizes economic, social and technical benefits resulting into minimal or insignificant environmental impacts.

6.1. No Project Alterative

The no project option is the least preferred or viable alternative options from both the socio-economic, health and partly environmental perspective. On this basis, the 'No Project Alternative' is rejected as option to be carried forward for the project implementation option is maintained.

6.2. Alternative Fecal Sludge Treatment Plant

6.2.1. Alternative to site selection

Site selection is the process of screening potential sites and assessing their advantages and disadvantages, avoiding unsuitable areas, and identifying the most favorable location for the proposed project. This involves a variety of technical and non-technical (e.g., environmental, social, and financial) factors and criteria, all of which are important and need to be considered carefully and adequately. For this project during the feasibility and design study, the site selection analysis had been carried out based on a 3-stage assessment methodology (namely preliminary screening, technical evaluation and site selection). Accordingly, three sites 1) Near Gudeta Buka kebeles at GPS point of (X=258486, Y=853916) 2) Boye at GPS point of (X=265286, Y=847429) and 3) Kofe GPS point of (X=257748, Y= 848284) were proposed for analysis. It was reported that the sites were proposed by the participation of stakeholders and consultation of the city master plan. Topography, proximity to drainage line and land uses was used as factors to select the best site for the project. Therefore, the site for FSTP was selected at Kofe kebele behind the Abba Jifar Airport at about 6 km in the southwest of the town along the road to Melko with available area amounts to 4 ha. The Site is located on land that is being used by private land right holders, newly established cemetery and near to Jimma Aba Jifar airport that could cause significant social and environmental impacts unless appropriate mitigation or alternatives are implemented.

The ESIA team has strategically examined the conditions and possible impacts of the project on the selected site in terms of various environmental, social, economic and technical considerations and observed limitations. The site is located within 100 meters from boundary and 300 meters from takeoff or landing area of Abba Jifar airport. In the feasibility study it was mentioned to

have 30 meters buffer zone from the airport. However, with regards to the topographic nature of the area and the relative locations of the two entities, it poses high risk to the airport if sudden failure of structures occurred in the treatment plant during operation phase. The airport takeoff is within 300 meter from the lower edge of the plant with an elevation difference of about 8 meters between them. In addition, there is high risk of land pollution with leakages from the treatment plant during operation phase of the project. It poses risk of flooding if drainage system of the plant failed to properly function. It can also impact adversely during construction phase with noises and probable dust pollution that can interfere with flight service of the airport.

On the other hand, the selected site is moderately steep slope with elevation difference of about 15 to 20 meters which may lead to high construction costs. It is also environmentally unfriendly and technically infeasible to cut large depth of earth during construction phase. In addition issue of cemetery has to be properly consulted and agreed to relocate the dead bodies.

Based on the abovementioned reasons, field observations, and the site selection procedure of the design and feasibility consultant the ESIA team has recommended the FSTP site has to be partly modified and adjusted to reduce the risks and adverse impacts that it can arise. Accordingly, alternative sites (as coordinates and polygons are presented in figure 20) were proposed to offset the possible adverse impacts of the project in the site as follows.

- Alternative one (proposed by the ESIA team): In this alternative the site is slightly moved to south west direction to increase the distance from the airport and to place it on gentle slope land for the safe construction and operation of the plant. However, in this alternative designing and implementing mitigation options for relocating the cemetery is needed. In addition, the site covers a coffee plantation which is owned by private individuals.

- Alternative two (proposed by Jimma city land administration office): This is a site proposed by Jimma city municipality which is about 350 away from the airport and offsets the cemetery and it has some irregularities in shape.

- Alternative Three (proposed by the ESIA and SH[1]): In this alternative the site has been modified to increase the distance from the airport, to get gentle slope land and to exclude the cemetery from the project site. It is about 400m away from the fence of the airport and 700m away from the takeoff site. In addition site alternative three is more than 500m away from residential area and it is free from any settlement. The area is occupied by natural grown Guava and other naturally grown shrubs.

[1] Stakeholders including the MoWE sanitation and safeguard staffs, JCWSSSE, and Jimma city administration.

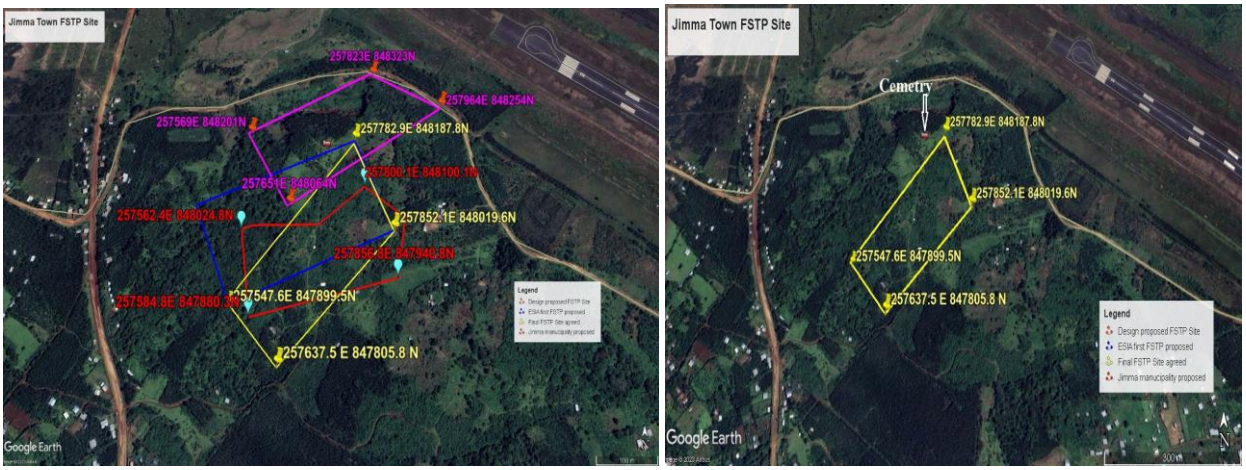

Figure 19) Site alternative proposed (alternatives to the left and selected site to the right)

During the second round tripartite consultation (Experts from MoWE, the ESIA and design consultants), it was agreed that alternative three was chosen in consent as it can help to construct the FSTP relatively on gentle slope to minimize landslide and flooding during either construction or operation work. Besides the dense natural forest between the airport and the newly proposed site can help wind break and buffer the area during operation of the FSTP. The site shift proposed by the ESIA consultant excluded the cemetery that was situated in the design-proposed site. However, the site takes extra government-owned land and the seven HHs (farmers) farming land. Regarding road accessibility, the newly selected site connects with 1km earthen road to the junction of existing open dumping site from where 5 km all whether road connect to the asphalt road, but the upgrading of the existing road to gravel road can not cause any significant impact.

6.2.2. Alternatives to Fecal Sludge Treatment Technologies

Fecal sludge treatment technique typically consists of 3 stages: primary treatment, where the solid and liquid components of the waste are separated, sludge treatment, and liquid or leachate treatment, which is the last step of treatment and is produced by the first treatment. The primary sludge treatment methods that are most suitable for Jimma Town were identified through a literature analysis, feasibility study and detailed study report assessment. This section gives an overview of the possible treatment technology options, including their fundamental principles, advantages, and disadvantages from perspectives of the environment, social, and economy.

6.2.2.1. Technology for Primary Treatment (Solid–Liquid Separation)

Primary treatment is used for solid-liquid separation (dewatering) as well as for the treatment of solid and liquid parts of fecal sludge that is generated from the septic tank, pit latrine and other onsite sanitation systems. The technologies used for primary treatment are: 1) Unplanted Drying Bed (UDB), 2) Planted Drying Bed (PDB), 3) Up-Flow Anaerobic Sewage Blanket (UASB) reactor, 4) Centrifugation, 5) Settling and Thickening (S&T) Tank, 6) Imhoff Tank (IT), and 7) Belt Filter Press (BFP). Out of these technologies centrifugation and BFP would be used only for

solid-liquid separation, whereas UDB, PDB, UASB reactor, IT and S&T tank would be used for solid-liquid separation as well as treatment of solid and liquid parts.

1) Unplanted Drying Bed

An unplanted drying bed is a simple, permeable bed that has numerous drainage layers as demonstrated in Figure 21. When loaded with sludge, it collects leachate that has percolated through the bed and enables the sludge to dry by percolation and evaporation. Between 50 and 80 percent of the volume of the sludge flows out as liquid or evaporates. But the sludge has not truly stabilized or sanitized. Before the dried sludge may be properly disposed of or utilized as a nutrient-rich soil additive in agriculture, it may require further treatment by composting.

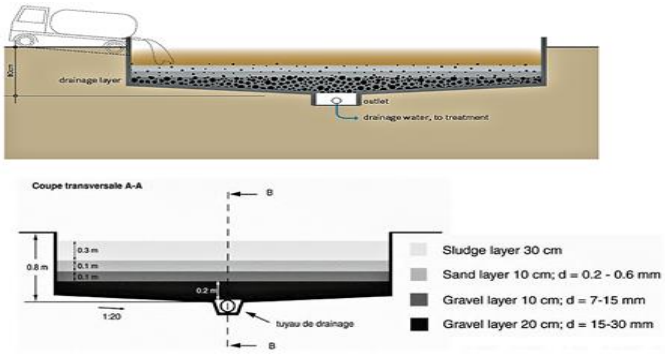

Figure 20**:** Schematic of an unplanted drying bed

The percolate has to be collected for treatment or regulated reuse since bacteria are still present. Before adding new sludge, unplanted drying beds must be de-slugged. Although frequent desludging necessitates huge surface areas, personnel, or mechanical power, drying beds are very simple to build and maintain (see Table 6).

Table 6: Comparative analysis of Unplanted Drying Bed

Advantages	**Disadvantages**
Relatively low capital costs; low operating costs	High land requirements
Good dewatering efficiency, especially in dry and hot climate	Odors and flies are normally noticeable
No energy requirements	Labor intensive removal
Can be built and repaired with locally available materials	Limited stabilization and pathogen reduction
Simple operation, only infrequent attention required	Leachate requires further treatment
No experts, but trained community required	Requires expert design and construction supervision

2) Planted Drying Bed (PDB)

A planted drying bed is comparable to an unplanted drying bed as demonstrated in Figure 22, but the presence of plants adds the advantages of increased sludge treatment and transpiration. For the purpose of separating the solid from the liquid part of fecal sludge from latrines, septic tanks, biogas reactors, trickling filters, etc., it is a sealed shallow pond filled with various drainage layers. By using a mix of percolation and evaporation, sludge is naturally dried. The filters do not need to be de-sludged after each feeding/drying cycle, which is the main advantage of the planted bed over the unplanted bed (See Table 7).

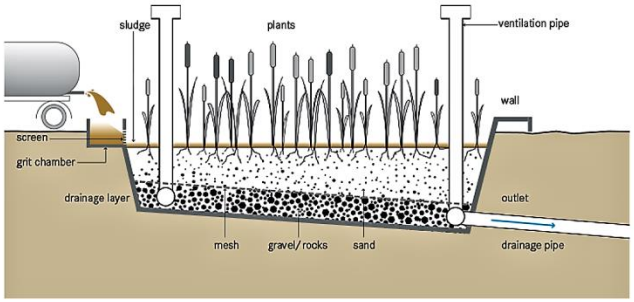

Figure 21: Schematic of a planted drying bed.

The plants and their root systems maintain the porosity of the filter, allowing new sludge to be put directly over the preceding layer. Unlike unplanted drying beds, planted drying beds (also known as humification beds) only require desludging once every five to ten years. The removed sludge provides a nutrient-rich soil amendment that may be utilized right away in farming.

Table 7: Comparative analysis of Planted Drying Bed (PDB)

Advantages	**Disadvantages**
Can handle high loading	Requires a large land area
Better sludge treatment than in unplanted drying beds	Odors and flies may be noticeable
Easy to operate (no experts, but trained community required)	Long storage times
Can be built and repaired with locally available materials	Labor intensive removal
Relatively low capital costs; low operating costs	Requires expert design and construction supervision
No electrical energy required	Leachate requires further treatment
Fruit or forage growing in the beds can generate income	Only applicable during dry seasons or needs a roof and contour bund

3) Up-Flow Anaerobic Sewage Blanket (UASB) reactor

The UASB reactor uses anaerobic digestion to treat fecal sludge and wastewater, and it has the ability to both decrease sludge volume and create biogas. Figure 23 illustrated the schematic representation of UASBR reactor. Before employing the UASB reactor technology, the fecal

sludge properties must be examined since fresh or less stabilized fecal sludge will have larger quantities of organic matter but will also include inhibitory substances.

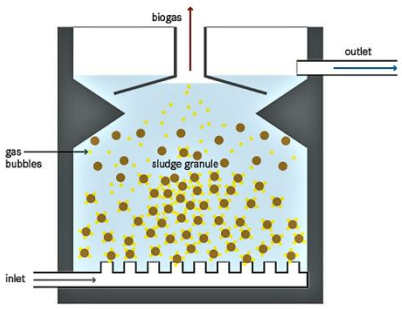

Figure 22) Cross-section of an Up Flow Anaerobic Sludge Blanket (UASB) reactor

Every two to three years, the septic tank's digested fecal sludge is drained; however, because the sludge in the septic tank has already undergone some digestion, this procedure might not be suitable for anaerobic co-treatment. In this instance, the digested fecal sludge's low organic matter concentration will result in poor biogas generation but significant solid buildup, which will raise operating expenses at the expense of small benefits (see Table 8).

Table 8. Comparative analysis of Up-Flow Anaerobic Sewage Blanket (UASB) reactor

Advantages	**Disadvantages**
High nutrient recycling	High level of skill for operation and maintenance (O&M)
Energy balance and CO_2 emission	Effluent and sludge require further treatment and/or appropriate discharge
High reduction of BOD_5	Longer start-up period
Low sludge production	A proper temperature range is required for the anaerobic process (15^{o}C to 35^{o}C), therefore it is not applicable during cold season
A low energy requirement for the treatment process	Some equipment (i.e. pH meter, thermometer etc.) and professional staff is necessary for monitoring the internal condition of the reactor. It is costly.
Less nutrients required;	A constant source of electricity is required
System can be shut down for extended periods without serious deterioration; and	Need import of electro-mechanical equipment and shortage of locally available spare parts
Can handle organic shock loads effectively.	Requires expert design and construction

4) Settling and Thickening (S&T) Tank

Settling-cum the thickening tank (ST tank) primarily permits heavier septage particles to sink to the bottom of the tank due to gravity while lighter septage components (fats, oils, grease, and water) remain above. The supernatant is expelled from ST tanks by an outlet on the other side

from the intake, which is rectangular in form. To stop the scouring of settled sludge and the separating of scum, a baffle can be put at the outflow. The tank primarily has two compartments, occasionally three compartments, which can be alternately utilized for loading septage as illustrated in Figure 24.

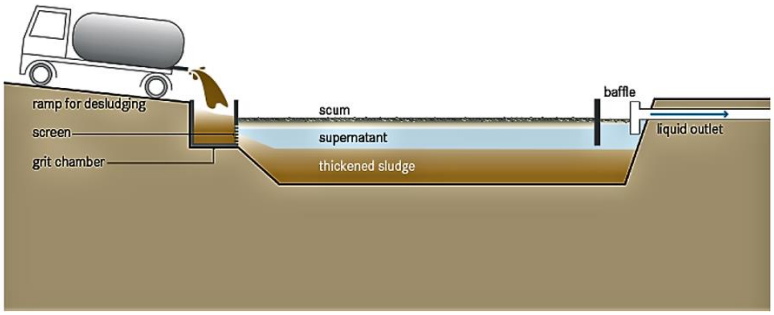

Figure 23**:** Schematic of a Thickening Pond

Each tank is loaded for a minimum of a week, after which the sludge is allowed to thicken and settle, stabilizing the settled solid through the anaerobic sludge digestion process. Then, at regular intervals, thickened sludge is injected to the sludge drying bed. If the sludge is not thick enough, it is often removed by vacuum truck, excavator, or pumping (see Table 9).

Table 9: Comparative analysis of Settling and Thickening (S&T) Tank

Advantages	**Disadvantages**
Thickened sludge is easier to handle and less prone to splashing and spraying	Requires a large land area
Can be built and repaired with locally available materials	Odors and flies are normally noticeable
Relatively low capital costs; low operating costs	Long storage times
No electrical energy is required	Requires front-end loader for desludging
	Requires expert design and construction supervision, Effluent and sludge require further treatment

6.2.3. Technology for sludge treatment and disposal

Sludge that has undergone partial treatment is produced after dewatering. This treated FS cannot be used directly in agriculture since it still contains pathogenic bacteria and parasite eggs. Further treatment is needed to raise the sludge's quality. This is the last step in the sludge treatment process before discharge. 1) Composting, 2) vermicomposting, 3) shallow trenches, and 4) solar drying are the methods employed for further sludge treatment.

1. Co-composting

Fecal sludge and municipal solid waste co-composting is a biological process that uses microorganisms to break down organic material in an aerobic environment as shown in Figure 25. The processing of source-separated human faeces has made extensive use of this technique.

Fecal sludge is dewatered, and the partially treated sludge is combined in a ratio of 1:2 or 1:3 with the organic portion of municipal solid waste. The survival of microorganisms throughout the composting process depends on properly regulated moisture and aeration conditions. Municipal solid waste has strong bulking qualities and is rich in organic content; whereas, faeces have a high moisture and nutrition content.

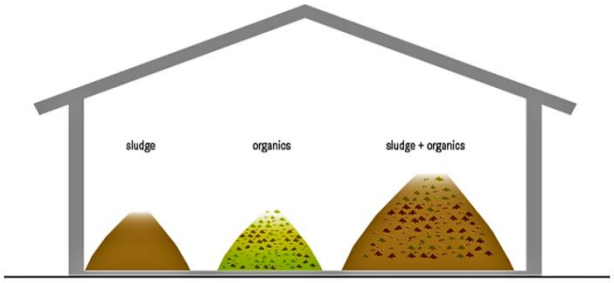

Figure 24: Schematic of the Co-compost

Stabilized organic matter that may be utilized as a soil conditioner is the final outcome of co-composting. Furthermore, it includes nutrients that can act as a long-term organic fertilizer and have positive impacts. A high temperature (50-70^{o}C) is maintained during co-composting for 3 weeks in order to destroy helminth eggs and harmful bacteria. The co-composting procedure takes 10-12 weeks. Comparative analysis of Co-composting is given in Table 10. Only when a source of well-sorted biodegradable solid waste is available the co-composting technique could be used.

Table 10: Comparative analysis of Co-composting

Advantages	**Disadvantages**
Relatively straightforward to set up and maintain with appropriate training	Requires a large land area (that is well located)
Provides a valuable resource that can improve local agriculture and food production	Long storage times
A high removal of helminth eggs is possible (< 1 viable egg/g TS)	Requires expert design and operation by skilled personnel
Can be built and repaired with locally available materials	Labor intensive
Low capital and operating costs	Compost is too bulky to be economically transported over long distances
No electrical energy required	

2. Vermicomposting

Earthworms are used in the low-cost composting process known as vermicomposting to break down organic waste. This system for managing fecal sludge is quick, simple to use, economical, energy-efficient, and waste-free. Earthworm biomass and vermicomposting are the two beneficial byproducts of vermicomposting. Practically every type of organic matter may be

consumed by earthworms, and they can consume as much as their own body weight in one day; for example, a 1 kg earthworm can devour 1 kilogram of leftovers daily.

Table 11: Comparative analysis of Vermicomposting

Advantages	**Disadvantages**
Compact size	Maintenance requirements
Nutrient-rich compost	Limited types of waste
Reduction of waste	Potential for odor
Educational opportunity	Risk of pests

3. Solar Drying

Treatment by solar drying is generally done in greenhouse structures with glassy covers, concrete basins, and walls. Sludge is disposed of into the concrete basin and processed for about 10–20 days. Options exist for batch or continuous operation, with devices to control the conditions in the greenhouse (e.g., ventilation, air mixing, temperature).

Table 12) Comparative analysis of Solar Drying

Advantages	**Disadvantages**
High efficiency for dewatering	Large space requirements
Low energy requirements	Need mechanical means to turn sludge
Low investment cost	Ventilate the greenhouses

The main factors influencing the evaporation efficiency in these systems are the solar variation, air temperature, and ventilation rate, with the initial dry solid content of the sludge and air mixing also influencing.

Figure 25: Schematic of solar drying

4. Shallow trenches

It is a straightforward approach that aids in the cleanup of contaminated soil and does not smell bad or seem unattractive to nearby residents. No matter how much or how little sludge there is, a shallow trench may be employed. However, the area need and the demand for routine groundwater monitoring are the key limitations of this system.

6.2.3.1. Decision matrix for sludge treatment technologies option

Based on the sludge treatment technical options, a decision matrix was prepared for Jimma town with respect to land requirement, energy requirement, skill requirement, CAPEX, OPEX and groundwater level and discharge standard (See Table 13).

Table 13: Decision matrix for sludge treatment technology

Constraint	Co-composting	Vermicomposting	Solar drying	Shallow trenches
Land requirement	+++	+++	+++	+++
Energy requirement	+	+	+	+
Groundwater level	+	+	++	++
CAPEX	+++	+++	++	+
OPEX	+++	+++	++	+
Skill requirement	+	++	++	+
Discharge standard	+++	+++	+++	-
+: low favorability; ++: moderate favorability: +++: high favorability; -: no need				

Based to the decision matrix (Table 13), shallow trenches are an affordable alternative in terms of CAPEX and OPEX. However, the functioning of composting, vermicomposting, and solar drying is not reliant on the level of the groundwater. Solar drying treatment is the best alternative sludge treatment technique that ESIA teams could provide based on the real conditions in Jimma town in terms of the selected solid-liquid separation treatment plant, current sanitation level, and climate consideration. Furthermore, co-composting and vermicomposting were strongly advised as a first and second order alternative by an ESIA consultancy team as a secure solution for disposing of dried sludge. It is because keeping the dried sludge enclosed in the landfill for over a year causes the pathogens to perish and eliminates the moisture still present in the dried sludge. Co-composting also aids in the inactivation of pathogens and produces a product that is useful as a soil conditioner.

6.2.4. Technology for leachate /liquid effluent treatment

To meet the standards for water reuse or release into the environment, the liquid effluents from dewatering technology must first undergo further treatment. This liquid effluent frequently needs extra treatment to fulfill criteria for discharge quality. Therefore, a low-cost technique should be used (e.g., wetlands, waste stabilization ponds).

Waste Stabilization Ponds

The cheap capital and operating and maintenance expenses of waste stabilization ponds (WSP) make them a viable choice for wastewater treatment in underdeveloped nations. In general, they are made up of a number of ponds with different names depending on what they are used for: facultative, maturation, or anaerobic ponds for lowering organic, nutrient, and pathogen loadings through sedimentation and biodegradation under anaerobic, anoxic, and/or aerobic conditions (Figure 27).

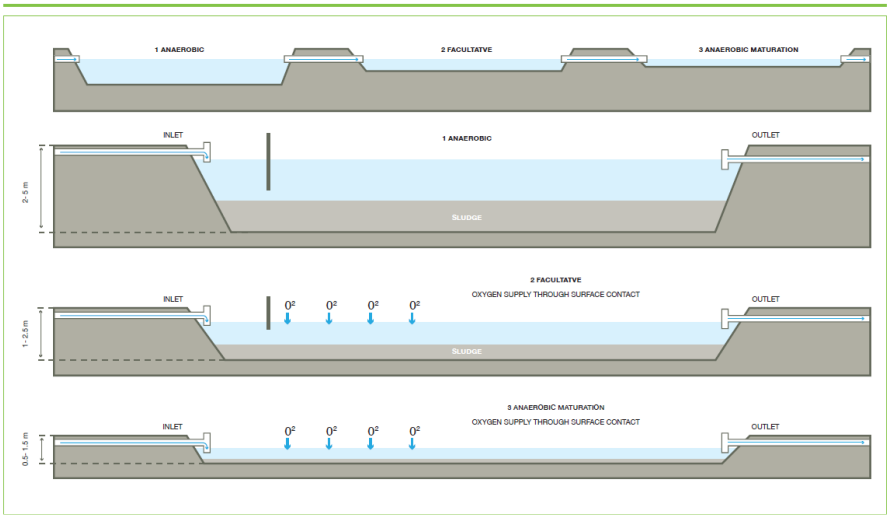

Figure 26**:** Typical scheme of a waste stabilization system: an anaerobic, facultative and maturation pond in series.

The ponds might be sealed with clay, asphalt, or any other impermeable material to stop water penetration. The properties of WSP will change depending on the scenario of liquid fecal sludge dewatering and thickening effluent. The effluent properties, which can be very diverse as indicated in Table 14, will dictate the number of ponds and the type of maintenance necessary.

Table 14. Key features of selected treatment options for liquid effluents from dewatering units

	KEY FEATURES	**ADVANTAGES**	**DISADVANTAGES**
Waste Stabilization Ponds	Consists of bioreactors in series operating under anaerobic, facultative and aerobic conditions	Low construction costs	Requires large land area
	BOD removal: 80-95%	Low O&M costs; main O&M requirement includes weeding (to prevent breeding of mosquitoes) and removal of scum	May promote breeding of insects
	Residence time: 20-60 days	Low energy demand	Odor may be generated in some cases
		Appropriate for treating high-strength Effluent	Well suited for tropical and subtropical countries
Wetlands	Organic loading rate: 30-110 g COD m^{-2} d^{-1} (typical: 75 g$BOD_5$$m^{-2}$ d^{-1})	Does not require chemicals, energy or high-tech infrastructure	Requires large land area
	Hydraulic residence time: typically 3-6 Days	Suited for combination with aquaculture or sustainable agriculture (irrigation)	Delayed operational status (vegetation establishment needed for peak removal efficiency might take 2-3 years)
		Good control of odor	Pretreatment of the effluent may be required to prevent clogging of the filter bed

	KEY FEATURES	ADVANTAGES	DISADVANTAGES
		Low construction, O&M costs	Not very tolerant to cold climates

Constructed Wetlands

In the treatment of wastewater, there are three types of constructed wetlands as illustrated in Figure 28. The treated water flows horizontally and above ground in free water surface wetlands (FWSW), whereas it flows horizontally and underground (5 to 15 cm below the surface) in subsurface flow wetlands (SSFW). A planted drying bed is what the vertical-flow constructed wetland (VFCW) does. Of course, the direction of the wastewater's flow channel is a key distinction between VFCW and FWSW/SSFW wetlands.

In contrast to the other two systems, which constantly function under aerobic circumstances, this causes occasional aerobic-anaerobic situations in the VFCW. The horizontal-flow systems, on the other hand, are more susceptible to clogging, which may be brought on by a high SS content in the liquid to be treated. As a result, they should primarily be employed to remove dissolved pollutants, with the VFCW being more successful at doing so. To properly treat wastewater, a hybrid unit can mix FWSW, SSFW, and VFCW.

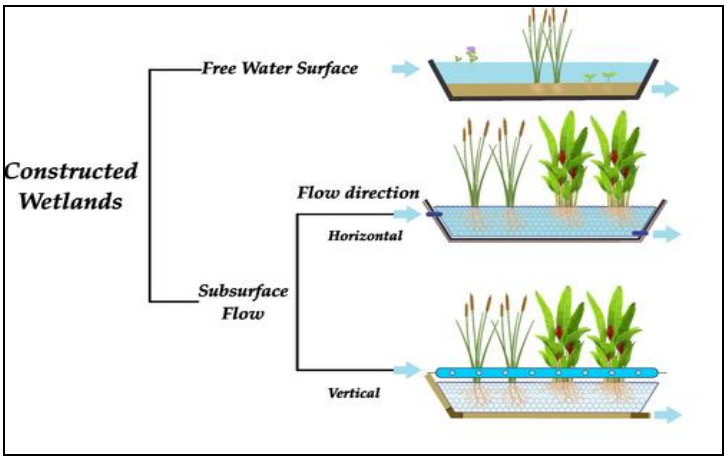

Figure 27**: S**cheme of types of constructed wetland

An anaerobic baffled reactor (ABR)

An anaerobic baffled reactor (ABR) is an enhanced septic tank with a series of baffles that compel grey, black, or industrial effluent to flow under and over the baffles from the entrance to the output. The treatment is improved as a result of the longer contact time with the active biomass (sludge). Although ABRs are strong and can handle a variety of wastewater types, further treatment is still required before residual sludge and effluents may be adequately recycled or released.

Table 15: Comparative analysis of an anaerobic baffled reactor (ABR)

Advantages	Disadvantages
Resistant to organic and hydraulic shock loads	Long start-up phase
No electrical energy is required	Requires expert design and construction
Low operating costs	Low reduction of pathogens and nutrients
Long service life	Effluent and sludge require further treatment and/or appropriate discharge
High reduction of BOD	Needs strategy for fecal sludge management (effluent quality rapidly deteriorates if sludge is not removed regularly)
Low sludge production; the sludge is stabilized	Needs water to flush
Moderate area requirement (can be built underground) and Simple to operate	Clear design guidelines are not available yet

6.2.5. Fecal Sludge Treatment Process Technologies Adopted for Jimma Town

Jimma town lacks a facility for the treatment of fecal sludge or wastewater, thus vacuum trucks are used to transfer sludge to illegal dumps on the outside of the town. In view of this, the three various fecal sludge management options have been examined by CES Consulting Engineers and MS Consultancy PLC (CES and MS consultancy PLC) and reported in the feasibility study and detailed design of CWIS for Jimma City.

Alternative 1: Reception and screening chamber-STT-Anaerobic Baffled Reactor (ABR)-Constructed Wetland-Maturation Pond, SDB-Extended Sludge Storage

Alternative 2: Reception and screening chamber-SDB-Constructed Wetland-Maturation Pond, Extended Sludge Storage

Alternative 3: Reception and screening chamber-STT-Anaerobic Baffled Reactor (ABR)-Facultative Ponds-Maturation Pond, SDB-Extended Sludge Storage.

Based on the outcome of the multi-criteria analysis, the consultant had proposed their top choice for properly treating the produced fecal sludge in Jimma town is alternative 2 which is unplanted sludge drying bed and with constructed wetland without ARB as presented in Figure 29. The sequence of the proposed fecal sludge treatment process was: Reception and screening chamber-SDB-Constructed Wetland-Maturation Pond-Extended Sludge Storage as illustrated in Figure 29.

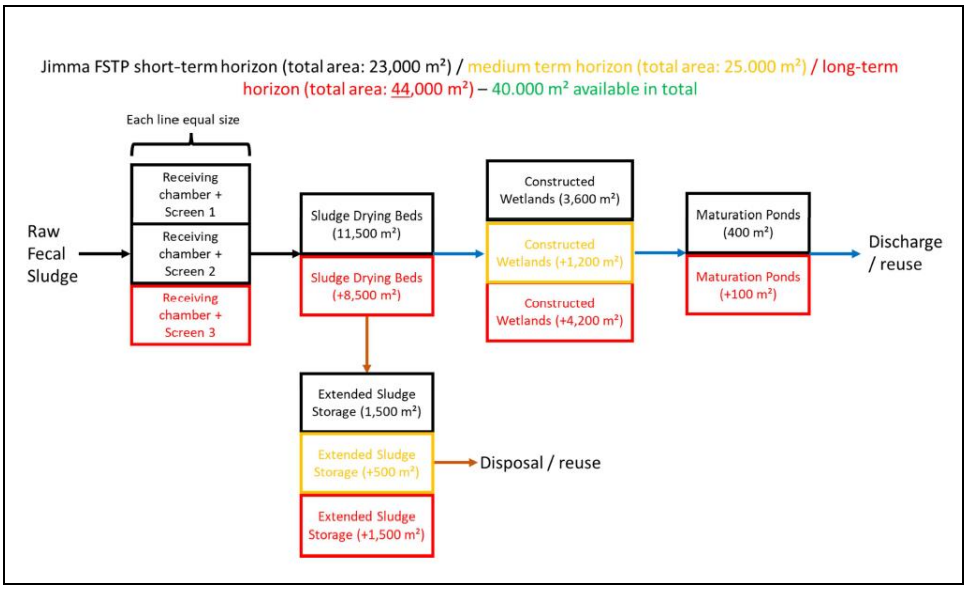

Figure 28: FSTP allocation on the site Layout

The ESIA team has made review of the proposed technology and additional literatures. Hence, diverse combination methods were implemented worldwide for solid-liquid separation throughout the treatment process, and then wastewater underwent further treatment before being released into the environment. The decentralized wastewater treatment system (DEWATS), shown in Table 16, was the most widely used technology in developing countries. It treats fecal sludge through a settler, anaerobic baffled reactor (ABR), planted gravel filter (PGF), and polishing pond, and starts treatment with a planted or unplanted sludge drying bed with or without ABR.

Table 16. Worldwide available fecal sludge treatment plant process alternatives

S.N.	Technology	Description	Post treatment
1.	Decentralized wastewater treatment system (DEWATS)	Settler, anaerobic baffled reactor (ABR) and planted gravel filter (PGF)	No treatment
2.	Decentralized wastewater treatment system (DEWATS)	Unplanted sludge drying bed (USDB), ABR and PGF	Tertiary treatment using sand filter and activated carbon filter
3.	Decentralized wastewater treatment system (DEWATS)	Planted sludge drying bed , ARB and PGF	No tertiary treatment
4.	Decentralized wastewater treatment system (DEWATS)	Unplanted sludge drying bed and PGF without ARB	No tertiary treatment
5.	Decentralized wastewater treatment system (DEWATS)	Planted sludge drying beds (PSDB) and PGF without ABR	No tertiary treatment

S.N.	Technology	Description	Post treatment
6.	Decentralized wastewater treatment system (DEWATS)	Screw press technology for solid-liquid separation integrated settler, ARB and PGF	Tertiary treatment using sand filter, activated carbon filter and UV radiation
7.	Package STP and pyrolysis	Anaerobic , anoxic, aeration and sedimentation zones	Tertiary treatment using sand filter, activated carbon filter and chlorination
8.	Moving bed biofilm reactor (MBBR)	MBBR, tube settler and clarifier	Tertiary treatment using sand filter, activated carbon filter and chlorination
9.	Tiger bio-filter technology	Anaerobic digestion followed by two stage vermin-filtration	Tertiary treatment using sand filter, activated carbon filter and chlorination
10.	STP co-processing	Up flow anaerobic sludge blanket (UASB), pre-aeration tank, polishing pond	Tertiary treatment using chlorination

On the final technology alternative options; the ESIA consultancy team, MoWE and designer consultant discussed and agreed on the proposed technology by the design consultant for treating fecal sludge in Jimma Town. These technological possibilities offered the possibility of successfully treating fecal sludge to generate leachate effluent that could be safely disposed of without damaging the environment or providing health risks to people. Sludge and leachate that would fulfill the minimal or indicative wastewater quality standard values described in the UWSSP II, ESMF/WBG EHSG can also be treated using the suggested fecal sludge treatment approach.

7. STAKEHOLDER CONSULTATION

The ESIA study has conducted public consultations (PC) with community members, project beneficiaries and interested stakeholders to present the subproject, its' likely impacts and to seek their opinions, questions, concerns and suggestions over the proposed subproject components. The consultations were held from 22nd June to 31 2023 with PAHs by FSTP construction and stakeholders from JTWSSSE. People who have participated in the public consultations are residents of proposed construction sites, representatives of women and youths. Beside community members, a consultation is also held with stakeholders from Jimma City's Environmental authority.

The PCs are conducted in the form of meeting or a focus group discussion. The consultation process was facilitated and led by the consultant team consisted of Environmentalist, GIS expert, sociologists and climatologist. The procedures of PCs are as follow; the consultant team has presented the proposed subproject to attendants of PC and they have informed that PC is organized in order to incorporate their opinions, concerns and questions in the ESIA study. They are also encouraged to express their feelings openly using any language they are comfortable with.

7.1. Community Consultation with PAHs by FSTP

All the land selected for FSTP construction is under private land use right holders in Koffee Kebele. A consultation with six PAHs and representatives on behalf of the community which owns the cemetery place was held on 23 June 2023 at Koffee Kebele near project site. Issues, questions and concerns raised by community members during PC are presented as follow.

The first question put forwarded for consultation was to comment on whether such type of similar PC was held during site selection or not.

- Ato Murade Aba Zenab said that, "yes, they have talked with us over the matter before and they told us that the land is needed for a project."
- At Nuru Sheik Ibrahim said that, "a committee comprised of Mayor Office, Land Administration, Water and Sanitation Services Office and two representatives from Koffee and Ifa Bula Kebles have made a consultation with us about the matter."

The second discussion issue raised for participants was whether there was any community mobilization and awareness creation activities on proposed FSTP subproject in the area or not.

- Ato Zelalem G/Georgis, who is speaking on behalf of his mother, said that, "they told us that the land is needed for a project and they have been measuring the area and inventorying properties found on the place. After land measurement and property inventory, there is nothing we know about it."

The other question participants of PC were asked to comment on the presence of forests, protected areas, cultural resources, cemetery or archeological sites on the land selected for FSTP construction or not.

The fourth question of PC was on land ownership claim over the land selected for FSTP construction:

- Ato Murad Aba Zenab said that, "the land belongs to me; before the land is required for the project by the government I had given the land as a cemetery place for residents of Ifa Bula and in return they gave me an equivalent amount of land in their Kebele as a substitution." He added that, "it was a 5000 square meter area which was under my ownership. However, when we told the land is required for a project; an agreement was reached between the government, me and members using the cemetery on the following points: on my part to provide a replacement land for the cemetery and the government will pay me compensation." Based on these experts from Municipality have measured and enumerated properties found on the land. They did this twice but no one informed us about the amount of compensation and yet compensation payment is not given to us."

The last question of consultation was whether participants have addition points they have made over the issue or not:

7.2. Stakeholder Consultation at office

Efficient implementation of subprojects and ensuring their sustainable services require active involvement of stakeholders which have interest on and/or may be affected by proposed subprojects in the town. However, because of time constraint, the consultant team was not able to conduct PC with relevant stakeholders in Jimma. Instead a discussion on issues observed and questions raised during site visits and data collection was held on 25 June 2023 with the general manager of and focal persons from JTWSSSE.

Figure 29) Stakeholder consultation with JTWSSSE General Manger and staffs

During the discussion, the consultant team has presented its preliminary findings learned during site visits and data collection. The following are issues reported by the consultant team that:

- The existence of a cemetery place on the site selected for FSTP construction; and that members of local community are facing challenges following restriction to the cemetery place in relation to the proposed FSTP subproject;
- Yet compensation payment is not made for seven households who have properties on the land selected for the subproject;
- Some of the survey questionnaire distributed to stakeholders are not filled and returned to the consultant team; and
- The need to undertake a consultation with Ethiopia Air Ports Organization since the proposed FSTP is located between 300 and 500-meter distance from Jimma Air Port

The responses of JTWSSSE representatives for the above issues raised by the consultant team are as follows:

- Ato Addisu Arefasa said that, "we will discuss these issues you raised with all relevant stakeholders and we will try to resolve them as soon as possible."
- Ato Alferid Abdu, UWSSP-II coordinator, said that, "the problem mentioned in relation to Jimma Air Port is usually caused by solid wastes treatment plant. As far as waste water is concerned they are not a problem as such."
- Ato Minewer Hussein, the General Manager of JTWSSSE, said that, "we are already reached an agreement with the City Administration to pay compensation for the land. However, some land owners in the area are attempting to receive compensation more than once; the City Administration never refused to compensation payment; but it only demanded compensation payment to be fair. At the begging the City was asked to pay 50-million-birr compensation. But now, the amount is reduced to 24 million birr and right now the City is preparing to make the payment. He added that, "regarding to the cemetery place, our agreement with the community was that Ifa Bula Kebele will be providing a replacement place for the cemetery." At last the general manager stressed that, "before we start paying compensation we want to be certain about the persons eligible to compensation; and we want to see your study findings before making compensation payment in case the ESIA study suggest site change." Before closing his speech, he promised that, "we will work with the said stakeholders to fill the survey questionnaire and we will send it to you."

Table 17) Summary of issues raised during public consultation

No.	Issues raised	Responses given
1	**On FSTP subproject**	
1.1	Compensation payment delay for PAHs	The consultant team promised PAHs that the issue will be: • Presented and discussed with concerned officials in the town; • Adequately addressed in ESIA study; and • Presented to the Ministry of Water and Energy and the WB General manager of JTWSSSE stated that: • The delay was over exaggerated compensation claims

No.	Issues raised	Responses given
		made by PHAs; and • Now the City Administration is preparing to start compensation payment
1.2	Not providing a substitute cemetery place	Our agreement with the community was that a substitute place for the cemetery will be provided by Ifa Bula Kebele

7.3. Tripartite Stakeholder Consultation

7.3.1. First Round Tripartite Consultation

A First round tripartite consultation was held among the ESIA consultant, the MoWE and LDK Engineers and Planners (the design consultant) on 13th October 2023 in the office of MoWE UWSSP-II unit. The aim was to discuss on the site alternative and technology options planned for the Jimma town's FSTP construction. The consultation was attended by 19 experts gathered from the three stakeholders and two of them were women.

The consultation was opened by W/ro Frehiwot Zewede, UWSSP-II acting coordinator and who presides over the consultation, after welcoming participants of the consultation; she has described that the tripartite consultation is summoned with the aim of reaching a common consensuses on the technology options and site alternatives proposed by ESIA and the design consultants. W/ro Frehiwot reported that the technology option and project site recommended by the ESIA consultant were different from the one proposed during design study. She informed the participants the importance of reaching a common agreement on these issues and then, she has invited the ESIA consultant team to explain factors that resulted in variations of technology and site options between the two studies.

The ESIA team reported that the weather condition of Jimma town and its surrounding is characterized by an extended rainy season; and our recommendation of additional technology option is based on this peculiar weather condition of the project area. Due to this, the ESIA recommends the construction of temporary sludge storage facility option which was not part of the design study. In addition, the ESIA team has described that the project site selected by the design study located near to Jimma Aba Jifar Airport. Next, the ESIA team further explained that the site is so rugged, sloppy and gully. So it can lead to high construction cost and might be susceptible for land slide and flooding during either construction or operation. Finally, the ESIA consultant explained that because of the above two reasons we are not accepted the site proposed in the design study. Thus, the ESIA consultant recommends amendment of the FSTP construction site.

After hearing explanations given by the ESIA consultant, W/ro Frehiwot has invited the design consultant to reflect on the explanations given and technology option and the site alternatives recommended by the ESIA consultant.

The design study team described that initially the technology option recommended by the ESIA consultant was part of the design study. However, it was the client (MoWE) who dropped the technology option from the design study due to financial and technical reasons. Regarding the site amendment the design consultant explained that it was the only plot of land allotted by the JTWSSSE for the design study, so we could not have any option, they said. The discussants revealed that the reasons presented by the design team were not technically sound and adequate for economically feasible, environmentally safe and socially acceptable site selection.

Thus in conclusion the technology option proposed by the design consultant was accepted among all the discussants. On the other hand for the selection of appropriate site for the construction of the FSTP all the parties decided to travel to Jimma on 27 October 2023 and to held additional consultation with the Jimma town administration and undertake site investigation to amend the site.

7.3.2. Second Round Tripartite Stakeholder Consultation

During the first phase tripartite discussion, which was held in the office of the MoWE on 13 October 2023, it was agreed to conduct the second round tripartite discussion and FSTP construction site visit of the Jimma town. Thus the second round tripartite stakeholder consultation was undertaken in JTWSSSE office on 27 October 2023 and the site visit was also made on 28 October 2023. The participants were from MoWE concerned (UWSSP-II sanitation and environment unit) experts, GSEMC manager and expert, JTWSSSE, Jimma town land administration office and the design consultant (virtually) representative. The total number of participants was 13 (1F). The discussion podium was chaired by Mr. Addisu Arfasa who (JTWSSSE deputy manager) and Mr. Solomon Haileyesus (environmental safeguard specialist, MOWE UWSSP-II).

Figure 30) Second round tripartite stakeholder consultation (top), site visit (bottom)
Source: Green Sober Consult 28 Oct 2023

The aim of the consultation and site visit was to amend design proposed FSTP construction site from environmental safety and social acceptance point of view. Mr. Esubalew Assefa (GIS expert of the ESIA consultant) presented the two major drawbacks of the design consultant proposed FSTP construction site supported with Google map and figures in a short power point. The first drawback he revealed was that the site was only 36m away from the border/fence of the Aba Jifar airport. The other key problem identified was that site is highly susceptible for land slide due to its very sloppy/gully nature and can lead to high cut and fill or construction cost. With these environmental concerns and the issue related to established cemetery in the design proposed site, it was recommended to move the site with intension of avoiding the risks posed.

Based on the ideas posed, the JTWSSSE UWSSP-II coordinator, Mr. Habtamu has raised a point that if site change occurred then it can lead to design change. So who can take the responsibility to revise the design following the site amendment since the design consultant was not on board.

The design consultant representatives (Mr. Nibret Alemu design engineer and Desalegn Getachew, deputy manager) replied that the site was so rugged and if the enterprise agrees with the site change it is possible to revise the design work during the onset of construction. Hence the contract administration and supervising consultant can amended and revise the design accordingly. This site amendment proposal was accepted by all the tripartite stakeholder consultation participants after consultation and field visit of the site. Moreover Mr. Desta Kassa (ESIA consultant) added during discussion that they originally proposed the intended site and made community consultation in their first round site visit and ESIA data collection. He also added that the community representatives during the first round community (including the project affected household/people) consultation were agreed on the amendment which was also supported with consultation minutes documented and filed.

Then on 28 October 2023 all the consultation participants except those who joined virtually moved to visit the design consultant proposed site and agreed to amend as pre the ESIA consultant proposal. After the field visit The ESIA consultant and stakeholders have reached an agreement on alternative three from the proposed sites below.

- Alternative one proposed by the ESIA team: In this alternative the site is slightly moved to south west direction to increase the distance from the airport and to place it on gentle slope land for the safe construction and operation of the plant. However, in this alternative designing and implementing mitigation options for relocating the cemetery is needed.

- Alternative two proposed by land administration office: This is a site proposed by Jimma city land administration which is about 350 away from the airport and offsets the cemetery.

- Alternative Three (proposed by ESIA team): In this alternative the site has been modified to increase the distance from the airport, to get gentle slope land and to exclude the cemetery from the project site. This site is 400m away from the fence of Jimma Aba Jifar airport fence and 700m away from the takeoff site.

It was agreed that alternative three was feasible to construct the FSTP relatively on gentle slope to minimize landslide and flooding during either construction or operation work. Besides the dense natural forest between the airport and the newly proposed site can help wind break and buffer the area during operation of the FSTP. The site also excluded the cemetery and included the 7 previously mentioned HHs and additional land owned by the government.

8. CENSUS OF THE PROJECT AFFECTED HOUSEHOLDS

The FSTP subproject is proposed to rest on 4 hectares of land in Kofe Kebele. The site selected for construction located in one of the four rural Kebeles which recently demarcated under the administration of Jimma. The site selected for FSTP construction is not settled by people; hence it will not result in displacement of people from the area. However, the selected land is a by seven land right holding individuals living around the proposed site and they have also agricultural properties such as coffee, guava, eucalyptus trees and other trees and plants on the place. WB OP 4.12 explicitly stipulates that any impacts on livelihoods associated with land acquisition are construed as involuntary resettlement. Thus, project affected households must be provided a compensation amount that can commensurate with their affected properties and should be assisted to improve their livelihoods and standard of livings. To this end, this ESIA study has conducted HH census on six PAHs and one HH/representative has not been available during the survey and this will be addressed during the ARAP preparation by the city administration.

8.1. Demographic Features of PAHs

FSTP subproject will displace the properties of seven households found on the land proposed for the subproject in Kofe Kebele. During conducting the households' census six of the seven PAHs have participated and responded to the questionnaire prepared by the consultant team to assess demographic, educational, livelihoods and economic status of households whose land is required for the proposed FSTP subproject. Table 18 shows HHs demographic features.

Table 18) Gender and Household size of PAHs

No.	Household head sex	Number	Percent
1	Male	3	50
	Female	3	50
	Total	6	100
2	**Household Size**		
	HH1	15	28.3
	HH2	12	22.7
	HH3	8	15
	HH4	9	17
	HH5	6	11.3
	HH6	3	5.7
	Total	53	100
3	**Number of children**		
	Male	20	57.1
	Female	15	42.9
	Total	35	100

Source: (Green Sober Survey: 2023)

According to Table above, the number of households who actually participated in households census are six; but the number of PAHs in the area are seven. Based on the census of these six households, the total numbers of people living in these six households are 53 persons and the average household size is nine. From 53 persons living in the six households 66% (35) of them are children 20 males and 15 children and 50% (3) of PAHs are female headed households. Land acquisition process for Jimma City FSTP in the area causes displacement to six households and their 53 family members in the area in forms of losing land and assets on it such as coffee and eucalyptus trees. According to WB OP 4.12, PAHs must be provided compensations commensurate with their properties and should be assisted to improve their livelihoods and standard of livings. Thus, before expropriation of the land for the subprojects, PAHs must be identified and provided with compensations commensurate with their lost properties associated with land acquisition.

8.2. Vulnerable Community Groups affected by the Subproject

All members of PAHs are not equally affected by the impacts of development interventions. Usually, women and members of vulnerable groups such as children, PWDs, elderly and marginalized groups are disproportionately affected. As presented above, 50% of PAHs are female headed households and the impacts of property loss in these three female headed households will be felt differently by the head and members of the households. Table 19 presents the numbers and types of vulnerable group members which will be affected by the proposed FSTP subproject.

Table 19) Gender and vulnerability features of PAHs

No.	Demographic feature	Number	Percent
1	**Age of HH head**		
	40-50	2	33.3
	51-64	1	16.7
	>65	3	50
	Total	6	100
2	**Marital status of HH head**		
	Married	3	50
	Widow	3	50
	Total	6	100
3	**Age of HH members**		
	<7 year	6	11.3
	8-15	7	13.2
	16-63	37	69.8
	>64	3	5.7
	Total	53	100
4	**Number of orphans**		
		3	100

Source: (Green Sober Survey: 2023)

According to Table 19, from the six PAHs, 3 (50%) of them are female headed households as well as they are older people whose age are 65 years old and above. In addition, three of them are widows with the responsibility of taking care of an average six household members where eight of them are children. From the total of 53 people living in these six households, 24% of the residents are children in the area, 11 % (6) below seven years old and 13% (7) of them are between eight and fifteen years old. In addition, there are three orphan children inside these PAHs in the area. Other members of vulnerable groups living in PAHs are the elderly who accounts 5% (3) of the household members as well as three orphans are living inside PAHs. Thus, before and during subproject implementation issues of gender and the special needs of other vulnerable groups must be considered, promoted and mainstreamed in payment of compensations as well as in the design, implementation, monitoring and evaluation of FSTP subproject in the area.

8.3. Educational and Occupation Status of PAHs

Educational status of PAHs are very important in order to assess their adaptive ability after losing properties and livelihood means associated with land acquisition for Jimma City's FSTP construction. Table 20 presents educational status of FSTP subproject affected households in Kofe Kebele in Jimma.

Table 20) Educational Status of PAHs

No.	Education Status	Frequency	Percent
1	**Levels of education**		
	Illiterate	1	16.7
	Grade 1-8	4	66.6
	High school	1	16.7
	College and University	0	0
	Total	6	100
2	**Special Trainings**		
	Yes	2	33.33
	No	4	66.7
	Total	6	100

Source: (Green Sober Household Census: 2023)

Based on Table 13 above, out of the six PAHs household heads, 66 % (4) of them have attended elementary school while one household head is not able to read and write altogether while the remaining one household head has a high school education. Only two of the PAH heads had received special trainings from farmers training center and driving schools. The remaining four heads of households do not have trainings other than agricultural skills. Based on the above information, PAHs heads educational preparedness and their level of skills may not enable them to adapt and compete in employment and working opportunities outside of agriculture. Thus, payment of compensation should be done in a way that enables PAHs overcoming skill related

constraints. During FSTP subproject construction and operation phases, employment opportunities that could be created by FSTP subproject should consider these PAHs in the area.

8.4. Occupation and Income Generating activities of PAHs

WB OP 12.4 states that PAHs should be provided with compensation commensurate with property losses and in addition it emphasized that they should be assisted to improve their livelihoods and standard of livings. in order to estimate the amount of property PAHs are losing due to FSTP related land acquisition and property loss, assessing PAHs types of occupation, sources and monthly of income and major employment opportunities in the area are helpful to estimate compensation amount and further assistance that could be given to PAHs in relation to Jimma City's FSTP subproject. Table 21 presents the above information below.

Table 21) PAHs sources of occupation and income

No	Livelihood features	Frequency	Percent
1	**Types of occupation**		
	Farmers	6	100
	Civil Servant		
	Merchant		
	Not working		
	Total	6	100
2	**Monthly income**		
	<1000	1	16.6
	1001-5000	1	16.6
	5001-10,000	1	16.6
	>10,001	3	50.2
	Total	6	100
3	**Major employment activities in the area**		
	Formal employment		
	Informal sector	3	50
	No employer	3	50
	Total		
4	**Source of income**		
	Farming	4	66.7
	Three Wheel Taxi driving	1	16.66
	Producing bricks	1	16.66
	Total		

Source: Green Sober Household Census: 2023)

Based on the Table 21 above, all of the six households involved in the occupation of agriculture and for two households supplemented by small business activities; and 4 of PAHs stated their sources of income as farming and the reaming two respondents indicated that their source of income generated from driving three-wheel taxi and producing and selling bricks. From these income sources, respondents reported their average monthly income from these sources are: 3

(50%) of PAHs stated that their monthly income is above 10,000 birr, one of them claimed 50,00 birr, and the remaining three households reported that their monthly income as 1000, 5000 and 15,000 birr. 50% of the respondents opined that employment opportunities that are available in the area are in informal sector while the remaining 50% of respondents replied that the absence of any employing opportunities in the area. Although some respondents claim of monthly income seems over exaggerated, estimation of compensation payment for PAHs should consider the nature of HHs occupation activities and the shortage of alternative employment and income generation activities in the area once HHs loss their land and assets on it due to FSTP subprojects.

8.5 Properties of Households affected by the Subprojects

The site selected for FSTP subproject is not a residential area and as a result there are no households displaced by it. However, acquisition of land for the subproject in Kofe Kebele will inevitably cause loss of land and other properties found on it. Hence, identifying owners of properties, enumerating types and amount of properties which will be lost due to subproject should be clearly known and recorded for estimation of compensation and preparation of resettlement action plan. The following Table 22 presents the size land and other properties owned by PAHs over the land proposed for FSTP construction in the area.

Table 22) Properties owned by PAHs on proposed FSTP site

No.	Property status of PAH's	Frequency	Percent	Remark
1	**Forms of ownership**			
	Owner and producer	4	66.6	
	Share cropper			
	Land tenant			
	Owner but don't cultivate it	2	33.4	
	Total	**6**	**100**	
2	**Landholding size in hectare**			
	<0.5	3	50	
	0.5-1.5			
	1.5-2.5	1	16.6	
	>2.5	2	33.4	Claimed 5 and 7 hectare land each
	Total	**6**	**100**	

Source: (Green Sober Survey: 2023)

Based on the Table 22 above, 67% (4) of the households are land owner as well as they are farming over the land while 33% (2) of the households own land on the place selected for FSTP but the households are not farming the land. 50% (3) of the total six households owns less than 0.5hectare land and 17% (one) of them have land holding size between 1.5 and 2.5 hectare. According to 33% (two) households, the size of land they own over the site proposed for FSTP construction is more than 2.5 hectare, and as remarked on the above Table 7.5. Based on the data

obtained during the field work, the type and number of trees to be removed include 2,400 heads of eucalyptus tree; 1,850 heads of guava (Psdium guajava) plants, 1,055 heads of coffee trees, 435 heads of bisana (Croton Macrostachyus), 157 wanazas, 37 mangoes, 20 avocados, 15 Gravilia and 7 hop plants. Notwithstanding households' exaggeration, the landholding size of all six PAHs and their properties should be accurately measured and inventoried and commensurate and timely compensation payment must be made before they leave the land.

In a nut shell, the household survey conducted in this ESIA study finds that six households will loss land and property found on it due to land acquisition process for the proposed FSTP construction in Kofe Kebele and most of PAHs are farmers with a lower educational backgrounds and skills other than farming. In addition, half of PAHs are female headed households as well as the presence of a significant numbers of PAHs are members of vulnerable groups including widow, children, PWDs and elderly. Land acquisition process for the proposed subproject will causes involuntary resettlement for seven households in the form of losing land and properties on it and this in turn will undermine the livelihoods of property owners and their household members. Thus, project affected households must be provided a compensation consummate with their properties and should be assisted to improve their livelihoods and standard of livings.

9. IMPACT IDENTIFICATION, ANALYSIS AND MITIGATION MEASURES

9.1. Introduction

Many projects impact society and environment in different ways. Some of its impacts are seen within the project locations and others along the routes leading to the project sites. The impact level of such sanitation related projects on the environment depends on the nature of receiving environment and its assimilation capacity; quality and quantity of sanitation infrastructures; the proportion of population covered; and the utilization of the sanitation facilities by the population. The sensitivity of the receiving environment is determined by specialists' keen field observation, feedbacks from the relevant stakeholders and environmental baseline information analyses. In this chapter, prediction and analysis of possible positive and negative impacts of construction and operation of the sanitation project is presented.

9.2. Assessment Methodology

The impact assessment was done through a standardized structured impact assessment process. Identification of impacts was done first by collecting a comprehensive list of key potential environmental impacts related to the project.

Impact identification: It is important to predict possible impact of the project on the environment in line with what could potentially happen to resources and receptors as a consequence of the project and its associated activities. Sections of the environment in this report include the physical environment (landscape, geology, soil, air and water); biological environment (wildlife, habitats and biodiversity); and the socio-economic environment (economic systems, cultural heritage, settlement patterns, and employment levels). Moreover, the potential impacts on resources and receptors were identified in accordance with the project stages such as pre construction, construction and operational phases. Identification of possible sources of impacts was conducted by using checklists. This was followed by listing possible receptors of the impacts in the environment. The possible impact receptors in the environment were identified through surveying the existing environmental and socioeconomic conditions through baseline studies and consultation with concerned parties.

Impact description: An impact is both a description of the planned project activities and their effects on the environmental and/or social receptors. Impact description technically characterizes causes and effects of impacts, and their secondary and synergistic consequences on the environment and the local community. Potential impacts of the proposed projects, their characteristics and the attributes of the receiving environment were predicted and presented for tenable mitigation measure development. Project impact characteristics include whether the impact is: adverse or beneficial; direct or indirect; short, medium, or long-term; and permanent;

affecting a local, regional or global scale; including trans-boundary; and cumulative or not. Each of these characteristics was addressed for every major impacts identified during analyses.

Impact evaluation: The significance of the predicted or identified impacts has been quantified and evaluated by considering the magnitude of the effect and the sensitivity, value, and importance of the affected resource or receptor. For the quantification and evaluation of impacts, checklists and interaction matrices methods were applied for this purpose.

Each major impact is evaluated using the criteria assigned by experts' professional judgment based on the impact intensity, extent, duration and sensitivity of the receiving biophysical and socio-cultural environment. The judgment of impact evaluation and significance has been determined based on the comparison of national/international laws, regulations or accepted standards; consultation with the relevant decision makers; reference to government policy objectives; concern of the local community or the general public. After evaluation of impacts, appropriate and justified mitigation measures for the negative impacts and enhancement measures for the positive impacts are forwarded.

Table 23: Classification of impact evaluation

Classification	Description
Extent	Evaluation of the area of occurrence or influence of the impact on the subprogram environment; whether the impact will occur **on site**, in a limited area (**2km radius**); locally (**5km radius**); regionally (city wide, nationally or internationally).
Duration	Evaluation of the duration or persistence of impact on the subprogram environment, whether the impact was temporary (<1 year); short term (1 – 5 years); medium term (5 – 10 years); long term (subprogram design period); or permanent (bound design period).
Sensitivity	Assessment of the impacts for sensitive receptors in terms of physical, ecological, social, and cultural setting, and potential for major conflicts for stakeholders. The sensitivity classification is: **High sensitivity***:* Involuntary displacement of entire community; property damage or loss; biodiversity disturbance and species extinction; destruction of world heritage and important cultural sites; large scale stakeholder conflict according to RPF; and so on. **Medium sensitivity***:* Displacement of some households according to the RPF; moderate level of stakeholder concern; medium and reversible damage to the natural environment; etc. **Low sensitivity***:* No displacements; no potential for stakeholder conflict; negligible impact on the natural environment; etc.
Severity (Overall Impact rating)	Using a combination of the above criteria, the overall severity of the impact was assigned by rating as: Severe; Substantial; Moderate; Minor; and Negligible. Note: These are just guidelines that will constitute professional judgment required in each individual case.

Impact severity: The impact severity was determined by professional experts through evaluating the intensity of the impact and the sensitivity of the environmental and social

receptors, which is largely subjective. This is basically a semi-qualitative method designed to provide a broad ranking of the different potential impacts of a project. For each potential impact, impact severity assessment was done by assigning numerical descriptors to the impact intensity as well as the environmental and social receptors. The numerical descriptors are 1, 2, 3, or 4 which are equivalent to very low, low, medium or high. Then, impact severity is calculated as the product of the two numerical descriptors which is equivalent to negligible, minor, moderate or major as indicated in Table number 28 below.

Impact significance: Impact significance is determined from an impact severity matrix which compares severity of the impact with probability of its occurrence. Impact significance criteria are as follows:

- ***Major:*** These denote that the impact is unacceptable and further mitigation measures must be implemented to reduce the significance. It is shaded in red (see Table number 24 below)
- ***Moderate:*** Impacts in this region are considered tolerable but efforts must be made to reduce the impact to levels that are as low as reasonably practical. Shaded in Yellow.
- ***Minor:*** Impacts in this region are considered acceptable. Shaded in Gray.
- ***Negligible:*** Impacts in this region are almost not felt. Shaded in Light green.

Table 24: Determination of impact severity

			Sensitivity of receptor			
			Very low	Low	Medium	High
			1	2	3	4
Impact intensity	Very low	1	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	2	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	3	3 Minor	6 Moderate	9 Moderate	12 Major
	High	4	4 Minor	8 Moderate	12 Major	16 Major

The scale of intensity is defined on the basis of social and ecological consideration and expert's professional judgment as indicated in Table number 25.

Table 25: Intensity scale gradation for socio-environmental impacts

Intensity	**Criterion**
Very low	Environmental changes are within the existing limits of natural variations or carrying capacity
Low	Environmental changes exceed the existing limits of natural variations. Natural environment is completely self-recoverable or renewable.
Medium	Environmental changes exceed the existing limits of natural variations and results in damage to the separate environmental components. Natural environment is remains self-renewable.
High	Environmental changes result in significant disturbance to particular

	environmental components and ecosystems. Certain environmental components lose self-recovering ability.

Overall impact rating: Table 26 below is showing the overall impact rating and description methods.

Table 26: Overall impact rating and description

Overall Impact Rating	Description of Impact	Significance
Major	• Non-compliance with national policy, environmental laws and regulations; • Highly noticeable and irreparable effect upon the environment; • Significant, widespread and permanent loss of resource; • Major defilement of water, air quality and noise posing threat to human health in long and short term; • Causing widespread nuisance both on and off site; and • Extensive property damage or loss.	>12
Moderate	• Noticeable effects on the environment, but reversible over the long term; • Localized degradation of resources restricting potential for further usage; • Increased traffic in sensitive environments; and • Widespread physical resettlement and affecting livelihoods.	6 – 12
Minor	• Noticeable effects on the environment, but returning naturally to original state in the medium term; • Slight local degradation of resources, but not jeopardizing further usage; • Small contribution to global air problem through unavoidable releases; • Infrequent localized nuisance; and • Population increase but, not expected to stress existing infrastructure.	2 – 4
Negligible	• No noticeable or limited local effect upon the environment, rapidly returning to original state by natural action; • Unlikely to affect resources to noticeable degree; • No noticeable effects on regionally endangered species; • No significant contribution to global air pollution problem; • Minor elevation in ambient water/air pollutant levels well below guidelines; and • Temporary or intermittent changes to livelihoods or life quality aspects.	< 2

Cumulative impacts: Cumulative impact is the effect on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impact results from the aggregated effect of more than one project (or more than an action of the same project) occurring at the same time, or the aggregated effect of sequential projects. Cumulative effects manifest when socio-environmental conditions are already or will be affected by present, past or rationally probable future developments or

activities. The ESIA identifies current and probable future impacts of the CWIS project in Jimma on the receiving environment.

9.3. Positive Environmental and Social Impacts and Their Enhancement Measures

The development and operation of the proposed CWIS project in Jimma will have substantial direct or indirect positive environmental and social impacts to the local people, the town and the region at large. Some of the major beneficial impacts include access to improved sanitation facilities and services; enhanced water quality; improving public health conditions, household health status, and personal hygiene; infrastructure improvement; skill and technology transfer; and creation of employment opportunities during the construction and implementation phase of the project. Specifically, the following positive impacts are anticipated during construction and operation phases of the project component.

Employment Opportunities

Construction and operational phases of the project will provide a number of employment opportunities for various disciplines. In this employment opportunity both skilled and unskilled workforces will potentially participate. Mostly, temporary jobs will be created at construction phase and permanent jobs when the overall project completed and start operating. This job opportunity will be available for local residents, especially the PAHs, woman, and youths who are living in the project area.

Enhancement Measures

Unskilled and semi-skilled labor will be recruited preferentially from local communities, provided that they have the necessary experience, qualification, competence and desired experience. Wherever feasible, local people should be considered for job opportunities commensurate with their level of skills. In this process special considerations and priority should be given for vulnerable groups of the society like women, the youth and the disabled.

Adequate occupational health and safety standards training program for artisans such as builders, carpenters, plumbers, etc in the project area has to be facilitated by the project to ensure skills transfer and to ensure working environment is conducive.

Information to create awareness about the proposed project activities will be provided to the PAPs targeting members of vulnerable groups including female headed HH, people with disability, elderly and others historically marginalized community groups.

Skill and Knowledge Transfer

Construction and operation of FSTP is a new technology to Ethiopia and Jimma City. It is expected that some degree of capacity building trainings will be given to those workers who operate and run the plant to facilitate the transfer of new technologies and skills as well as for

smoother implementation of the proposed project. Besides, local sub-contractors and companies are also beneficiaries from the transfer of skills and will also build additional local capacity. Thus, during construction and operation phases, local skilled and unskilled workers will encounter and get experience from the FSTP installation, operation, maintenance and management. This might be done through on-the-job training as well as through exposure to modern practices, management and logistics procedures.

Enhancement Measures

During hiring labors people from the local community should be given priority provided that they can meet the criteria required for the job. Providing technical trainings for unskilled labors is also the other enhancement measure that will expand job opportunities for local community members. Particularly, both in hiring labors and organizing training, preferential treatment should be given to members of vulnerable groups such as women, female headed households and youths.

Income Generation to Material Suppliers and Contractors

Some of the inputs, instruments and equipment to be used in the construction and operation of the FSTP may come from the locality or even other countries. A number of equipment and materials such as gravel, bricks, plumber, steel reinforcement and cement for civil works can be sourced locally within Jimma and the neighboring regions. So, local suppliers of construction materials and equipment in the project area will benefit financially. This is a positive but short-term and reversible impact.

Enhancement Measures

Construction materials might be supplied from legal or illegal supplier but it has to be a contractual obligation for contractors to procure construction materials from legal quarries/suppliers who are legitimate and licensed by the respective district authorities. Procuring construction materials from local sources will improve livelihoods of residents.

Boosting Local Economy

During construction phase of the project, relatively large number of workforce (unskilled and skilled) will be employed. The workforce will require and get most of their food and other necessities from the surrounding area and this will provide a market for the local agricultural producers, craftsmen/women and other small businesses. This will improve the income of petty traders in the locality; wages will quickly increase household income and stimulate the local economy. Business opportunities especially for locals such as catering food and beverages for construction workers will be created. Thus, the project will stimulate local economic activities by providing opportunities for provision of basic and other services to the contractors and workers. Moreover, provision for direct employment and business opportunities for the local community

are expected. It is also important to mention that the money (allocated for the construction) will be a new injection to the local and the national economy.

Enhancement Measures

Provide adequate awareness about the business opportunity that the project has to the local community. Encourage vulnerable groups of the local community (women and youth) to participate on petty business activities. It is also important to involve local actors such as local restaurants and local sub-contractors, as far as they have the capacity and willingness to participate, to maximize the positive economic impact of the project on the local economy.

Urban Infrastructure Services Improvement

The installation of FSTP in general will improve sanitation system of the town; increase the service delivery; and contribute a lot for the development and improved image of the town. The modern waste management facilities to be constructed in Jimma will definitely improve image of the town, induces development, play pivotal role in attracting tourists, enhance employment opportunity and helps improve the sanitation and hygiene level of the society.

Enhancement Measures

Infrastructure development should be of a type that is desirable and sustainable. For this to happen, all future development plans must be undertaken within the framework of proactive government policy and strict planning and enforced environmental measures. Sustainability of the project is assured if the public/society at large participated actively in all stages of project development. Urban sanitation consists of the collection, storage/treatment, transportation, re-use or disposal of excreta, liquid and solid waste in ways that improve or sustain human health and decrease negative impacts on the environment. To achieve the desired purpose of urban sanitation, collaborative and integrated work of stakeholders duly required.

To ensure sustainability of the infrastructure service, effective and efficient utilization of the developed infrastructure and maintenance for the malfunction systems has to be done timely with the required standard. Recurrent community awareness creation trainings are required to improve awareness on sustainable waste management, sustainable use and ownership of the developed infrastructure.

Improved Health Status of Households and Communities

FS is highly hazardous for human health & for the environment. The provision of adequate sanitation facilities in urban & rural areas positively impact health of users by greatly reducing the incidence of water-borne and sanitation related diseases. Thus, safe disposal of human excreta is one of a key measure to break the chain of transmission of diseases. Visit made by the ESIA team clearly revealed that Jimma severely lacks fecal sledge treatment facilities at all. The

community is totally devoid of these critical infrastructures and is affected by their absence in many ways. So the construction of the FSTP will reduce and/or eliminate the indiscriminate disposal of human excreta and wastewater in the town. Enhanced sanitation facility of the town also contributes for community's livelihood improvement directly or indirectly. The project has huge role to control and reduce the outbreak of waterborne and communicable diseases. Hence, the construction and proper use of the toilet facilities and FSTP will play an important role in the improvement of the health and sanitation of the public in particular and the town's environment in general.

Enhancement Measures

It is important to create/improve awareness of the general public on how to use and manage the FSTP. Educate users on the proper use of the facilities; monitor the regular cleaning and effective services of developed infrastructures. Ensure the required service and timely maintenance of the FSTP and other related infrastructures.

Using Sludge as a Fertilizer

Fecal sludge that has been properly handled and allowed to mature can be used as fertilizer. The use of composted sludge (decomposed sludge) as fertilizer has a potential to improve crop yield and enables a reduction in cost for nitrogen and phosphorus mineral fertilizers. Moreover, sludge application helps to reduce soil erosion and improves soil quality as a plant growth medium and can help conserving soil organic matter, and stimulates biological activity in the soil (Stamatiadis, et al: 1999.) Recycling of sludge for agricultural purpose and soil amendment is an appealing solution for sustainable management of sludge. It is environmentally the best solution.

Enhancement Measures

Awareness creation on the importance of fecal sledge as alternative fertilizer than chemical fertilizer should be given to the general public. Encourage local people (especially vulnerable groups of the society) to participate in the preparation and use of compost. Provide the required training and awareness for the relevant users on how they can safely use sludge substances.

9.4. Identification of Negative Impacts of the project

The implementation of CWIS project in Jimma town may have adverse impacts on the socioeconomic conditions and the environment at large. The pre-construction and construction phases of the project involve planning and design, resource mobilization, transportation of construction materials, site clearing, land labeling, compaction and construction of access roads. Potential adverse impacts associated with the above activities are presented as follow:

9.4.1. Pre-construction, Planning and Design Phase

Major activities involved in this phase are topographical surveys; site selection; geotechnical investigation; finding of natural resources for construction materials; mobilization of

construction machineries; land acquisition; and resettlement issues. The planning and design processes were already completed. The main impact in this phase is related to project affected people (PAPs).

Land acquisition, Resettlement and Compensation Issues

Fecal sludge treatment plant project site is currently occupied by seven land right holding individuals. The consultant team has also learnt that the PAPs are already under discussion with the municipality about compensation and this process has not been completed yet. The PAP indicated that the town has to compensate the people before the start of the project. On the site there are various kinds of natural vegetation and plantations. Some of the vegetation are eucalyptus, guava trees, banana, coffee and different kinds of natural vegetation.

The team also saw that there is no residential house on the site except two newly constructed empty single-roomed houses as a refreshment shelter in the FSTP site constructed by the PAP mentioned above and need to consider the damage of the properties during compensation process.

The ESIA team recommended preparation of Abbreviated Resettlement Action Plan (ARAP) and pay compensation prior to the start of the project. The team clearly raised the issue during exit meeting conducted with the JTWSSSE and informed them that this has to be concluded before the commencement of the project. In addition, the meeting held with the PAP was attended by the environment specialist of the aforementioned concerned office of the municipality. This meeting was evidenced by photographs and meeting minutes annexed at the end of this document.

All of the likely displaced persons, economically, and their livelihoods have to be considered for compensation through Abbreviated Resettlement Action Plan (ARAP) and Compensation has to be made for adversely affected PAPs.

The ESIA team was told by the concerned town official at the JTWSSSE that the land owners need to be adequately compensated as per the requirements of the RPF, the World Bank policy on involuntary resettlement and Ethiopian laws on compulsory land acquisition.

Impact Significance

The expansion of FSTP is directly affecting 7 households. Among the project affected people some of them are members of vulnerable community groups such as women headed families such as Ms. Fatuma. The likelihood of the impact occurring is **high** although the duration of the impact will generally be temporary during pre-construction phase. The extent of the impact will be on site. The **intensity of the impact and** the **sensitivity** of the receptor are **high** given the high potential to affect the poor local dwellers, children, elderly and female headed HHs. This results in **major** impact **significance**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation measures:

1. Conduct meaningful consultation with the PAPs regarding the potential impacts of the project, issues related to compensation and displacement and about the project in general;
2. ARAP need to be conducted to identify the extent of the impact of the FSTP. This ARAP has to be conducted carefully prior to any civil work of the project is commenced and PAP need to be properly compensated for the losses. PAHs should directly involve in the entire ARAP study and make their own informed decisions;
3. Compensate those affected according to the laid down policies in collaboration with Jimma Municipality, taking Ethiopian laws, Proclamation No. 1161-2019 as well as World Bank safeguard policy on involuntary resettlement (OP 4.12) into consideration. Tenable and commensurate compensation must be paid both in cash and kind for the properties to be lost, damaged and transferred;
4. Vulnerable community groups like female headed HHs, and elderly must get priority during compensation study, land delivery and post livelihood rehabilitation works;
5. Depending on the recommendations to be made by the ARAP study, the town administration shall meaningfully consult each of the PAPs independently, not with their representative, as it is being done currently, because negotiations are private and unique. Negotiation with representation may create communication gap and interests and demands of households may not be voiced especially those of female headed HHs and members of vulnerable groups and thereby affect the negotiation outcomes;
6. The resettlement site must have access for social amenities at least commensurate to their original lost property;
7. For vulnerable community groups a special focus must be given in terms of land for land compensation, compensation cost estimation, job opportunity, property, capacity building programs and post livelihood restoration plans;
8. Grievance Redress Mechanism shall be put in place to resolve all project related grievances; and
9. Implement an institutional structure or a mechanism for monitoring and evaluating the compensation/resettlement process including the Grievance Redress Mechanism.

The planned and carefully adoption of the aforesaid mitigation measures can reduce impact intensity to "**low"** resulting in residual impact of **"minor significance**".

9.4.2. Construction Phase

Loss of Vegetation Cover/ Vegetation Clearance

There are large number of natural vegetations and plantations, and shrubs species observed at the proposed FSTP site. Large amount of plant species mostly shrubs, eucalyptus trees, naturally grown guava plants are found in the project area and owners of the land at FSTP site utilize the land for eucalyptus tree and cultivated crops such as banana, coffee and other fruits. Land clearing and removal of the existing vegetation can be a cause for the alteration of landscape integrity, grasses, perennial vegetation and change in land use pattern in the project area. Thus whatever little vegetation may be affected by the proposed construction work, the **intensity of *the impact and*** the **sensitivity** of the receptor are **high**. This results in **major** impact **significance**.

The vegetation clearance activity, especially in the FSTP sites, will lead to interference with habitats causing total loss or change and leading to the destruction of biodiversity. This aspect triggers the WB safeguard policy on Natural Habitats (OP/BP 4.04) and Forests (OP/BP 4.36).

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation measures:

1. Ensure replacement of 10 seedlings per each of the removed trees (in a way it would over-compensate the number of lost trees), followed by protection and watering of the seedlings until it reaches to at least 1.5 meters height. Establishment of a buffer zone followed by plantation of trees around the FSTP site, can improve local microclimatic conditions and enhance the image of the surrounding and serve as a wind break;
2. Store and reuse the topsoil removed from the site during site rehabilitations;
3. Identify and delineate the types of vegetation that must not be necessarily removed;
4. Minimize the amount of destruction caused by machinery by promoting non mechanized methods of vegetation removal;
5. Prior to undertaking vegetative clearance from environmentally sensitive areas the contractor shall seek approval from the relevant authorities and comply to the conditions provided;
6. All areas planned for clearing of vegetation must be demarcated prior to the commencement of the construction; and

7. A Wildlife Management Plan has to be prepared for the project. This wildlife management plan should be implemented by the Contractor during construction and the operator during the operation phase of the project.

Soil Erosion/Degradation, Land slide, Flooding, Erosion and Loss of Top Soil

Site preparation will involve clearing of strips of vegetation to allow for excavations to begin. Land clearing and removal of the existing vegetation can be a cause for the alteration of landscape integrity. Topsoil stripping during leveling and grading of the right of way (ROW) and the excavation of subsoil during trenching will break up the soil structure. Also, construction equipment engaged in activities (fecal sludge treatment plant) might cause light contaminations of soil due to leakage of fuels and lubricants from equipment. Moreover, soils excavated may be exposed to agents of erosion. Prolonged storage of topsoil can lead to a loss in soil nutrients (leaching effect) viability of seed bank in the soil. This aspect triggers the WB safeguard policy on Natural Habitats (OP/BP 4.04) and Forests (OP/BP 4.36).

Impact Significance

These are short term and direct impacts of the project on soil. By considering the project footprint, receptor sensitivity is assessed to be low. The water drainage lines are towards to a local stream. Medium impact intensity is expected since the construction of FSTP will be done by registered qualified contractor that considers social and environmental issues. The duration of exposure of stockpiles shall be relatively short and assuming the rugged terrain around the proposed FSTP. The sensitivity of the impact occurrence is medium in this case. Thus, both **intensity** of the impact and ***sensitivity*** of the receptor are rated as moderate and this results moderate impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation measures

1. The contractor should develop a Site Specific Environmental and Social management plan (C-ESMP) prior to start of construction activities;
2. Store topsoil and subsoil removed from the site during site preparation properly for reuse elsewhere or for backfilling and reinstatement.
3. The valuable top soil containing organic material, nutrients as well as seeds and the soil fauna should be excavated separately and piled in an adequate manner for re-use where

applicable. Temporary spoil heaps will not be higher than 3m. Use the subsoil for backfilling of trenches;

4. Contour temporary and permanent access roads / lay down areas so as to minimize surface water runoff and erosion;
5. Avoid using of more than 10 years old and properly unmaintained machineries which can most likely lead to oil, grease and fuel leakages. Ensure that all equipment's on duty are properly maintained and fully functioning to avoid oil and grease leakages;
6. Plan emergency response measures in case of accidental oil spills;
7. Develop a stable landform that mirrors the pre-disturbed condition, for instance contours, shape, level of compaction and etc, as this will minimize the risk of preferential erosion and therefore facilitate natural grass and bushes recovery;
8. All waste generated during site preparation and construction will be transported and disposed to an authorized disposal area only. The contractor will seek guidance from project office and on the final waste transportation and disposal site;
9. Excess soil must be removed from the site timely (in hourly or daily bases as applicable) manner and deposited at an approved site; abandoned quarries be used for the disposal of excessive quantities of excavated soil material;
10. Protect adjacent area to the construction site from disturbance and wherever possible construction work will take place during the dry season;
11. Work on the watershed management especially for the upper catchment. Sheet and rill erosion of soil shall be prevented where necessary through the use of sand bags, diversion beams, culverts, or other physical means; and
12. Improve the vegetation cover of the open area by indigenous plant species diversity.

Air Quality and Noise Pollution (Dust Emissions)

Dust emission: Project site clearing, earth works like leveling, trenching, excavation of top soil and vehicle movement over un-paved areas will generate fugitive dust. Actually elevated level of dust emissions resulted in temporary air pollution. So, the air quality in the construction sites along transportation routes of project pollution of gases expected from the engines. Major dust sources will be vehicle movement over un-paved areas and transportation of raw materials and equipment within the work site. The emissions of dust from construction activities will be localized & the dust is likely to settle in close proximity to the project. Sustained high level of dust could impact negatively on various groups of the people who spend considerable time within the area adjacent to the project sites, such as construction workers and road side businesses.

Air quality: In regions being excavated for trenches, pits or ponds, along transportation routes and at the building site dust and engine pollution gases may accumulate. During dry times, this is probably going to happen. Emissions of CO_2, CO, SO_2, NO_X and PM_5 and $PM_{2.5}$ and other pollutants are produced by the continuous operation of trucks and equipment during construction phase of

the project. Moreover, some welding fume such as metal oxides (Fe_2O_3, SiO_2, K_2O, CaO) and CO, NO_x can be produced during construction phase but this work happens in a short time and impact is localized and temporary.

Noise pollution: The use of heavy equipment including bulldozers, graders and dump trucks during site preparation and transportation of materials will generate noise and vibrations. The levels of noise generated will depend on the types and conditions of equipment employed by the contractor; and the number of employs at a particular time. With noise being perceived as one of the most undesirable consequences of construction activity, it might become a nuisance to the settlements and animals within its environs. Since the noise levels in the area are low or within the acceptable limit, the activities will therefore temporarily increase such levels. Generally, construction phase noise level exceeding 70 decibels (dB) has significant impacts on surrounding sensitive receptors within 50m of the construction site.

Impact Significance

The FSTP site before the construction has ambient noise level with good air quality. The construction phase of the project might disturb these ambient conditions. The air quality impacts associated with dust generation, noise pollution to the receptor sensitivity is considered to be "low". The ***intensity*** of impact is assessed as ***low*** resulting into **minor** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation measures

1. Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment;

2. Construction truck drivers and machine operators have to be informed to switch off vehicle machine engines while offloading materials. According to Ethiopia Ambient Environment Standard Guideline (2003); noise levels at construction sites or industrial areas should not exceed 75 dBA and 70 dBA during the day and night, respectively;

3. It is the responsibility of the contractor to utilize well maintained and functional working equipment. Old and malfunctioned working instruments will produce noise beyond the required level. Contractor has to ensure that all construction equipment is properly maintained and fully functional;

4. During periods of off work time, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis;

5. Movement of haulage vehicles be limited to day time since the noise impact will be less felt;

6. No construction activities will take place at night for sites where the closest residence is within less than 100 m from the project site;

7. Whenever the dust emission is to become higher than expected and disturbance is created for the workers and project activities, it is recommended to spray the location with water to reduce the impact;

8. Workers be provided with the necessary personal protective equipment (PPE) such as ear muffs, masks whenever needed and as found appropriate; and

9. Workers operating near stationary emission emitting equipment/machinery generating noise levels greater than 80 dBA over long hours must be given PPE earmuffs.

Alteration of Natural Drainage Pattern

Proposed FSTP site is located on a gently sloped area that drains into a local stream. This may trigger some amount of surface runoff that ends up in a stream. Since there is no other drainage system between the local stream and the FSTP, there may not be a major alteration of natural drainage lines. However, since the construction of the FSTP may collect small naturally draining lines to one trunk line, there is a need to carefully design this trunk line not to affect the local stream. Hence, designing and constructing safe and efficient drainage line for the storm water is particularly important to maintain environmental safety of receiving water environment.

Moreover, the construction of the proposed project can result in changes on surface and sub-surface hydrology. Changing the natural soil characteristics of the project site from its present state to a more built state will lead to a change in the water regime at the project site. This is because the built areas will increase run-off while reducing percolation of water into the ground and thereby also changing the sub-surface hydrology.

Impact Significance

Particularly the FSTP site is located nearby of the natural drainage lines. The construction phase of the project might disturb this natural drainage lines and conditions and the construction of the project might be disturbed. The impact associated with alteration of natural drainage line to the receptor sensitivity is considered to be "***low***". The ***intensity*** of impact is also assessed as ***low*** resulting into **minor** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Plan and work on integrated water shade management for the natural drainage lines;
2. Storm water drainage planning, design and management activities should ensure the participation of the people and other stakeholders at all levels;
3. Work on flood avoidance strategies as precautionary interventions that involve structural adaptations to constructions to reduce the impacts of inundation, or the relocation of houses /structures that are on drainage pathways and floodplains;
4. Flood mitigation strategies involve responses, both before and during a flood event, which include early warnings, the operation of flood control works, and emergency unblocking of blocked inlets and drains;
5. Proper drainage channels shall be constructed within the construction site to allow for convenient and free flow of storm water. Drainage channels shall be installed in all areas that generate or receive surface water. The channels shall be designed with regard to maximum expected volumes;
6. To prevent possible erosion and flood, collaborative work needed for the stabilization of gullies and drainage lines; and
7. Integrated work of stakeholders to water shade management with careful planning and abatement of drainage lines are required.

Slope Failure due to Earthworks

In fact, this impact is addressed due to the existence of slope on the FSTP area. The earth work activity on sloppy area might result slop instability. Earthworks and river flow diversion in steep area could lead to slope instability, accelerated erosion and gully formation resulting increased sediment transport to surface waters or wetlands or gardens. Slope failure would affect downhill community property, land and aquatic environments. The chance of occurrence is medium; it is essential to consider the risk of this potential impact actually occurring to the construction sites.

Impact significance: The likelihood of the impact occurring is medium in the steep area). Duration of the impact will be short-term and effects reversible. Hence, intensity of the impact is and sensitivity of the receptor are both **medium**. Impact significance is therefore **moderate**.

	Sensitivity of receptor			
	Very low(1)	Low (2)	Medium (3)	High (4)

Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Relatively very weak landform slopes should be protected using engineered structures (retaining walls), especially at the lower courses of the FSTP site;
2. Protect the susceptible areas of the project by using temporary or permanent drainage works;
3. Minimize the possible risk by undertaking all earthwork construction activities during the dry season;
4. The contractors expected to use best available methods of construction technology to minimize the risk of blockages and constrictions during construction; and
5. The eroded channels will be backfilled and restored to natural contours.

Adoption of this mitigation measures will reduce impact intensity to "very low" resulting in a residual impact of **low** significance.

Traffic Congestion and Disruption of Private Communication Routes

Traffic congestion is anticipated from construction phase of the project. Heavy-duty trucks can obstruct or damage roads and increase the likelihood of accidents. The proposed FSTP is found in Kofe Kebele at Sedecha area about 4km away from asphalted highway road. Project activities could have adverse impacts on movement of vehicles, and pedestrians by blocking road access and delaying travel times. Since there is no high movement of vehicular traffic in the locality, traffic congestion to the receptor sensitivity is considered to be "low". The ***intensity*** of impact is also assessed to be ***low*** resulting into **minor** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. The Contractor should provide temporary road signs or notices to indicate ongoing works;

2. The Consultant and Contractor should choose traffic routes to reduce the impact in the neighborhood and any sensitive areas;

3. Ensure that vehicles for the construction work are operated only by qualified drivers;

4. All vehicles need to use only designated areas for parking, loading and unloading; and

5. All of the drivers have to obey the speed limit of vehicles and strictly stick to these limits particularly in the residential areas.

Risk of Accidents

Accidental risks associated with the project could happen due to trenches created for the construction. People in the area including children, domestic and wind animals could be affected by this. Vehicles and trucks transporting construction materials to the site may cause risk of traffic-related accidents especially if proper signals and safe speed limits are not put in place or not adhered to. Most of the access roads to the proposed site traverse some communities with a significant number of people. Traffic accidents would have significant social impact and likely to affect children, women, disabled, elderly people and livestock. Although some effects of the accidents for instance minor injuries may be reversible while some accident for example loss of human life are irreversible.

Impact Significance

The duration of the risk will be short-term occurring only during the construction phase. The receptor sensitivity is **Low** given that the number of people and animals along the roads and near the project area are lower while the intensity is **Medium** given the temporary nature of the construction activities. However, some of the impacts like loss of life or severe physical damages may be irreversible. The impact significance is thus assessed to be **Moderate**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. The contractor shall develop TMP (Traffic Management Plan) and incorporate proposed arrangements for traffic diversions with details of all necessary budget and signals;

2. Restrictions on hours of driving (including night time restrictions where sensitive receptors such as wild animals are affected) and timing of vehicle movements will be

emphasized to avoid busy periods in urban areas, particularly the start and end of school, market, and the working days;

3. No drivers or personnel under the influence of alcohol or any drug abuse shall be allowed onsite;

4. Travel speeds of construction vehicles along the road should be controlled by setting travel speeds and informing through signals; and

5. Fencing or placing obstacles to trenches and ditches to avoid interference and accident of wild and domestic animals and children.

Water Pollution

The FSTP is located near seasonal natural drainage lines. Unless potential contaminants of the construction phase properly managed, water pollution could happen. Contaminants introduced by construction could migrate into key receptors of the area like Kito and Awetu rivers and into the ground water. Hence, mismanagement of construction wastes might affect these rivers. Potential contaminants associated with the construction activities include sediments; fuels and lubricating oils; domestic wastes; welding wastes; wastes from paints and solvents; and corrosion inhibitors. For instance, oil and grease lubricants which are used for construction machineries contain hydrocarbons and heavy metals such as lead, chromium and cadmium which are known water pollutants. This aspect triggers the WB safeguard policy on Natural Habitats (OP/BP 4.04).

Impact Significance

The likelihood of the impact occurring is **high.** However, the extent of the impact remains local since the extent of the impact would be limited into 5km radius. The ***intensity*** of the impact is assessed to be ***medium*** where intensive sedimentation/flooding during the rainy season around Kito and Awetu river banks. The ***sensitivity*** of the receptor is also **medium** given the close proximity of the aquatic environment. This results in an impact significance of **moderate**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. All construction equipment will be kept in good operating condition to avoid oil, grease or fuel leakages that might contaminate the water bodies;

2. All routine maintenance of construction machinery and vehicles shall be carried out in a designated workshop or maintenance area with concrete hard standing surface and drainage to an oil interceptor;
3. Stockpile areas for materials such as sand, gravel, stone, and topsoil as well as overburden dumps will be located away from water courses and will be surrounded by perimeter or cut-off drains with sediment and other pollutant traps located at drain exits;
4. Fuel handling and oil spill measures must be implemented to prevent, control and address spill or leaks. Use trained personnel for fuel and oil handling;
5. All hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site and regular removal and disposal has to be done in accordance with the national hazardous waste management regulation; and
6. Construction has to be done mainly on the dry season to avoid sediment transport to the river;

Solid Wastes

Different types of solid wastes will be generated during construction phase. Some of the wastes are characterized as organic and others inorganic wastes. These solid wastes come from vegetation clearance, excavation of rock and soil works. Moreover, other activities that will generate related solid wastes include packaging waste, stones, wood, broken glasses, containers, wire cuttings, metal scrap, wooden planks, sharp objects (nails) etc. If solid wastes are not properly managed, they will lead to health and safety issues related to accidents. Therefore, this will have a major negative short and medium-term impact on solid waste collection in the area and the environment. Wastes from construction activities must be disposed-off at authorized places in compliance with government rules.

Impact Significance

The likelihood of the impact occurring is **high**. The duration of the impact will generally be medium term if the water body is once polluted. The extent of the impact will be local since the pollution remains in the local environment. The ***intensity*** of the impact is assessed to be ***Low*** where intensive sedimentation/ flooding during the rainy season around river bank and Lake. The ***sensitivity*** of the receptor is also **low**. This results in an impact significance of **Minor**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Prepare solid waste management plan and site prior to commencement of work including appropriate waste storage areas, collection and disposal schedule;
2. Apply integrated solid waste management system in the project site;
3. Materials from excavation of the ground and foundation works shall be reused for earthworks and landscaping;
4. Solid waste collection bins shall be placed at strategic locations within the site as collection centers to facilitate separation and sorting of the various types of wastes;
5. The solid wastes shall be properly segregated and separated to encourage recycling of some useful resource; and
6. The contractor and the client shall work hand in hand to facilitate sound solid waste management.

Hazardous Wastes

Some of the wastes generated at the construction phase are categorized as hazardous wastes. The waste materials such as paints, cement, adhesives, spills clean-up and contaminated materials and cleaning solvents will also be considered and managed as hazardous waste substances. Careless disposal of used containers of oil, lubricants, paint, and other toxic substances may pose health hazard. Plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. The storage and disposal of these waste substances have to be carefully performed and need to respect existing legal frameworks. Hazardous waste poses risks or would have major and irreversible effect on both human and environment if it is not handled, stored and disposed off according to engineering best practice. Hazards waste mishandling and uncontrolled disposal would have major health impacts for on-site workers, inhabitants in the project's area of influence, and people who get in contact with waste during transportation and disposal. The liquid form in particular, would cause soil contamination through direct contact or leaching and affect ground water quality through extended leaching. Thus, the proposed project would require an adequate waste management strategy, occupational health and safety strategy, and hazardous material safety plan.

Impact Significance

The probability of impact occurrence is medium. The ***sensitivity*** of receptors is assessed as "low" given that the project site is located around inhabited areas. The impact intensity is assigned ***low*** rating resulting in a ***minor*** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. The contractor has to develop mobile or temporary sanitary facilities in the construction site and in the vicinity of the project area which should be adequate at construction sites;
2. Hazardous wastes require segregating hazardous waste from the non-hazardous waste and keep it in designated storage facilities at project site;
3. Hazardous wastes such as paints, accessories and adhesives should be properly sealed, labeled, secured, kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation before transportation;
4. A hazardous waste label that has a "Hazardous Waste" mark on it must be placed on the container while still at the generation point;
5. The contractor will be required to prepare a hazardous waste management plan that will ensure proper collection, storage and transport to identified disposal site; and
6. Solid waste storage bins are provided at contractor's camp site and at the constructions sites and ensure they are collected or emptied in time. Depending on the rate of accumulation, waste collection is made at least once in 24 hours and done in such a way to minimize nuisance of smell and dust during collection.

Occupational Health and Safety (OHS) risks

Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, to ensure fair treatment, remuneration and working conditions. Construction sites are considered the most potentially hazardous and accident-prone parts of any working environment. Grinding, cutting, masonry, and construction workers will be exposed to risks of accidents and injuries. In addition to this, excavation machinery and trenches may pose accident risk to workers either when equipment is operated by inexperienced workers or when the equipment is in poor mechanical condition. OHS risks might be aggravated from insufficient medical capability, neglect of safety equipment, precautions and procedures in the construction site. So according to the safety and health standards every, employee shall have sound knowledge of their susceptibility to harm or injury in the workplace. In construction phase some causes of risks to OH (occupational health) are related to lack of safety signals at specific and required areas; improper storage/ handling and use of dangerous substances/ chemicals; inadequate lighting and ventilation in workplaces; lifting of heavy and sharp objects; and misuse of equipment and materials for functions they are not designed.

Impact Significance

Due to the high probability of occurrence and the high risk involved, accidents could cause considerable damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life and body injury are irreversible. The receptor *sensitivity* is considered **High** given that such impacts may be irreversible once they occur. The impact *intensity* is considered to be **medium** resulting in a **Major impact significance**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. The contractor shall prepare site specific health and safety management plan. Moreover, qualified health and occupational safety officer will be recruited by the contractor to oversee OHS matters on a daily basis;
2. All construction workers will be oriented on safe work practices and guidelines (OHS) first and ensure that they adhere to them. All must be fully aware and mentally prepared for potential emergency;
3. Workers must follow safety standards and use protective equipment to minimize hazards while trenching and excavating;
4. Appropriate signal will be used to warn staff and/ or visitors that are not involved in construction activities in dangerous places;
5. Contractor will provide first aid kits and ensure availability of trained first aiders within the construction site;
6. Contractor shall ensure that the campsite is fenced from external human, pet and wild animal interference and accidents and hygienically kept with adequate provision of facilities including waste disposal receptacles, sewage, firefighting and clean and safe water supply;
7. Contractor will ensure that its Code of Conduct is followed to regulate the performance and behavior of all workers. Personnel will only undertake tasks for which they are trained or qualified;
8. Contractor will prohibit the use of alcohol, or" *Chat*", which could adversely affect the ability of employees to perform the work safely or adversely affect the health and safety of other employees or the environment;
9. Adequate OHS personnel protective gears such as nose, ear mask and clothing will be provided to the employees and good camp management shall be provided. Some of PPE include:

Spread of Communicable Diseases (HIV/AIDs, STIs/STDs)

Job seekers and other service providers such as food vendors would come from different places and this might induce illicit contact and sexual relationships. The gatherings might result spread of communicable disease like sexually transmitted diseases (STDs) including HIV-AIDS. The project will employ more young workers at lower skill levels. These categories of workers are

prone to engage in high risks unsafe sexual activity and soliciting school girls, widows and others for sexual intercourse. This can cause unwanted pregnancy, breaks families and heighten risk of contracting STDs.

Illicit contact or sexual relationships can be short-term but have long-term and irreversible effects if HIV or Hepatitis-B were contracted. If this impact occurred, extent of disease spread would be local, national or international depending on origin and next destination of infected persons.

Impact Significance

Duration of the impact is short-term or long-term based the contracted person. In most of the cases when elderly and immune-compromised, people who have chronic illness like hypertension, diabetics, TB, cancer, HIV/AIDS etc, it is mostly deadly. Regarding HIV/AIDS duration of the impact will be short-term or long-term depending on whether HIV/AIDS is contracted or not. The extent of the impact will be local or national depending on the origin and final destination of the construction worker.

The likelihood of the impact occurring is medium if contractor do not adequately sensitize workers about responsible and safe behavior. The ***intensity*** of the impact is ***low*** given that the prevalence of HIV/AIDS is lower. ***Sensitivity*** of the receptor is rated ***high*** given that HIV/AIDS, if contracted, has a long-term effect. Therefore, impact significance is ***moderate***.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. As a contractual obligation, contractors shall be required to have HIV/AIDS management plan (responsible staff, action plan, sensitization budget and others) to implement during project construction;
2. The contractor shall prepare and enforce a Code of Ethical Conduct (CEC); in the camp to encourage respect for the local community and to maintain cleanliness of the camp at all times. The code of ethical conduct of workers has to be translated in to local language. The workers should quarterly be sensitized on the code of conduct;
3. All construction workers shall be orientated and sensitized about responsible sexual behavior in project communities. A safety, health and environment induction trainings shall be conducted to all workers, putting more emphasis on HIV/AIDS; and
4. The contractor shall prepare an HIV/AIDS awareness campaign plan to reduce risks of spreading of HIV/AIDS and other STDs as part of contractual obligation.

Physical Cultural Resources (PCRs)

PCRs can be movable or immovable objects, sites, structures or groups of structures having archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Although the ESIA team finds cemetery at the project sites, the site was shifted through discussions among ESIA team, the client and design consultant.

Consequently, impact on culture heritage is low. The ***intensity*** of the impact is low given that the project offsets the cemetery site. ***Sensitivity*** of the receptor is rated ***high*** because the implementation of the project brings long-term and serious impact on the relatives of the deceased**.** Therefore, impact significance is ***Major***.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Chance Finds Procedure (CFP) has to be followed when an event of buried PCRs being unexpectedly encountered or “chance find” during construction phase of the project and duly reported to respected bodies.

Rise of Deviance and Conflicts due to influx of labor

Many societies have social norms and expectations that guide behavior and promote social cohesion. While these norms can vary across cultures and communities, they generally promote respect for others, civility, and consideration for the common good. Adhering to these social norms can help maintain a harmonious and functional society, while violating them can lead to social disorder and conflict. Usually, it is common among construction workers to use money and gifts to flirt with young girls living in and around project sites. The community living around and all the way to FSTP site is predominantly Muslims and they view, even consenting romantic relationships, as deviance. Besides, if priority is not given to unemployed people especially for youths during hiring manual labors, members of local community could develop resentment toward construction workers and the project. This could be a potential source of conflict. Due to an influx of labor may violet some social norms of the society and may result in incidences of deviance, conflict and Gender-Based Violence on the job site or in the neighborhood. Hence, the contractors need to create awareness about appropriate social behaviors expected from their workers in interacting with local community.

Impact Significance

The probability of impact occurrence is medium. The ***sensitivity*** of receptors is assessed as **'**medium' given that the project is located in rural Kebele, close to green areas. The impact intensity is assigned ***very low*** rating resulting in a ***minor*** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Unskilled and skilled (if available) labor should be hired from the local population as far as possible to minimize on influx of foreigners into the community;
2. Effective communication and collaboration are key to addressing the challenges and opportunities presented by an influx of labor;
3. Local governments, businesses, and community organizations to work together to develop strategies for ensuring that workers are paid fair wages;
4. Any new employee will be required to sign a code of behavior; and
5. Awareness has to be given for the new comers about the importance of respecting the norms local community living in the project area.

9.4.3. Operation Phase

Air Emissions and Dust

During the operation phase there are no permanent emission sources except the stand-by diesel generators and dust and combustion emissions by vacuum trucks bringing the fecal sludge. Dust has the potential to cause significant nuisance to people living close to the site and may pose a risk to the health of those working on the site, or visiting the site. Dust can be a problem, especially during the warm summer period and during dry weather conditions. Given the scale and duration of operation of standby generators (emergency case only) and emissions from vacuum trucks, the comparatively small volumes of emission will be generated as a result. The impacts (contribution) of these emissions to cumulative air quality are considered to be of minor significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Dust and air emissions are inherent and cannot be completely eliminated. Few mitigation measures that can be applied at locality will be enough to overcome or significantly reduce the problem.

Mitigation Measures

1. Enforcing regulation of speed limit to a suitable speed (20 km/h) for all vehicles entering the village's boundaries;
2. Watering dusty roads during operation;
3. Using new vehicles and giving proper service to the trucks on regular basis to improve their fuel performance and reduce emission; and
4. Turn on generators only during power cut-offs period, implementing preventive maintenance program for vehicles and equipment and promptly repair vehicles with visible exhaust fume.

Air Pollution/ Odor

Fecal sludge treatment processes can generate foul odors and greenhouse gases such as methane and carbon dioxide which contribute to climate change and can also cause respiratory problems to nearby residents. Potential odor emissions from the FSTP at inlet works, grit chambers and from sludge drying beds and sludge storage area are issues of concern. Odors are the products of decomposition of organic matter. Within the FSTP, odors are expected to be generated near the inlet open channels and screens, oxidation ponds and sludge storage areas.

Different types of odors such as ammonia or organic might be produced especially from the handling of the liquid waste when it is unloaded from the waste trucks at the sorting area or when leachates are generated and accumulated in storage pond. The main constituent of these odors is hydrogen sulfide (H_2S) due to its relatively high concentration in wastewater. This can be carried by wind to nearby settlements, thus unpleasant breathing environments. In general, the impact of odor nuisance, though localized, can be immense magnitude, will be permanent and irreversible. Odor can be a significant problem for the people working in the waste treatment plant area and people living in the surroundings of the site.

Due to the location of waste treatment site and wind direction the probability of the odor reaching the Jimma town is less but there are rural settlements near and around the selected waste treatment sites that the pungent odor may reach to them.

Impact Significance

The above impacts will affect the communities neighboring the FSTP project, workers and road users. Given that the location of the project site general wind direction the likelihood of the impact is **low** and the extent is local. The intensity of impact is assessed as **low** given that intensive greenery can serve as wind break and sensitivity of the receptor becomes **medium**. The impact significance is therefore **moderate**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Plant indigenous trees at the perimeter of the project area with varying heights thereby forming wind breakers in addition to masonry or brick fences;
2. Project office must ensure proper operation to render unfriendly emissions during discharge of treated leachates due to overloading of the systems or negligence of the operators;
3. Odors generated by the facility can be controlled by use of suppressants and daily cleaning of the receiving areas;
4. Making sure that emergency water containers installed are full and work properly during water interruptions;
5. Good site management of the operation must regularly ensure to avoid foul odors that would arise from improper functioning;
6. Use of Ferric chloride (FeCl3) which will be added to control the generation of hydrogen sulfide (H2S) the main source of odor in the sludge digestion process;
7. Good maintenance of wastewater stabilization ponds, removal of accumulated debris and other solids at the inlets and outlets, removal of floating scum and floating macrophytes from the pond surface, and repair of embankment which are eroded by rainfall or damaged by rodents and livestock grazing;
8. The volumetric BOD loading should lie between 100-400 g/m3 in order to maintain anaerobic conditions and at the same time control odor release; and
9. Regular maintenance and monitoring shall be undertaken to avoid accidental surface runoff intrusions from the manholes of the drainage network which can overburden the facilities and cause foul odors.

Pollution to Water Sources, Channels and Swampy Lands

Improper treatment and disposal of fecal sludge can lead to the contamination of water sources including groundwater, surface water and swampy areas. This can lead to the spread of

waterborne diseases such as cholera and typhoid fever. It can also adversely affect aquatic biodiversity. There could be soil and groundwater pollution if the proposed FSTP facility does not work as intended. Inadequate operation could potentially damage aquatic life and the environment as a whole by having a negative effect on the local population and the water quality of ground and surface water for instance the water quality of Kito and Awetu rivers which are the major sources of water for the people and the town. If appropriate design and construction methods and improper effluent management are not strictly followed, there is a possibility of ground or surface water pollution from leachate. This can happen as a result of overloading of the system, breakdowns in operating machines, and vehicles and equipment failures that lead into deterioration of treatment efficiency.

Impact significance

The likelihood of the impact occurring is medium and its duration will generally be long term if the water body is once polluted. The *intensity* of the impact is assessed as ***medium*** given that the design and construction activity will be carefully done by the responsible bodies and the contractor. It is also believed that continuous monitoring mechanisms will be devised and in place to protect both ground and surface water from contamination. The extent of the impact is regional since the pollutants of surface and ground water may cover large area through ground water flow. The *sensitivity* of the receptor is **medium** given that once, it is contaminated treatment measures would take some time; resulting in **moderate** impacts.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Establish scientifically selected, professionally designed and constructed fecal sludge treatment system strictly following national and international building code standards;
2. Appropriate care has to be implemented throughout the project phases especially during construction phase of the project; and standard working procedures of building code has to be followed to avoid errors of construction that may finally lead to leakage and contamination of the ground, nearby surface water and swampy areas;
3. Institute periodic testing of surface water, hot springs and groundwater at the downstream of the project site; and sampling and testing quarterly or yearly as needed; and taking appropriate measures when signals of contamination is detected;

4. Develop standard monitoring procedure for the FSTP facility and surrounding environ. Monitoring the normal operating functions of the system and environmentally sensitive receptors like ground and surface waters found nearby and others;
5. Adopt standardized operational management plan of FSTP which will help to control possible contamination from the implementation of the project;
6. Strict monitoring on chemical and biological loads entering the FSTP and swift adjustment of treatment process to cater for overloads in effluent quality;
7. Incorporate the leachate drainage and collection networks as well as treatment mechanisms before moving to an offsite disposal area;
8. Work and ensure that the FSTP effluent quality complies with the national effluent discharge limit and as well the indicative wastewater quality standard values set out within the UWSSP II ESMF;
9. Protect the natural receptors technically through impermeable lower layer that prevents the leakage and infiltration of leachate from the facility;
10. Ensure proper preventive and routine maintenance inspections of the FSTP which will be vital to avoid breakdowns;
11. Regularly monitor the quality of effluent discharged from the septic tanks and FSTP against the ESMF effluent quality standard values; and
12. The dried-up sludge cake shall further be used as a raw material in the production of fuel products as briquettes or compost fertilizer.

Occupational Health and Safety Risks

FSTP can pose several occupational health risks to workers involved in the collection, transportation, and treatment of fecal sludge. Fecal sludge contains a variety of harmful pathogens including bacteria, viruses, and parasites which can cause serious infections and diseases. Untreated or improperly treated fecal sludge can lead to the spread of diseases and infections such as diarrhea, hepatitis, and parasitic infections. Workers' who would contact with fecal sludge directly or indirectly may be at risk of exposure to these pathogens. Moreover, fecal sludge treatment can generate dust and fumes which can cause respiratory problems and other health issues for workers who inhale them during the operational phases. Fecal sludge treatment facilities can be wet, slippery, and uneven which can increase the risk of slips, trips, and falls. Some fecal sludge treatment processes involve the use of chemicals such as disinfectants or cleaning agents which can be harmful if not handled properly.

Workers at the facilities might experience work related adverse health impacts, particularly during the operational and maintenance phases of the project. This is particularly observed if they do not have access to proper personal protective equipment or if they do not follow appropriate hygiene practices. So it is important to identify and mitigate occupational health risks associated with fecal sludge treatment to protect the health and safety of workers.

Impact Significance

Accidents could cause considerable damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life and bodily injury are irreversible. The receptor **sensitivity** is considered **medium** given that although such impacts may be irreversible once they occur; workers will get adequate trainings, provided with safety protective equipment and will have done similar work and have knowledge on how to avoid such incidences. The impact **intensity** is considered to be **medium** since project office will hire qualified experts who are aware of OHS measures; this gives rise to an impact of **moderate** significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Hire qualified and trained OHS and environmental health crew for regular monitoring and management FSTP;
2. To reduce the occupational risks, FSTP Workers has to use appropriate personal protective equipment, proper protection gears such as cut resistant and high visibility protective clothing, gloves, safety boots (foot wares) and providing appropriate respiratory protection equipment and face masks;
3. Develop and work on EHS Plan including health and safety measures to avoid accidents and injuries during work at the FSTP and implementing appropriate safety procedures;
4. Routine maintenance including the removal of garbage, screenings and grit; slashing around the embankments; and repair of the fence shall be done timely;
5. Providing appropriate training and equipment, and implementing appropriate ergonomic practices are important to minimize ergonomic hazards;
6. Provide accessible easy to reach first aid in and immediate medical care in case of injuries and accidents;
7. Vaccinate all labor working force at the site properly and provide regular health examinations access;
8. The FSTP should be fenced and signals put in place with security personnel to stop unauthorized people from accessing the site;
9. Exercise regular fumigation of the FSTP stores, administration rooms and similar places to minimize / kill disease vectors such as vermin, rodents and mosquitoes;
10. Maintain important information of emergency resources (e.g., fire extinguishers, first aid kits, emergency contacts of doctor, police men) in easily available place; and

11. Strict follow operation in accordance with manufacturer's instructions and Material Safety Data Sheets (MSDS) procedures to store all chemicals utilized in FSTP and storage must conform to compatibility restrictions.

Overflowing of Sludge into the Surrounding Residents

Overflowing of fecal sludge can occur when the volume of sludge exceeds the capacity of the treatment plant or storage facility. FSTP can pose accidental risks to the surrounding community if not properly designed, constructed, and operated. Poor management and working procedures could lead to sludge treatment overflowing with untreated sludge that could end up in highways, water sources or nearby resident areas and can contaminate nearby soil and water sources, and can potentially expose the surrounding flora, fauna and the community to harmful pathogens and pollutants. This can pose significant public health and environmental risks if not properly managed.

Impact Significance

The likelihood of the impact arising from improper management of overflowing of fecal sludge facilities is **medium** given that proper operational procedures are strictly followed and good maintenance of infrastructures are carefully done by the responsible bodies. Continuous monitoring mechanisms shall be devised and put in place to protect both ground and surface water from contamination. The extent of the impact is local since the pollutants of surface and ground water may cover 5km radius. The ***sensitivity*** of the receptor is **medium** given that once, it is contaminated treatment measures would take some resource and time; resulting in **moderate** impact significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Implementing appropriate safety procedures, such as proper ventilation and regular monitoring of gas levels;
2. Utilize emergency pumping and transportation to remove the excess sludge and transport it to a suitable treatment or disposal facility;
3. Use of additional pumping equipment and trucks, and work in collaboration and coordinated manner with local authorities and emergency services;
4. If emergency pumping and transportation is not feasible, consider temporary storage tanks /lagoons for accumulation of excess sludge is necessary;

5. To prevent overflowing of fecal sludge, it may be necessary to reduce the inflow of sludge into the treatment plant or storage facility; and
6. If overflowing of fecal sludge is a recurring problem, it may be necessary to upgrade the treatment plant or storage facility to increase its capacity. This can involve expanding existing facilities, constructing new facilities, or implementing alternative treatment technologies that are more efficient or have higher capacity.

9.4.4. Decommissioning Phase Negative Impacts

Decommissioning process has to be planned and implemented carefully and systematically. To minimize potential environmental and social risks, decommissioning a fecal sludge treatment plant requires careful planning, engagement with local stakeholders, and adherence to applicable regulations and best practices. Some of the project activities in the decommissioning phase include proper cleaning, decontamination of the project site, dismantling of equipment and metallic structures, demolishing of concrete structure, appropriate disposal of hazardous materials, and transportation of recyclable and reusable materials for site restoration into its original or pre-project condition. In fact, engagement of local stakeholders and authorities also required to ensure that the decommissioning process is socially and environmentally friendly.

Pollution of Soil and Water bodies

Decommissioning a fecal sludge treatment plant can result in the release of contaminants or pollutants into the surrounding environment, particularly if the plant has not been properly maintained or cleaned. This can result in soil and water contamination, as well as potential health risks to wildlife and humans. Spillage of contaminated water, sludge, chemicals, grease or oil is the main cause of soil contamination.

Impact Significance

The effect of the impact will be long-term and the extent of the impact will be on site. Since standardized working procedure followed, the intensity of the impact given for kind of the proposed facilities is **low** but the sensitivity of the receptor is rated **High** given that the impact to the natural environment is long term effect areas. Therefore, significance of the impact is rated as **moderate**.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation Measures

1. Conduct a site assessment to identify potential environmental and health risks associated with the plant. Consider review of plant records, site inspections, and environmental sampling to identify potential contaminants or pollutants that may need to be addressed;
2. Develop a decommissioning plan that outlines the steps and working procedures for decommissioning of the plant;
3. Engage local stakeholders including nearby residents, businesses, and community organizations in the decommissioning process to ensure their concerns are addressed;
4. Conducting environmental quality assessment of the water body and the treated wastewater prior to the commencement of the decommissioning;
5. Properly transporting all the hazardous wastes construction materials, chemical containers to a predetermined site for treatment, deposal or storage;
6. Topsoil and subsoil removed for decommissioning will be stored properly and used for backfilling and reinstatement;
7. Back-filling materials will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channeling;
8. Restore the project site into its original or to a condition that is acceptable to local stakeholders and regulatory authorities. Apply site grading, replanting vegetation, or other measures to restore the site to its natural state;
9. Monitor the decommissioned site to ensure that there are no potential environmental or health risks associated with the decommissioned plant; and
10. Monitor through regular sampling of soil, water, and air to identify any potential contaminants or pollutants, and can be used to ensure that the site is safe for future use.

Occupational Health and Safety and Air Pollution

Decommissioning a FSTP can pose several occupational risks to workers involved in the decommissioning process. Workers involved in decommissioning may be exposed to hazardous materials through inhalation, ingestion, or contact with the skin or eyes that can pose a risk to their health. Workers may also be exposed to biological hazards, such as harmful pathogens or infectious diseases, which can be present in fecal sludge. Moreover, workers might be exposed to physical hazards including accidents, falls, and crushing injuries when they are working in confined spaces, with heavy equipment, or at heights. Certain tasks such as heavy lifting or awkward postures, can pose ergonomic hazards to workers, which can result in musculoskeletal disorders.

Impact Significance

Accidents could cause considerable damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life and bodily injury are irreversible. The receptor **sensitivity** is considered **medium** given that although such impacts may be irreversible once they occur, the workers will get adequate trainings, provided with safety protective equipment and will have done similar work and have knowledge on how to avoid such

incidences. The impact **intensity** is considered to be **medium** since project office will hire qualified experts who are aware of OHS measures; this gives rise to an impact of **moderate** significance.

		Sensitivity of receptor			
		Very low(1)	Low (2)	Medium (3)	High (4)
Intensity of impacts	Very low (1)	Negligible (1)	Minor (2)	Minor (3)	Minor (4)
	Low (2)	Minor (2)	Minor (4)	Moderate (6)	Moderate (8)
	Medium (3)	Minor (3)	Moderate (6)	Moderate (9)	Major (12)
	High (4)	Minor (4)	Moderate (6)	Major (12)	Major (16)

Mitigation measures

To minimize these occupational health and safety risks, it is important to implement appropriate mitigation measures and procedures to protect workers. This can include:

1. Recruiting a qualified health and occupational safety officer who will oversee OHS matters on site;
2. Proper induction of the workers prior to decommissioning commencement. Providing training and education to workers on the proper use of equipment, PPE, and hygiene practices;
3. Implement ergonomic interventions, such as job rotation or use of assistive devices to reduce ergonomic hazards;
4. Provide appropriate, adequate PPE, such as gloves, masks, and protective clothing, OHS personnel protective gear to the employees; and
5. Implementing engineering controls, such as ventilation systems and barriers to reduce exposure to hazardous materials and physical hazards.

Socio-economic Impact

Decommissioning the fecal sludge treatment will halt the essential services the community was getting from this infrastructure. This may also have economic impacts on the surrounding community, particularly if the plant has been a source of employment or revenue. Decommissioning can result in job losses and reduced economic activity, which can have ripple effects on the local economy. Some unskilled workers will get temporary employment during the dismantling of the plants but the skilled workers that were hired to manage day to day operation of the FSTP are expected to lose their job during this phase.

Mitigation Measures

1. Based on their skill, knowledge, experience and interest, vulnerable community groups must be transferred to another secured job opportunity;
2. Provide financial assistance or grants to affected workers or businesses. This can involve providing loans, grants, or other forms of financial support to help workers or businesses transition to new opportunities;

3. Providing adequate provident fund or pension for those who want to retire;
4. Providing retraining programs in new industries or skills opportunities for workers who have been impacted by the process. Supporting workers to start their own businesses; and

10.ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

An Environmental and Social Management Plan (ESMP) is a formal document that outlines the measures and actions that will be taken to mitigate potential environmental and social impacts associated with a project or activity. The ESMP summarizes the identified potential impacts, mitigation measures for adverse impacts, expected outcomes, indicators, monitoring and evaluation. The ESMP report identifies parties responsible for management and monitoring actions, associated costs, indicators and reporting.

The ESMP is a critical component of ESIA because it takes the project-specific environmental and social safeguards as integral part of the project execution. The purpose of an ESMP is to ensure that potential environmental and social risks and impacts associated with a project or activity are identified, assessed, and effectively managed. The ESMP establishes a comprehensive framework that outlines the measures and actions that will be taken to minimize or eliminate negative impacts on the environment and local communities, while promoting positive environmental, social and economic outcomes.

Adverse Impact	Mitigation measures	Responsibility			
		Execution body	Regulatory body	Time frame	Budget in birr
	Phase: pre-construction				
Involuntary displacement, Land Acquisition & Property damage	For FSTP: Conducting ARAP by Jimma town administration and JTWSSSE prior to any civil work.	JTWSSSE & Jimma town mayor office	MOWE	Once	
	Tenable compensation paid both in cash & kind to the PAHs.	JTWSSSE & Mayor office	Jima Town Environmental protection office (JTEPO)	During ARAP	To be determined by the ARAP
	Vulnerable community groups like female headed HHs, and elderly must get priority during compensation study, land delivery and post livelihood rehabilitation works.	JTWSSSE & municipality	JTEPO	During ARAP	To be determined by the ARAP
	Induction about the project for the nearby community at least once during construction phase	JTWSSSE	JTEPO	Every 1st quarter	50,000
	Construction phase				
Water Resource Pollution	All construction equipment will be kept in good operating condition to avoid oil, grease or fuel leakages that might contaminate the water bodies.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Poorly maintained machinery will not be allowed to operate on site	Contractor	Jima transport office	Every quarter	10,000
	Stockpile areas for materials such as sand, gravel, stone, and topsoil, as well as overburden dumps will be located away from water courses	Contractor	JTWSSSE & JTEPO	Every month	10,000
	Fuel handling and oil spill measures will be implemented to prevent and control spill or leaks. Fuel and oil handling will be assigned to trained personnel and procedures for fuel storage, operation of mobile fuel tankers and refueling areas will be well defined	Contractor	JTWSSSE & JTEPO	Every month	100,000
	All hazardous wastes including materials soiled with hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site for regular removal	Contractor	JTWSSSE & JTEPO	Every month	100,000
	A Spill Kit will be maintained onsite to clean-up any accidental spills.	Contractor	JTWSSSE & JTEPO	Every month	100,000

Removal of Vegetation	Planting adequate number of trees (10 seedlings per each of the removed tree) around the FSTP site to establish a buffer zone, improve local microclimatic conditions and enhance the image of the surrounding and serve as a wind break	Contractor	JTWSSSE & JTEPO	Every month	100,000
	Topsoil and subsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse elsewhere or for backfilling and reinstatement.	Contractor	JTWSSSE & JTEPO	Every month	100,000
Soil erosion	Contractor will avoid use of old and damaged equipment's, which can most likely lead to oil, grease and fuel leakages.	Contractor	JTWSSSE & JTEPO	Every month	
	During reinstatement, the trench back-fill material will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channeling.	Contractor	JTWSSSE & JTEPO	Every month	200,000
Land use Pattern Alteration	Recreation of a stable landform that mirrors the pre-disturbed condition.	Contractor	JTWSSSE & JTEPO	Every month	100,000
	Upon completion of subsoil and topsoil reinstatement, disturbed areas will be inspected jointly by the contractor, project office.	Contractor & JTWSSSE	JTWSSSE & JTEPO	Every month	100,000
	All wastes generated during site preparation and construction will be transported to an authorized disposal area.	Contractor	JTWSSSE & JTEPO	Every month	200,000
	The contractor develops mobile or temporary sanitary facilities in the construction site and in the vicinity of the project area.	Contractor	JTWSSSE & JTEPO	Every month	100,000
Improper hazardous and solid Management	Hazardous wastes such as paints, Asbestos Cement (AC) pipes and accessories and adhesives should be properly sealed, labeled, secured, kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation.	Contractor	JTWSSSE & JTEPO	Every month	200,000
	The wastes are properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated material can be used as backfills.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Washing shall not be done at working areas but should be restricted to workers' camps and on paved areas to control runoff.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Trucks will be covered during haulage of construction materials to reduce on spillage of materials and wherever dust suppression is necessary, water will be sprayed over dusty areas.	Contractor	JTWSSSE & JTEPO	Every month	100,000

Air pollution	Travel speeds of construction vehicles along the road (especially at public & business centers) should be controlled using signals and setting travel speeds not exceeding 30km/h. Carriage ways shall also be regularly watered during dusty conditions. (to contain dusts)	Contractor	JTWSSSE & JTEPO	Every month	100,000
	All surfaced roads shall be subject to road cleaning and dust control mechanisms through traffic management techniques of the contractor shall be implemented.	Contractor	JTWSSSE & JTEPO	Every month	100,000
	A maintenance program for equipment and vehicles will be implemented, to ensure air emissions like particulates, SOx and NOx are minimized.	Contractor	JTWSSSE & JTEPO	Every month	50,000
Disruption to Public Utilities	All road closures for the construction of the FSTP shall be separately notified and agreed with the transport and traffic office.	Contractor	JTWSSSE & JTEPO	Every month	
	Prior to commencement of any civil works, the contractor must obtain from the utilities agencies details of all utilities locations within 50m of the works.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Damage to any utility at a defined site shall be restored and maintained to the satisfaction of the responsible agency at the contractor's cost. Damage to utilities not defined prior to construction, despite the contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the contractor.	Contractor & JTWSSSE	JTWSSSE & JTEPO	Every month	100,000
	Disruptions to public access shall be identified in the Contractor's Traffic Management Plan (CTMP), under which suitable notice of intending delays and closures are given to all concerned parties and approved prior to commencing work.	Contractor & JTWSSSE	JTWSSSE & JTEPO	Every month	20,000
Traffic congestion & disruption of communication routes	Access to or from an individual property should not be closed for more than 2 hours.	Contractor	JTWSSSE & JTEPO	Every month	100,000
	Vehicular access to and from hospitals, police stations and fire stations shall be maintained through the use of steel road plates over open trenches. Pedestrian access to schools, health facilities, and other premises frequently accessed by the public will be maintained with the use of walking boards.	Contractor	JTWSSSE & Jima town traffic office	Every month	100,000
	Backfilling, installation of temporary reinstatement shall be completed within 2 weeks after trench excavations. It should not extend 2 weeks after excavation.	Contractor	JTWSSSE & JTEPO	Every month	

Risk of Accidents	All workers will undergo an OHS and environmental induction before commencing work on site.	Contractor	JTWSSSE & JTEPO	Every month	70,000
	The contractor shall incorporate proposed arrangements for traffic diversions in the form of a Traffic Management Plan in the bid document / agreements, with details of all necessary budget and signals.	Contractor	JTWSSSE & Jima town traffic office	Every month	100,000
	Restrictions on hours of driving (including night time restrictions where sensitive receptors may be affected) and timing of vehicle movements will be emphasized to avoid busy periods in construction areas, particularly the start and end of school and the working day.	Contractor	JTWSSSE & JTEPO	Every month	5,000
	No drivers or personnel under the influence of alcohol or any drug abuse will be allowed onsite.	Contractor	JTWSSSE & Jima town traffic office	Every month	10,000
	Travel speeds of construction vehicles along the road especially at public and business centers like schools, hospitals and market area should be controlled using signals, flagmen and setting travel speeds not exceeding 30km/h.	Contractor	JTWSSSE & Jima town traffic office	Every month	
	Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment.	Contractor	JTWSSSE & Jima town traffic office	Every month	50,000
Noise pollution	Contractor will be careful when selecting the working equipment to avoid use of old or damaged ones; besides check every day proper functioning of all the machines on duty.	Contractor	JTWSSSE & JTEPO	Every month	10,000
	All generators and heavy duty equipment will be insulated or placed in enclosures to minimize disrupting ambient noise levels.	Contractor	JTWSSSE & JTEPO	Every month	60,000
	During periods of off work time, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis.	Contractor	JTWSSSE & JTEPO	Every month	
	No construction activities of the FSTP near religious institutions will take place on Sunday/Fridays (depending on the kind of religious institution) and holidays.	Contractor	JTWSSSE & JTEPO	Every month	
	No construction activities will take place at night for sites where the closest residence is within less than 100m from the project site.	Contractor	JTWSSSE & JTEPO	Every month	
Occupati	A qualified health and occupational safety officer will be recruited by the contractor to oversee OHS matters on a daily basis.	Contractor	JTWSSSE & JTEPO	Every month	140,000

onal Health and Safety Risks	All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them.	Contractor	JTWSSSE & JTEPO	Every month	30,000
	Appropriate signal will be used to warn staff and/ or visitors that are not involved in construction activities in dangerous places.	Contractor	JTWSSSE & JTEPO	Every month	10,000
	Personnel will only undertake tasks for which they are trained or qualified.	Contractor	JTWSSSE & JTEPO	Every month	
	Communication line will be ensured between workers and drivers of heavy equipment.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Adequate OHS personnel protective gear will be provided to the employees.	Contractor	JTWSSSE & JTEPO	Every month	100,000
Spread of STDs and by Workers	As a contractual obligation, contractors shall be required to have an HIV/AIDS management plan (responsible staff, action plan, sensitization budget and others) to implement during project construction.	Contractor	JTWSSSE & JTEPO	Every month	80,000
	All construction workers shall be orientated and sensitized about responsible sexual behavior in project communities.	Contractor	JTWSSSE & JTEPO	Every month	50,000
	Priority should be given to unemployed members of local community especially for youths and women.	Contractor	JTWSSSE & JTEPO	Every month	
Polluting Water Resources	Establishing water & wastewater quality testing laboratory for the regular monitor of the effluent	Contractor	JTWSSSE & JTEPO	Every month	100,000
	JTWSSSE should ensure adequate operation and management of all the project components to avoid leakages and discharge of inadequately treated effluent.	JTWSSSE	JTWSSSE & JTEPO	Every month	20,000
	Phase : Operation				
Water pollution	The treated wastewater should be discharged into the nearby water body		JTWSSSE & JTEPO	Every quarter	
	Leakages from treatment ponds & sludge drying beds	JTWSSSE	JTWSSSE &	Every month	100,000
	Beds will be avoided or minimized by regular monitoring & maintenance of the network.		JTEPO		
	A maintenance crew will be put in place to monitor and repair the FSTP immediately after damage or leakage occurs to avoid accidental surface runoff intrusion into water points.	JTWSSSE	JTWSSSE & JTEPO	Every month	

	Maintain, repair and refuel vehicles and machinery at an offsite garage or workshop.	JTWSSSE	JTWSSSE & JTEPO	Every month	
	A quarterly laboratory quality tests for effluent and receiving water resources will be done to ensure that the quality of effluent meets the national discharge standards or requirements, and wastewater quality data base should be generated.	JTWSSSE	JTEPO	Every month	100,000
	8. Awareness campaign will be launched every half a year for all the beneficiaries about proper operation and maintenance of sanitation facilities put in place.	JTWSSSE	JTEPO	Every month	100,000
	9. Emergency telephone lines should be established to enable the public to immediately notify the JTWSSSE of any damages to the FSTP and other components of the network to ensure timely response and repair of such damages.	JTWSSSE	JTEPO	Every month	250,000
Improper Management of Solid Waste	The JTWSSSE should ensure adequate operation and management of the project to avoid improper management of solid waste.	JTWSSSE	JTEPO	Every month	
	The dried sludge should be used as organic fertilizer**.**	town's office of urban agriculture	JTEPO	Every month	
	Adequate bins will be provided to prevent access by vermin at the FSTP treatment plant.	JTWSSSE	JTEPO	Every month	130,000
Land Degradation and Soil Erosion	The project staff will be trained for proper management of screenings and sludge to avoid soil contamination.	JTWSSSE	JTEPO	Every month	100,000
	The dried sludge shall be removed regularly from the sludge drying area and shall be given to local interested farmers as soil conditioner (fertilizer) and should not burnt/ nor end up in landfill.	Urban agriculture office	JTEPO	Every month	20,000
	Structures will be made watertight during maintenance to avoid intrusion of storm water into the system and cutoff drains provided to FSTP to control flooding.	JTWSSSE	JTEPO	Every month	
	Follow- up and regular maintenance will be taken to avoid accidental surface runoff intrusion from the outside of the system, which can overburden the FSTP & cause discharge of partially or untreated sludge onto land.	JTWSSSE	JTEPO	Every month	100,000
	5. Periodic tests will be done to assure the quality of effluent and treated sludge, to avoid partially treated wastewater and sludge to reach the soils.	JTWSSSE	JTEPO	Every quarter	120,000

Landscape and Land Use Impacts	During operation water impounded in derelict borrow pits should be immediately removed and the site should be restored to its natural conditions to avoid breading of mosquitoes, vermin and other insects.	JTWSSSE	JTEPO	Every quarter	100,000
	Restoration of borrow pits as close pre-project maintenance conditions as possible will be done immediately after use in cases where they are opened for maintenance and repair of the project. Native vegetation must be used for re-seeding the excavated site.	JTWSSSE	JTEPO	Every quarter	100,000
	During maintenance or replacement, reinstatement of the previous condition will be done in such a way that the return of the visual integrity of the landscape as closely as possible to its previous condition.	JTWSSSE	JTEPO	Every quarter	200,000
	Where sections of the road and other public amenities are cut, these will be reinstated immediately after maintenance activities of any of the project components.	JTWSSSE	JTEPO	Every quarter	200,000
Air Pollution	The perimeter of the proposed sites will be vegetated with trees, bushes, grasses and plants of varying heights thereby forming wind breakers in addition to a chain link fences.	JTWSSSE	JTEPO	Every quarter	**200,000**
	JTWSSSE must ensure adequate operation and management of the FSTP facilities to avoid foul odors that would arise from improper management of the facilities. JTWSSSE should develop an Operations and Maintenance Manual for the FSTP to guide staff on how to run it effectively.	JTWSSSE	JTEPO	Every quarter	300,000
	JTWSSSE needs to ensure adequate operation and management of the facilities to avoid obnoxious smell.	JTWSSSE	JTEPO	Every quarter	
	Facultative ponds need to be commissioned before anaerobic ponds to avoid odor nuisance when anaerobic pond effluent discharges into an empty facultative pond.	JTWSSSE	JTEPO	Every quarter	
	Anaerobic ponds must be commissioned by filling them with raw sludge and seeded with sludge from a conventional sludge treatment plants. After filling and seeding, the pond should gradually be loaded up to the design-loading rate.	JTWSSSE	JTEPO	Every quarter	
Occupational Health	Qualified and trained OHS and environmental health Expert must be hired for regular community sensitization, capacity development, and management and monitoring of social and environmental issues.	JTWSSSE	JTEPO	Every quarter	

and Safety Risks	Adequate OHS personnel protective equipment's (PPE) gears shall be provided to the employees.	JTWSSSE	JTEPO	Every quarter	
	Routine maintenance including but not limited to facilities involved in the removal of garbage and grit screenings, slashing around the embankments & repair damages to the fence.	JTWSSSE	JTEPO	Every quarter	
	The site needs to be fenced and signalization put in place with security personnel to stop unauthorized people from accessing the site.	JTWSSSE	JTEPO	Every quarter	
	The manufacturer's instructions and Material Safety Data Sheets (MSDS) must be followed for the storage of all chemicals used in sewage treatment.	JTWSSSE	JTEPO	Every quarter	
	Regular fumigation of the plant will be undertaken to kill disease vectors such as vermin and mosquitoes.	JTWSSSE	JTEPO	Every quarter	300,000
	An Accident Log will be maintained onsite to register all injuries and to investigate their causes.	JTWSSSE	JTEPO	Every quarter	5,000
	8. Emergency resources (e.g., fire extinguishers, stocked First Aid kits, and Emergency Contacts, Doctor and policy men on Call).	JTWSSSE	JTEPO	Every quarter	300,000
	Phase : Decommissioning				
Pollution of Soil and Water bodies	Properly transporting all the metallic, AC pipes, and chemical containers to a predetermined site for deposal or storage.	Contractor	JTWSSSE & JTEPO	Every month	
	Topsoil and subsoil removed for decommissioning will be stored properly and used for backfilling and reinstatement.	Contractor	JTWSSSE & JTEPO	Every month	
	Back-filling materials will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channeling.	Contractor	JTWSSSE & JTEPO	Every month	
	Conducting environmental quality assessment of the water body and the treated fecal sludge prior to the commencement of the decommissioning.	JTWSSSE	JTWSSSE & JTEPO	Every month	50,000
Occupational Health Safety and Air pollution	A qualified health and occupational safety officer will be recruited to oversee OHS matters on site.	JTWSSSE	JTWSSSE & JTEPO	Every month	
	Proper induction of the workers prior to work decommissioning commencement.	JTWSSSE	JTWSSSE & JTEPO	Every month	200,000
	Adequate OHS personnel protective gear will be provided to the employees.	Contractor	JTWSSSE & JTEPO	Every month	80,000
	Trucks will be covered during haulage of materials to reduce dust emissions.	Contractor	JTWSSSE & JTEPO	Every month	

Socio-economic impact	Providing adequate provident fund or pension those who want to retire	JTWSSSE and Mayor office	JTWSSSE & JTEPO	Every month	JTWSSSE & JTEPO
	Local young workers, particularly the vulnerable groups, need to be given priority during hiring in position commensurate with their skill, interest and experience	JTWSSSE and Mayor office	JTWSSSE & JTEPO	Every month	
	Sub-total in Birr				7,130,000

Table 27) Summary of Environmental and Social Management Plan

11. MONITORING PLAN

A monitoring plan is a formal document that outlines the procedures and methods for monitoring the environmental and social performance of a project or activity. The monitoring plan is a key component of an ESMP and helps to ensure that the mitigation measures outlined in the ESMP are effective and that potential environmental and social impacts are identified and addressed in a timely manner.

11.1. Environmental Monitoring and Evaluation

Environmental monitoring is one of the required activities in a given project. It is important to assess the status of environment during project operation, identify unexpected changes, and measure the effectiveness of the operational procedures, to confirm statutory and mandatory compliance. Hence, monitoring of identified mitigation measure is a key for sound environmental and social safeguard management, project sustainability and community sense of ownership development. It can also give clues for environmental audit planning for unforeseen adverse impacts management. The objective of environmental monitoring is to design a regular plan for the proper and timely execution of the mitigation measures and further helps evaluate and design further remedial actions for unforeseen events.

The JTWSSSE should establish both compliance and effects monitoring plans starting from pre-construction phase. The compliance monitoring mechanism will ensure that the various project concerned institutions are implementing the provisions of the ESMP effectively due date. Moreover, with the knowledge of baseline conditions, the environmental monitoring program will serve as an indicator for any deterioration in environmental conditions due to operation of the project, to enable taking up suitable mitigation measures in time to safeguard the environment. The effects monitoring part will check on the impacts which the project is causing on the receiving physical, biological, and social environment by regular measuring of indicators. The results will be fed back to project management body for evaluation and curative actions. The following Table 21 below examines the extent to which the adverse impacts identified can be controlled through the adoption of mitigation measures.

Table 28) Environmental monitoring plan for Jimma City

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
Involuntary displacement, Land Acquisition & Property damage	For FSTP: Conducting ARAP by independent consultant prior to any civil work.	ARAP document and Number of PAHs	Measurement	MoWE & WB	One –Off	Pre-Construction phase	determined during ARAP
	The date the consultant introduces itself to the PAHs for ARAP will be taken as Cut-off date.	Recorded date of cutoff	Document review	MoWE & WB	One –Off	Pre-Construction phase	To be determined by the Consultant
	Tenable compensation paid both in cash & kind to the PAHs.	Documentation and PAHs witness	Document review and interview	JTWSSSE , MoWE	One –Off	Pre-Construction phase	determined by the ARAP
	Vulnerable community groups like female headed HHs, and elderly must get priority during compensation study, land delivery and post livelihood rehabilitation works.	Documentation and PAHs witness	Document review and interview	JTWSSSE , MoWE, Local EPA, MoWE	One –Off	Pre-Construction phase	To be determined by the ARAP
	Induction about the project for the community every year at least once during construction phase.	Induction plan, material and report	Document review and interview of community	JTWSSSE , Local EPA, MoWE	once per year	Construction phase	50,000
Water Resource Pollution	All construction equipment will be kept in good operating condition to avoid oil, grease or fuel leakages that might contaminate the water bodies. (Not more than 10 years)	Age of vehicles/machines, frequency of maintenance and presence of malfunctioning parts	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Pre-construction	Construction phase	200,000
	Poorly maintained machinery will not be allowed to operate on site. (Not more than 10 years)	Age of vehicles/machines, frequency of maintenance and presence of	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Every month	Construction phase	10,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
		malfunctioning parts					
	Stockpile areas for materials such as sand, gravel, stone, and topsoil, as well as overburden dumps will be located away from water courses.	Measurement from water courses	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Every month	Construction phase	10,000
	Fuel handling and oil spill measures will be implemented to prevent and control spill or leaks. Fuel and oil handling will be assigned to trained personnel and procedures for fuel storage, operation of mobile fuel tankers and refueling areas will be well defined.	Presence of labelled and defined areas	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Every month	Construction phase	100,000
	All hazardous wastes including materials soiled with hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site for regular removal.	Designation of araes for these materials	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Throughout the construction phase	Construction phase	100,000
	A Spill Kit will be maintained onsite to clean-up any accidental spills.	Presence of spill kit	Observation & document	JTWSSSE , Contractor, Local EPA, MoWE	Every quarter construction phase	Construction phase	100,000
Removal of Vegetation	Planting adequate number of trees (in a way it would over-compensate the number of lost trees) around the FSTP site to establish a buffer zone, improve local microclimatic conditions and enhance the image of the surrounding and serve as a wind break	Hectares of the FSTS covered with trees, bushes and vegetation	Area re- vegetated	Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Construction phase	Construction phase	200,000
	Topsoil and subsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse elsewhere or for	Documented verification of top & subsoil reused for backfilling, leveling & greening	Observation & document	JTWSSSE , Contractor, Local EPA,	Throughout the construction phase	Construction phase	100,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	backfilling and reinstatement.	Landscape recovery					
Soil erosion	Contractor will avoid use of old and damaged equipment's, which can most likely lead to oil, grease and fuel leakages.	Age of vehicles/machines, frequency of maintenance & presence of malfunctioning parts	Documentation and site observation	Jimma Municipality, JTWSSSE , Contractor, Local EPO,	Throughout the construction phase	Construction phase	
	During reinstatement, the trench back-fill material will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channeling.	Presence of compacted backfill	Visual inspection of the site and documentation	JTWSSSE, Local EPO, Contractor	Throughout the construction phase	Construction phase	100,000
Land use Pattern Alteration	Recreation of a stable landform that mirrors the pre-disturbed condition.	Visual appearance of the landscape	Observation & document	Jimma Municipality, JTWSSSE	Throughout the construction phase	Construction phase	100,000
	Upon completion of subsoil and topsoil reinstatement, disturbed areas will be inspected jointly by the contractor and project office.	Documented Inception	Observation & document	Jimma Municipality, JTWSSSE ,	End of construction phase	Construction phase	100,000
	All wastes generated during site preparation and construction will be transported to an authorized disposal area.	No complaint from communities around the site. No litter at project site and complaints from Authorities	Observation & document	Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	400,000
	The contractor develops mobile or temporary sanitary facilities in the construction site and in the vicinity of the project area.	Presence of sanitary facilities that are well-maintained	Observation & document	Jimma Municipality, JTWSSSE , Contractor, Local EPO,	Pre-construction phase	Construction phase	100,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
Improper hazardous and solid Management	Hazardous wastes such as paints, asbestos cement (AC) pipes and accessories and adhesives should be properly sealed, labeled, secured, kept inside a locked fenced area to prevent access by unauthorized personnel, and covered to prevent water accumulation.	Presence and condition of the storage facility records of waste disposal; proof of waste delivery and safe disposal	Observation & document	Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	100,000
	The wastes are properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated material can be used as backfills.	Waste management plan, presence of waste segregation	Observation & document	Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Pre-construction phase	Construction phase	150,000
	Washing is not done at working areas but should be restricted to workers' camps and on paved areas to control runoff.	Prepared washing site at the camp	Observation & document	JTWSSSE , Contractor, Local EPO,	Entire construction phase	Construction phase	50,000
	Trucks will be covered during haulage of construction materials to reduce on spillage of materials and wherever dust suppression is necessary, water will be sprayed over dusty areas.	Workers and local community opinions and suggestions on the contractor's efforts to minimize dust nuisance	Observation & document	Jimma Traffic /Transport Office, Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	100,000
Air pollution	Travel speeds of construction vehicles along the road (especially at public & business centers) should be controlled using signals and setting travel speeds not exceeding 30 km/h.	Errected signals, number of accidents and/ or complaints reported	Observation & document	Jimma Traffic /Transport Office, Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	100,000
	All surfaced roads shall be subject to road cleaning and not surfaced roads to dust suppression through traffic management techniques of the contractor.	Nearby community opinions and documented reports	Observation & document	Jimma Traffic /Transport Office, Jimma, Jima EPO,	Entire construction phase	Construction phase	100,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	A maintenance program for equipment and vehicles will be implemented, to ensure air emissions like particulates, SOx and NOx are minimized.	Air quality analyses, vehicle & equipment maintenance schedule. Documented verification of equipment & vehicle maintenance	Air quality parameters analyzed Observation & document	Jimma Traffic /Transport Office, Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	50,000
Disruption to Public Utilities	All road closures for the construction of the FSTP shall be separately notified and agreed with the transport and traffic office.	Information communicated with the municipality	Observation & document	Jimma town Traffic Office, Jimma Municipality, Jima EPO,	Entire construction phase	Construction phase	
	Prior to commencement of any civil works, the contractor must obtain from the utilities agencies details of all utilities locations within 50m of the works.	Mapped and documented verification of all utilities within 50m radius	Type and number of utilities Observation & document	All affected utility offices, JTWSSSE , Contractor,	Pre-construction	Construction phase	50,000
	Damage to any utility at a defined site shall be restored and maintained to the satisfaction of the responsible agency at the contractor's cost. Damage to utilities not defined prior to construction, despite the contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the contractor.	Documented evidence for no any damages incurred; when they happen, remedial measures implemented to the satisfaction of the utility agency	Observation & document	All affected utility offices, JTWSSSE , Contractor,	Entire construction phase	Construction phase	100,000
	Disruptions to public access shall be identified in the Contractor's Traffic Management Plan (CTMP), under which suitable notice of intending delays and closures are given to all concerned parties and approved prior to commencing work.	CTMP	Observation & document	All affected utility offices	Pre-construction	Construction phase	20,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
Traffic congestion and Disruption of private Communication Routes	Where access to or from an individual property should not be closed for more than 2 hours.	Documented verification and property owners opinions	Observation & document	Jimma Municipality, JTWSSSE , Contractor, Local EPA,	Entire construction phase		100,000
Risk of Accident	All workers will undergo an OHS and environmental induction before commencing work on site.	Documented induction material and plan	Observation & document	JTWSSSE , Contractor, Local EPA,& social affairs office	Entire construction phase	Construction phase	70,000
	The contractor shall incorporate his proposed arrangements for traffic diversions in the form of a Traffic Management Plan in the bid document, with details of all necessary budget and signals.	Traffic Management Plan with budget indications	Observation & document	Jimma Traffic /Transport Office, JTWSSSE , Contractor, Local EPA,	Pre-construction	Construction phase	100,000
	Restrictions on hours of driving (including night time restrictions where sensitive receptors may be affected) and timing of vehicle movements will be emphasized to avoid busy periods in the FSTP construction area), particularly the start and end of school and the working day.	Traffic Management Plan	Observation & document	Jimma Traffic /Transport Office, JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	5,000
	No drivers or personnel under the influence of alcohol or any drug abuse will be allowed onsite.	Traffic Management Plan & an especial induction plan for drivers	Observation & document	Jimma town Traffic Office	Entire construction phase	Construction phase	10,000
	Travel speeds of construction vehicles along the road especially at public and business centers like schools, hospitals and market area should be controlled using signals, flagmen and setting travel speeds not exceeding 30km/h.	Documented evidence of signals and speed limit put in place	Observation & document	Jimma town Traffic Office, JTWSSSE , Jima EPO	Entire construction phase	Construction phase	
	Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment.	Ethiopia Ambient Environment standard (2003)	Observation & document	Jimma Town EPO,	Entire construction phase	Construction phase	50,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
Noise pollution	Contractor will be careful when selecting the working equipment to avoid use of old or damaged ones; besides check every day proper functioning of all the machines on duty.	Site noise level testing, workers reflections	Observation & document	JTWSSSE , Jimma town EPO	Entire construction phase	Construction phase	
	All generators and heavy duty equipment will be insulated or placed in enclosures to minimize disrupting ambient noise levels.	Site inspection & workers reflections	Observation & document	JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	
	During periods of off work time, equipment will be switched off whenever possible. A limited number of construction activities may have to continue on a 24-hour basis.	Site noise level test inspection & workers reflections	Observation & document	JTWSSSE , Contractor, Local EPA,	Entire construction phase	Construction phase	
	No construction activities of FSTP near religious institutions will take place on Sunday (for churches), Friday (for Mosques) and public holidays.	Site noise level test & reflections from religious institution's governing body	Observation & noise level test, document	JTWSSSE	Entire construction phase	Construction phase	
	No construction activities will take place at night for sites where the closest residence is within less than 100m from the project site.	Site noise level test & residents reflections	Observation & document	JTWSSSE	Entire construction phase	Construction phase	
Occupational Health and Safety Risks	A qualified health and occupational safety officer will be recruited by the contractor to oversee OHS matters on a daily basis.	Presence of qualified OHS officer	Observation & document	JTWSSSE	Throughout construction	Construction phase	240,000
	All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them.	Induction plan & records of verification of workers' orientation	Observation & document	JTWSSSE	Pre-construction phase	Construction phase	30,000
	Appropriate signal will be used to warn staff and/ or visitors that are not involved in construction activities in dangerous places.	Presence of signals	Observation & document	JTWSSSE , Jima EPO	Pre-construction phase	Construction phase	10,000
	4. Personnel will only undertake tasks for which they are trained or qualified.	Verification documents for personnel	Observation & document	JTWSSSE	Entire construction	Construction phase	

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	Communication line will be ensured between workers and drivers of heavy equipment.	Verification of creation of communication routes	Observation & document	JTWSSSE , Contractor, Local EPA,	Entire construction	Construction phase	50,000
	Adequate OHS personnel protective gear will be provided to the employees.	Budgeted verification of protective gears	Observation & document	JTWSSSE , Contractor, Local EPA,	Entire construction	Construction phase	200,000
Spread of STDs and Social Misdemeanor by Workers	As a contractual obligation, contractors shall be required to have HIV/AIDS management plan (responsible staff, action plan, sensitization budget and others) to implement during project construction.	HIV/AIDS management plan	Observation & document	Jimma City Health bureau, JTWSSSE , Contractor, Local EPA	Entire construction phase	Construction phase	80,000
	All construction workers shall be orientated and sensitized about responsible sexual behavior in project communities.	Interview with workers and induction manual in place	Observation & document	Jimma City Health bureau, JTWSSSE , Contractor, Local EPA	Entire construction phase	Construction phase	50,000
	Priority should be given to unemployed members of local community especially for youths and women.	Number of women employed	Surveying employment	Local EPA JTWSSSE	Entire construction phase	Construction phase	
Polluting Water Resources	JTWSSSE should ensure adequate operation and management of all the project components to avoid leakages and discharge of inadequately treated effluent.	Quarterly wastewater quality monitoring	Observation & document	JTWSSSE , Local or Jima Town EPO	Entire Operation phase	Operation phase	20,000
	The treated wastewater should be discharged directly into the nearby water body	Nearby water quality test	Number and type of Water quality tested	Jima EPO		Operation phase	
	Leakages from treatment ponds & sludge drying beds will be avoided or minimized by regular monitoring & maintenance of the network.	Site inspection, public opinions, system regular maintenance & follow-up	Observation & document	JTWSSSE , Local EPA,	Entire operation phase	Operation phase	100,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	A maintenance crew will be put in place to monitor and repair the FSTP immediately a damage or leakage occurs to avoid accidental surface runoff intrusion into water points.	Qualified, experienced & well equipped staff in place	Observation & document	JTWSSSE , Local EPA,	Entire operation phase	Operation phase	
	Maintain, repair and refuel vehicles and machinery at an offsite garage or workshop.	Site visit of the workshop	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	
	A quarterly laboratory quality tests for effluent and receiving water resources will be done to ensure that the quality of effluent meets the national discharge standards or requirements.	National Ambient Environment Standard (2003)	Observation & document	JTWSSSE ,	Entire operation phase		100,000
	Awareness campaign will be launched every half a year for all the beneficiaries about proper operation and maintenance of sanitation facilities put in place.	Documented verification of public awareness campaign guideline	Observation & document	JTWSSSE , Local EPA,	Entire operation phase	Operation phase	100,000
	Emergency telephone lines should be established to enable the public to immediately notify the JTWSSSE of any damages to the components of the network to ensure timely response and repair of such damages.	Monthly bill of emergency telephone line used	Observation & document	Jimma City Administration, JTWSSSE ,	Entire operation phase	Operation phase	50,000
Improper Management of Solid Waste	The JTWSSSE should ensure adequate operation and management of the project to avoid improper management of solid waste.	No accumulation of waste in facilities' vicinity. No complaint of littered waste from community	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	
	The dried sludge should be used as **organic fertilizer.**	Number of local famers using the treated sludge as fertilizer	Observation & document	JTWSSSE , Local EPA, Jimma town Urban Agriculture Office	Entire operation phase	Operation phase	
	Adequate bins will be provided to prevent access by vermin at the sludge treatment plant.	Number of waste collecting bins in place	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	130,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
Land Degradation n	The project staff will be trained for proper management of screenings and sludge to avoid soil contamination.	Soil waste well managed and no any soil contamination record due to the project	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	100,000
	The dried sludge shall be removed regularly from the sludge drying area and shall be given to local interested farmers as soil conditioner or taken to tip and should not burnt.	No any accumulated sludge on site; livelihood of farmers improved due to fertilize	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	20,000
	Structures will be made watertight during maintenance to avoid intrusion of storm water into the system and cutoff drains provided to FSTP to control flooding.	Site inspection; public opinions; and system maintenance plan	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	
	Follow- up and regular maintenance will be taken to avoid accidental surface runoff intrusion from the outside of the system which can overburden the FSTP & cause discharge of partially or untreated FSTP onto land.	Follow-up and maintenance plan to avoid accidental surface runoff	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	300,000
	Periodic tests will be done to assure the quality of effluent and treated sludge, to avoid partially treated sludge to reach the soils.	Sludge and treated wastewater quality test report	Observation & document, Sludge quality tests	JTWSSSE , Local EPA,	Entire operation phase	Operation phase	120,000
Landscape, Land Use Impacts	During operation water impounded in derelict borrow pits should be immediately removed and the site should be restored to its natural conditions to avoid breading of mosquitoes, vermin and other insects.	Site visit, local community and workers reflections	Observation & document	JTWSSSE	Entire operation phase	Operation phase	100,000
	Restoration of borrow pits as close pre-project maintenance conditions as possible will be done immediately after use in cases where they are opened for maintenance and repair of the project. Native vegetation must be used for re-seeding the excavated site.	Project repair & maintenance plan	Observation & document	JTWSSSE Local EPA,	Every Month	Operation phase	100,000

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	During maintenance or replacement, reinstatement of the sewer routes will be done in such a way that the return of the visual integrity of the landscape as closely as possible to its previous condition.	Site inspection & local community reflection	Observation & document	JTWSSSE Local EPA,	Entire operation phase	Operation phase	200,000
	Where sections of the road and other public amenities are cut, these will be reinstated immediately after maintenance activities of any of the project components.	Monitoring of maintenance plan & local beneficiaries or public opinions	Observation & document	JTWSSSE Local EPA,	Entire operation phase	Operation phase	200,000
Air Pollution	The perimeter of the proposed sites will be vegetated with trees, bushes grasses and plants of varying heights thereby forming wind breakers in addition to a chain link fences.	Length of perimeter vegetated; fence around the FSTP sites	Observation & document	JTWSSSE Jimma City Administration	Entire operation phase	Operation phase	**200,000**
	JTWSSSE must ensure adequate operation and management of the FSTP facilities to avoid foul odors that would arise from improper management of the facilities. The JTWSSSE should develop an Operations and Maintenance Manual for the FSTP Treatment Plant to guide staff on how to run it effectively.	Well organized and developed operation manual and information level of the workers to use the manual	Observation & document	JTWSSSE	Entire operation phase	Operation phase	100,000
	JTWSSSE must ensure adequate operation and management of the facilities to avoid obnoxious smell that would arise from dysfunctional.	No any obnoxious smell grievance from workers & the local residential communities	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
	Facultative ponds will be commissioned before anaerobic ponds to avoid odor nuisance when anaerobic pond effluent discharges into an empty facultative pond.	Commissioning of facultative ponds before anaerobic ponds	Observation & document	JTWSSSE ,	Entire operation phase	Operation phase	

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	Anaerobic ponds must be commissioned by filling them with raw sewage and seeded with sludge from a conventional sewage treatment plants. After filling and seeding, the pond should gradually be loaded up to the design-loading rate.	Commissioning of anaerobic ponds	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
Occupational Health and Safety Risks	Qualified and trained OHS and environmental health expert must be hired for regular community sensitization, capacity development, and management and monitoring of social and environmental issues.	Presence of qualified OHS officer with well-organized qualification documents	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
	Adequate OHS personnel protective equipments (PPE) gears will be provided to the employees.	Record of PPE provided and staff; use of PPE on site	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
	Routine maintenance including but not limited to facilities involved in the removal of garbage and grit screenings, slashing around the embankments & repair damages to the fence.	Clean, green conducive work environment and well managed fences	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
	The site, where possible, will be fenced and signalization put in place with security personnel to stop unauthorized people from accessing the site.	Well established security system	Observation & document	JTWSSSE	Entire operation phase	Operation phase	
	An Accident Log will be maintained onsite to register all injuries and to investigate their causes.	Keeping accident logbook	Observation & document	JTWSSSE & Health Bureau	Entire operation phase	Operation phase	5,000
	Emergency resources (e.g., fire extinguishers, stocked First Aid kits, and Emergency Contacts, Doctor and policy men on Call).	Standby emergency communication facilities	Observation & document	JTWSSSE & Health Bureau, local Police, Local Fire Department	Entire operation phase	Operation phase	100,000
Pollution of Soil and Water bodies	Properly transporting all the metallic, AC pipes, and chemical containers to a predetermined site for deposal or storage.	Documented evidence of proper transportation of indicated materials	Observation & document	JTWSSSE , Local EPA	During commissioning	Decommissioning phase	

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	Topsoil and subsoil removed for decommissioning will be stored properly and used for backfilling and reinstatement.	Volume or meter cube of soil used	Observation & document	JTWSSSE , Local EPA	During commissioning	Decommissioning phase	
	Back-filling materials will be compacted to a level similar to the original surrounding soils to avoid subsidence as a consequence of rain water channeling.	Documented evidence of materials used	Observation & document	JTWSSSE , Local EPA	During commissioning	Decommissioning phase	
	Conducting environmental quality assessment of the water body and the treated sludge prior to the commencement of the decommissioning.	Water and treated wastewater analyzed	Observation & document	JTWSSSE , Local EPA	During commissioning	Decommissioning phase	50,000
Occupational Health and Safety and Air pollution	A qualified health and occupational safety officer will be recruited to oversee OHS matters on site.	Number of quality professionals document	Observation, tested water quality parameters & document	JTWSSSE	Start of commissioning phase	Decommissioning phase	
	Proper induction of the workers prior to work decommissioning commencement.	Presence of indiction for workers participating in the decomissioning	Observation & document	JTWSSSE	Start of commissioning phase	Decommissioning phase	200,000
	Adequate OHS personnel protective gear will be provided to the employees.	All OHS protective gear provided	Observation & document	JTWSSSE	During commissioning phase	Decommissioning phase	80,000
	Trucks will be covered during haulage of materials to reduce dust emissions.	Number of trucks covered during haulage	Observation & document	JTWSSSE	During commissioning phase	Decommissioning phase	
Socio-economic impact	Providing adequate provident fund or pension those who want to retire.	Number of employees covered by the pension system	Observation & document	JTWSSSE	Commissioning phase	Decommissioning phase	
	For young workers, particularly the vulnerable groups, facilitating to be hired in similar position commensurate with their skill, interest and experience.	Number of local young and vulnerable people hired	Observation & document	JTWSSSE , Women and Social affairs office	Commissioning phase	Decommissioning phase	

Adverse environmental Impact	Mitigation measures	Monitoring indicator	Method of monitoring	Monitoring institutions	Monitoring frequency	Phase/ status	Budget in birr
	Total cost						5,860,000

The above Environmental and Social Management and Monitoring Plan table summarized the main possible negative impacts, nature of the receiving environment, possible mitigation measures, expected outcomes, monitoring indicators, monitoring plan, responsible institution for monitoring, time duration and cost estimations in Birr. Even though it is very rough and subjective the overall ESMP cost estimated during pre-construction, construction and operation phase is about 28,180,000.00 (Twenty-Eight Million and one hundred eighty Thousands) Birr. This price estimation is not exhaustive due to very wide nature of the study and market dynamics. Thus, assuming the market dynamics and complexity of the study, the price estimation might have an error of **±30**% of the current value.

11.2. Construction Monitoring

During construction phase, JTWSSSE shall require contractors to comply with this ESMP and to recruit an environmental and occupational health and safety officer to effect the implementation of this ESMP. The contractor should have a designated environmental officer to oversee day-to-day project construction activities. In addition, both the project and site managers should familiarize themselves with the ESMP so as to execute required environmental, health and safety supervision roles. It is also preferable that, the site engineer has to work by considering environmental issues related to the project. The project manager shall have the ultimate responsibility for implementation of ESMP and will, therefore, ensure that resources are duly provided. The project manager shall be responsible and ensure that E&S staff will be deployed and are adequately inducted and trained at site regarding environmental and social management including emergency procedures. The Contractor's site supervisors and foremen will ensure that the provisions in this ESMP are implemented within the sites under their supervision and to collect and transmit relevant information to the environmental and occupational safety and health Officers.

11.3. Reporting

During construction, concise monthly monitoring reports should be compiled by the contractor. The report will highlight the different activities undertaken to manage environmental and social aspects of the project in line with contract specifications, laws, standards, policies, and plans of Ethiopia and WB safeguard policies. The report will be discussed during the monthly progress meetings among the Local EPA, JTWSSSE, the contractor and other concerned utility agencies as necessary. JTWSSSE's Environmentalist and Social Specialist and the supervising engineer will approve the contractor's monthly environmental and social monitoring report that will then be transmitted to Local EPA and JTWSSSE for final approval. JTWSSSE's Environmental Management and Social Specialist will also independently monitor the implementation of the ESMP and/or verify the accuracy and content of the contractor's monitoring report and then report to project office. The report will also be compiled and shared with the MoWE, WB and other relevant stakeholders at least on quarterly bases. Approval of the environmental monitoring

report by the supervising engineer shall be a prerequisite for approval of the respective bill of Quantity (BoQ) items.

During operation phase, monitoring will mostly be relying on Local EPA and JTWSSSE's Environmental and Social Specialist for effective project execution. The role of JTWSSSE's is both implementing and internal monitoring. Local EPA monitoring reports should be shared with project office, regional EPA and MoWE for further remedial actions. Besides Local EPA has a mandate, or order JTWSSSE's to hire consultant, to conduct audit studies and disclose the findings to interested public bodies as a regulatory requirement (National EIA proclamation 299/2000).

11.4. Environmental Audit

Audits will be necessary both during construction and project operation. While construction audits will aim to verify compliance to impact mitigation requirements, post-construction audits are a regulatory requirement to ensure effects and compliance monitoring and the implementation of the mitigation measures within 12 months and not more than 24 months after the start of the operation of the FSTP. Both construction and post-construction audits can be conducted internally by project office or by a Consultant hired by project office with a technical support from local EPA.

11.5. Grievance handling procedure

This section describes the avenue for affected persons to lodge a complaint or express a grievance against the project, its staff or contractors during project implementation. It also describes the procedures, roles and responsibilities for addressing grievances and resolving disputes. Every aggrieved person shall be able to trigger this mechanism to quickly resolve their complaints.

The objectives of the grievance handling are to:

- Ensure that appropriate and mutually acceptable corrective actions are identified and implemented to address complaints;
- Verify that complaints are satisfied with outcomes of corrective actions; and
- Avoid the need to resort to judicial proceedings.

The grievance mechanism at each project facility will be fed from four main sources:

- Project affected persons (PAPs) or project affected Household (PAHs);
- Local community residents and the respective local leaders;
- Supervising engineer, clerk of works or contractor; and
- Monitoring team who will forward issues/concerns identified in the field.

According to the RPF (2016) the grievance resolution committee is indicated in Table 33.

Table 29) Grievance Resolution Committee

No	Institution/ individual representation	Role
1	Municipality representative	Chairperson
2	JTWSSSE representative	Secretary
3	Community representative	Member
4	Representative of PAPs	Member
5	Women affairs	Member
6	Two respectable citizens from society including one from the underserved community, one of them should be women	Members

Steps of the grievance process

Step One: Receipt of complaint

A verbal or written complaint from a complainant will be received by the Clerk of Works or Grievance Redness Committee and recorded in a complaints log s(he) keeps on site. The log will indicate grievances, date lodged, action taken to address complaint or reasons the grievance was not acted on; information provided to complainant and date the grievance was closed.

The process for lodging a complaint is:

- Clerk of works on site or project office receives complaint(s) from complainant and records it in log;
- Clerk of Works or Grievance Redness Committee reads the recorded grievance for the complainant to confirm correct detail of complaint has been documented; and
- Both the complainant and clerk of work or Grievance Redness Committee sign the log to confirm grievance was accurately recorded.

Step Two: Determination of corrective action

If in his/her view, a grievance can be solved at this stage, the Clerk of Works or Grievance Redness Committee will determine a corrective action in consultation with the aggrieved person. Remedial action(s) and timeframe within which they must be accomplished has been described and the party responsible for implementing them will be recorded in the complaint log. Grievances will be resolved and status reported back to complainants within 5 days. If more time is required, this will be communicated clearly and in advance to the aggrieved person.

Step Three: Meeting with the complainant

The proposed remedial action and the timeframe in which it is to be implemented will be discussed with the complainant within 5 days of receipt of the grievance. Consent to proceed with the corrective action will be sought from the complainant and witnessed by a local government chairperson.

Step Four: Execution of Corrective Actions

Mutually agreed corrective action will be commenced by the project office or its contractor within the agreed timeframe. The date of the completed action will be recorded in the log against the complainant's grievance.

Step Five: Verification of the Remedial Actions

To verify satisfaction, the aggrieved group or person will be asked to return if not satisfied or bring the case to court with the corrective action.

Step SIX: Action by the project office and/or the contractor

If the project office or contractor cannot solve the grievance within 15 days, s(he) will refer it to court through the social safeguard and/or occupational safety and health professional. It is believed that most of possible grievances can be solved at this level.

12. Institutional Arrangements Capacity Building

12.1. Human resources

Depending on the size of the plant, the volume of treatment, and the necessary degree of ability, FSTPs may have a wide variety of personnel needs. It should be explicit about the duties and responsibilities of each employee member as well as the channels of communication. In fact, FSTPs may integrate several job titles into one job description, including plant superintendent, safety officer, and maintenance technician. The key employee requirements and their corresponding tasks, which are essential for the long-term operation of FSTPs, are described herein.

Microbiologist: for efficient microbiological parameters laboratory analysis

Chemistry /Water supply and environmental engineer: for efficient Monitoring of physical-chemical parameters

Public health: health and safety hazards associated with the typical tasks required to operate and maintain FSTP

Sociologist: related social problem with respect of fecal sludge handling, collection and transportation

Water supply and environmental engineer: FSTP operating, Interpretation and communication of technical data

Electro-mechanical engineer: Electrical safety FSTPs with electrical equipment must enact specific procedures to keep workers safe when performing O&M activities on powered devices

Mechanical technician: mechanical equipment and related accessories inspections and repair the pump and electromechanical equipment's

12.2. Overview of the service chain organization

The overlapping and ambiguous assignments of duties as well as the absence of incentives for effective operation are some of the key causes of FSM system failure. Incomplete institutional frameworks frequently lead to both a lack of accountability and conflicts amongst stakeholders, which frequently results in this predicament. The duties and responsibilities must be clearly defined because every component of the service chain affects the others and is interdependent. For instance, parties involved in FS collection and transportation must also be included in FS treatment plant discharge planning. In turn, the managers of the FSTP must coordinate their efforts with the stakeholder(s) in responsibility of resource recovery and end-product disposal. As a result, coordination between each link in the chain is crucial to a successful FSM system.

In Jimma city currently project coordinator, environmental and social safeguard specialist and procurement officers are recruited under JCWSSE and on duty to implement the project. In the long run when the plant starts operation the number of employees may not be sufficient with

regards to professional requirement to run the plant as described above. Therefore, additional human resources management options should be devised and implemented to implement the project effectively.

12.3. Role distribution among the stakeholders

In the FSM systems that are now in Jimma town, a variety of stakeholders such as the town's water supply and sewerage authority, municipal services, private entrepreneurs, and universities tend to provide services in the FS service chain. The potential stakeholder duties are compiled in Table 30. They might be given control over one or more service chain operations. Due to a lack of regulations, numerous parties are now managing feces without working together. The institutional study showed that multiple government ministries share responsibilities for managing fecal sludge and that there had never been any communication between the collection and transport businesses and other stakeholders.

Table 30) Stakeholders in the fecal sludge sector and their possible involvement in the management

Stakeholder	**Laws**	**Coordination**	**Collection & Transport**	**Treatment**	**Resource Recovery**	**Enforcement**	**Training & Information**	**Monitoring**
Ministries of Water and energy, Ministry of health, minstry of urban planning and housing	X	X				X	X	X
Water supply and sewerage ahutority		X	X	X	X	X	X	X
Police						X		
Private Companies			X	X	X			
SME			X		X	X		
NGO							X	X

12.4. Capacity building

The environmental and social sustainability of this project is dependent on the capacity of institutions at all levels to carry out the associated ESMP implementation work. 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 JWSSESE. 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 rising of awareness, sensitization to the issues, and detailed technical training. The JWWSSSE is found to have a limited institutional capacity to implement the provisions of the ESMP,

especially regarding the FSTP management sub-project. Training programs required budget is presented for the three phases of the project in Table 31.

Table 31) Capacity building program or ESMP implementation

S.N.	Capacity building activity	Phase of project	Participants	Budget (Birr)
1	Awareness raising and sensitization workshops	Start of construction and operation phases	Representatives of stakeholders and responsible staffs (55)	200,000
2	Technical trainings on environmental and social safeguard and OHS issues	Beginning of the three phases	Environmental and social safeguard and OHS staffs	200,000
3	Review workshops on quarterly and annual bases	Construction and operation phases	Officials and staffs (8 years)	1,000,000
4	Trainings on project management and coordination	Construction and operation phases	Officials and staffs (4 rounds)	500,000
Total				1,900,000

It is recommended that capacity building interventions including training should take place at all levels i.e., Community Based Organizations, relevant government officials (members of steering committee), community leaders, JWSSSE management team. The JWSSSE environmental and social safeguard expert 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.

13. CONCLUSIONS AND RECOMMENDATIONS

13.1. Conclusions

Jimma City, with technical support from the federal MoWE and financial support from the WB, planned to build an FSTP in the town. The construction of the FSTP can contribute immensely to the improvement of the town's sanitation by reducing practices of open defecation and the outbreak of water-borne diseases; create job opportunity for various segments of the society; build capacities; and create opportunities for local construction companies and their professionals and help in the transfer of new technology and knowledge to the town and the nation at large. The long term environmental and social benefits include reduce morbidity and increased productivity of households; increase enrolment of children in educational institutions and improved tourist destination and economic development.

Taking the receiving environment into consideration, the ESIA study identified major negative impacts during construction and operation phases as follow; involuntary displacement, land expropriation, property damage, biodiversity disturbance, landscape and integrity change, water, air and noise pollution, social misdemeanor, among others. The negative impacts can cause damage to the biological, physical and social environment if they are not properly planed and managed as indicated in the mitigation measure or ESMP section of this report. The project office, the town municipality and the contractor have a lion’s share role in the execution of the mitigation measures presented. The regulatory work, monitoring and evaluation mostly rely on the town's EPA, MoWE, and the WB in addition to the project office itself. The PAHs, the local community particularly the youth, woman and vulnerable groups and kebele leaders should properly involve in the compensation procedure, study and decision making to minimize grievance and ensure tenable benefit from the project development. Although various impacts were identified by this study and different mitigation measures are proposed, the issue of compensation of the right holders where the FSTP is going to be constructed should be given utmost attention from all stakeholders. In the project site, the seven households that are going to lose property as a result of the construction of the FSTP need to be properly compensated before the commencement of the project. It is also very much important to carefully consider the project site which is agreed up with tripartite discussions to eliminate negative impacts due to the topographic nature of the site, its proximity to Jima aba Jifar airport and cemetery included in the site proposed by the design consultant and was finally offset through discussions.

In conclusion, if the FSTP is constructed and operated in conformity with the legal and other requirements provided in the ESMP, the benefits of the project to the town and the nation will be by far outweighing its potential negative effects.

13.2. Recommendations

As clearly indicated in the conclusion sub-section, with proper implementation of the mitigation measures and legal frameworks, the environmental and social benefits of the FSTP constructions in Jimma will outweigh the adverse effects. And, it is repeatedly noted that the adverse impacts identified can be mitigated through proper implementation of the proposed management and monitoring plans. Therefore, it is strongly recommended to implement the project with strict monitoring of the environmental and social issues. Hence, monitoring teams shall closely follow the state of implementation of the environment and social management and monitoring plans.

Moreover, the town, especially the JTWSSSE, and the MoWE need to ensure that the ESIA studies of projects are completed before commencement of construction. The project supervision consultant once mobilized should also 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 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. Moreover, the Environment and Safety Division should develop an environmental checklist 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 City EPA.

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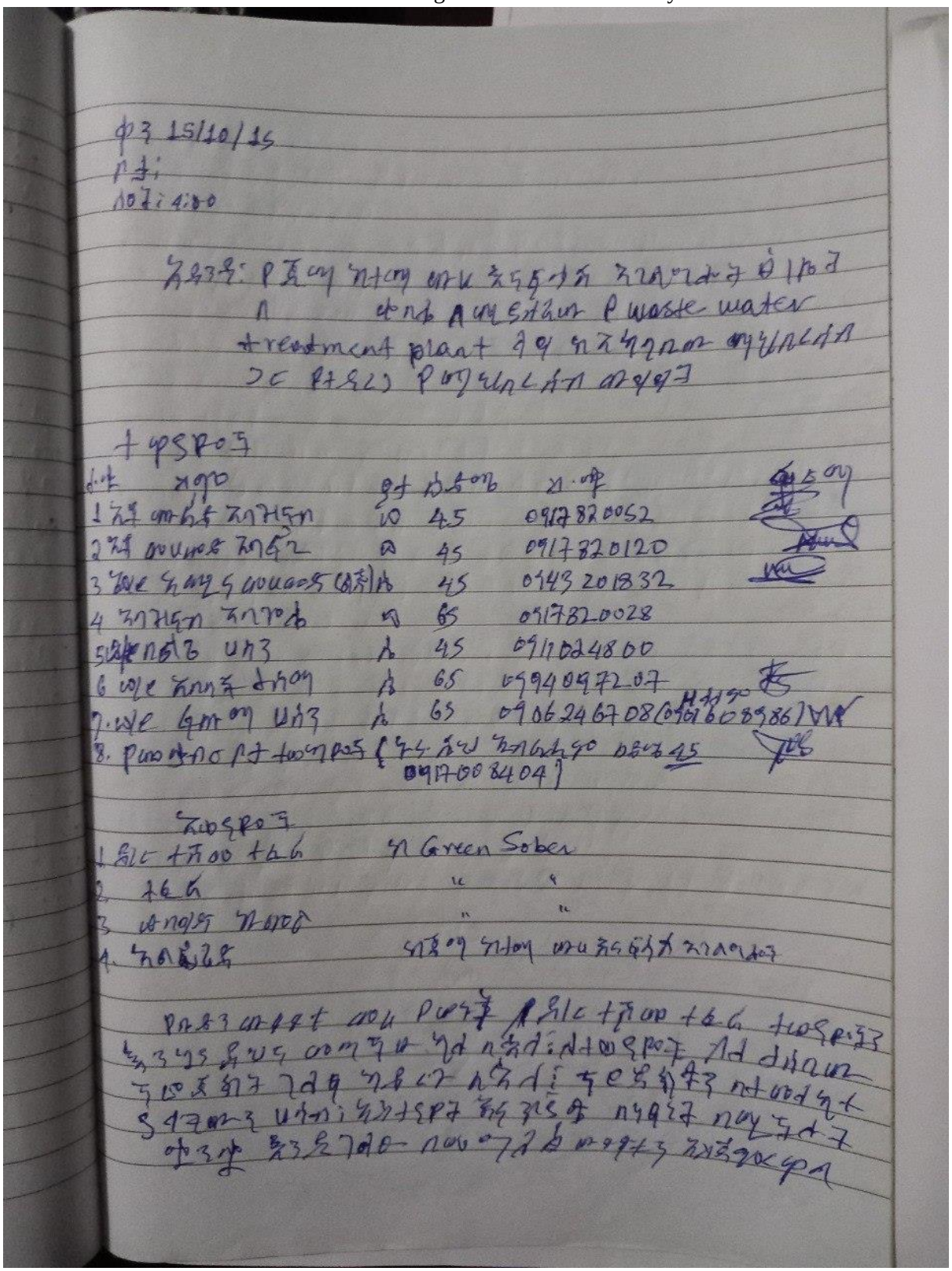
Annexes

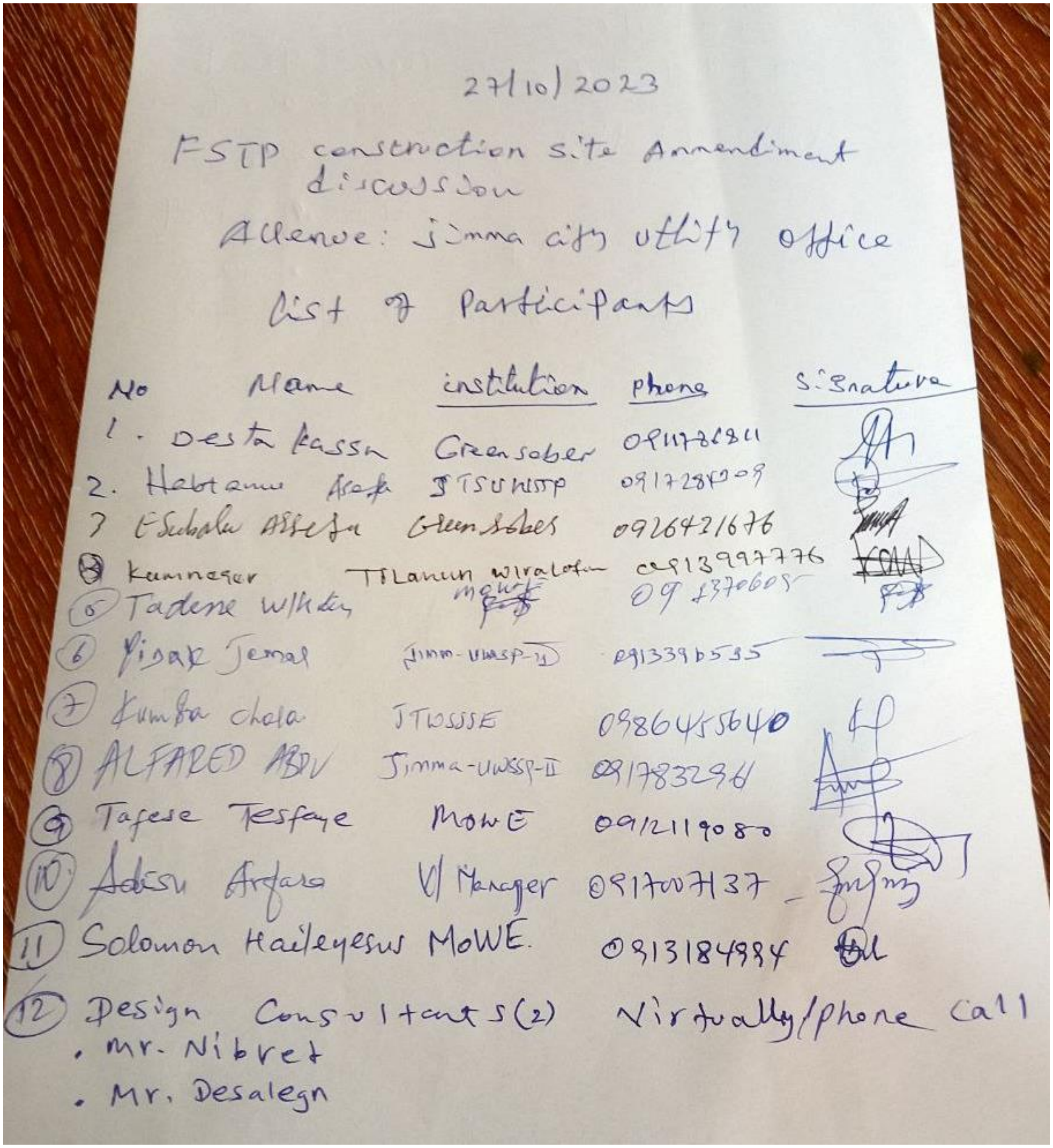
Annex 1: Meeting minutes with community



Annex 2: List of participant involved in the first tripartite discussion among the MoWE, ESIA and design consultant.

S.N	Name of participant	Position	organization	Tel.no
1	Ato Desta Kassa	Manager	Green Sober consultant	0911786811
2	Ato Mengistu Asrat	Environmentalist	”	0911971015
3	Dr.TamiruTesema	Sanitary engineer	”	0938309018
4	Ato Yihawu Biru	Biodiversity expert	”	0911022665
5	Ato Semere G/stadik	Sociologist	”	0911817968
6	Ato Esubalew Assefa	GIS	”	0926431676
7	Dr.Tewodros Bekele	Environmentalist	”	0911370536
8	W/ro Firehiwot Zewudie	UWSSP-II coordinator	MoWE	0911763304
9	Ato Solomon Hailyesus	Environmentalist	”	0913185994
10	W/ro Kidist Gizachew	social safeguard	”	0920623714
11	AtoTafesTesfaye	social safeguard	”	0912119080
12	Ato Gezahagn H/Mariam	Senior Wastewater Engineer	”	0911172849
13	Ato Disasa		Oromia WE	0913329390
14	Ato Nibret	Surveyor	Institution they represent	Phone
15	Dr Said Tiku	Environmentalist		
16	Ato Zeleke Chafemo	Senior Environmentalist		
17	Eng Asnake Brehane	Senior Sanitary Engineer		
18	Ato Million GlYes	Senior Sociologist		
19	EngTesfaye Workineh	Project Coordinator		

Annex 3: List of participant involved in the second round tripartite discussion among the MoWE, ESIA and design consultant.



27/10/2023

FSTP construction site Ammendiment discussion

Allenve: jimma city utlity office

List of Participants

No	Name	institution	phone	Signature
1.	Desta Kassa	Greensober	0911786811	
2.	Habtamu Asefa	JTSUWSSP	0917284909	
3	Eshetu Assefa	Green sober	0926431676	
4	Kumneger	TTLanun wiralofm	0913997776	
5	Tadene w/kidan	mowe	09 8370605	
6	Yisak Jemal	Jimm-UWSSP-II	0913396535	
7	Kumba chala	JTWSSSE	0986455640	
8	ALFARED ABDU	Jimma-UWSSP-II	091783296	
9	Tafese Tesfaye	MoWE	0912119080	
10	Adisu Arfaso	V/ Manager	0917007137	
11	Solomon Haileyesus	MoWE.	0913184984	
12	Design Consultant s(2)	Virtually/phone call		

. Mr. Nibret

. Mr. Desalegn

Annex 4: Chance Find procedure

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown Physical cultural resources (PCR) are encountered during project construction or operation. If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken

1. Stop all works in the vicinity of the find, until a solution is found for the preservation of these artifacts', or advice from the relevant authorities is obtained;
2. Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
3. Record details in Incident Report and take photos of the find;
4. Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
5. Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find
6. Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry/Agency, once completed
7. In case of significant find the Agency/Ministry (Agency for Protection of National Heritage or Archaeological Research Centre, hereinafter referred to as Heritage team) should be informed immediately and in writing within 7 days from the find (ref. law on heritage protection).
8. The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items
9. The Ministry must investigate the fact within 2 weeks from the date of notification and provide response in writing. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
10. Construction works could resume only after permission is granted from the responsible authorities.
11. In case no response received within the 2 weeks period mentioned above, this is considered as authorization to proceed with suspended construction works.
12. In case no response received within the 2 weeks period mentioned above, this is considered as authorization to proceed with suspended construction works.

One of the main requirements of the procedure is record keeping. All finds must be registered.

Photo log, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports – kept.

Additional information Management options for archaeological site

- **Site avoidance**. If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost-effective management option)
- **Mitigation**. If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation (The most expensive and time-consuming management option.)
- **Site Protection**. It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

Management of replicable and non-replicable heritage: Different approaches for the finds apply to replicable and non-replicable heritage.

Replicable heritage: Where tangible cultural heritage that is replicable 26 and not critical is encountered, mitigation measures will be applied. The mitigation hierarchy is as follows

Avoidance; **Minimization** of adverse impacts and implementation of restoration measures, in situ; **Restoration** of the functionality of the cultural heritage, in a different location; **Permanent removal** of historical and archaeological artifacts and structures; **Compensation of loss** - where minimization of adverse impacts and restoration not feasible.

Non-replicable heritage: Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage.

Annex 5: Environmental Guidelines

This Environmental Guideline applies to the Contractor. It also applies to any sub-contractors present on Project work sites at the request of the Contractor with permission from the Client. Besides, the regular inspection of the sites by the supervisor appointed by the Client for adherence to the Contract conditions and specifications, the Client may appoint an environmental inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. Regional Environmental Authorities may carry out similar inspection duties. In all cases, as directed by the Client's supervisor, the Contractor shall comply with directives from such inspectors.

Contractor's Health, Safety and Environment Management Plan (HSE-MP)

Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP for the Client's approval. No works shall commence until the EHS-MP has been approved. The plan is to ensure the adequate management of the health, safety, environmental and social aspects of the works.

The Contractor's HSE-MP will set out the precise actions that the contractor will take to deliver: the mitigation measures and environmental performance requirements set out in the ESIA and the ESMP; any conditions or recommendations associated with the consenting process of the ESIA; relevant requirements of the contract (as set out in the General/Particular Conditions and General/Specific Specifications); the General Protection Measures and the Specific Protection Measures (as appropriate) as set out in this ESMF. As a minimum it shall include:

- A description of procedures & methods for complying with E&S requirements stated above;
- A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- A description of all planned monitoring activities and the reporting thereof;
- The internal organizational, management, inspecting, monitoring and reporting mechanisms, including the roles and responsibilities for the contractor's personnel.

The Contractor's HSE-MP will be a focused document/manual in the order of 50-100 sides and Environmental and Social Management Framework - Second Phase of UWSSP shall be reviewed and approved by the Client before start of the works.

General Protection Measures In general, environmental protection measures to be taken at any work site shall achieve the following aims:

A. Minimize the effect of dust on the environment resulting from earth mixing sites, vibrating equipment, construction related traffic on temporary or existing access roads,

etc. to ensure safety, health and the protection of workers and communities living in the vicinity of work sites and access roads.

B. Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) comply with the most stringent of the Ethiopian legal requirements or the World Bank EHS Guidelines and are generally kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
C. Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels are maintained and/or re-established where they are disrupted due to works being carried out.
D. Prevent any construction-generated substance, including bitumen, oils, lubricants and wastewater used or produced during the execution of works, from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs. Maintain water quality of these water resources.
E. Avoid or minimize the occurrence of standing water in holes, trenches, borrow areas, etc. (to minimize breeding grounds for mosquitos etc)
F. Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. Restore/rehabilitate all sites to acceptable standards.
G. Ensure that all drums, containers, bags, etc. containing oil/fuel/surfacing materials and other hazardous chemicals or materials shall be stored at construction sites on a sealed and/or bonded area in order to contain potential spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed of at designated disposal sites in line with applicable Ethiopian government waste management regulations.
H. Ensure that all drainage and effluent from storage areas, workshops, housing quarters and generally from camp sites shall be captured and treated before being discharged into the drainage system in line with the more stringent of the national and World Bank EHS Guidelines Environmental and Social Management Framework - Second Phase of UWSSP applicable water pollution limit values. Sufficient and appropriate spill kits (as agreed with the client) shall be provided and workers trained in their use to contain and clear up spills.
I. Ensure used oil from maintenance shall be collected, properly stored in sealed containers, and either disposed of appropriately at designated sites or be re-cycled.
J. Restriction of entry of runoff into construction sites, staging areas, camp sites, by constructing diversion channels or holding structures such as berms, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
K. Inhibit the leaving of construction waste along the road in stockpiles, but ensure it is removed and reused or disposed of on a daily basis.

L. Ensure, where temporary dump sites for clean excavated material are necessary, that they shall be located in areas, approved by the Client's supervisor, where they will not result in supplemental erosion. Any compensation related with the use of such sites shall be settled and all necessary consents obtained prior to their use.
M. Ensure areas for temporary storage of hazardous materials such as contaminated liquid and solid materials are approved by the supervisor and appropriate local and/or relevant national or local authorities before the commencement of work: these shall be sufficiently constituted to prevent accidental or intentional discharge to the environment. Disposal of such waste shall be in existing, approved sites.
N. Restrict vegetation clearing to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
O. Ensure Stockpile areas are located in areas where trees or other natural obstacles can act as buffers to prevent dust pollution, and generally at a distance from human settlements. Wind shall be taken into consideration when siting stockpile areas. Perimeter drains shall be built around stockpile areas.
P. Upon discovery of graves, cemeteries, cultural sites of any kind, including ancient heritage, relics or anything that might or believed to be of archeological or historical importance during the execution of works, immediately stop works and report such findings to the Client so that the Ministry in charge of Culture may be expeditiously contacted for fulfillment of the measures aimed at protecting such historical or archaeological resources. In this instance the chance finds procedures (Annex VI) should be followed.
Q. Compliance with a workers code of conduct that amongst its measures, shall prohibit construction workers from engaging in the exploitation of natural resources such as hunting, Environmental and Social Management Framework - Second Phase of UWSSP fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities, and prohibit explicitly the transport of any bush meat in Contractor's vehicles.
R. Prohibit the transport of firearms in Project-related vehicles.
S. Prohibit the transport of third parties in Project-related vehicles.
T. Implement soil erosion control measures in order to avoid surface run off and prevent siltation, etc.
U. Ensure that garbage, sanitation and drinking water facilities are provided in construction workers camps.
V. Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
W. Ensure public safety, and meet Ethiopian traffic safety requirements for the operation of work to avoid accidents.

X. Ensure that any trench, pit, excavation, hole or other hazardous feature is appropriately demarcated and signposted to prevent third-party intrusion and any safety hazard to third parties.
Y. Comply with Ethiopian speed limits, and for any traffic related with construction at UWSSP sites, comply with the following speed limits unless Ethiopian speed limits are lower: • Inhabited areas: 50 km/h • Open road: 90 km/h.
Z. Ensure that, where unskilled daily-hired workforce is necessary, such workers are hired from neighboring communities.

(aa) Generally comply with any requirements of Ethiopian law and regulations.

Specific Protection Measures: Drilling

The Contractor will make sure that any drilling fluid, drilling mud, mud additives, and any other chemicals used for drilling at any UWSSP construction site complies with the more stringent of the Ethiopian environmental, health and safety legal and regulatory requirements and World Bank EHS Guidelines. In general, only bio-degradable materials will be used. The Contractor may be required to provide the detailed description of the materials he intends to use for review and approval by the Client. Drilling fluids will be recycled or disposed of in compliance with Ethiopian regulations in an authorized disposal site.

If drilling fluids cannot be disposed of in a practical manner, and if land is available near the drilling site that is free of any usage rights, the Contractor may be authorized Environmental and Social Management Framework - Second Phase of UWSSP to dispose of drilling fluids near the drilling site. In this occurrence, the Contractor will be required to provide to the Client due evidence of their total absence of potential environmental impacts, such as leachate tests certified by an agreed laboratory. In this case, drilling fluids will be dried at site, mixed with earth and spread at site. Any site affected by drilling work will be restored to its initial condition. This applies to drilling pads, access roads, staging areas, etc.

Topsoil will be stripped ahead of any earthmoving, stored near the construction site, and replaced in its original location after the re-contouring of the area affected by the works. Where successive aquifers are intersected by the drilling works and upon order by the work supervisor, the Contractor may be required to take measures to isolate aquifers from contamination by each other. The Contractor will take all measures to avoid bacteriological or chemical contamination of the intersected aquifers by the drilling equipment.

Similarly, the Contractor will take all measures to avoid bacteriological or chemical contamination of the intersected aquifers from the surface by providing an adequately sealed well-head. When greasing drilling equipment, the Contractor will avoid any soil contamination. In the event of a limited hydrocarbon spill, the Contractor will recover spilled hydrocarbons and

contaminated soils in sealed drums and dispose of them in an authorized waste management facility. Unless duly requested by the Contractor and authorized by the supervisor, no servicing of drilling equipment or vehicles is permitted at the drilling site.

Specific Protection Measures: Pipelines

No trench shall be left open for more than 7 days, unless duly authorized by the supervisor upon Contractor's request. Trenches and other excavation works shall be established, demarcated/fenced and/or signposted sufficient to prevent accident or injury to workers or the public, including during hours of darkness. . General conditions related with topsoil stripping, storage and restoration apply. The Contractor will take measures to dispose of water used for pressure tests in a manner that does not affect neighboring settlements.

Specific Protection Measures: Quarries and Borrow Areas and deposit sites

The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas prior to their first use. The location of quarries and borrow areas shall be subject to review and approval by relevant local and national authorities. Environmental and Social Management Framework - Second Phase of UWSSP New sites:

A. Shall be located 1km or more from settlement areas, archaeological areas, and cultural sites - including churches and cemeteries, wetlands or any other valued ecosystem component, or on high or steep ground.
B. Shall not be located in water bodies, or adjacent to them, as well as to springs, wells, well fields.
C. Shall not be located in or near forest reserves, natural habitats or national parks.
D. Shall be designed and operated in the perspective of an easy and effective rehabilitation. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.
E. Shall have clearly demarcated and marked boundaries to minimize vegetation clearing and safety hazards for third parties.
F. Shall be operated in accordance with the General Environmental Protection Requirements, the Construction ESMP for the project and in accordance with any consent / permit conditions.

The Contractor shall deposit any excess material in accordance with the principles of these guidelines, and any applicable ESMP, in areas approved by local authorities and/or the supervisor.

General Protection Measures: Rehabilitation of Work and Camp Sites

Topsoil shall be stripped, removed and stored for subsequent rehabilitation. Soils shall not be stripped when they are wet. Topsoil shall not be stored in large or high heaps more than 3m in height: low mounds of no more than 1 to 2m high are recommended to preserve topsoil structure. Generally, rehabilitation of work and camp sites shall follow the following principles:

- To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
- Remove toxic materials & dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- Ensure reshaped land is formed so as to be stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- Minimize erosion by wind and water both during and after the process of reinstatement.
- Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise. Environmental and Social Management Framework - Second Phase of UWSSP

General Protection Measure: Management of Water Needed for Construction Purposes

The Contractor shall at all costs avoid conflicting with water needs of local communities. To this effect, in the case of any temporary water abstraction for construction needs from either ground or surface water maps outlining current water shortage and drought situation should be first consulted. Following this proposed abstraction plans shall be submitted to the following community consultation process:

- Identification of water uses that may be affected by the planned water abstraction,
- Consultation with all identified groups of users about the planned water abstraction,
- In the event that a potential conflict is identified, report this to the supervising authority.

This consultation process shall be documented by the Contractor (minutes of meeting) for review and eventual authorization of the water withdrawal by the Client's supervisor. Abstraction of both surface and underground water shall only be done with the consultation of the local community as mentioned and after obtaining a permit from the relevant authority. Abstraction of water from wetlands is prohibited. Temporary damming of streams and rivers is subject to approval by the Client's supervisor and any permits/consents required by law or regulation to be in place prior to works occurring. It shall be done in such a way as to avoid disrupting water supplies to communities downstream, and to maintain the ecological balance of the river system.

No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses. Similarly, wash water from washing out of equipment shall not be discharged into water courses or road drains. Washing bays shall be

sited accordingly. Washout waters should be collected and appropriately treated prior to discharge in accordance with legal requirements and meeting the most stringent of limit values (national or World Bank EHS guidelines.) Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

General Protection Measures: Traffic Management and Community Safety

The contractor shall prepare a Traffic Safety Management Plan that sets out the approved routes and safety measures (such as signalization, fencing safe crossings, diversions, traffic sign locations etc.) to be taken, for the approval of the Client's supervisor. Location of temporary access roads shall be done in consultation with the local community and based on the screening results, especially in important or sensitive environments.

Temporary access roads shall not traverse wetland areas or other ecologically sensitive areas. The construction of any access roads shall be submitted to a prior consultation process with Environmental and Social Management Framework - Second Phase of UWSSP potentially affected communities that will have to be documented (minutes of meetings) for supervisor's review and approval. Upon the completion of civil works, all temporary access roads shall be ripped and rehabilitated. Measures shall be taken to suppress dust emissions generated by Project traffic. Maximum speed limits for any traffic related with construction at UWSSP sites shall be the following, unless Ethiopian speed limits are locally lower:

- Inhabited areas: 50 km/h and Open road: 90 km/h.

General Protection Measure: Salvaging and Disposal of Obsolete Components Found by Rehabilitation Works

Obsolete materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures shall be salvaged and disposed of in a manner approved by the supervisor. The Contractor has to agree with the supervisor which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.

Any asbestos cement material that might be uncovered when performing rehabilitation works will be considered as hazardous material. Upon discovery it shall be segregated and covered as necessary to prevent the spread of fibres/dust. A plan shall be prepared by the contractor for the safe removal to a suitable facility, and the plan shall be affected only following its approved by the client.

General Protection Measure: Compensation of Damage to Property

Compensation of land acquired permanently for Project purposes will be handled under Client responsibility based on the provisions of the RPF. However, in the event that the Contractor, deliberately or accidentally, damages property, he shall repair the property to the owner's satisfaction and at the contractor's own cost. For each repair, the Contractor shall obtain from the owner/user a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

In any case where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the supervisor.

General requirement: HSE Reporting

The Contractor shall prepare bi-monthly progress reports to the Client on compliance with the HSE-MP. The content of the Contractor's reports will agreed with the client and will include as a minimum information on: Environmental and Social Management Framework - Second Phase of UWSSP

- HSE management actions taken, including approvals sought from local /national authorities;
- Problems encountered in relation to HSE aspects. For example number of time lost accidents, accidents involving non-worker personnel, injuries, fatalities, environmental incidents & infringements, grievances recorded and closed, no. of inspections undertaken;
- Non-compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs & actual works in relation to HSE aspects;
- Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.

The reporting of any significant HSE incidents shall be done as soon as practicable and within 24 hours of the contractor becoming aware of the incident. Such incident reporting shall therefore be done individually. The Contractor shall keep his own records on health, safety and welfare of persons, incident reports and damage to property and shall provide access and copies of these records to the Supervising Engineer and/or Client upon request.

General requirement: Training of Contractor's Personnel

The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of and suitable equipped to comply with the approved Contractors HSE-MP. Specific training will be provided to those employees that have particular responsibilities associated with the implementation of the HSE-MP. Training activities will be documented for potential review by the Client. Amongst other issues, training will include an awareness session for all employees on HIVAIDS addressing the following topics:

• What is HIV/AIDS? • How is HIV/AIDS contracted? • HIV/AIDS prevention.

General Requirement: Code of Conduct

The Contractor shall prepare, for the client's approval, a code of conduct for all workers (including sub-contractors) and provide details of the methods that the contractor will use to ensure compliance with the code.

Annex 6: TERMS OF REFERENCE

1. Introduction

1.1 **Project Proponent**

1.2 The Federal Democratic Republic of Ethiopia, Ministry of Water and Energy

1.2 Background

Ethiopia is among the countries that have made considerable achievement in meeting the Millennium Development Goals (MDGs). Despite progressive economic growth the country lag behind from the regional average on access to safe water and improved sanitation services to have a significant impact on better health and nutrition, lower school dropout rates and improved household incomes. Ethiopia's rapid urbanization is putting stress on the already inadequate water supply and sanitation system in urban areas. Towns are growing horizontally and vertically and rural villages are also being clustered with small towns faster than ever before. The growing demand generated by rapid population growth, fast growing infrastructure development, service sector growth such as hotels, trade, and industrialization, as well as changes in way of life and awareness level of the residents have mounted pressure in the already inadequate WSS system.

The UWSSP-II is designed to support service providers in Addis and select secondary cities move towards a longer term goal of efficient, universal and affordable service provision within a supporting policy and regulatory framework. The objective of the Project is "to increase access to improved sanitation facilities and improve efficiency in water supply service delivery in Addis Ababa and selected secondary cities. The project will support the Government's effort to respond to the increasing urban demand through investments in sanitation infrastructure, and engaging private operators to improve O&M of the facilities. There will also be activities to improve WSS services levels by facilitating the establishment of institutional arrangements for modernizing the operational and management systems of utilities in Addis Ababa and the selected secondary cities.

The project will also undertake legal, institutional and sector reforms that will permit selected urban water and sewer utilities to function in a more efficient manner deliver better service and achieve a higher degree of financial sustainability. To achieve its development objectives, the project will finance the following components in selected secondary cities.

The project includes three components to achieve the revised PDO: (i) sanitation and water supply services improvement in Addis Ababa; (ii) sanitation and water supply services improvements in select secondary cities; and (iii) Project management and institutional strengthening. To realize component 1, the project has designed three sub-components, namely; Sub-component 1.1: Sanitation services improvement in Addis Ababa: Sub-component 1.2: Operational efficiency improvements in Addis Ababa: and Sub-component 1.3: Project management and Institutional strengthening in Addis Ababa

Similarly, for secondary cities the project has classified component 2 into three sub-components, namely Sub-component 2.1: Sanitation improvement in secondary cities and towns: Sub-component 2.2: Water supply and operational efficiency improvement in secondary cities and Sub-component 2.3: Project Management & Institutional Development in secondary cities and towns.

The proposed investments are likely to incur some adverse environmental and social impacts requiring mitigation (that is, soil erosion, soil and water pollution, a potential increase in malaria, loss of vegetation, traffic accidents and air pollution, health and safety of people near construction sites, taking of privately owned land) due to the project's construction and rehabilitation activities under Components 1 and 2. This will mitigated by screening of projects and implementing relevant WB operational policies.

Limited capacity and experience of selected secondary cities on implementation and management of urban sanitation could substantially affect implementation progress and effective operationalization of the facilities. Most of the participating cities have weak capacity in safeguard that could substantially affect implementation. The project will require availability of critical safeguard staffs and capacity building at every level to support safeguards.

The Water Development Commission which was designated as the implementing agency as established by proclamation No 1097/2018 will be replaced by Ministry of water and Energy after project approval to carry out study, design and construction of potable and sustainable water supply and sanitation infrastructure.

1.3 Brief Description of Sub Projects

1.3.1 Proposed Infrastructures/Activities

The project will implement in each town for the immediate, intermediate and long-term sanitation interventions based of demand assessment findings. It is considered that the population will continue to increase, and it is assumed that a number of infrastructure service improvements will be implemented as presented below:

- **Fecal Sludge Treatment System (FSTS)**

The FST plant will be constructed in order to treat the daily produced fecal sludge. It will consist of the following: truck reception (fecal sludge feeding); grid separation and/or screening; settling- thickening tanks and sludge drying beds. The liquid phase coming from the settling tanks and drying beds is led to the biological treatment phase for further treatment.

- **Toilets**

New public toilets and new communal toilet construction are planned in areas where the availability of sanitation facility is low and/or where more households share the same facility;

The toilets to be constructed are water closet/flush type public latrine, potentially connected to septic tank. The sludge and waste water will be transported by vacuum trucks to FSTP for safe disposal.

Moreover, public awareness campaigns should also be launched, preparing the population for such an incremental change in their sanitation status, with the aim of raising the acceptance of the envisaged works (e.g. the WWTPs to be constructed), raising the value of safe and hygienic sanitation facilities, the willingness to pay ensuring the feasibility of the system, as well as ensuring the necessary funding for the next phases;

1.3.2 Location of the Sub projects (Jimma, Nekemte, Asella, Shashemene, Bishoftu, Arbaminch and WolaitaSodo towns)

Jimma is the largest city in south-western Oromia. It is a special zone of the Oromia Region and is surrounded by Jimma Zone. It has a latitude and longitude of 7°40'N 36°50'E. Prior to the 2007 census, Jimma was reorganized administratively as a special Zone. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 120,960, of whom 60,824 are men and 60,136 women. The national 1994 census reported this town had a total population of 88,867, of whom 43,874 were men and 44,993 were women. With an area of 50.52 square kilometers,

Jimma has a population density of 2,394.30 all are urban inhabitants. A total of 32,191 households were counted in this Zone, which results in an average of 3.76 persons to a household, and 30,016 housing units.

Nekemte is a market town and separate woreda in western Ethiopia. Located in the East Welega Zone of the Oromia Region, Nekemte has a latitude and longitude of 9°5'N 36°33'E and an elevation of 2,088 meters. The 2007 national census reported a total population for this woreda of 75,219, of whom 38,385 were men and 36,834 were women. Nekemte is host city to the newly built Wollega University as of 2007.

Asella is a town located in the Arsi Zone of the Oromia Region about 159 kilometers from Addis Ababa, this city has a latitude and longitude of 7°57'N 39°7'E, with an elevation of 2,430 meters. The 2007 national census reported a total population for Asella of 67,269, of whom 33,826 were men and 33,443 were women.

Bishoftu is a town and separate woreda of Ethiopia, lying south east of Addis Ababa. The town is located in the East Shewa Zone of the Oromia Region, and has an elevation of 1,920 meters. Bishoftu is located 47.9 kilometers southeast of Addis Ababa along its route highway. The 2007 national census reported a total population for Bishoftu of 99,928, of whom 47,860 were men and 52,068 were women.

Shashemeneis a town of West Arsi Zone, Oromia Region, Ethiopia. The town lies on distance of 240 km from the capital of Addis Ababa. It has a latitude of 7° 12' north and a longitude of 38° 36' east.

The 2007 national census reported a total population for this town of 100,454, of whom 50,654 were men and 49,800 were women. A plurality of the inhabitants practiced Ethiopian Orthodox Christianity, with 43.44% of the population reporting they observed this belief, while 31.15% of the population said they were Muslim, 23.53% of the population were Protestant, and 1.3% were Catholic.

Arba Minch is a city and separate woreda in southern Ethiopia. It is located in the Gamo Zone of the Southern Nations, Nationalities, and Peoples Region. The town is located at a distance about 500 kilometers south of Addis Ababa, at an elevation of 1285 meters above sea level. It is the largest town in Gamo Zone and the second town in SNNPR next to Awassa. It is surrounded by Arba Minch Zuriaworeda and the most resourceful zone in southern region including two largest Lakes in Ethiopia (Chamo and Abaya), more than 40 springs, National Nechsarpark, crocodile market, several fruits including banana,

apple, mango, avocado, etc. Based on the 2007 Census conducted by the CSA, this town has a total population of 74,879, of whom 39,208 are men and 35,671 women.

WolaitaSodo is a town and separate woreda in south-central Ethiopia. The administrative center of the Wolaita Zone of the Southern Nations, Nationalities, and Peoples Region, it has a latitude and longitude of 6°54'N37°45'E with an elevation between 1,600 and 2,100 meters above sea level. It was part of the former Sodoworeda which included SodoZuria which completely surrounds it. Based on the 2018 Population Projection by the CSA, this town has a total population of 254,294, of whom 125,855 are men and 128,439 are women. This makes WolaitaSodo the second most populous city in South Region after Awassa.

1.4 Purpose of the Terms of Reference

This ToR essentially outlines the issues that should be considered in preparing the ESIA reports for the **seven sub projects** under UWSSP-II. Furthermore, the ToR provides the framework for the ESIA, including information on the purpose the ESIA and factors considered to be most significant for the project proposal. It indicates the types of studies and the data that should be provided in the ESIA.

1.5 Objective of the Consultant's Service

The main objective of Consultancy is to carry out the Environmental and Social Impact Assessment for Second Urban Water Supply and Sanitation Project seven subprojects in seven towns (Jimma, Nekemite, Asella, Shashemene, Bishoftu, Arbaminch and Wolaitasodo towns). The consultant is expected to identify environmental and social impacts during the life cycle of the sub-projects and recommend appropriate mitigation measures. Further, the consultant shall prepare environmental and social management and monitoring plans. Additionally, under the ESIA study process, the consultant will develop an indicative socio-economic assessment for preparation of resettlement action plans (RAPs) for potential affected villages.

1.4.1 Specific Objectives:

- Examination of the National and the World Bank environmental safeguard policies and regulations that will be triggered by the subproject activities at any development phase of the sub project and these shall include but not limited to the project ESMF, GAP, World Bank's Gender strategy and GBV requirements.

- Describe the views and concern of the public and stakeholders towards implementation of the subproject.
- Establish baseline features of the biophysical, socio-economic and cultural attributes in the subproject influence area.
- Identification and evaluation of significant impacts (both beneficial and adverse) due to the subproject implementation that require appropriate mitigation measures.
- Propose specific mitigation for inclusion in the subproject detail design and management plan to reduce or avoid significant adverse environmental and social impact including gender and potential GBV risks.
- Conduct analysis of alternatives to the proposed sub-projects in terms of technology, design, and operation; including the “without project” situation.
- Assessment and identification of capacity gap and propose training and capacity building requirements for implementation of environmental mitigation and monitoring.
- Preparation of Environmental and Social Management Plan.
- Cost estimate for each proposed mitigation measure and monitoring program.
- Develop a monitoring program that will be followed during the project implementation.
- Recommend environmental and social compliance requirements, design measures, and staffing that should be included in the works contract documents.

The ESIA shall be prepared in a level of detail specific enough for incorporation of environmental and social measures into a tender package for potential construction works, to allow these activities to be adequately priced and become part of the successful bidder‘s works contract. The ultimate aim is to foster on the ground implementation of effective environmental and social measures during the project execution and operational phases.

The Consultant shall be an independent firm, hired on a competitive basis and shall not be connected to the study and design consultant/firm of the project to avoid a conflict of interest. The ESIA consultant shall be a qualified and licensed consultancy firm that will prepare separate full ESIA reports to the **seven sub-projects**

2. Scope of Work and Guideline for Preparation of Environmental and Social Impact Assessment Studies

General: All potentially significant environmental and social impacts of the proposed sub-projects are to be investigated, socio-economic and cultural situation at the project site be addressed, and requirements for the mitigation of any adverse impacts are to be detailed in the ESIA and the ESIA should address at least the requirements as set out in this ToR. Any prudent and feasible alternatives should be discussed and treated in sufficient detail. The reasons for selection of the preferred option should be clearly identified. The nature and level of investigations should be relative to the likely extent and gravity of impacts.

The guideline should, however, not be interpreted as excluding from consideration of any matters which are currently unforeseen, which may arise during the course of the ESIA studies, which may arise from any changes in the nature of the proposal during the preparation of the ESIA, and based on the outcome of community consultations.,

2.1 Scope of the Work

The consultant shall carry out desktop review and field studies in order to fully describe environmental and social baseline of the affected areas. The consultant is expected to undertake investigation on social aspects, economic activities, and conservation of natural resources, historical and anthropological heritages, and conduct public consultation. Based on the knowledge of the affected environment, the consultant shall identify and describe impacts and associated mitigation measures for the design, construction and operation phases.

During the study, the consultant shall take into account issues and concerns raised during stakeholders/community consultations and incorporate these issues and concerns into the environmental and social analysis.

One of the beneficial project impacts of UWSSP is the production of job opportunities for citizens during construction as well as operation phases. Especially during these two phases of the projects, Occupational Safety and Health of workers should be given special attention. In this respect, to manage health, safety and environmental issues with regard to the community and workers. The consultant should assess the following health and safety issues, but not limit to:

- review conditions of the proposed site asset , especially underground works regarding structural stability, potential spilling and rock fall risks during waste water treatment plan(if applicable) .

- review the experience of the organization /utilities regarding emergency equipment and communication system, first aid equipment and rescue service
- Review experience of personal protection equipment for surface and underground works.
- Review site health and safety management procedures.
- Draw up recommendations to improve Health and Safety conditions on construction site, elaborate comprehensive H&S measures. And other health and Safety issues will be clearly identified with their mitigation measures.

The Consultant shall be responsible for carrying out all necessary preparatory studies, field work, research and investigations (including the generation of new field data, as deemed necessary or appropriate) to compile the information required for the work. The scope of the works to be undertaken by the consultant shall include the following tasks:

Task 1: Description of the Proposed Sub-Project

The consultant shall prepare detailed descriptions of the subprojects including but not limited to the following:

- The proposed subprojects design, size and nature of the development supported with appropriate descriptive diagrams, plans, or maps;
- Estimated duration of subprojects development phases including pre-construction, construction, operation, and decommissioning (as appropriate) along with the nature of program/activities & method of execution;
- Type and characteristics of resources required including land (for temporary and permanent works), water, energy, construction materials, machineries/vehicles, estimated number of workers, etc.
- Estimates types and quantities of waste, energy (noise, vibration, light, heat, radiation, etc.), and residual materials generated during construction and operation of the subprojects, and rate at which these will be produced.

Task 2: Review of Regulatory and Policy Framework

The Consultant shall review policy, institutional and legal framework related to water development by giving special attention to institutions responsible for environment and social management relevant to implementation of the water supply and sanitation projects including land acquisition. The Consultant is also expected to review the project's ESMF, RPF and Gender Action Plan (GAP).

Based on the National legislations and regulations identified in the ESMF and RPF, the Consultant shall

identify any relevant changes occurred since the time the ESMF and RPF were prepared, and identify the practical implications thereof in preparing the ESIA. The Consultant is also expected to review relevant World Bank safeguard policies applicable to the subprojects, such as Environmental Assessment (OP/BP 4.01), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP /BP 4.12.), Projects on International Waterways (OP/BP 7.5), and the Bank's Environmental, Health and Safety Guidelines, and GBV requirements.

The Consultant will summarize in the ESIA reports the applicable regulatory and policy background with a focus on practical implications in terms of:

- ✓ ESIA process, including public consultation and disclosure,
- ✓ ESIA scope of work,
- ✓ Contents of the ESIA report,
- ✓ Sub-project description:

The legal, policy and institutional framework should be reviewed the following, but not limited to:

- ✓ The Constitution of Ethiopia
- ✓ Environmental Policy of Ethiopia
- ✓ National Sanitation Strategy
- ✓ National Social Protection Policy
- ✓ Ethiopian water resource management policy
- ✓ Environmental Impact Assessment Proclamation No 299/2002
- ✓ Environmental Pollution Control, Proclamation No 300/2002
- ✓ Regulation No 159/2008, Prevention of Industrial Pollution Regulation
- ✓ Addis Ababa City Regulation No 25/2007, on pollution control
- ✓ Public Health Proclamation No 200/2000
- ✓ Expropriation of landholding for Public Purposes & Payment of compensation and resettlement Proclamation No 1161/2019 and Regulation 472/2020
- ✓ The Labour Law, Proclamation No 1156/2019
- ✓ Women Policy
- ✓ Policy on People Living with Disability
- ✓ Environmental Guidelines and Standards
- ✓ The World Bank Safeguard Policy Requirements
- ✓ Institutional Framework for Environmental and Social Management etc…

Task 3: Public Participation and Consultations

The purpose of the consultation process on environmental and social aspects is to ensure that the views of all key interested and affected parties and public communities are heard, so that their views can be taken into account where appropriate during physical design of the subprojects. The views shall influence the mitigation measures and the formulation and design of any complementary environmental and social measures and activities that will be included in the tender documentation. Key activities include:

- The consultant shall undertake identification of interested parties (beneficiary communities, communities potentially affected by the project, downstream water users, local authorities, regional authorities);
- The consultant shall undertake initial meeting with each of the identified parties, to introduce the sub-projects and acquire input to further develop the preparation of the environmental and social assessment activities;
- At least one official consultation meeting shall be arranged in each subproject sites involving representatives from key interested and affected parties and public communities, business communities, local administration and institutions where the subproject components are located.
- The consultation interview meeting shall also extend to relevant institutions and facilities including, but not limited to, the following:
    - Representative from communities, institutions and facilities;
    - Respective Cities Environment Protection Authority
    - Cities Utility offices, sub-cities and Woreda's.
    - Local and national representatives from agencies responsible for environmental protection, agricultural development, health facilities, water management, cultural heritage, archaeology, infrastructure and service provision
    - Local community leaders and community representatives comprising women participants (including government, non-government and civil society organizations)
- The consultant, after the environmental and social assessment work is completed, shall follow up with second round consultations through presentation of the results of the environmental and social assessment such as identified impacts and proposed mitigations measures so as to get input for the enrichment of the assessment report on those proposed environmental

management measures. The second round consultations shall include dissemination of information to identified interested parties in a form of brief summary in local languages and/or English;

- Any public consultation meeting undertaken by the consultant shall be reviewed and discussed with the client and documented in an appropriate format.
- Main issues raised during consultation meetings shall be summarized in the ESIA reports, with a description of the manner in which these issues were addressed in the ESIA process.
- The Consultant shall keep a written record of all meetings, and ensure that they reflect an accurate and true reflection of the discussions.

Consultation with local Community: Community participation and consultation is an important step in the ESIA preparation process. Public consultation is instrumental in assessing the socio-economic impacts of projects. Community consultation meetings shall be convened to draw together the issues and concerns of stakeholders and project affected parties. Consultations with project-affected parties include woman and youth, community leaders and the disadvantaged groups such as the elderly and disabled individuals and community members whose livelihood or income generating activities will be directly affected by the project activities.

Discussion with the project design team: Project alternatives, designs and processes shall be thoroughly discussed with the design engineers to understand the nature of the sub projects. Similarly, discussions shall also be made with the relevant experts from the cities' relevant administration offices to develop common understanding on the scope of the assignment.

Discussions with the government authorities: The Federal, regional/city offices or any responsible for environment will be consulted and their institutional framework, policies, procedures, guidelines etc. will also be reviewed.

Task 4: Baseline Conditions

The consultant shall undertake baseline assessment and provide description of the environment that will be affected by the subproject. During field work information on physical, biological and socio-economic environmentshallbe collected. In addition, water samples from the rivers where treated wastewater will be discharged to the nearby river shall be collected for analysis in order to establish baseline data useful for monitoring impact during construction and operation phases of the projects. This will be done using checklist, matrices or other methods as required.

Description of the baseline conditions include:

- Physical and bio-physical environment (climate, topography at the sub-project site(s), geology, hydrogeology/groundwater, surface water, soils, erosion sensitivity, flora, fauna, including the identification of any protected or endangered species);
- Description on socio-economic data including population, demography, community structure, standard of living, housing condition, energy and water supply, socio-political organization, access to public services, economic state of local population, extent of poverty, cultural properties, heritage sites, building and other, existing livelihoods and employment, transport patterns;
- Human environment: description of neighboring communities (population size, population structure and demography, socio-political organization, livelihoods, access to public services),
- Description on gender considerations (that incorporates gender disaggregated data and analysis) including the gender-based violence and sexual exploitation and disadvantaged groups including vulnerable women and other people with special needs. The project's benefit for poor people other than employment opportunity and special treatment to be proposed for them, identify potential risk and mitigation measures for downstream residents for wastewater treatment plant sites (if applicable),
- Land tenure, land use rights, land use system in and around the subproject areas;
- Existing infrastructure services utilities found in and around the subproject influence area interfered during the subproject construction period
- Access to health centers, primary and secondary schools, other public private and government facilities;
- On-going and planned activities that may affect implementation of the subprojects
- Health issues, prevalence of major disease such as HIV/AIDS and likely trends, availability of health centers and likely health trends including GBV issues mainly potential GBV risks;
- Labor and employment condition;
- Physical cultural resources defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance;

For the above baseline data collection purpose, the consultant shall collect available documents from credible sources and stakeholders' consultations, data gap on key relevant baseline aspect shall be identified, and the consultant will possibly address the gap/weakness through interview and meeting with stakeholders during the ESIA study;

- The consultant may also obtain data based on the design consultant survey which are relevant supporting baseline information, environmental and social opportunities and constraints;
- The baseline assessment will be summarized using the format presented in the "typical ESIA report structure" hereunder;
- Reports of field observations and bibliography used will be presented as appendices;

Task 5: Impact Identification, Characterization and Evaluation

The consultant shall briefly describe methodology for identifying, predicting and evaluation of impacts (both negative and positive). The consultant shall assess cumulative impacts (positive and negative, direct and indirect, long-term and short term) due to implementation of multiple interventions of the sanitation sub-projects. With regard to each impact, the following shall be included:

- Criteria used for determining significance of impact (magnitude, geographic extent, duration, frequency, reversible or irreversible, risk of uncertainty, size of group affected); in addition it shall take in to account views and concern of stakeholders, sensitivity of the environment, considering consistency with international environmental and social agreement/standards, environmental and social objectives and policies; effect on resources/heritage/cultural sites protected by laws, socio-economic and gender consequences (vulnerable groups including women);
- Brief description and analysis of each impact (nature, significance, and extent);
- Affected stakeholders in and around the subproject area;
- Impacts on the environment which results from the incremental impact of the proposed subproject when added to other past, current and reasonably foreseeable future proposals;
- Identify potential accident or hazard scenarios covered in the assessment and the impacts that might arise from non-standard operating conditions
- Indicate whether predictions, judgments and assessments of significance have been made based on expert opinion, standards, models, case studies, stakeholder perceptions or personal experience and judgments.
- Clearly identify which environmental and social impacts are significant and need to be mitigated against and monitored, and which are not likely or only marginally likely to be affected and do not need to be considered further.

The consultant shall pay particular focus, among others, to the following environmental, social and gender impacts/issues:

- Air pollution related to subproject site excavation work and transportation of materials;
- Solid and liquid waste generation;
- Soil erosion and land stability, especially with the construction of underground crossings;
- Flooding concerns;
- Loss of access to resources, livelihood, and income due to temporal and permanent land acquisition, give due attention to identification of displacement effect on Female Headed Households (FHH) livelihood since women are mostly engaged in small informal business along road corridor;
- Loss of household infrastructure such as granaries, outside toilets and kitchens;
- Effect the quantity or quality of surface waters (e.g. rivers, streams, wetlands), or groundwater (e.g. wells);
- Effect on vulnerable groups, people with disabilities (PWD);
- Traffic congestion during construction works;
- Community/workers safety and health related issues;
- Potential GBV risks;
- Effect on available vegetation/trees;
- Loss of access to services due to construction works and detours
- Construction traffic management.

Task 6: Setting of alternatives/options for comparison

It is expected that the design consultants will develop at least two (2) alternative fecal sludge treatment systems for each town mentioned above consisting a variety of conceptual solutions for the liquid waste sanitation problem. Thus, the ESIA consultant shall provide inputs for setting feasible alternatives in relation to the nature of the plan and objectives. Alternative redesign options should be sought if sever impacts have the possibility to occur due to subprojects implementation.

Consideration of alternatives shall include a minimum comparison between the “do-nothing” scenario and the proposed subprojects implementation. In this regard, the ESIA consultant shall assess and evaluate the likely evolution of the current state of environment and identified environmental, social and gender priorities without implementation of the subprojects.

Task 7: Impacts Mitigations and Management

Based on the typical Environmental and Social Management Plan (ESMP) presented in the UWSSP II Environmental and Social Management Framework, and the actual findings of the ESIA, the Consultant shall develop site specific ESMP for each of the seven sub projects **(Jimma, Nekemte, Asella, Shashemene, Bishoftu, Arbaminch and WolaitaSodotowns)** which will include as a minimum for each identified impact:-

- Identified impacts;
- proposed the mitigation measures;
- detail description of monitoring measures including monitoring indicators,
- responsible bodies for implementation,
- frequency of monitoring,
- Implementation responsibilities for the mitigation measures and monitoring;
- Cost estimate with budget;
- Assessment of residual impact after implementation of the mitigation;
- If any changes to the Environmental Guidelines for Construction Contractors presented as an appendix to the ESMF are warranted, the Consultant will propose such changes.

Such recommendations for the development of monitoring plan shall ensure implementation of the feasible and cost-effective mitigation measures to prevent or reduce significant negative environmental impacts to acceptable level. As necessary, specific additional protection measures to those included in the Environmental Guidelines for Construction Contractors presented as an appendix to the ESMF shall also be proposed by the Consultant.

The ESMP will consist of the following information for each identified impact (Note that mitigation and management for identified gender and GVB issues shall form an integral part of the ESMP):

- **2.2 Grievance Redress mechanism**

The consultancy firm shall assess mechanism established to identify and solve grievances and shall develop a process for grievance procedures, which shall be accessible to all affected persons (taking into account literacy and numeracy constraints), open and transparent, and take into account judicial, community and traditional dispute resolution systems. The GRM shall also entertain grievance and related aspect to gender and GBV issues.

3. Deliverables

All the ESIA reports of each seven sub projects (Jimma, Nekemite, Asella, Shashemene, Bishoftu, Arbaminch and WolaitaSodo towns)shall be reviewed by the proponent institutions and the World Bank environment and social safeguard team of experts. The report shall also be acceptable to the requirement of the national and World Bank's standard to be disclosed in all the necessary websites as per the ESMF requirement. The below table shows expected deliverables of the assignment, schedule of deliverables and number of copies:

Table 1 Expected deliverables period and number of copies

Major Outputs	Key Activities	Number of copies
1. Inception report	• Review of existing project and policies • Outline of work plan, methodology, activity timeline, outline of the ESIA report, • Roles of team members, and key information for achieving the objectives of the assignment, • Preliminary field finding as well as any new findings/changes that may affect the tasks and, among others.	5 hard copies & electronic copy on a CD
2. Draft ESIA report	• Field assessments, surveys, analysis • Brief description and analysis of each impact • Affected stakeholders in and around the subproject area • identify which environmental and social impacts are significant and need to be mitigated • submission of due diligence reports and draft report and recommendation of clients, WB and other stakeholders	6 hard copies & electronic copy on a CD
3. Final ESIA report	• Completion of report and recommendation linked documents from clients, WB and other stakeholders	6 hard copies & electronic copy on a CD

4. ESIA Consultancy Firm Staffing

The ESIA consultant shall be qualified and licensed firm with the required educational qualification of the team. The firm shall have renewed level-1 (senior consultancy firm) environmental consultancy

license from Environment Protection Authority (EPA) with relevant work experiences in different projects and specifically WaSH projects.

The consultant shall undertake the environmental and social impact studies in multidisciplinary manner. Therefore, according to EPA (former ECFCC) environmental and social impact assessment consultant competence licensing directive no. 03/2010 the consultant shall have seven licensed professionals in the team. The licensed professional team composition includes: i) Environmental Pollution Analyst, ii) Social Issues Analyst, iii) Environmental Health Analyst, iv) Biodiversity and Ecosystem Analyst, v) Economic Issues Analyst, vi) Water Resource Utilization Analyst and vii) Green House Gases Emission (GHGs) Analyst. The required skills and experience of the consulting service includes but not limited to the following as presented in the table 2 below.

Table 2 Details of Team Composition, Required qualification and experience for the assignment

S/N	Team Composition and Leadership	Minimum Skill (Education and Work Experience)
1	Team Leader/ Environmental Pollution Analyst	• The team leader should have a PhD. /masters/bachelor's degree in Environmental Engineering, Chemical Engineering, Environmental Management, Environmental Science, Chemistry or related fields. • At least 10 years of experience in environmental studies particularly in Environmental and Social Impact Assessment • Should have Senior Consultant level professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • Previous experience and good knowledge of ESIA study. • 3 years of specific experience and good knowledge of ESIA study in Urban WASH projects, and other World Bank funded projects • Fluency in English
2	Social Issues Analyst	• The Social Issues Analyst should have at least Masters/bachelor's degree in Sociology, Social Studies, Social Works, Social Anthropology or related fields. • At least 8 years of experience in environmental and social Studies particularly related to involuntary resettlement issues, indigenous peoples, gender mainstreaming. • Should have Senior Consultant level professional competence renewed license, experience in infrastructure development projects, in urban settings and preferable on WASH sector, • 3 years of specific experience on Resettlement for development projects, SIA/RAP, Socio-economic study preparation in Urban WASH projects, and other related World Bank financing projects. • Fluency in English

S/N	Team Composition and Leadership	Minimum Skill (Education and Work Experience)
3	Environmental Health Analyst	• The Environmental Health Analyst should have at least Masters/bachelor's degree in Environmental Health, Environmental Science, Occupational Health and Safety or related fields. • At least 8 years of experience in conducting environmental health investigations. • Should have Senior Consultant level professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • 3 years of specific experience in Health and safety or related activities in Urban WASH projects, and other related World Bank financing projects. • Fluency in English
4	Biodiversity and Ecosystem Analyst	• The Biodiversity and Ecosystem Analyst should have at least Masters/bachelor's degree in Biodiversity, Forestry/Wild Animal/, Biology, Plant Science/Agronomy or related fields. • At least 8 years of experience in conducting assessment of biodiversity and ecosystem for establishing baseline information. • Should have Senior Consultant level professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • 3 years of Specific experience of ESIA study in Urban WASH projects, and other World Bank funded projects • Fluency in English
5	Economic Issues Analyst	• The Economic Issues Analyst should have at least Masters/bachelor's degree in Economics, Environmental Economics, Agricultural Economics or related fields. • At least 8 years of experience in undertaking project economic assessment. • Should have Medium level Consultant professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • 2 years of Specific experience of ESIA study in Urban WASH projects, and other World Bank funded projects • Fluency in English
6	Water Resource Utilization Analyst	• The Water Resource Utilization Analyst should have at least Masters/bachelor's degree in Water Resource Utilization, Natural Resource Management, Water Engineering, Geology or related fields. • At least 8 years of experience in water and sanitation studies particularly environmental and social impact assessment. • Should have Medium level Consultant professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • 2 years of specific experience of ESIA study in Urban WASH projects, and other World Bank funded projects

S/N	Team Composition and Leadership	Minimum Skill (Education and Work Experience)
		• Fluency in English
7	Greenhouse Gases (GHG) Emissions Analyst	• The GHG Emissions Analyst should have at least Masters/bachelor's degree in Climate Change, Chemistry, Environmental Science, Environmental Health or related fields. • At least 8 years of experience in conducting assessment of GHG emission and evaluation of the significance. • Should have Medium level Consultant professional competence renewed license, experience in infrastructure development projects, preferably in urban settings and preferable on WASH sector, • 2 years of specific experience of ESIA study in Urban WASH projects, and other World Bank funded projects • Fluency in English

- **4.1Consulting Service Staff Inputs**

ESIA shall be implemented over a period of 120 days. The estimated inputs of the consultant's staff are presented in the below table.

Table 3 Summary of ESIA Key Experts Requirement

S/N	Team Composition and Leadership	Person- months
1	Environmental Pollution Analyst (Team Leader)	6
2	Social Issues Analyst	3
3	Environmental Health Analyst	1.5
4	Biodiversity and Ecosystem Analyst	2
5	Economic Issues Analyst	1.5
6	Water Resource Utilization Analyst	1
7	Green House Emission Gases Analyst	1

Therefore, to carry out the assignments on the scheduled time the consultant shall deploy at least three teams at a time with the required profession. Accordingly, the consultant shall make his/her own

assessment of the manpower requirements in terms of man-month for various categories of persons proposed to be deployed to carry out the services as envisaged in the ToR.

The Consultant is required to furnish the company profile of the firm and CVs of the required licensed professionals. The CV's of all the key experts will be evaluated. The evaluation of the team is the main criterion in the evaluation of the proposal.

The Consultant staff shall work closely with the Client's Environment, Social and Climate Change Directorate safeguard specialists assigned to the work, and lead design consultant working on the concept and detail design components of the subproject. The Consultant shall liaise and undertake meetings with the design consultant to obtain details on subproject components and exchange information to facilitate the high-quality execution of both the technical and environmental and social assignments.

The consultant is expected to be fluent in English and be able to work closely with the clients' staff, the World Bank Environment and Social Specialists and other third parties relevant to the assessment.

5. Working Language

The ESIA should be written in English language. Charts, diagrams, site plans, photos and maps should be provided wherever useful to clarify the text, including perspective drawings that convey what the developed sites would look like. The executive summary of the ESIA and any necessary checklists should be translated to local languages, as required.

6. Starting Period

The consultant shall start the assignment within 15 days after signing the contract agreement with the client.

7. Timeline of the Consultancy Service

The timeline for the proposed consultancy service including field works and preparation and submission of final ESIA reports shall be completed within 150 days or four months of the contract period.

- **7.1 Working Schedule for Submission of Deliverables**

Table 4 Schedule of deliverables

S.N	Deliverables	Duration (in Days)	Starting date
1	Inception Report	15	after commencement
2	Draft ESIA report	100	after inception report submitted
3	Final ESIA report	35	after comment on the draft ESIA report is submitted
	Total	**150**	

Appendix I

Content of the Environmental and Social Impact Assessment (ESIA)

The ESIA report should include at least the following sections but need not be limited to these sections. The indicative outline of the ESIA shall be updated as part of the Inception Report.

1. Executive Summary

Provide a plain language Executive Summary that provides the reader with a concise but complete overview of the ESIA and includes the following information:

• Background on the Proponent(s)

• Project overview

• Project setting: geographic, physical, biological and human environments

• Summary of environmental & social impacts as well as mitigation measures

• key information of the ESIA

As it may be used as a stand-alone document, the Executive Summary should present the information in a general manner focusing on the main issues and findings. The use of maps and figures to aid in the

presentation of information is encouraged. The purpose of the executive summary is to convey the most important aspects and options relating to the project on the findings of the ESIA to the reader in a concise and readable form. The summary shall be interpreted and presented with local languages.

2. Introduction

- Scope of the ESIA
- Team in charge of the ESIA, with list of consultants involved and tasks assigned for each
- Summary of requirements applying to the ESIA
- General Ethiopian legal requirements
- ESMF requirements
- RPF requirements
- Other World Bank requirements if applicable
- Time frame for implementation of the ESIA

3. Description of the Proposed Sub-project

- Technical components, including description of the methods used for construction and operation
- Sub-project decommissioning at the end of the operation period
- Implementation arrangements
- Implementation schedule and cost

4. ESIA Methods

- Terms of Reference of the ESIA, and process through which they were arrived at
- Description of the methods used for the ESIA, including description of field investigations, mathematical models, social investigations, available literature
- Description of standards and guidelines used
- Statement on the extent of involvement
- Identification of information gaps and uncertainties

5. Outline of the main alternatives

- Identification of alternatives in terms of site, technology, engineering options.

6. Consultation

- Identification of interested parties
- Description of consultation with affected parties (timeframe, methods)

Main issues arising from consultation and how they were addressed in the ESIA process

7. Description of the baseline environmental and socio-economic conditions

- Focus of the baseline assessment depending on the nature of the sub-program and on its likely impacts
- Description of the physical environment (climate, topography, geology, hydrogeology, surface water, soils in the sub-program area)
- Flora and fauna - brief description of the baseline situation at sub-project site, with a specific focus on endangered species if any, and assessment of the general biodiversity situation in the program area
- Description of the human environment:
  - ✓Identification of neighboring communities, description thereof
  - ✓demography, sociopolitical conditions),
  - ✓Land use pattern, land tenure, and related social organization,
  - ✓Livelihoods
  - ✓Water usages
  - ✓Noise
  - ✓Health situation

8. Potential Sub-project Impacts

Generally, prediction and assessment of each impact at all stages of the program cycle for each alternative, including, but not limited to;

Pre-construction Phase

- Land acquisition

Construction phase

- Employment
- Impact on land use
- Impact on flora and fauna, with a specific focus on endangered species if any
- Noise, Dust and Vibration
- Impact on ground water quality
- Impact on surface water quality (related with erosion at the vicinity of the work site for example)
- Impact on surface water usage
- Impact on ground water usage
- Impact on soils (compaction by drilling equipment, removal of top soil)

- Potential uses of the environment that will be affected
- Impact on Buildings and structures;
- Impact on Other structures (wells, channels, agricultural or commercial buildings, etc...);
- Impact on livelihoods;
- Impact on infrastructure service/water, electricity and access road/ during trench excavation and related works;
- Temporary acquisition of land/for camping, Quarry production and storage area of Pipes and Fittings/;
- Impact on cash crop (e.g., Papaya, Mango, Avocado and other);
- Impact on Vegetables in Urban agricultural area;
- Impact on Standing Crops;
- Impact Trees and perennial crops;
- Impact on Annual crops, etc …

Operation phase

- Impact on ground water levels, flow and quality
- Impact on surface water (quantity - flow, quality)
- Impact on surface water usage with a focus on potential conflicts between upstream and downstream users if relevant
- Impact on ground water usage
- Impact of changes in water regimes on flora and fauna, and bio-diversity in general, with a specific focus on wet zones if any
- Potential uses of the environment that will be affected

Decommissioning phase

- Summary table assessing the significance of each identified impact in terms of magnitude, extension, duration or frequency of occurrence and probability of occurrence

1. Consultation Process

- Description of the consultation process (who was consulted, how, when)
- Results: main issues raised and how they are addressed in the program design and in the ESIA in general

2. Mitigation Measures

- Table showing for each identified impact at each of the main three phases of the program the

proposed mitigation measures, with narrative justifying them

- Table showing the residual impacts once the mitigation measures are implemented,

3. Environmental and Social Management Plan (ESMP)

Table showing for each identified impact both the mitigation and the monitoring measures proposed in the ESIA, with for each the implementation arrangements, including responsibilities for implementation, the timeframe, and the budgetary implications

4. **Monitoring Plan**

Table showing for each identified impact the monitoring measures that will be taken, with indication of indicators used, frequency of measurement, frequency of reporting and any relevant details on the methods to be used for collecting and treating monitoring data.