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MINISTRY OF WATER AND ENERGY
የኢትዮጵያ ፌዴራላዊ ዴሞክራሲያዊ ሪፐብሊክ | Federal Democratic Republic of Ethiopia

Environmental and Social Impact Assessment Report On Fecal Sludge Treatment Plant

Shashemene City, Oromia

Client: Ministry of Water and Energy



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LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
BOD	Biological Oxygen Demand
CBOs	Community Based Organizations
COD	Chemical Oxygen Demand
CWIS	City Wide Inclusive Sanitation
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
ESIA	Environmental Social Impact Assessment
ESMF	Environmental Social Management Framework
ESMP	Environmental and Social Management Plan
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussions
FS	Fecal Sludge
FSTP	Fecal Sludge Treatment Plant
GAP	Gender Action Plan
GBV	Gender-Based Violence
GoE	Government of Ethiopia
GRM	Grievance Redress Mechanism
GSEMC	Green Sober Environmental Management Consultant
GTP	Growth and Transformation Plan
HHs	Households
KII	Key Informant Interviews
MDG	Millennium Development Goal
MM	Modified Mercalli
MoWE	Ministry of Water Energy
MoWIE	Ministry of Water Irrigation and Electricity
NGOs	Non-Governmental Organizations
OHS	Occupational Health and Safety
OP	Operational Policy (World Bank)
OWEB	Oromia Water and Energy Bureau
PAHs	Project Affected Households
PAPs	Project Affected Populations
PC	Public Consultations
PO	Project Office
PPE	Personal Protective Equipment
PPP	Public Private Partnerships
RPF	Resettlement Policy Framework
SWSSE	Shashemene Water Supply Sewerage Enterprise
SDGs	Sustainable Development Goals
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SME	Small and Micro Enterprises
UWSSP	Urban Water Supply and Sanitation Project
WB	World Bank
WSP	Water and Sanitation Program
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Like most of the Sub-Saharan countries, Ethiopian cities and towns are characterized by poor sanitation services. As a result, people in many towns lack access to adequate sanitation systems, consequently causing environmental and social problems. To alleviate these problems, the Federal Democratic Republic of Ethiopia (FDRE), as represented by Ministry of Water and Energy (MoWE) is working in partnership with World Bank (WB) and launched the second Urban Water Supply and Sanitation Program (UWSSP II).

The objective of the UWSSP-II is to increase access to safe, sustainable and inclusive sanitation and hygiene, with improved management of fecal sludge for people living in deprived urban communities. This forms an integral part of Government efforts to improve access to sustainable sanitation in line with the National Growth and Transformation Plan (GTP-II). The program aim to eliminate open defecation, raise the proportion of the population using a "safely managed" sanitation service. And to improve current water supply services through increased operational effectiveness and expansion of water supply service to underserved areas of urban centers. As part of the objective of UWSSP-II through MoWE, this subproject intends to build Fecal Sludge Treatment plant (FSTP) in Shashemene City, using current state-of-the-art technology.

Assessment of the environmental and social impacts is a prerequisite for implementing developmental projects both by the Ethiopian Environmental Protection Authority (EPA) and the WB. Thus, this agreement is designed to conduct an Environmental and Social Impact Assessment (ESIA), for Shashemene City FSTP; and to develop an environmental management and monitoring plan to be implemented during the construction, operation and decommissioning phases of the subproject. To this end, the client (MoWE) commissioned Green Sober Environmental Consultant (GSEMC) PLC to carry out the ESIA in the subproject site. Accordingly, the ESIA team identified major project impacts and developed feasible mitigation options including environmental and social management and monitoring plans. It also included institutional arrangement, human resources, capacity building requirements and Grievance Redress mechanisms.

The ESIA team adopted an integrated approach involving desk research, data and information evaluation, field investigations, experimental approach, and consultations among relevant

stakeholders. The team utilized both quantitative and qualitative data from primary and secondary sources. Moreover, relevant national policies and legal frameworks as well as WB safeguard policies were also reviewed. Structured questionnaires, observational checklists, and interviews were also employed to collect data on the social and environmental issues of the subproject.

Shashemene city is located in Oromia national regional state at distance of 250 km south of Addis Ababa. The city has a total population 273, 193 with annual growth rate of 4.8%. Shashemene has an overall area of 17,149ha and subdivided into eight sub cities. The plot of land proposed for the FSTP is 11ha and it is agricultural land which is owned by 7 small holder farmers. Urban sanitation facilities and practice is very poor and without fecal sludge disposal site. As a result SWSSE and private trucks collect the liquid waste from institutions and households and empties it at Alamura hill which is located in the south eastern outskirts of Hawassa city. The new proposed FSTP site is located at about 10 km from the center of the city to Shashemene-Halaba Kulito main road in *Cabi Dida Gnata* Kebele.

Stakeholder consultations (PAPs, design consultant and concerned institution representatives) were held in between July 27 and August 11, 2023 both on the FSTP construction site and SWSSE office. Land acquisition, compensation, relocation and restoration of the PAPs were the central point of discussion. The consultant clearly stated that both in-kind and cash compensation should be made for the PAPs prior to the start of any civil work. Besides environmental safety, water pollution management, benefits of the project, job opportunity, concerns for the vulnerable group were also get attention during the discussion. The major concerns raised by the PAPs include: what will be the fate of the vulnerable groups? How could the government support our livelihoods? What benefits does the intended subproject bring to the local community? Accordingly, relevant information was provided by the consultant and the SWSSE expertise. Thus consensus was made among the consultant, the PAPs and the SWSSE representatives to proceed the FSTP development.

Concerning the project alternative analysis, the no project alternative option is not technically feasible, since the city has grave sanitation facility shortage and associated environmental and community health problems. For the FSTP construction site selection three alternatives were

visited and analysis was made. Together with the surveying team of the design consultant and the SWSSE representatives, the ESIA consultant agreed during field visit to slightly amend the selected location and that specific site was accepted among the three parties. Based on the environmental, social and economic feasibility, and in agreement with the design consultant team a combination anaerobic pond with wetland FS treatment technology was proposed.

The positive impacts of the subproject were identified and appropriate enhancement measures were suggested. In the meantime, the major negative impacts of the subproject during the construction, operation and decommissioning phases were also identified and feasible mitigation measures were forwarded for the identified impacts. The major negative impacts of the FSTP subproject include:

- Resettlement and compensation issues;
- Impacts on soil;
- Disturbance of air quality;
- Noise pollution;
- Traffic congestion and accident risks;
- Surface and ground water pollution;
- Operational Safety and Health Risks;
- Increased incidence of diseases;
- Gender based violence;
- Social disharmony;
- Spread of some foul odors to the surrounding residential areas;
- Overflowing of sludge into the surrounding farms;
- Public health impacts and risks;
- Release of contaminants or pollutants into the surrounding environment;
- Loss of job opportunity.

The identified adverse impacts can be minimized to acceptable levels by adopting appropriate mitigation measures. Proper compensation to farmers for the loss of cultivated crops and their farmlands should be made based of the ARAP findings. Impacts related with soil, air and sound pollution can be managed by using an excavated soil management plan, minimizing the speed of trucks to 30Km/hr on unpaved construction sites and use of water spray. Impacts on surface and

ground water can be mitigated by using modern vehicles as well as construction machineries that could minimize oil, grease and fuel leakages to the environment. Proper traffic management plan should also be implemented throughout the project phases. According to the developed environmental health and safety plan, the necessary PPE should be provided to all employees as well as visiting and supervising team in order to mitigate the OHS related risks. Proper awareness should be given for the employees about cultural issues and gender sensitivity, along with HIV/AIDS sensitizations. Any gender and cultural violence should be managed using informed code of conduct. Public health impact and risk as well as effluent contamination to the environment should be managed by maintaining the effluent content to the national standard before released in to the environment.

So far, the enterprise has recruited one environmental and one social safeguard expert. However, it has shortage of OHS and waste water technical staff. Therefore, one OHS expert and one waste water engineer should be employed for effective subproject implementation. In addition to the mitigation options, the required capacity gaps along with role playing stakeholders for the proposed subproject were identified and described. Stakeholder's capacitation and training programs include: an orientation program on the ESMP, Environmental and Social Assessment Processes and Safeguards, OHS, GRM, environmental sampling, water and wastewater quality monitoring and project management and monitoring procedures.

If all mitigation measures and the ESMP recommended by this ESIA are appropriately implemented, it is believed that the benefits that can be achieved from the proposed FSTP development at the City and Regional level by far outweigh the anticipated negative impacts. So it is advisable to use both compliance and effect monitoring plans during the subproject lifecycle. The compliance monitoring mechanism will ensure that the various subproject concerned institutions are implementing the provisions of the ESMP effectively due date. Whereas the effects monitoring part will check on the impacts which the subproject is having on the receiving physical, biological, and social environment by regular measuring of indicators. Moreover, environmental audits should also be carried out at different phases of the subproject. Excluding the Abbreviated Resettlement Action Plan (ARAP) cost, the estimated Environmental and social safeguard management and monitoring plan budget for Shashemene City FSTP subproject is **7,712,500.00** (Seven Million Seven Hundred Twelve Thousand Five Hundred) Ethiopian Birr.

1. INTRODUCTION

1.1 Background

The Government of Ethiopia (GoE) has adopted the country's Vision 2025 through the Growth and Transformation Plan (GTP 1 and 2); and has committed to improve the socioeconomic status of the people through key interventions like improved delivery of water and sanitation services that satisfies the need of lower middle income countries' citizens by the year 2020. At early stages of the MDG period, Water and Sanitation coverage in Ethiopia was very low (13% for Water Supply and 3% for Sanitation) (MoWIE, 2016). Recent Government efforts to promote delivery of household and public sanitation facilities, has resulted in better access to sanitation (about 28%) in urban areas (Belay Desye *et al.*, 2022) and 20% overall the country (Demsash *et al.*, 2023), which is still below the Sub-Saharan Africa average (30%). More than half of the Ethiopian population (52%) still used unimproved sanitation facilities, implying that the country is little far from the MDG target for access to improved sanitation (56%).

Most people in urban areas used unimproved sanitation facilities, indicating that the urban poor did not receive adequate sanitation services (Abebe Beyene *et al.*, 2015). Noticeably, improperly designed and inaccessible sanitation facilities are problems for physically disabled poor people across communities (Manaye *et al.*, 2018). The situation is exacerbated by higher population growth due to increasing rate of urbanization (nearly 5.1%). As a result, people in many urban areas lack access to adequate sanitation systems, consequently causing environmental and social problems (ESMF, 2020). Urban sanitation is crucial for human health, social well-being and economic development. It helps to prevent the spread of communicable diseases and environmental pollution through the use of improved sanitary facilities like flush toilets and fecal sludge treatment technologies. Fecal Sludge Management (FSM) is a global concern particularly in low-income countries which predominantly rely on on-site sanitation technologies.

A nationwide sector assessment supported by WB Water and Sanitation Program (WSP) in 2014, identified twenty two potential clusters of cities and towns to be provided with shared fecal sludge treatment/disposal infrastructure to help improve fecal sludge service chain management across Ethiopia. Therefore, the MoWE is directing its efforts towards improving the sanitation by providing additional treatment facilities and improving collection capacity to ensure universal access to urban dwellers by 2030. Thus, the GoE and the WB have launched the UWSSP II. The

program 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 water supply services through increased operational effectiveness and expansion of water supply service to underserved areas. Accordingly, the WB WSP provided a loan and grant to finance the development of an integrated City-wide sanitation plan, feasibility study and detailed design investment plans for FSTP construction in Shashemene city. Therefore, the Federal Democratic Republic of Ethiopia's (FDRE) MoWE hired Green Sober Environmental Consultant PLC to conduct an ESIA for the FSTP subproject under UWSSP-II in Shashemene city.

1.2 Objectives of the ESIA

1.2.1 General Objective

The general objective of the consultancy is to carry out the environmental and social impact assessment on a FSTP construction in Shashemene City. The consultant is expected to identify environmental and social impacts during the life cycle of the FSTP management and recommend appropriate mitigation measures. Furthermore, the consultant prepares environmental and social management and monitoring plans. Additionally, under the ESIA process, the consultant develops an indicative socio-economic survey for potentially affected villages.

1.2.2 Specific Objectives

The specific objectives are:

- 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 subproject and these shall include but not limited to the project ESMF, Gender Action Plan (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, socioeconomic, 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 subproject 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 work contract documents.

1.3 Scope of the ESIA

One of the scopes of the ESIA was pertinent policy, legal instruments, standards and guidelines and institutional arrangement review. The other was collection of city wide biophysical, socioeconomic and cultural baseline data. Thus, an all-encompassing baseline data on soil mapping, land use land cover, water and hydrology, landscape and visual features, archaeological and cultural heritage, biodiversity and ecological parameters and socioeconomic environment was collected. The stakeholder consultation and indicative household survey for the likely PAHs was also made. Project impact identification was conducted and possible mitigation measures were also forwarded. Finally, proposal of human resources, capacity building and monitoring plan with time and cost implications was also described.

1.4 Organization of the ESIA Report

This report is organized into 11 chapters. The contents of this ESIA report are as follows:- Following the executive Summary, **Chapter One** is an introduction and indicates the purpose of the ESIA; present an overview of the proposed project, as well as the project's purpose and needs. **Chapter Two** discusses related policy, legal, institutional and administrative frameworks. It presents the relevant environmental and social policies of the World Bank, as well as the relevant national legal requirements to the subproject. **Chapter Three** deals about the ESIA study approaches and methods. **Chapter Four** outlines the description of the subproject and its

justification. This chapter discusses the subproject components and their area of influence including a map showing the subproject's location. **Chapter Five** presents a description of the baseline environment like subproject's physical, biological and socio-economic environments within the proposed subproject affected area. **Chapter Six** addresses the procedural aspect of public consultation's aim, objectives and identifications in relation to the subproject. The views and concerns of the affected communities and other key stakeholders on the subproject have also been presented. **Chapter Seven** focuses on the baseline socioeconomic background of project affected households. **Chapter Eight:** addresses analysis of the project alternatives including the "without project" option. **Chapter Nine** discusses the potential subproject impacts on the physical, biological and socioeconomic environments. The unit also presents mitigation /enhancement measures and complementary initiatives to prevent, minimize, mitigate or compensate for adverse environmental and/or social impacts. **Chapter Ten** summarizes the environmental social management and monitoring activities and the proposed monitoring indicators derived from the baseline survey. Also, it describes the roles and responsibilities of stakeholders in the implementation as well as the estimated cost of the activities. **Chapter 11** presents overall conclusions and recommendations of the ESIA. The last section contains references and annex contained within the ESIA report.

1.5 Team in charge of the ESIA Study

Eight experts of different disciplines have been involved in ESIA. Five members hold second degree (MSc, MA) and two of them have PhD. All of them do have an experience of research, conducting ESIA including baseline data collection, analysis of project alternatives, public consultations and others. The participant of this ESIA, their role, and educational background is annexed with this report.

2. LEGAL FRAMEWORKS AND INSTITUTIONAL ARRANGEMENT

This chapter describes the relevant national policies and strategies, legal instruments, institutional arrangement and international framework applicable to FSTP ESIA.

2.1 Relevant National Policy and Legal Frameworks

2.1.1 Constitution of the Federal Democratic Republic of Ethiopia

The Constitution of the FDRE (Proclamation No. 1/1995 as amended) is the foundation for human rights, and natural resources and environmental management. The concepts of sustainable development and environmental rights of the people are enshrined in the constitution by the following articles:

Article 43: The Rights of Development

- ❖ The peoples of Ethiopia as a whole, and each Nation, Nationality and People in particular have the right to improved living standards and to sustainable development.
- ❖ Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.

Article 44 – Environmental rights

- ❖ All persons who have been displaced or whose livelihoods 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.

Moreover, *Article 92* Concerning environmental objectives it declared that:

- ❖ Government shall ensure that all Ethiopians live in a clean and healthy environment;
- ❖ Programs and projects designed shall not damage or destroy the environment;
- ❖ People have the right to full consultation and expression of views;
- ❖ Government and citizens have the duty to protect the environment;
- ❖ Regular and accurate assessment and monitoring of environmental conditions shall be undertaken and the information widely disseminated within the population, and
- ❖ Natural resources and environmental management activities shall be integrated laterally across all sectors and vertically among all levels of organization.

2.1.2 Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia (EPE) was approved in 1997 (EPA, 1997) and the principal features of the Environmental Protection Policy of Ethiopia:

- Provides for the protection of human and natural environments;
- Ensure that essential ecological processes and life support systems are sustained;
- Biological diversity is preserved;
- Provides for an early consideration of environmental impacts in projects and program design;
- the satisfaction of the needs of future generations is not compromised
- Recognizes public consultation;
- Includes mitigation and contingency plans;
- Provides for auditing and monitoring, and
- Establishes legally binding requirements.

2.1.3 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 People of Ethiopia, and shall not be subjected to sale or to other means of transfer. 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.

2.1.4 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.

2.1.5 Ethiopian Water Resources Management Policy (Proclamation No. 197/2000)

The proclamation aims “to ensure that the water resources of the country are protected and deployed for the highest social and economic benefits of the people of Ethiopia; to follow up and

supervise that they are duly conserved; to ensure that harmful effects of water are prevented; and that the management of water resources is carried out properly.” The proclamation is designed to serve as the basic legislative framework of the country for management, planning, utilization and protection of water resources.

2.1.6 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: ensure participation of women in the formulation of government policies, laws, regulations, programs and projects that directly or indirectly benefit and concerns 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.

2.1.7 Health Policy

Ethiopian health policy was issued in 1993 with the goal of prioritizing women and children, underserved areas, and populations, and those affected by man-made disasters. Health-related information, education, and communication are policy priority areas because they help society become more aware of and change its attitudes towards health issues. As a result, a focus is placed on the prevention and control of communicable diseases, epidemics, and diseases associated with malnutrition and poor living conditions, as well as the promotion of workplace health and safety, environmental health development, infrastructure rehabilitation, appropriate health service management systems, the provision of essential medications, and the development of frontline and middle-level health professionals.

2.1.8 National Policy on HIV/AIDS

The 1998 Policy on HIV/AIDS of the FDRE 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 it is expected that sufficient awareness exists within the community.

2.1.9 National and Regional Conservation Strategy

Since the early 1990s, the Federal GoE has undertaken a number of initiatives that aims to develop regional, national and sectoral strategies to conserve and protect the environment. Among these was the Conservation Strategy of Ethiopia (CSE, 1996). It 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 so that planners may take into account environmental protection as an essential component of economic, social and cultural development.

2.1.10 Urban Wastewater Management Strategy

The MoWE issued this strategy in 2017. 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 transportation and treatment and reuse of treated effluent and sludge.

2.1.11 Integrated Urban Sanitation and Hygiene Strategy

The Ministry of Health (MoH) issued the strategy 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 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).

2.1.12 National Public Health Proclamation (No. 200/2000)

Article 2 of General public health proclamation, No 200/2000 states the ‘development of the preventive and curative promote components of health care’ as the basic element. The promotion of occupational health and safety (Article 2.2.2) and the protection and enhancement of environmental health (Article 2.2.3) are identified as priority policy areas for the health sector. Article 5.2 states that the promotional and proactive measures as instrumental to address ‘prevention of environmental pollution with hazardous chemical wastes’. 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. The FDRE public health Proclamation 200/02 place duty on the owners of the site with obligations and liabilities shown in table 2.1.

Table 2. 1: Obligations and Liabilities of the National Health Policies and Strategies

OBLIGATIONS	LIABILITY	APPLICABLE LAWS
1) Shall not dispose waste in any manner which contaminates the environment or affect the health of society; 2) Shall collect waste in a specially designated place and in a manner which doesn't affect the health of the society; 3) Shall put in place clean, adequate and accessible toilet facilities to its customers.	1) Liable to pay from Birr 1000 up to 9000; 2) imprisonment from three months to three years; and 3) suspension or cancelation of business license	Public Health Proclamation No. 200/02, Article 11, 20(2): Commercial Registration and Business Licensing Proclamation No. 686/02 Article 39/2
1) Shall ensure the availability of occupational health services to his employees; 2) Use of machinery or instrument which generates excessive noise is prohibited; 3) If uses such machinery shall install noise reducing apparatus or instrument.	Fine 1000 to 9000 and imprisonment from one month to one year.	Public Health Proclamation No. 200/02, Article 11, 20(2):
Without the authorization from the authority or from the relevant regional environmental agency, no person shall commence implementation of any project that requires environmental impact assessment as determined in a directive issued pursuant to article 5 of this proclamation.		Proclamation No. 299/02, Environmental Impact Assessment Proclamation

2.1.13 Labour Law/Proclamation (No. 1156/2019)

The Labor Proclamation (revised in 2019) provides the basic principles, which govern labor conditions taking into account the political, economic, and social policies of the federal government, and in conformity with the international conventions and treaties to which Ethiopia is a signatory. The Proclamation obliges the employer to take the necessary measures for adequate safeguarding of the workers in terms of their health and safety. Moreover, the Occupation Health and Safety Directive (MOLSA, 2008) provides the limits for occupational exposure to working conditions.

2.1.14 Environmental Impact Assessment (Proclamation No. 299/2002)

As part of the ongoing effort to develop environmental legislation and guidelines in Ethiopia, the EPA released its ESIA guidelines document. The document provides a background to ESIA and environmental management in Ethiopia. The document aims as being a reference material to ensure effective environmental assessment and management practice in Ethiopia for all parties who are engaged in the process. The proclamation specifies the projects and activities that will require an ESIA. The proponent of the project must prepare the ESIA following the format specified in the legislation. 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.

In accordance with this Guideline, projects are categorized into three 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.
- ✓ *Schedule 3:* Projects that have negligible direct environmental impacts hence do not require environmental impact assessment.

Therefore, Shashemene City FSTP subproject fall under *schedule II* that can cause some environmental and social impacts but are not likely to warrant a full ESIA.

2.1.15 Environmental Pollution Control Proclamation (No. 300/2002)

Proclamation 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 4 of the same proclamation elucidates about management of wastes, chemical and radioactive substance by the producer.

2.1.16 Solid Waste Management Proclamation

The main objective of this 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.

2.1.17 Hazardous Waste Management and Disposal Control Proclamation

The objectives of this Proclamation (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 and 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.

2.1.18 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.

2.1.19 Expropriation of Land, Payments of Compensation and 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.

2.1.20 Resettlement Regulation (No. 472/2020)

Concerning the compensation, the government has developed a regulation (Regulation 472/2020) which defines in detail how compensation for the expropriated property should be calculated. If

the Proclamation 1161/2019 answers the question “What shall be compensated?” The Regulation 472/2020 answers. According to the law, people who are displaced due to expropriation in rural lands (lands used for production) have the right to be compensated for the loss of income from the land.

2.2 World Bank Safeguard Policies

In 1989, the WB adopted Operational Directive 4.00, Annex A: Environmental Assessment (EA): EA became standard procedure for Bank-financed investment projects. The Directive was amended as 00 4.01 in 1991 and is currently being converted to Operational Policy (OP) and Bank Procedure (BP). 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 the 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, Environmental Assessment (EA), the proposed Shashemene city FSTP subproject falls under category “**B**” that requires ESIA.

Natural Habitats (OP 4.04): This policy recognizes that the conservation of natural habitat is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. However, OP 4.04 will not be triggered due to the absence of any natural habitat in SC FSTP subproject site.

Indigenous Peoples (OP 4.10): The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of vulnerable and historically under-served communities and peoples; (ii) ensure that they do not suffer adverse effects during the development process; and (iii) ensure that such communities and

peoples receive culturally compatible economic benefits. Fortunately, no indigenous people will be affected, in the current subproject, so it does not trigger OP 4.10.

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. OP 4.11 shall be applicable for the SC FSTP project for any chance finds during any kinds of excavation activities..

Involuntary Resettlement (OP/BP4.12): This policy has four objectives:

- Avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs;
- Assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them;
- Encourage community participation in planning and implementing resettlement, and
- Provide assistance to affected people regardless of the legality of land tenure.

Since the current FSTP subproject displaces PAHs from their farmlands OP/BP 4.12 should be considered during the ARAP study and compensation activities.

2.3 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.

2.4 Comparison of the World Bank Safeguard and National Policies

The short summary of the Ethiopian and the World Bank safeguard policy comparison is indicated in table 2.3.

2.5 International Conventions and Protocols

In addition to national environmental legislations, Ethiopia has adopted and ratified several international conventions and agreements related to the environment (Table 2.4). It is required that these treaties and agreement be considered in environmental analysis, where relevant and feasible, with a view of minimizing possible adverse impacts on global environmental quality. In addition to the conventions listed under table 2.4, Ethiopia has signed the *Nagoya Protocol* (on fair and equitable sharing of benefits arising from the utilization of genetic resources), *Cartagena Protocol* (on safe handling, transport and use of living modified organisms (LMOs)), *The Global*

Environment Facility (GEF), Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), Convention on the Conservation of Migratory Species of Wild Animals (CMS), World Heritage Convention (WHC), International Plant Protection Convention (IPPC), Convention on Wetlands of International Importance (Ramsar) and International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Table 2. 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 emphasis to both environmental and social impact assessment of programs or subprojects. It also made the public disclosure of category A and 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 should be applied.
Eligibility for compensation	Proclamation No. 1161/2019, 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 eligibility 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, and 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 WB OP 4.10

Table 2. 3: Summary of International Environmental Conventions and Protocols Signed by Ethiopia

Conventions	Summary of the Convention	Year Ratified
Convention on Biological Diversity (CBD)	- The Convention on Biological Diversity has three goals: 1) the conservation of biodiversity; 2) the sustainable use of the components of biodiversity; and 3) the fair and equitable sharing of the benefits arising from the use of genetic resources.	The Convention was ratified by Ethiopia by Proclamation 98/94, on May 31, 1994.
The United Nations Convention to Combat Desertification (UNCCD)	- The objective of the Convention is to combat desertification and mitigate the effects of droughts in countries experiencing serious drought and/or desertification, particularly in Africa.	Ethiopia has ratified the Convention by Proclamation No. 80/1997.
The Vienna Convention for the Protection of the Ozone Layer	- The basic objective of the Convention is to combat the negative impact on the environment and human beings resulting from Ozone depleting substances by reducing the amounts released and eventually banning their commercial use through internationally agreed measures.	Ethiopia has ratified and became party to Vienna Convention and the Montreal Protocol in 1996.
United Nations Framework Convention on Climate Change (UNFCCC)	- The basic objective of this Convention is to provide for agreed limits regarding the release of greenhouse gases into the atmosphere and to prevent the occurrence or minimizes the impact of climate change.	Ethiopia has ratified the Convention by Proclamation No. 97/1994.
The Basel Convention	- The objective of the Basel Convention is to regulate the trans boundary movement of hazardous waste.	Ethiopia has ratified the Convention by Proclamation No. 192/2000.
The Stockholm Convention	- The objective of the Convention is to ban the use of persistent organic pollutants (POPS)	Ethiopia has ratified the Convention in 2002.
The Rotterdam Convention	- This Convention relates to prior informed consent in the context of international trade in specific hazardous chemicals and pesticides.	Ethiopia has ratified the Convention in 2003.
International Convention on Trade in Endangered Species of Wild Fauna and Flora (CTIES)	- The objectives of the Convention are: 1) to control international trade in endangered species and 2) to ensure that international trade in non-endangered species is carried out in a manner which ensures stable markets and economic benefits for the exporting countries as well as to and regulate illegal trade in such non-endangered species, fossils and/or their derivatives.	Ethiopia has ratified the Convention in 1989.
Universal Access Program (UAP)	- The objectives of the Convention is to provide safe water to all citizens of the nation.	Ethiopia has ratified the Convention in 2005.

2.6 UWSSP II Specific Legal Frameworks

2.6.1 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 WB safeguard OP. 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 city 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, and
- Prepare an Environmental and Social Management / Monitoring Plan (ESMP), including monitoring indicators, for the UWSSP II.

2.6.2 Resettlement Policy Framework (RPF)

The main objective of this RPF is to ensure adequate management of land acquisition process in accordance with the WB OP as well as the country's legal requirement and provide guidance for the preparation and implementation of ARAP for the subprojects of the UWSS-II Project. This RPF aims to ensure that any possible adverse impacts of proposed subproject 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 sanitation facility.

2.7 Administrative and Institutional Framework

2.7.1 FDRE Environmental Protection Authority

The general role of the EPA is to provide 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. In accordance with the principles of government decentralization each national

regional state shall establish an independent Regional Environmental Agency or designate an existing agency that shall, based on the Ethiopian Environmental Policy and Conservation Strategy and ensuring public participation in the decision-making process, be responsible for: coordinating the formulation, implementation, review and revision of regional environmental monitoring, protection and regulation activities.

2.7.2 Oromia Environmental Protection Authority

Oromia Environmental Protection Authority (OEPA) is responsible for environmental protection matters in the region. It has the mandate of enacting regional environmental proclamations, regulations, standards and guidelines. The OEPA is responsible for the review and approval of ESIA of development proposals under the mandate of the Regional Government. It is also 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 city administration environmental regulatory agencies.

2.7.3 West Arsi Zone Environmental Protection Office

West Arsi Zone Environmental protection Office (WAZEPO) is mandated to ensure concerned stakeholder involvement in the FSTP planning, construction and operation. And community follow up of the implementation of ESIA recommendations of such proposals becomes a joint responsibility of regional and Zone EPO. Zone EPO should follow up every quarter and compile progress report to the regional EPA. The regional EPA at least should visit twice per year and give written feedback to the developer. Therefore, project proponents in the Region should operate in close cooperation with both the regional and Zone EPO to ensure that the adverse environmental and social effects of development proposals are properly identified and their mitigation or management actions incorporated in the project design planning and implemented at the right time.

3. ESIA APPROACH AND METHODS

3.1 Approach/Design

Conducting ESIA naturally involves a whole range of stakeholders and needs to be carried out in a much more participatory manner. As such, discussions and consultations were conducted at different levels starting from the pertinent directorates and departments at the MoWE down up to the level of the Project Affected Populations (PAPs) in the project communities. The consultant employed a multidimensional approach in considering the impact of the subproject by way of assessing the: physical and chemical environment, the biological environment, and communities, social groups and individuals and their interactions.

3.2 Methodologies Employed and Detailed Scope of Work

3.2.1 Period of Field Data Collection and Site Visits

The required field data from Shashemene city and the subproject site was collected from July 27-August 11 /2023. The consultant team involved in ecological data collection and information gathering from the public, project owners and sector experts in the project site.

3.2.2 Assessment Methods

The ESIA included a range of methods including scoping, desk research, field baseline studies, stakeholder's engagement, impact prediction, impact assessment and rating, risk assessment, mitigation measures, monitoring and evaluation mechanisms.

Approaches to Scoping

An important initial stage in the ESIA is the scoping of key issues. So, this scoping report and the stakeholder engagement activities related to scoping have been planned to ensure full compliance with EPA legislations and WB Environmental, Health, and Safety Guidelines.

Baseline Studies

The consultant used descriptive and explanatory research methods during the field surveys basically to describe and explain the baseline environment and the without project situation in both biophysical and socioeconomic terms.

Impact Identification and Risk Assessment

The key inputs for the identification of impacts include the legislation review, the environmental baseline, the socioeconomic baseline and stakeholder consultations. Impact and risk assessment

was conducted using various methods, such as Screening, Checklists, Matrix method, and Expert judgments.

Impact Evaluation and Analysis

For each identified impact, risk assessment was done through quantifying the likelihood and severity of potential environmental, social, and health impacts of the subproject. 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 receptor. Each potential impact resulting from the subproject is categorized based on the Basic Impact Index and the Receptor Sensitivity. Based on these two parameters, the Impact Significance is evaluated. 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.

3.2.3 Sources of Data

In accordance with the ESIA guideline of Ethiopia, the GSEMC utilized both quantitative and qualitative data from primary and secondary sources. Subproject linked primary data were obtained through structured surveys (questionnaire), stakeholders' consultations, experiments, field observations, while secondary data were collected from government statistics, institution reports, EIA and WB policies and guidelines, academic research and public records.

3.2.4 Field Surveys

The study team undertakes preliminary flora and fauna assessment in order to establish species richness and associated impacts from the subproject.

Vegetation Survey

The ESIA team conducted vegetation sampling in the study area using five (20 x 20m) plots. Since the proposed site is located in farmland, we recorded individuals trees or shrubs with a diameter at breast height (DBH) ≥ 1 cm. The plant species, frequency of each individuals were also recorded (Anderson and Hoffman, 2007).

Wildlife Census

A total of 4 standard transect lines were used to record the available wildlife species in the proposed FSTP area. At each transect line, the number, type, and location of wild animals observed were recorded for a set amount of time. Mammalian and avian species counting was

held following the activity patterns of the animals at a safe distance to reduce disruptions (Bibby and Burgess, 2000; Abate and Girma, 2023).

3.2.5 Data Collection Tools

3.2.5.1 Survey

A structured survey questionnaire containing closed- and open-ended questions was developed and administered to a total of seven PAHs found in *Cabi Dida Gnata* Kebele in the FSTP site. The questionnaire was developed by considering the socioeconomic variables, length of duration of local residence, nature of land utilization system, livelihood options, and income and expenditure levels. While, the office data collection dealt with demographic characteristics, human resources, infrastructural facilities of the city, cultural and economic resources.

3.2.5.2 Public Consultation Checklist

During the field survey, formal as well as informal consultations were conducted with experts and representatives of the local community. Representatives of local administrative bodies, community members composed of elders, the youth, women, religious leaders and vulnerable community groups found around the subproject site were engaged in the PC event. Moreover, meeting with concerned government sectors was also conducted at Shashemene city WSSE office with representatives from the city's environmental protection office, health office, education bureau, culture and tourism office, municipality, and urban development and construction Bureau.

3.2.5.3 Observations

The ESIA team also performed visual observations of the intended subproject site in order to document the presence of sensitive ecosystems, wildlife habitats, or cultural heritage sites.

3.2.5.4 Geological and Hydrogeological Investigations

Data collected for the hydrogeological and geological maps involved office-level analysis and site investigations. During the field work for water quality investigations, composite water samples were taken from three sites of the nearby Gogeti River following standard sampling procedures. A sterilized sample bottle was used to collect sample of surface water for chemical and physical constituents of the water. Soil texture analysis was also conducted through hand filling test in the subproject site. And a hand held global positioning system (GPS), was used to collect coordinate points of study site and development of GIS based maps.

4. DESCRIPTION OF THE PROPOSED SUBPROJECT

4.1 Overview of UWSSP-II Project

Ethiopia's rapid urbanization is putting stress on the already inadequate water supply and sanitation (WSS) system in urban areas. The capacity of urban centers to adequately dispose wastewater is low, exposing natural resources to pollution and posing a risk to human health. In light of these challenges, the UWSSP-II is launched primarily to improve urban sanitation holistically and equitably in the urban space and provide assistance to improve operational efficiency in 22 Ethiopian cities. The objective of the project is to increase access to enhanced water supply and sanitation services in an operationally efficient manner in Addis Ababa and selected secondary cities. The GoE selected the participating towns giving priority to regional capitals, large population size towns, nevertheless maintaining regional equity. A total of 3.38 million people (50 percent of them women) residing in Addis Ababa and the selected 22 towns will directly benefit from the project, of which 2.76 million from improved sanitation facilities and 623,000 from access to improved water supply services.

Shashemene city is among the secondary cities benefiting from the UWSSP-II project. The sanitation improvement plan is considered to be implemented using phased approach. The total project design period is 20 years in three (short term, medium and long term) phases.

The overall aim of subproject is to improve sanitation services of Shashemene city dwellers. And the major immediate/short term interventions are:

- Improving the existing private pit latrines and public toilets to flushing toilets and adding some new ones, especially at the densely populated areas and the areas of greatest need.
- Inspection on the existing pit latrines to identify the rehabilitation required for each element to save the environment or upgrading to septic tanks.
- Constructing new public and communal toilets by selecting land in dense area.
- Purchasing of four additional vacuum trucks (2 with capacity of 5 m³ and 2 with capacity of 8 m³), and small vehicles in order to collect and transport faecal sludge.
- Construction of new FSTP with average design capacity of 130 m³/d.
- Training and capacity building in both water and sanitation sector that greatly contribute to the improvement of service delivery.

- Public private partnerships (PPP) are investigated as they usually be found to have a great potential in the investment.

The proposed CWIS subproject in Shashemene city calls for the building of communal and public toilets and fecal sludge treatment infrastructure that could serve the city's sanitary service demand for over the course of the next 20 years. The components of the short-term, mid-term, and long-term intervention phases are described as follows:

Short term interventions (2020-2025): it strives to increase containment, collection, and a secure discharge site by offering adequate public and community toilets. It also involves construction of new FSTP.

Medium term interventions (2025-2035): rehabilitate existing sanitation infrastructure in short term to improve containment and collection. It also comprises upgrading the FS treatment units, which has been improved to be managed more effectively and efficiently.

Long term intervention (2035-2045): The permanent sanitation system will be fully implemented by the year 2035 and will last until the year 2045. It involves sewer systems to collect and treat wastewater from major roads, as well as places where people use more water and have flush toilets.

4.2 Fecal Sludge Treatment Plant

Shashemene City FSTP Site Description

The FSTP location is proposed about 10 km from the center of Shashemene city towards Shashemene-Halaba Kulito main road in *Cabi Dida Gnata* Kebele, in the southwest direction. The subproject lies within the coordinates of 44° 58' 28.9" and 44° 62' 68.9"N and 80° 10' 48.2" and 80° 15' 45.6" E with at an elevation of 1768m. As per the feasibility and design study report (2022), the subproject overlap with the newly under constructed sanitary landfill (Fig. 4.1: green polygon), and, part of it fall directly on edge of main asphalt. This potentially imposes adverse impact on the transport system of the area and the overall functionality of the sanitary landfill. Just after the ESIA team arrived in the site the above mentioned shortcomings were noted, then discussion with project owners (SWSSE) was held, and the ESIA team suggested for relocation of the site towards the left side of the sanitary landfill (Fig. 4.1: yellow polygon). Accordingly, the project owners communicated the issue to the feasibility and design study consultant, where

surveyors from the feasibility study team arrived on site and new GPS points were taken in the newly relocated site. Since the FSTP subproject lays along the side of the newly constructed sanitary landfill so the project can use as an option the existing access road for the sanitary landfill. The project site is located on farmlands (Fig. 4.1). The Gogeti River which is located about 2 km is also found in the vicinity of the site.



Figure 4. 1: Location Map of Shashemene City FSTP site

For the structure of FSTP units, the current site has a total area of 11 hectares including its buffer zone and land for access road. The proposed FSTP area is based on the assumption that FS would be produced from the communities and transported by vacuum trucks of the city for a 20-year design forecast. Besides, the selected site includes buffer zones with 400 meters away from any residents. This makes the area is also an advantageous for further expansion. But there are seven households, who owned farmland at the proposed site. This requires the Shashemene city to manage the farmland compensation and land substitution issues as per the ARAP outcome before commencing the construction of the subproject.

5. ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

This section describes the physical, socioeconomic, and biological baseline of the proposed site, based on the findings of the data collection, field investigations, and review of the relevant documents.

5.1 Background and Location of City

Shashemene is a town established in 1903 E.C. The city is one of the oldest towns in Ethiopia which have been serving as an administrative, commercial and transport center of the west Arsi zone. According to a proclamation of Amend Oromia Regional Government Cities Re-establishment Proclamation No.195/2008, Shashemene City has a rank of the Principal City Administration (Regiopolic city). The city has eight Sub-city and 9 rural Kebele administrations. The geographical coordinate of the city lies roughly $7^{\circ} 08' 51''$ to $7^{\circ} 18' 19''$ North latitude and $38^{\circ} 32' 43''$ to $38^{\circ} 41' 07''$ East longitude (Figure 5.1). The City has a total surface area of about 17,149 hectare. The city as one of the big market places in the region eventually results to daily entrance of substantial number of business persons, visitors, and transitory persons which contributes, among others, to large and potentially increasing waste generation capacity.

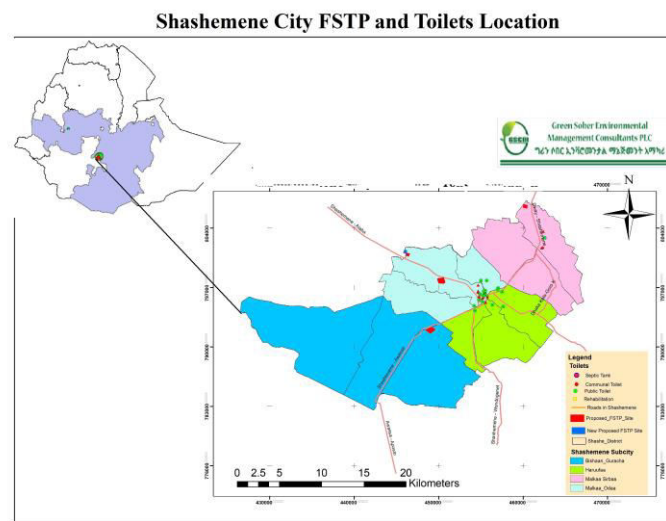


Figure 5. 1: Location of Shashemene City

5.2 Topography and Slope

The Topography of Shashemene city has been largely modified by geological events of the tertiary Period of Cenozoic era, mainly by the formation of rift valley which is associated with outpouring of volcanic lava and successive erosion and deposition cycles. The minimum and the

maximum altitude is about 1794m to 2094 m.a.s.l. respectively. The highest altitude is recorded at southeast and northeast part of the city and the lowest altitude is located in southwest and western parts. The slope of the city is hilly on the east and southeast and decreases toward west and northwest direction. The slope percentage of Shashemene varies from 0 to 35%, indicating a wide range of slopes throughout the region and is classified into five classes. Therefore, the consultant proposed the FSTP site in areas with flat to gentle slopes that ensures efficient functioning of the proposed facility (Figure. 5.2).

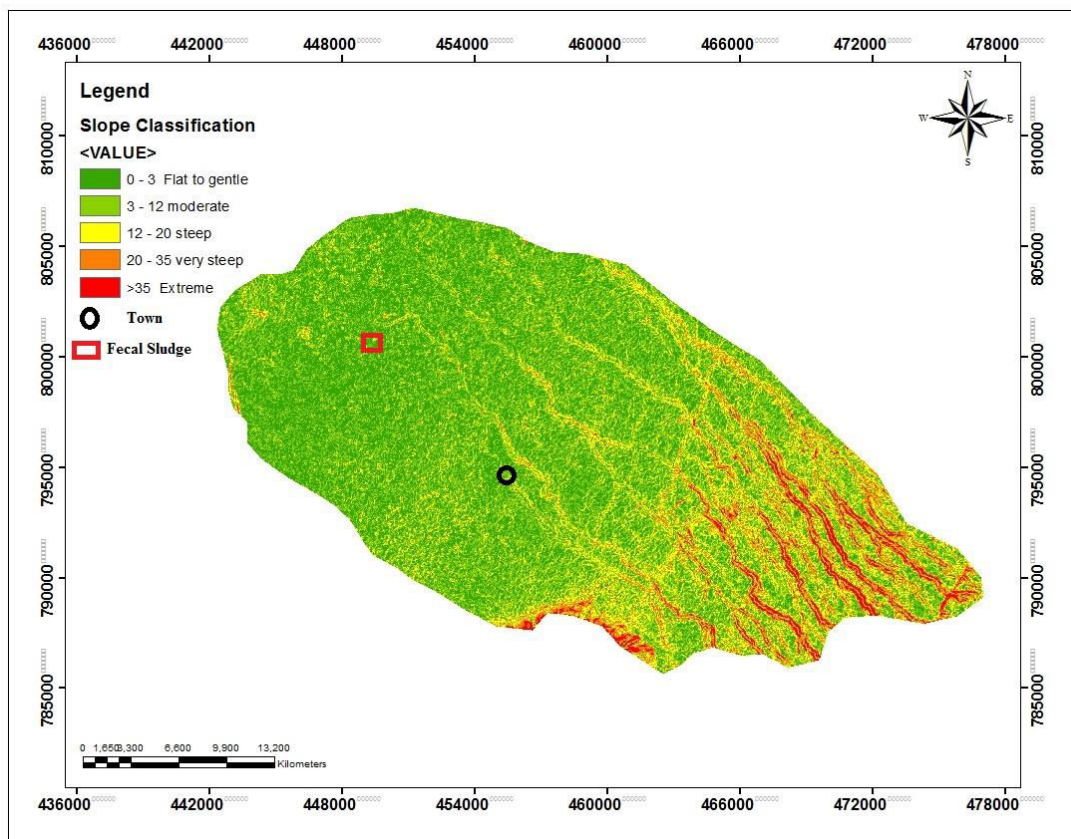


Figure 5. 2: Slope map of the study area

5.3 Hydrogeology of the Study Area

The porous aquifers are widely developed over the study area during the Quaternary age. Units with mixed fissured and porous permeability volcanic rocks are often mixed with sediments accumulated in between lava flows and or volcanic episodes in rivers and lakes and/ or relatively thick layers of unwelded tuffs, ash flows and pumiceous pyroclastic material. These intercalated porous materials do not act as independent aquifers but they form a mixed fissured and porous

multilayered aquifer together with the volcanic rocks. Porous materials can significantly contribute to the safe yield of wells when they are developed together with volcanic rocks. The permeable porous sediments in between lava flows form a body that can accumulate large volumes of groundwater by draining the surrounding fissured aquifers and contribute to the yields of wells developing groundwater from this mixed aquifer, which is more productive than fresh basalt, ignimbrite, trachyte and rhyolite that are normally considered as rocks with moderate and/or low permeability. These porous materials are recharged indirectly by groundwater from the overlying aquifers developed in volcanic rocks.

5.4 Drainage

The drainage system is found in the Shalla Lake Basin. Shalla Lake is located at distance of about 50 km in the northwestern part of the city. The city and the surrounding watershed belong to the Rift Valley Lakes Basin with a northwest drainage direction. It is drained by five rivers. The rivers are Gogeti, Essa, Melka Oda, Laftu, and Tinishu Dedeba. Laftu join Tinishu Dedeba downstream and finally drain to Lake Shalla. The western part of the city adjacent to Shashemene-Halaba road does not have a well-defined drainage outlet and the storm runoff dissipate on the farmland which eventually will evaporate or infiltrate.

5.5 Groundwater Flow and Recharge

Groundwater Flow

The deep local groundwater flow in the area penetrates even further and gives rise to deep regional groundwater flow. This deep regional groundwater flow plays a significant role in recharging aquifers present in sedimentary rocks. The deep regional groundwater, in turn, is discharged by the main perennial rivers of the lowlands, as well as their primary tributaries in the eastern region. Shalla Lake, a significant topographic feature that influences the direction of water movement is the slope or gradient of the surrounding land. As water flows from east to west, the topography plays a crucial role in determining the path and speed of water movement. The land slopes from east to west creates a natural drainage pattern that directs water towards the western part of the lake. In this case, water from the eastern side of the lake would flow downhill, following the slope, and accumulate in the western portion of the lake (Fig. 5.3).

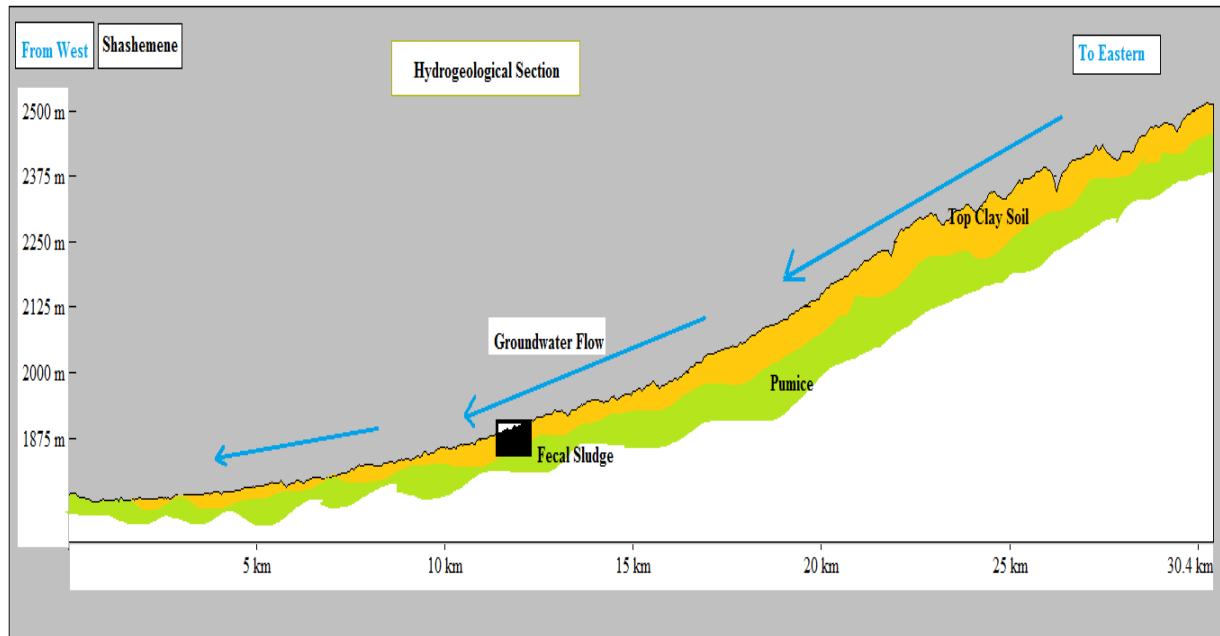


Figure 5. 3: Groundwater Flow Cross-section

Groundwater Recharge

There are several perennial and intermittent streams (tributaries) that contribute to the catchments around Shashemene. Specifically, in the Dhadhaba sub-basin, the major tributaries are Dhadhaba-Guda, Dhadhaba-Tika, Tutu-Karrara, and Abiyu. In the Debi-Bura sub-basin, the major tributaries are Meti, Agemsa, Dhessa, Dembi, and Bura. These rivers and streams within the study area ultimately flow into Lake Shalla, indicating that the lake serves as a receiving body for the drainage system.

5.6 Depth of Existing Water Wells

According to the SWSSE, there are nine water wells in the city, two of them are under construction as a result only seven wells are giving services. Field observations of the existing water wells was conducted, their GPS points and altitude were recorded. So that the distribution and depth of the functional wells with reference to the FSTP subproject site have been shown in figure 5.4. As shown in the figure the ground water potential around the subproject site is found between 110 to 120 m depth and all the water wells are located far from the proposed FSTP site.

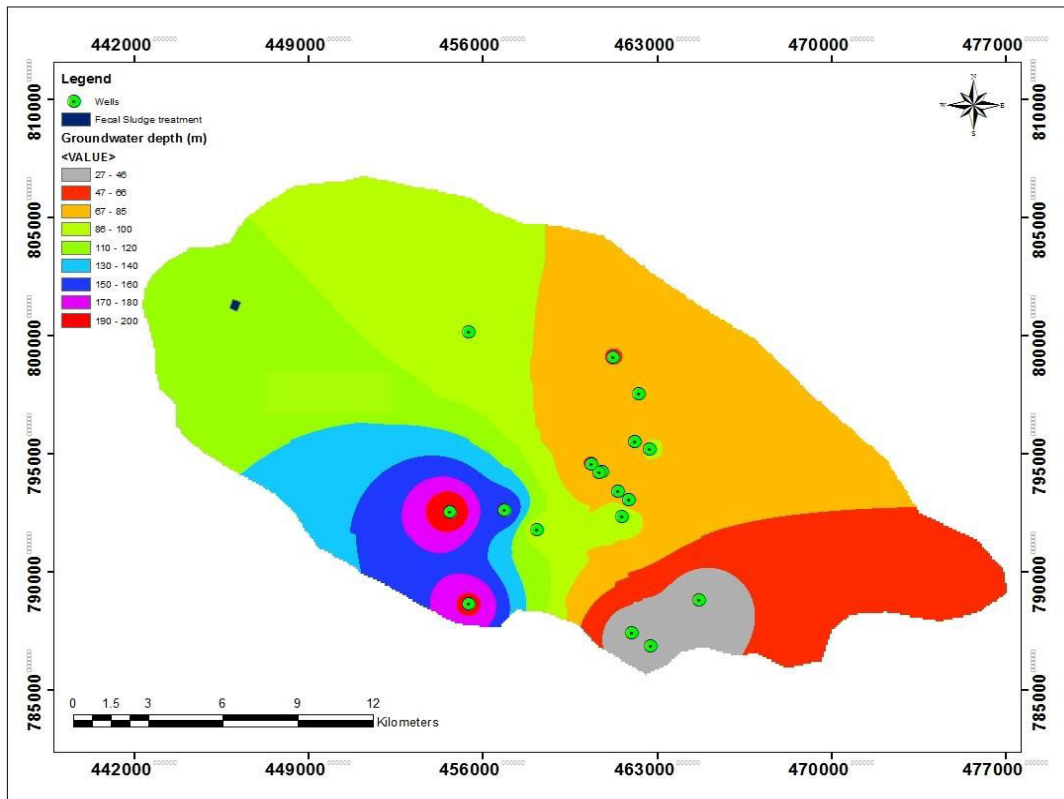


Figure 5. 4: Groundwater Depth map of Study area

5.7 Soil Characteristics of the Project Area

Soil physical properties play a critical role in the planning, design, and management of FS projects. These properties include texture, soil depth, color, and consistency. Proper management of a FS requires a solid understanding of these soil physical properties to ensure the safety of the FS treatment processes. In the treatment area under consideration, most of the soil falls under the very deep category, with a soil depth of 150-200 cm (Fig. 5.5). In the FSTP site, the soil color ranges from ash to white at the bottom. The range of soil color from ash to white suggests that the soil in the treatment area may have relatively low organic matter content. The hand feeling test revealed that the texture of the topsoil varied from very fine to volcanic pyro-clastics-textured soils typically have a high clastics which gives them high infiltration rate.

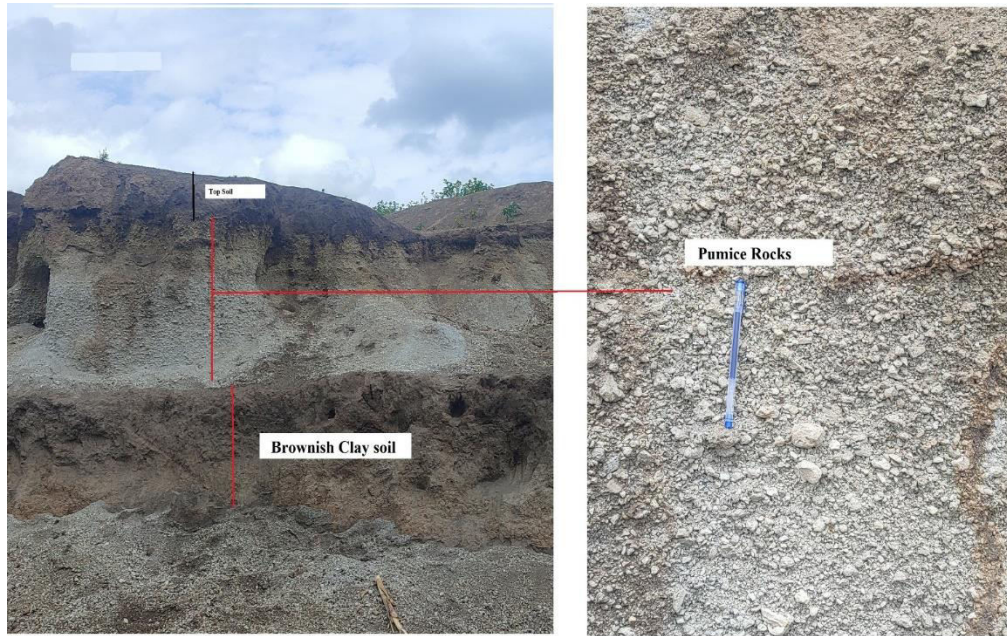


Figure 5. 5: Soil Profile around the FSTP of Shashemene City

5.8 Climate

Shashemene City is categorized under the Weyna Dega (subtropical) climatic zone. It has bimodal rainfall distribution that is Kiremit and Belg; which are the main and short rainy seasons respectively.

5.8.1 Temperature

The city has a moderate temperature with a mean daily temperature of 18.9°C , daily maximum temperature of 26.3°C and the daily minimum temperature of 11.5°C . The mean monthly temperature of the city is 17.4°C , whereas higher temperature was recorded on March with a value of 25.7°C and smaller value was recorded on the month of December 6.9°C . The yearly average temperature of the city is 17.3°C , with the yearly average maximum and minimum temperature of 23.8°C and 9.4°C respectively.

5.8.2 Rainfall

The rainfall in the region has a weak bi-modal pattern with first peak in April-May and the second and main peak occurring in July–September, and the total annual rainfall is about 945 mm. The main rainy season, (kiremt), is from mid-June to the third week of September with

seasonal mean value of 400mm. The mean monthly rainfall is around 80 mm, with the peak amount observed in July about 131 mm.

5.9 Wind Direction

Wind direction is an important factor for waste disposal site selection as its direction determines the odor impact on local dwellers. The dominant wind directions are blowing from southwest and southeast to the north-north-east direction. Even though, the magnitude of the wind speed is small, there is a wind flow from north to south direction. In addition, wind from southeast flow to north-west direction. The mountain ranges or higher altitude areas in the southern and southwest portion of the city have a major impact on wind direction and contribute to reduce the incidence and strength of the other direction of winds. Strongest winds are generally observed during March and July. The wind-rose diagram of Shashemene city is depicted in the figure 5.6.

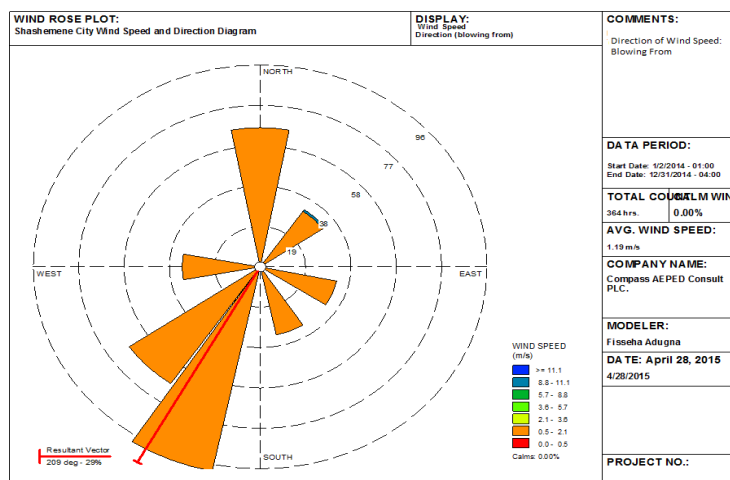


Figure 5. 6: Wind Rose Diagram of Shashemene City¹

5.10 Biological Environment

5.10.1 Flora

Shashemene area is characterized as semi tropical vegetation, where the micro climate is conducive for the growth of different types of vegetation. However, the natural vegetation surrounding the proposed FSTP site has been cleared for agricultural purposes. As a result, very few and scattered natural vegetation is detected inside the farmlands (Table 5.1). Concerning the

¹ Source: FAO New Local Climate Software tool at Kuyera station as cited in ESIA report, Blue Matrix consultancy, 2021

cultivated plants; Maize (*Zea mays*), Dagussa (*Elusine coracana*), Potato (*Solanum tuberosum*), and Haricot bean (*Phaseolus vulgaris*) were recorded at the time of data collection (Fig. 5.7).

Table 5. 1: Major Plant Species Recorded in the Project Site

No.	Scientific name	Family	Amharic name	Local name	Habit
1	<i>Cactus sp.</i> ,	Cactaceae	Tinni	---	Shrub
2	<i>Euphorbia abyssinica</i>	Euphorbiaceae	Kulkual	Adamii	Tree
3	<i>Cordia Africana</i>	Boraginaceae	Wanza	Waddeessa	Tree
4	<i>Croton macrostachyus Del.</i>	Euphorbiaceae	Bisana	Mokkoniisa	Tree
5	<i>Maytenus arbutifolia</i>	Celactraceae	Attat	Kombolcha	Tree
6	<i>Lantana camara</i>	Verbenaceae	Yewof Qolo	Qorso Simbira	Herb
7	<i>Parthenium hysterophorus L.</i>	Asteraceae	Qinche Areem	---	Herb
8	<i>Argemone ochroleuca</i>	Papaveraceae	---	Dalacho	Herb
9	<i>Acacia seyal</i>	Fabaceae	Wachu	Waaccuu	Tree
10	<i>Aloe sp.</i> ,	Aloaceae	---	---	Shrub



Figure 5. 7: Partial View of Farmland in the FSTP Proposed Site

5.10.2 Fauna

Investigations on the wild animals revealed the existence of very few common bird species like Baglafech Weaver (*Ploceus baglafecht*), Common Crow (*Corvus capensis*), Golden-breasted Starling (*Lamprotornis regius*), and different species of seedeaters in the FSTP site. However, indirect evidences confirmed the presence of nocturnal mammals like spotted hyena (*Crocuta crocuta*), common genet (*Genetta genetta*) and other carnivores around the subproject area.

5.11 Socio-economic Environment

5.11.1 Demographic Characteristics

According to the national population and housing census conducted in 2007, Shashemene city was inhabited by 101,647 people. One year later in 2008, when the structural plan of the city was

prepared, the total population of the city reached 193,194. By using this as a base year, the Finance and Economic Cooperation Office applied geometric method to forecast population figures for the subsequent years. Accordingly, the total population of the city was estimated to be 288,420 in 2018, out of which 49.9% males and 51.1% females. The total number of HHs was 57,684, giving an average family size of 5. The new structural plan of the city incorporate nine rural Kebeles and satellite towns found near by the town like *Bishan Guracha*. Inclusion of such rural Kebeles and nearby towns will ultimately increase the city's population pressurizing the existing water supply and sanitation system.

5.11.2 Education Facility

The education service in Shashemene city is composed of 196 schools, consisting 30 governmental, 48 NGO and 118 private schools. Out of the total schools, 2 are special need schools, 99 are KGs, 108 are primary and junior, 15 are high school and preparatory and 5 are TVET colleges. There are 98,104 students of which 49,123 were males and 48,981 were females.

5.11.3 Health Situations

There are 174 health institutions in the city including 3 hospitals, 6 health centers, 78 clinics and 87 pharmacies or drug stores. Among the health institutions 7 are owned by the government, 4 by NGOs and 163 by the private sector. Over 1,000 health professionals are serving in the health institutions. The top nine diseases in the city are summarized in figure 5.8.

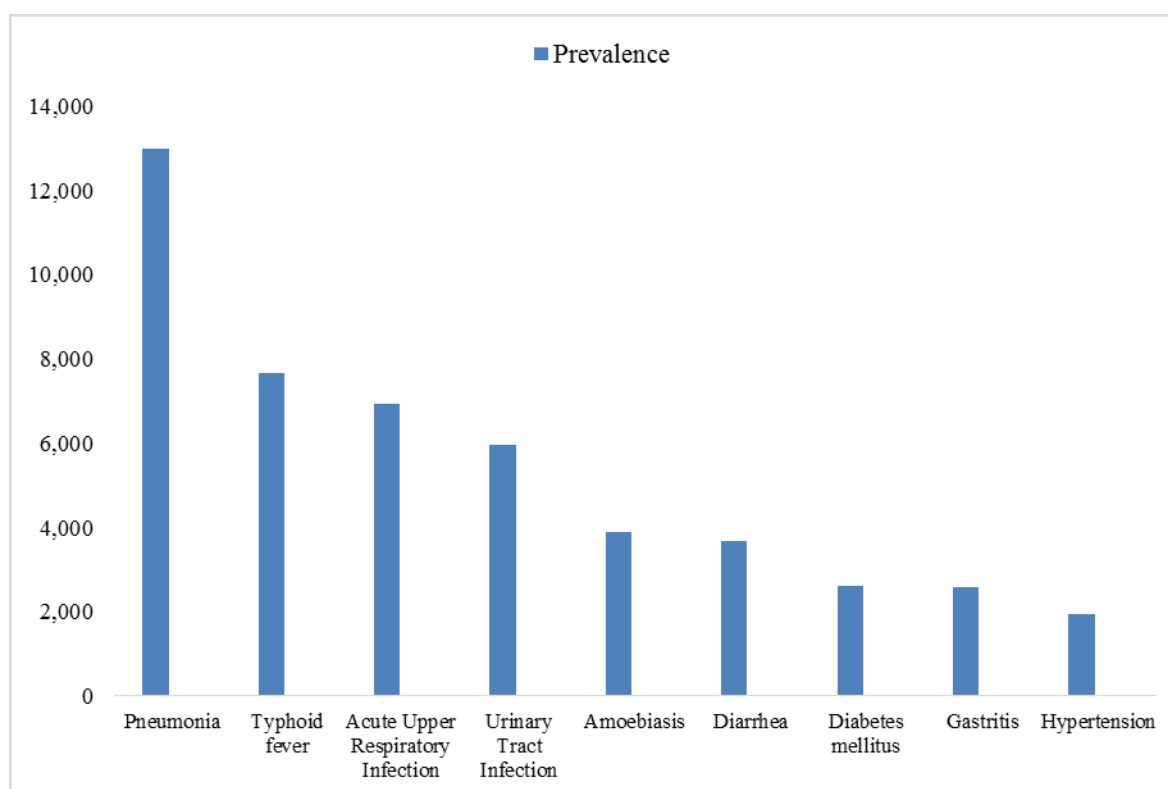


Figure 5. 8: Top nine diseases in Shashemene, 2022/23

5.11.4 Basic Economic Activities

5.11.4.1 Commerce and Trade

Shashemene City has a vibrant business sector, there are more than 11,741 traders engaged in different trade activities, out of these, 841 are whole sellers, the rest are retailers and service providers. 247 Micro and Small Enterprises with 1,977 members are organized and working on service sectors. The available business units in the city include 99 financial institutions 79 banks, 10 micro finance institutions and 10 insurance companies. Of the total, 20 were governmental and 59 are private.

5.11.4.2 Manufacturing and Small Scale Enterprises (MSEs)

In 2020, there were 145 manufacturing activities in the city mainly small-scale industries like wood and metal works, flour mills and water bottling. In 2021, there were 1,366 micro and small enterprises engaged in the mentioned activities with members of 7,204; of which 45% are female.

5.11.4.3 Urban Agriculture

Urban agriculture is playing very important role in enhancing urban food security, local economic development, poverty alleviation and social inclusion of the urban dwellers. Urban agricultural activities include preparation of seedlings of trees, shrubs, herbs and grass in nursery sites. Currently the city has one nursery site for seedlings. There are 272 dairy operators, more than 896 people are engaged in fattening and over 3,589 people are participating in poultry production in the year 2021.

5.11.4.4 Tourism

Shashemene has few tourist attraction areas such as the Shashemene Museum and Monuments, Bar-kume Park, Botanical Garden, and Banana Art Gallery which are playing key tourism and conservation roles.

5.11.4.5 Energy and Power Supply

Shashemene City and its surroundings get their electricity supply from the national grid system which serves 24 hours a day. There are about 37,554 customers of electricity in the city, of which residential accounts 90.5%, commercial 7.5%, institutions 0.8 % and industries 1.2%. The community also uses fire wood and other local energy sources for their daily consumption. Moreover, there are 13 fuel stations in the city with total capacity of 2,489,000 liters.

5.11.4.6 Water Supply

The city is currently supplied with drinking and domestic water from existing surface and groundwater sources. Weando perennial river, located about 17 Km from the city is the main water source. The other surface water source is Dhessa seasonal river. Currently, seven deep wells are providing groundwater and serving the city. The boreholes yield ranges from more than 25 to 52 l/s. The average daily consumption of water per household head is 60 liters. There are six concrete reservoirs with different water holding capacity, two 1000 m³, two 500 m³, and one 350 m³. There is also a masonry reservoir with water holding capacity of 100 m³. The lengths of the transmission line and distribution network are about 42km and 272.6km respectively. Currently the total number of customers has surpassed 23,000 and the water coverage for the city is around 71%.

The laboratory water quality parameter result of the sample collected from *Gogeti River* is shown in table 5.2. The average laboratory result is compared with the national water standards, the majority of the parameters were below the national limits with the only exception in nitrite and potassium that exceeded the national limit. Higher value for nitrite and potassium might be related with the use of synthetic fertilizers in the farmlands. Therefore, proper effluent treatment technology and procedures should be taken before it is released to the nearby water bodies.

Table 5. 2: Water sample quality parameter comparison against Ethiopian ground water standard

Parameters	Gogeti River			Result Average	Ethiopian Limit Values
	Upstream	Middle	Down stream		
pH	6.14	6.27	6.34	6.3	6-9
Temp (°C)	21.2	21.6	22.1	21.6	40
TDS (PPM)	353.7	357.4	357.5	356.2	3000
Electrical Conductivity μ s/cm	535.6	541.6	541.8	539.7	---
Nitrite (mg/l)	50	50	50	50	0.1
Sulfate (mg/l)	50	50	50	50	1000
potassium (mg/l)	47	49	51	49	5
Iron (mg/l)	4.5	2.5	3.5	3.5	10
Phosphate (mg/l)	162	164	160	162	---
Ammonia (mg/l)	5	5	4	4.7	5
Alkalinity (mg/l)	300	250	250	266.7	---

5.11.5 Existing Sanitation Condition

5.11.5.1 Solid Waste Management

Though much work has been done to improve the solid waste management system in the city, it is far below the city standard and much need to be done. The city major composition of wastes is organic (60%) and the average waste per capita generation is estimated 0.45 kg/c/day. The collected waste is transported to the dumping site located in Alelu Kebele, almost in the center of the city (Figure 5.10). The existing solid waste disposal site is inadequate to serve and manage the huge volume of solid waste generated by the city residents, as a result the municipality is developing a new sanitary landfill.

5.11.5.2 Liquid Waste Management

There are 11 existing public toilets and 8 communal toilets in the city. But most of public and communal toilets have unlined pit latrines containing only FS. The majority of septic tanks of institutional and condominium houses overflows of FS are common. On the contrary, the ESIA

consultant team have witnessed an exemplary decentralize FS treatment wetlands constructed and operated without environmental pollution at different parts of the City (Fig. 5.9). This practice should be replicated to other condominium houses having similar problems.



Figure 5. 9: Decentralize Fecal Sludge Treatment around Condominium Areas

There are five vacuum trucks (one municipal owned and four privately owned) that render services to transport wastewaters from sources to the disposal site, moreover, two new trucks were purchased under UWSSP-II and will be functional. Regarding the type of emptying the sludge in the city is 96% of the household heads use vacuum truck, 1% use manual/bucket and 3% use other services. Most of the households' containments are situated at the backyards and not accessible for the standard big vacuum trucks which have less than 60m suction hoses. Besides, transportation takes longer as there is no disposal site in the city and waste is being transported to Hawassa city liquid waste dumping site at the top of Alamura hill. The city has no sewerage system, the existing containment facilities for the city includes toilets, latrines and septic tanks.

The majority of septic tanks in the city are considered collection tanks as there are no separating baffles and they are used only for holding the sludge to be emptied by vacuum trucks. Most of the septic tanks are unlined type and nearly all of which are covered unsafely. According to the city wide sanitation feasibility study, only 8% of FS is safely managed and the remaining 92% of FS is unsafely managed.

6. STAKEHOLDER CONSULTATION AND ANALYSIS

This ESIA has undertaken public consultation with three categories: (1) PAPs and members of local community who are living around project area, (2) relevant government sectors from the city Administration and (3) feasibility/design study consultant

6.11 Public Consultation (PC)

The aims of public consultations were to present information about the nature and scope of the proposed FSTP construction; to identify people adversely affected by the subproject; to seek their views and concerns about the proposed project and to take their feedbacks into account in subproject implementation and monitoring activities. Main issues covered during the consultations were whether a prior community consultation was conducted during subproject design or not and their participation in subproject planning and site selection processes; to identify persons who owns the tracts of land proposed for the subproject; to determine the presence of physical cultural resources; to reflect their views and concerns on the project; and the mechanisms local community members participation. Land acquisition, compensation, relocation and restoration of the PAPs were also central point of discussion.

The consultation was facilitated by Kebele Officials and expert from SWSSE and lead by the consultant team. Participants of the consultation were invited to freely express their opinions and questions using local language. Questions and views raised during the discussion were documented as a minute (Appendix 4).



Figure 6. 1: Pictures taken during Community Consultation

The main issues discussed and raised by PAPs were the following:

- Most participants indicated that there were no any kinds of PC about the project prior to this PC.
- The participants of the consultation meeting repeatedly mention the issues of property loss need to be properly compensated for PAPs.
- The participants explained that compensation should be properly arranged and sufficient by considering the impact on their livelihoods. In addition to cash compensation, why doesn't the government prepare a replacement land?
- Most participants of the meeting raised issues of their livelihoods in order to consider the different livelihoods alternatives other than compensation for their loss property.
- Agriculture is the only source of livelihood for all of us living in this area. If you take this land away from us, we will become jobless so please consider such issues before executing the subproject.
- What will be the fate of PAPs? How their livelihood restored?
- How does the compensation will be issued? Will the compensation given individually or as a family?"
- One participant described that, "there are two grave yards on the nearby place selected for development" (Fig. 6.2).



Figure 6. 2: Grave yard Found on the Land Proposed FSTP Construction Site

- Are the waste materials will be brought and heaped here? Or what will happen to it after it is brought to here?
- Occurrence of bad smells. Water infrastructure must be installed first, or else, we will perish from diseases?

- What benefits does the project bring to the community?

The Summary of issues raised during consultation and responses given to participants by the consultant team and representative of SWSSE is outlined in the Table 6.1 below.

Table 6. 1: Summary of Issues Raised During Community Consultation

No	Issues Raised	Responses Given
1	Health risks posed by the presence of waste materials in the project area	Both consultant team and focal person from SWSSE described that: <ul style="list-style-type: none"> • The plant will adopt state of the art technology to treat the liquid wastes to avoid smell and other health risks; • After the treatment the water can be used for irrigation, car wash and other purposes
2	Kinds project benefits to local community	The consultant team described that: <ul style="list-style-type: none"> • Temporary construction job opportunities will be created during project construction phase During project operation phase <ul style="list-style-type: none"> • Permanent job opportunities will be created in the plant; • Provides easy access to compost fertilizer; and • Provide water source for irrigation works and car wash services
3	Whether local community members are allowed to get access to water source from water infrastructure installed for the project or not	Focal person from SWSSE described that: <ul style="list-style-type: none"> • We will work with SWSSE and the Contractor to prepare a communal water taps for the community; • Until its preparation a mechanism will be devised to get water access from the project
4	The importance of designing sustainable resettlement strategies for persons displaced by the project	Both consultant team and focal person from SWSSE described that: <p>Interested and qualified persons will be</p> <ul style="list-style-type: none"> • offered job opportunities during project construction and implementation phases; • organized in small and medium enterprises; • provided with trainings and working spaces; and • engaged in urban agriculture and car wash services around project area.
5	Inadequacy of cash compensation	Both consultant team and focal person from SWSSE described that: <ul style="list-style-type: none"> • Attempt will be made to prepare a replacement land in the area as far as possible; • Resettlement assistance will be offered; and • Self-employment opportunities will be facilitated
6	The tendency of Woreda officials collusion to undercut the amount of land compensation	Consultant team described that; <ul style="list-style-type: none"> • Displaced persons will participate in planning, implementing and monitoring of resettlement activities; and • Appropriate and accessible grievance mechanism will be prepared

6.12 Stakeholders Engagement/ Meeting

The consultation was focused on identifying issues sector stakeholders may have over proposed subproject. Six representatives from city's Municipality, health office, education bureau, culture and tourism office, urban development and construction bureau, and Environmental Protection Office were in attendance. Issues and suggestions raised during consultation are presented below.

Are you informed about the proposed FSTP subproject?

- Ato Aleka Teshete from the Municipality described that, “We have a working relation with the utility enterprise. So, we have information about the proposed FSTP subproject.”
- W/ro Shumba Kufa from Environmental Protection Office replied, “there is nothing we heard about it.”

Have you participated during subproject design and site selection?

- Ato Aleka Teshete, “we are not involved in both the design and site selection processes.”
- W/ro Shumba Kufa said that, “we do not have any participation in the subproject.”
- Ato Gameda from urban development and construction bureau, we were working the city’s structural plan and by then we were consulted by the SWSSE about the subproject and we incorporated the proposed site in the city’s revised structured plan.

What are the issues that need stakeholders’ coordination and attention in implementing the proposed subproject?

- Ato Aleka Teshete said that, “the issue of construction quality; the project should be built according to its construction standards. The project should be implemented according to its time plan. Lastly, before beginning of construction, it is important to coordinate project activities with authorities from telecommunication and electric utility service.”
- W/ro Shumba Kufa described that, “it is important to give attention for environmental issues. Before launching any activities, it is better to held consultation with the community.” She added that, “There is no communication between offices; so we have to avoid it and work together starting from project screening to decommissioning phases.”

6.13 Discussion with the Feasibility/Design Consultant

Consultations with the design/feasibility study team were held both on sites in the presence of the utility expertise and also in Addis Ababa with the presence of design/feasibility study team, two representatives from Oromia region Water Bureau and MoWE Water Supply and Sanitation Directorate staffs. The consultation points primarily focused on FSTP site alternatives and technology options. During the discussion with the feasibility/design team to select FSTP site, the ESIA consultant noted that the selected area is about 400 meters far from the residents. In addition, it is ensured that, there are no any buildings there. The demarcated area is an agricultural land including buffer zone and land required for the access road. For such reason,

the FSTP site is agreed and selected by the ESIA consultant, the design/feasibility consultant and SWSSE (Fig. 4.1). Moreover, according to multi-criteria analysis anaerobic pond with wetland technology option as suggested by the feasibility team was accepted considering technical, environmental, social, financial and economic feasibilities.

6.14 Consultation Outcome

Both the public as well as sector engagement meetings confirmed that there was an information gap regarding the intended FSTP. So, the ESIA team suggests the need for better information disclosure and project clarification for all concerned bodies before commencement of the construction activities. Fortunately, all consultation participants showed positive attitude towards the proposed FSTP development in the area. However, as discussed in earlier sections, the project lies on farmlands where agriculture is the only source of livelihood for the PAPs in the area. Therefore, the ESIA recommends ARAP study concerning the details of the PAPs and resident communities in the project area. So that proper compensation should be executed as per the ARAP investigations.

7. INDICATIVE SURVEY OF PROJECT AFFECTED HOUSEHOLDS

7.1 Demographic Status of PAHs

According to census, seven households (HHs) will be displaced from their farm lands for FSTP construction. All the HH heads are male with a total of 78 persons. Thus, taking of land for FSTP subproject will affect the lives of 78 individuals. The age of five HH heads is between 41 and 65 years while two of them are above 65 years. Therefore, planning and implementation of resettlement activities and measures should consider such demographic variations.

7.2 Vulnerable Group Members Affected by the FSTP Project

Implementations of any development projects affect members of project hosting community differently. Usually members of vulnerable groups: women, children, Persons with Disabilities, marginalized groups are disproportionately affected. Table 7.1 presents the number and types of vulnerable groups which will be affected by the FSTP subproject. For instance women's and children easy access to food items collected from their farm is no longer guaranteed; and their ability to procure food items from market is less likely. Due to cultural, economic and social status, women and children are lacking opportunities to present their views and interests, and rights to land. Hence, preparation of ARAP should take issues specific to women, children and older persons into account.

Table 7. 1: Distribution of Members of Vulnerable Groups

No	Types of Vulnerable Group	Number	Percentage
1	Children		
	Boys	10	24.39
	Girls	31	75.61
	Total	41	100
2	Women		
	Girls below 15 years age	31	55.36
	Girls above 15 years age	18	32.14
	Wives	7	12.5
	Total	56	100
3	Elders above 65 years age	3	100
4	Total	69	

Source: (Green Sober Survey: 2023)

7.3 Educational Status of Project affected Household Heads

Four of the HH heads were illiterate, while three attended primary education. Besides, only one individual received a special training on improved farming practices. Hence, to avoid long term

impoverishment and socioeconomic hardships, preparation of ARAP should consider land based resettlement measures considering productive skills the HHs are good at.

7.4 PAHs Land Ownership Status and Land Size Proposed for Expropriation

The census assessed PAHs land ownership and size which will be expropriated for FSTP subproject; and current users and uses of the required land in the project area (Table 7.2). All HH heads are the owners of the land, and the size of their landholding is between half and more than two hectare. All of them have title deeds to the tracts of land over which the construction of FSTP is proposed.

Table 7. 2: Distribution of landholding status and associated parameters by the PAHs

No.	Landholding Condition	Number	Percent
1	Landholding size in hectare		
	0.5 - 1 hectare	3	42.85%
	1.0 – 1.5 hectare	2	28.57%
	1.5 > 2.0 hectare	2	28.58%
	Total	7	100%
2	People cultivating the land		
	Myself	4	57.14%
	I and My son	2	28.57%
	My son	1	14.29%
	Total	7	100%
3	Uses of produces		
	For household consumption	3	42.86%
	For household consumption and market	4	57.14%
	Total	7	100%

Source: (Green Sober Household Census: 2023)

7.5 Pre-Displacement Levels of Productivity by PAHs

Involuntary taking of land by FSTP subproject will inevitably lead to dismantling of PAHs' production system and their source of livelihoods. Table 7.3 documents major agricultural production types, levels of productivity and annual incomes of PAHs.

Table 7. 3: Productivity and Income Status of PAHs

No.	Types of Production	Productivity Levels per Hectare	Unit	Price per Quintal in ETB	Total Revenue in ETB
1	Maize	10.8	Quintal	4,357.00	47, 055.60
2	<i>Teff</i>	5.4	Quintal	7, 643.00	41, 272.20
3	Haricot bean	8.4	Quintal	5, 786.00	48, 602.40
4	<i>Dagussa</i>	8.5	Quintal	6, 300.00	53, 550.00
5	Sesame	4	Quintal	12, 000.00	48, 000.00
6	Potato	32	Quintal	2, 040.00	65, 280.00
Total		69.1			303,760.20

Source: (Green Sober Household Census: 2023)

8. OUTLINE OF THE MAIN PROJECT ALTERNATIVES

8.1 No Project Option

Shashemene city is one of the growth and business corridors in the southern corner of Ethiopia. The population of the city is increasing at an alarming rate without proper urban sanitation facilities. Thus construction of improved sanitation amenities in the town is very imperative to augment the environmental health and create healthy and productive citizens, thus the no project scenario cannot be technically sound option.

8.2 Selection of Fecal Sludge Treatment Technologies

Fecal sludge treatment technique typically consists of three 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 and sludge treatment methods that are most suitable for Shashemene city were identified through a literature analysis, feasibility study and detailed study report assessment. This section gives an overview of the possible treatment technology alternatives, including their fundamental principles, advantages, and disadvantages from the perspectives of the environment, social, and the economy.

8.2.1 Primary Treatment (Solid–Liquid Separation) Technology

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) Drying Bed (UDB), 2) Planted Drying Bed (PDB), 3) Settling and Thickening (S&T) Tank.

1) Unplanted Drying Bed: this is a simple, permeable bed that has numerous drainage layers as demonstrated in Figure 8.1. 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.

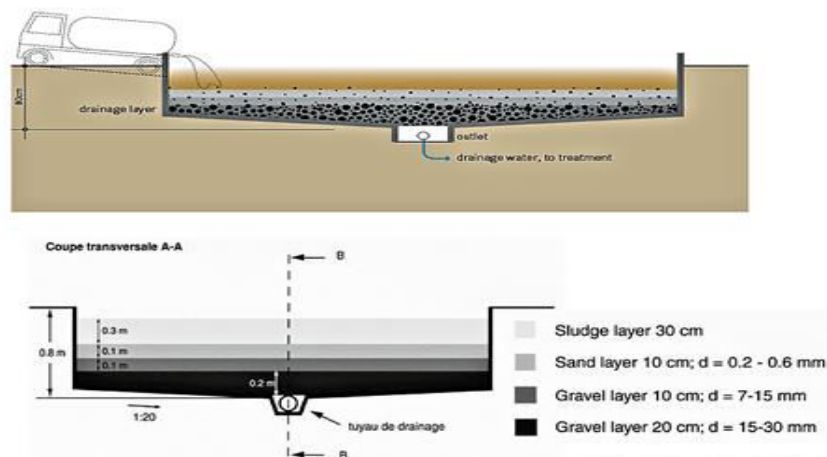


Figure 8.1: Schematic of an Unplanted Drying Bed

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-sludged. Although frequent desludging necessitates huge surface areas, personnel, or mechanical power, drying beds are very simple to build and maintain (see Table 8.1).

Table 8.1: Comparative Analysis of Unplanted Drying Bed

Technology Alternatives	Advantages	Disadvantages
Unplanted Drying Bed	Relatively low capital costs; low operating costs	High land requirements
	Good dewatering efficiency, especially in dry & 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 & construction supervision
Planted Drying Bed (PDB)	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
Settling and Thickening (S&T) Tank	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

2) Planted Drying Bed (PDB): A planted drying bed is comparable to an unplanted drying bed as demonstrated in Figure 8.2, 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 desludged after each feeding/drying cycle, which is the main advantage of the planted bed over the unplanted bed (see Table 8.1).

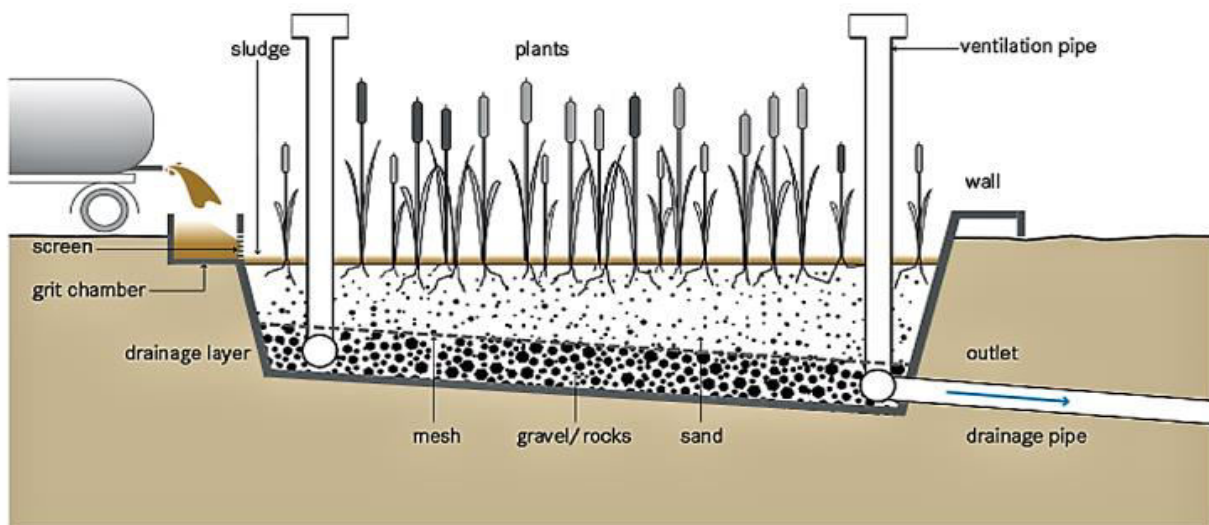


Figure 8.2: Schematic of a Planted Drying Bed.

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.

3) Settling and Thickening (S&T) Tank: It 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 8.3.

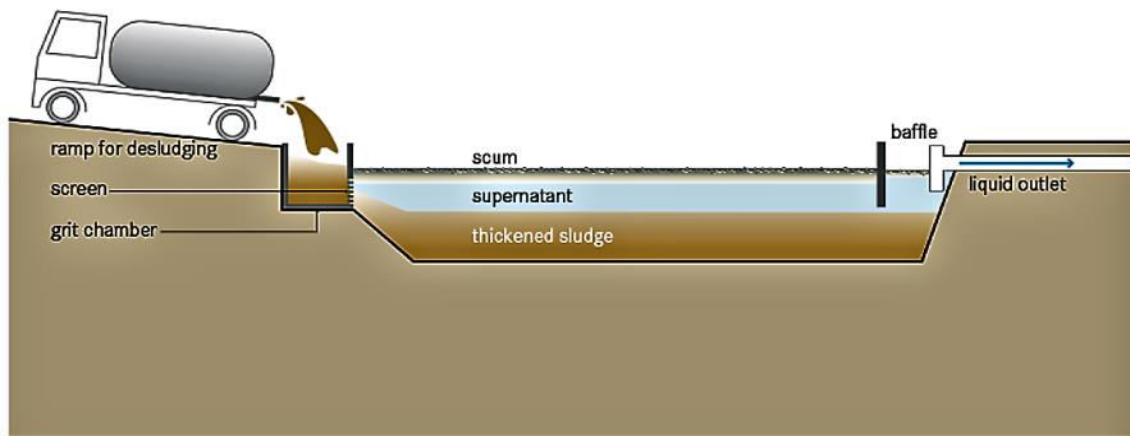


Figure 8.3: Schematic of a Thickening Pond

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 8.1).

8.2.2 Decision Matrix for Primary Treatment Technology (Solid-Liquid Separation)

The groundwater level, land need, energy requirement, skill required, capital cost (CAPEX), operational cost (OPEX), and sludge treatment technical possibilities were taken into consideration while creating the decision matrix for treatment technology. The selection of fecal sludge treatment technology for Shashemene city also depends on the UWSSP-II sanitation goals, the and the minimum/indicative wastewater quality standard values set out within the UWSSP II ESMF/WBG EHSR as well as benefits to the environment and health, and the elimination of open defecation. The decision matrix compares the benefits of various technologies based on factors related to the economy, the environment, and social safety. The UDB and PDB require a lot of area but no energy need. Whereas, the groundwater level should be deep for S&T tanks, although the UDB and PDB do not depend on it for operation (Table 8.2).

Table 8.2: Main Characteristics of the Sludge Dewatering Process

Characteristics	UDB	PDB	S&T
Land requirements	+++	+++	+
Energy requirements	-	-	+
CAPEX	+	+	+
OPEX	+	++	+
Groundwater level	+	+	++
Skill requirement	+	++	+
Discharge standard	++	++	++
Operational complexity	+	++	++
Maintenance requirements	+	++	++
Complexity of installation	+	++	++
Influence of climate	+++	+++	+
Sensitivity to type of FS	+++	+++	+
Chemical product requirement	-	-	+
Dewatered sludge removal complexity	++	++	++
Level of dryness	+++	+++	+
Odors and vectors	+++	+++	
Noise and vibration	-	-	+

The decision matrix compares the benefits of various technologies based on factors related to the economy, the environment, and social safety. The UDB and PDB require a lot of area but no UDP is determined to be the most appropriate option based on the decision matrix analysis for Shashemene city FSTP as liquid-solid separation. The PDB comes after it. Consequently, for Shashemene town FSTP, UDB, the principal treatment (solid-liquid separation) technique, was selected. Evaluations conducted with drying beds have shown that they offer effective treatment, simple operation and maintenance methods, resistance to shock loads, and climate adaption. Furthermore, sludge drying beds in general less sophisticated compare to other alternatives, more flexible, and easier to operate, and use less energy during operation than mechanical systems, which would make them preferable dewatering option for Shashemene city.

8.2.3 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, and 2) solar drying are the methods employed for further sludge treatment.

1) Co-composting: FS 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 8.4. The processing of source-separated human faces has made extensive use of this technique. FS 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, faces have a high moisture and nutrition content.

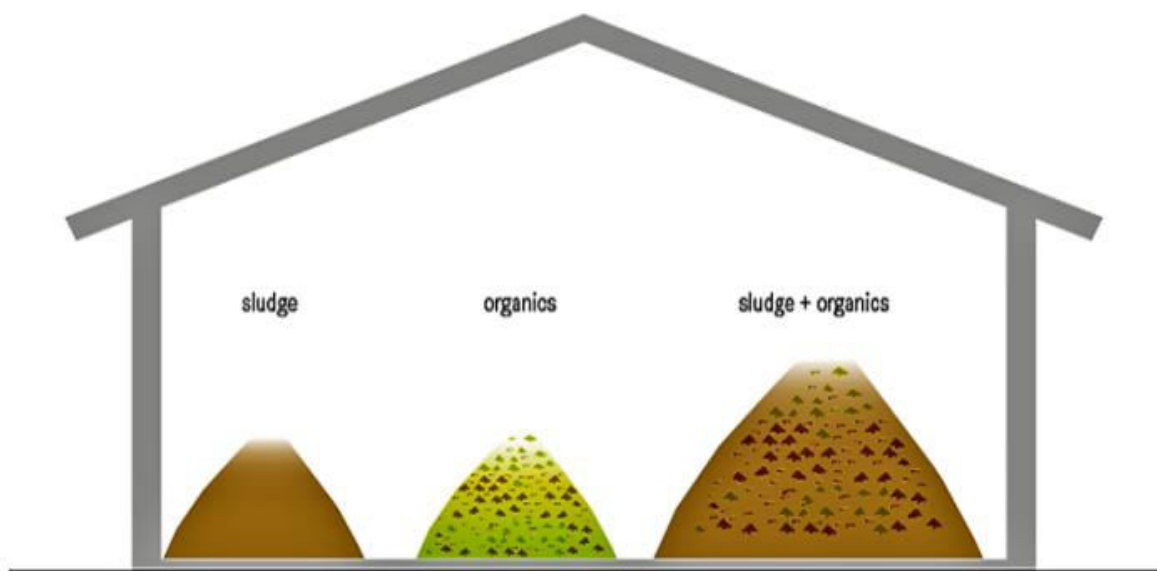


Figure 8.4: Schematic of the Co-compost

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°C) is maintained during co-composting for 3 weeks in order to destroy helminthes eggs and harmful bacteria. The co-composting procedure takes 10–12 weeks. Comparative analysis of Co-composting is given in Table 8.3. Only when a source of well-sorted biodegradable solid waste is available the co-composting technique can be used.

Table 8.3: Comparative Analysis of Sludge Treatment and Disposal Technologies

Technology Alternatives	Advantages	Disadvantages
Co-compost	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 helminthes 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	
Solar Drying	High efficiency for dewatering	Large space requirements
	Low energy requirements	Need mechanical means to turn sludge
	Low investment cost	Ventilate the greenhouses

2) 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). 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 8.5: Schematic of Solar Drying

8.2.4 Decision Matrix for Sludge Treatment Technologies Option

Based on the sludge treatment technical options, a decision matrix was prepared for Shashemene city with respect to land requirement, energy requirement, skill requirement, CAPEX, OPEX and groundwater level and discharge standard (Table 8.4).

Table 8.4 : Decision Matrix for Sludge Treatment Technology

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

Based to the decision matrix (Table 8.4), solar drying treatment is the best alternative sludge treatment technique that ESIA teams could provide based on the real conditions in Shashemene city in terms of the selected solid-liquid separation treatment plant, current sanitation level, and climate consideration. Furthermore, co-composting was strongly advised for further treatment of dried sludge 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.

8.2.5 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).

- 1) Waste Stabilization Ponds (WSP):** The cheap capital and operating and maintenance expenses of 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 8.6).

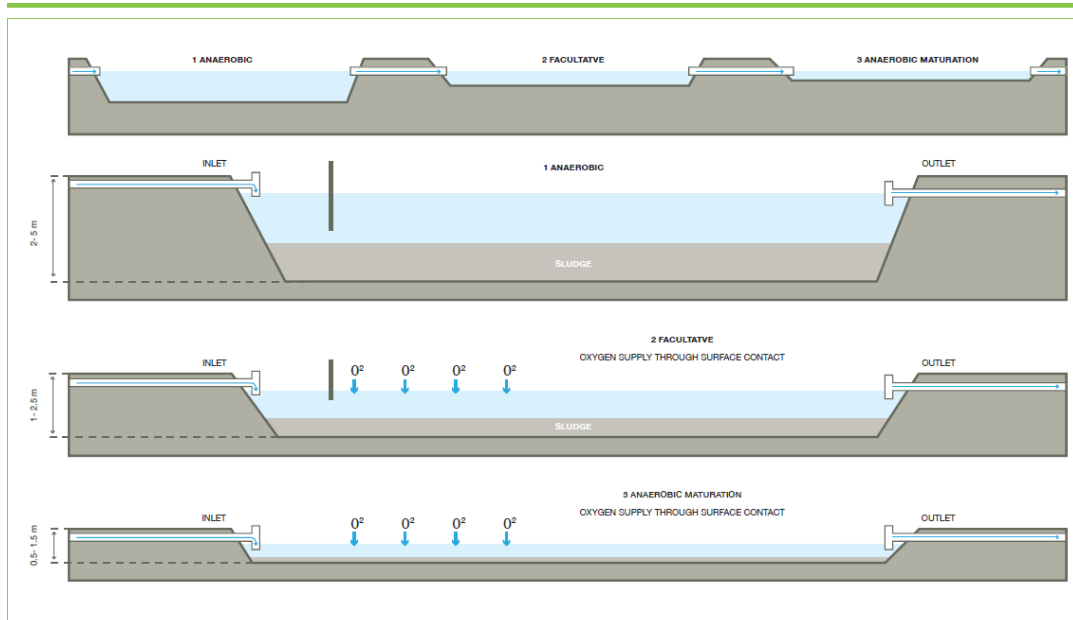


Figure 8.6: Typical Scheme of a Waste Stabilization System

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 8.5, will dictate the number of ponds and the type of maintenance necessary.

2) Constructed Wetlands: In the treatment of wastewater, there are three types of constructed wetlands as illustrated in Figure 8.7. 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.

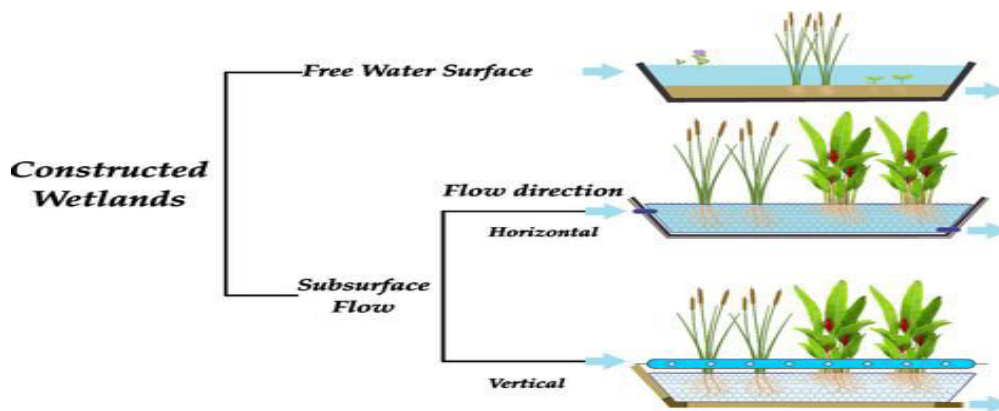


Figure 8.7: Scheme of Types of Constructed Wetland

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.

Table 8.5: Key Features of Selected Treatment Options for Liquid Effluents from Dewatering Units

Technology Option	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) & 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 & subtropical countries
Wetlands	Organic loading rate: 30-110 g COD m ⁻² d ⁻¹ (typical: 75g 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
		Low construction, O&M costs	Not very tolerant to cold climates
		High reduction in BOD, SS & pathogens possible	
		Attractive landscape features	

3) An Anaerobic Baffled Reactor (ABR): It 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).

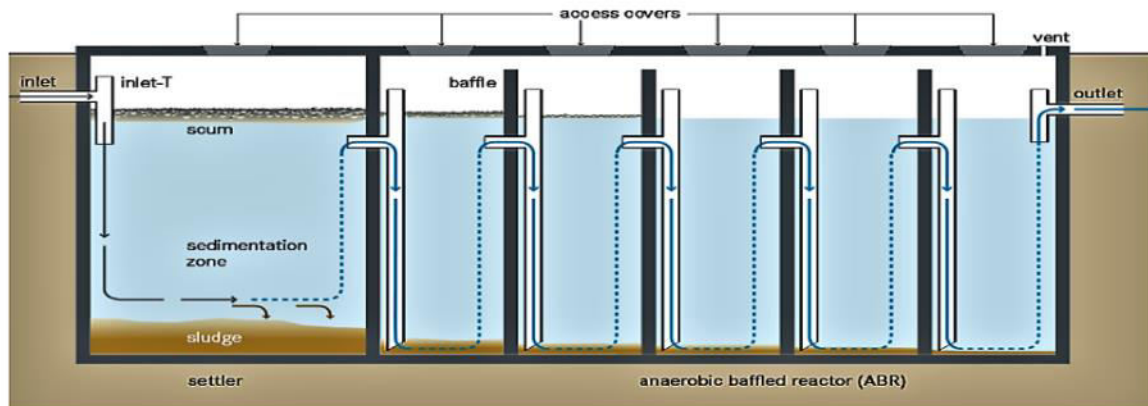


Figure 8.8: Schematic of the Anaerobic Baffled Reactor

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 8. 6: 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 FS 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)	Clear design guidelines are not available yet
Simple to operate	

8.2.6 Fecal Sludge Treatment Process Technologies Adopted For Shashemene City

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) was the most widely used technology in developing countries.

In reality, Shashemene city 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 various fecal sludge management options have been examined by – CATS and UNICONE Consultancy P.L.C. and reported in the feasibility study and detailed design of CWIS for the city. Based on the outcome of the multi-criteria analysis, the consultant was proposed their top choice for properly treating the produced fecal sludge in the city is treatment systems that consist of unplanted sludge drying bed with waste stabilization pond without settling-Thickening Tanks and ARB as presented in Figure 8.9. The sequence of the proposed fecal sludge treatment process was: Reception-drying beds-Anaerobic pond-facultative pond-maturation pond –Effluent as illustrated in Figure 8.9.

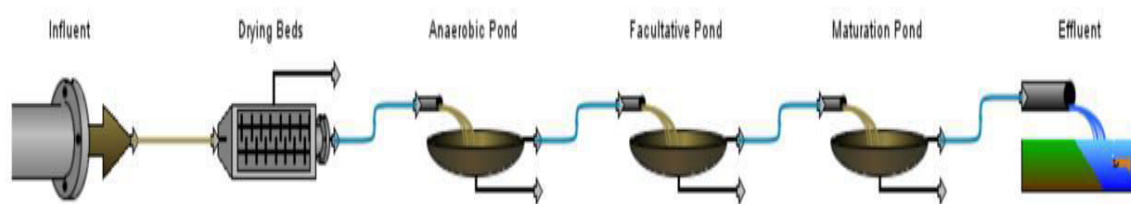


Figure 8.9: FSTP Allocation on the Site Layout

The ESIA consultancy team also recognized the suggested method for treating fecal sludge in Shashemene city by the design and feasibility study Consultancy P.L.C. (CATS and UNICONE). These technological possibilities offered the possibility of successfully treating fecal sludge and to generate leachate effluent. Among the available technologies based on the selection multi-criteria analysis, the proposed technology alternative for FSTP by feasibility/designing team was in consent with ESIA team by considering technical, financial, environmental, social, and economic feasibilities. As a consequence, the proposed technology design alternative for treating the produced FS Shashemene City comprises the combination unplanted sludge drying bed with waste stabilization pond without settling-Thickening Tanks and ARB.

This kind of fecal sludge treatment process would result in high effluent quality from both the sludge and the leachate, which could be disposed of properly without endangering the environment or creating health hazards to humans. Sludge and leachate that would meet the

minimal or indicative wastewater quality standard values given in the UWSSP II, ESMF, WBG, and EHSR can also be treated utilizing the advised fecal sludge treatment technique.

8.3 Site Alternative

Three alternative sites were proposed for Shashemene FSTP construction. Using basic environmental, social and economic feasibility indicators comparative analysis of the proposed sites was made to select the best option.

- A. **Site Alternative III:** this site was located 5km away from the town center along the Addis Ababa- Hawassa express road in the western outskirt of the Shashemene town. Environmentally it is rehabilitated quarry site (express road construction) ideal for FSTP construction. Economically this site is also feasible. Since it is closer to the town center than other site alternatives, which can make transportation cost of the sludge during operation minimal. The main drawback associated with site **Alternative III** was that it can lead to high number of rural household physical displacement. For this social reason site **Alternative III** was not recommended.
- B. **Site Alternative II:** this site is along Shashemene- Hallaba- Wolaita Sodo highway 10km to the West of the town center. The total area was 11hectare and it was design consultant indicated site alternative. The environmental problem associated with site **Alternative II** was that its construction can completely block the entrance of the newly constructed sanitary landfill site of Shashemene city. Since site **Alternative II** is located in front of the newly constructed (construction is not completed) sanitary landfill of the city. Moreover, the delineated area also overlaps with the new sanitary landfill. The other key limitation also was that some portion of the Site **Alternative II** overlaps with the Shashemene- Hallaba- Wolaita Sodo highway. The plot of land is private owned land and occupied by main plantation during the ESIA data collection. Thus during the ESIA field data collection Shashemene city utility office representative, the design consultant (on site adjustment survey) and the ESIA consultant team agreed to amend site **Alternative II**.
- C. **Site Alternative I:** this site is adjacent to the newly constructed sanitary landfill site of the city. It is only 200m away from site **alternative I**. The plot of land is private owned (seven households) and also occupied by main plantation like the other two site alternatives. On the

other hand, this site is environmentally recommendable for the construction of the FSTP. Therefore; during the ESIA field data collection the Shashemene city utility office representatives, the ESIA consultant and the design consultant together proposed site **Alternative I** as the best option for the development of the Shashemene FSTP (**Figure 8.12**).

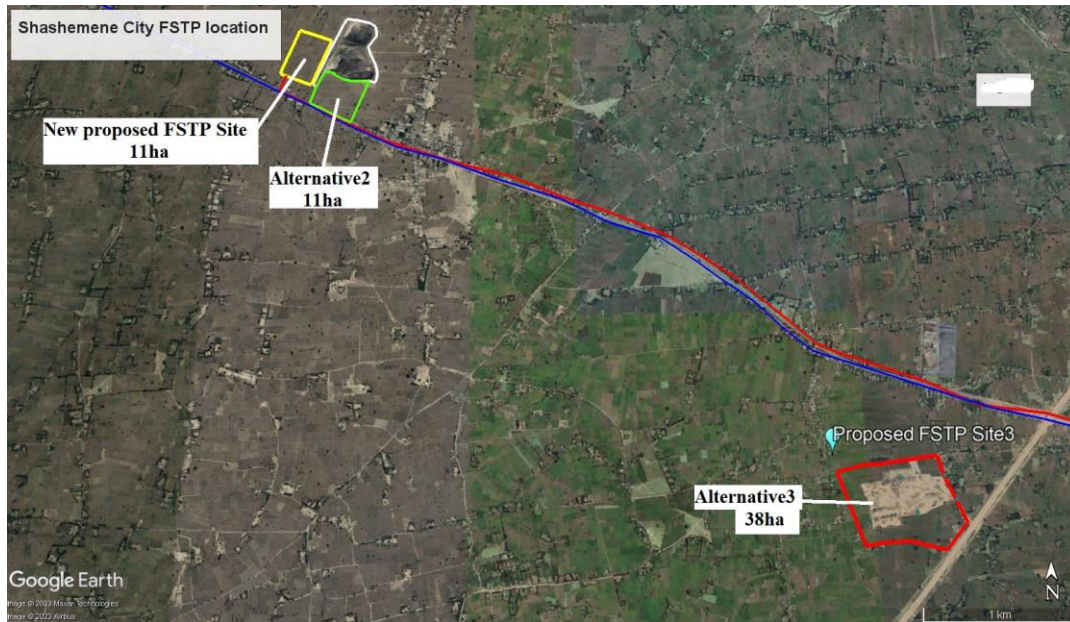


Figure 8.10: Site alternatives for Shashemene FSTP construction

9. POTENTIAL IMPACT IDENTIFICATION AND ANALYSIS

This section of ESIA set out the impact assessment and approach as well as identifies environmental and social impacts associated with the proposed FSTP. The potential impacts have been separated into those occurring during the construction, operation and decommissioning phases.

9.1 Impact Assessment Methodology and Approach

Impact identification: The possible impact receptors were listed and identified through surveying, the existing environmental and socioeconomic condition through baseline studies and consultation with stakeholders.

Impact Description: 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.

Impact Evaluation: 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.

Table 9. 1: Classification of Impact Evaluation

Classification	Description
Extent	Whether the impact will occur on site , in a limited area (2km radius); locally (5km radius); regionally (city wide, nationally or internationally).
Duration	Whether the impact was temporary (<1 year); short term (1 – 5 years); medium term (5 – 10 years); long term (sub program design period); or permanent (bound design period).
Sensitivity	<p>High sensitivity: Entire community Involuntary displacement, Property damage or Loss, biodiversity disturbance and species extinction, destruction of world heritage and important cultural sites, large scale stakeholder conflict according to RPF, etc.</p> <p>Medium sensitivity: Displacement of some households according to the RPF, moderate level of stakeholder concern, medium and reversible damage to the natural environment, etc.</p> <p>Low sensitivity: No displacements, no potential for stakeholder conflict, negligible impact on the natural environment, etc.</p>
Severity (Overall Impact rating)	Using a combination of the above criteria, the overall severity of the impact was assigned a rating Severe, Substantial, Moderate, Minor and negligible (see Table 9.4). Note: These are just guidelines that will constitute professional judgment required in each individual case.

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. The numerical descriptors are 1, 2, 3, or 4; which are equivalent to very low, low, medium or high. The impact severity is then calculated as the product of the two numerical descriptors, i.e. negligible, minor, moderate or major, as indicated in Table 9.2.

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 classified as follows:

- **Major:** These denote that the impact is unacceptable and further mitigation measures must be implemented to reduce the significance. It is **shaded red**
- **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 Yellow.**
- **Minor:** Impacts in this region are considered acceptable. **Shaded Blue.**
- **Negligible:** Impacts in this region are almost not felt. **Shaded Light green.**

Table 9. 2: Determination of Impact Severity Matrix

Impact Intensity		Sensitivity of Receptor			
		Very low (1)	Low (2)	Medium (3)	High (4)
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 (Table 9.3)

Table 9. 3: Intensity Scale Gradation for Socio-Environmental Impacts

Intensity	Criterion
Very low	Environmental changes are within the existing limits of natural variations
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.
High	Environmental changes result in significant disturbance to particular environmental components and ecosystems. Certain environmental components lose self-recovering ability.

Table 9. 4: Overall Impact Rating and Description

Overall Impact Rating	Description of Impact	Significance
Major	<ul style="list-style-type: none"> ✓ Non-compliance with national policy, environmental laws and regulations ✓ Highly noticeable, irreparable effect upon the environment ✓ Significant, widespread and permanent loss of resources ✓ Major defilement of water/air quality and noise guidelines representing threat to human health in long and short term ✓ Causing widespread nuisance both on and off site ✓ Extensive property damage or loss, 	>12
Moderate	<ul style="list-style-type: none"> • Noticeable effects on the environment, reversible over the long term. • Localized degradation of resources restricting potential for further usage • Increased traffic in sensitive environments • Widespread physical resettlement, affecting livelihoods 	6 – 12
Minor	<ul style="list-style-type: none"> ○ 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 ○ Population increase not expected to stress existing infrastructure 	2 – 4
Negligible	<ul style="list-style-type: none"> ➤ 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 ➤ 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 identified current and probable future impacts of the Shashemene city FSTP on the receiving environment (Table 9:4).

9.2 Positive Impacts and their Enhancement Measures

There a number of positive benefits associated with the proposed FSTP. It will contribute to alleviating the impacts of the existing uncontrolled fecal waste disposal into the environment, which include nuisance odors, poor aesthetics, and risk of ground water pollution/contamination, improved public health, hygiene and household health status, infrastructure improvement, skill and technology transfer, and creation of employment opportunities during the construction and operation phase among others. Moreover, it will also improve aesthetic view of the city by avoiding overflow of septic tanks in to roads and drainage ditches when the FSTP is functioning. The following are some of the identified positive impacts anticipated and their enhancement measures during construction and operation phases:

9.2.1 Jobs Creation and Business Opportunities

The subproject will involve the engagement both skilled and unskilled labor such as surveyors, engineers, technicians, machine operators and other staff with various skill sets. The creation of temporary and permanent employment and business opportunities will have socio economic benefits on households directly or indirectly involved on the project. Mostly temporary jobs will be created at construction phase and permanent jobs when the overall project is completed and start operating. Moreover, provision for direct employment, trade opportunities for the local community is also expected. The subproject will ensure that local communities, especially for PAPs, woman and youths are given priority during job creation and business opportunities, in the project area.

Enhancement Measure: Benefits from job and business opportunities can be enhanced by providing priority and special consideration for PAPs and vulnerable groups like women, female headed HHs, the youth and disabled. Moreover, providing an adequate on job training and capacity building for unskilled and semi-skilled laborers can ensure skills transfer and the work environment is conducive.

9.2.2 Skill and Knowledge Transfer

Since FSTP is new for Shashmene city, different capacity building sessions will be given (organized and unorganized) through the transfer of new technologies and new skills, to mainly unskilled workers. Thus during construction and operation 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. Local sub-contractors and companies are also beneficiaries from the transfer of skills and will also build additional local capacity.

Enhancement Measures: Where the required knowledge and skills are available locally, the local people should be given first priority, particularly the vulnerable group, proportionate to their level of knowledge, skills and interests. Moreover, by providing on job training and capacity building, it is possible to enhance the skill and knowledge transfer of semi-skilled and unskilled laborers from the local community.

9.2.3 Income to Material/ Equipment Suppliers and Contractors

A number of equipment and materials (such as gravel, bricks, plumber, steel reinforcement and cement for civil works) can be sourced locally within Shashmene city and the neighboring regions. Accordingly, local suppliers of construction materials and equipment in the project area will benefit financially. This is a positive but short-term and reversible impact only during the construction phase.

Enhancement Measures: Construction materials have to be based on a contractual obligation for contractors to procure construction materials from quarries/suppliers legitimately licensed /legal by the respective district authorities. The other enhancement option is through organizing job less youth to supply the local construction materials until the end of construction phase.

9.2.4 Reduce Public Health Risks and Associated Treatment Costs

As it is well stated at the baseline section of this ESIA, the existing city liquid waste treatment system is extremely poor and it lacks disposal sites. As a result, currently the fecal sludge from the septic tanks and toilets collected and disposed through vacuum trucks in the southern outskirts of Hawassa city at the top of *Alamura Mountain for drying*. Health reports from the city health bureau indicate that sanitation and hygiene related diseases are a major health problem in the city. According to the city health bureau, *pneumonia, typhoid fever acute upper respiratory*

infection amoebiasis and diarrhea were ranked among the top nine diseases that caused morbidity. Therefore, the implementation of the proposed FSTP would play important role in improving the environmental sanitation and prevent diseases related poor sanitation across the city. This helps to save the costs associated with the treatment and prevention of diseases.

Enhancement Measures: In order to enhance the health of city residents, the evacuation process of filled private and public septic tanks should be efficient and effective. The evacuation fee should be affordable by the poor households or it should be subsidized by the city administration. Effective and efficient utilization and maintenance for the malfunction systems has also to be done timely with the required standard. In addition to hardware components, integrating hygiene promotion and awareness creation activities will enhance the positive impacts or results of the proposed subproject. The other broad area of intervention required to enhance the identified positive impacts is conducting capacity-building programs within WSSE and municipality.

9.2.5 Reduced Sewage Spills, Infiltration to Soils and Groundwater

The provision of a proper FSTP in Shashemene city will reduce or eliminate any significant potential for infiltration of sewage into the soil and groundwater as well as into water streams. The discharged sewage into the surface, soils and natural waters can be caused by the overfilled and unmanaged septic tanks and toilet facilities. Collecting and treating the toilet sludge therefore will minimize uncontrolled discharge of the waste into water bodies and reduce the pollution risk of the surface and ground water resources.

Enhancement Measures: It is advisable plan and implements environmentally and socially acceptable fecal sludge management which comprises a whole set of factors, covering technical and non-technical aspects as well as involving stakeholders on all levels. To enhance the positive impacts on natural water quality, quarterly regular monitoring the quality of the effluent during release to downstream rivers and check whether the effluent quality complies with the Ethiopian effluent discharge standards.

9.2.6 Fertilizer and Biogas Production

The treated effluent provided that the content is within the acceptable standard can be used for irrigation purpose. Urban irrigation is important for improving livelihood of the people involved in urban agriculture by availing fresh vegetables for consumption at household level and for sale. To achieve this benefit, the FSTP need to be designed and operated to achieve

discharges that fall within the maximum values set out for effluent quality. Hence, the construction of FSTP will facilitate access to low-cost organic fertilizers. In addition, Fecal Sludge used to generate bio gas for households.

Enhancement Measures: Organizing farmers and assigning skilled irrigation extension workers to use the compost will be vital. Producing marketable compost will enhance the benefit and generate income to the concerned authority (establishing micro and small enterprises that prepare marketable compost). Also, working closely with the agricultural office will be useful to ensure the compost quality as per standard. Consequently, creating a sustainable market linkage for the compost products and constructing diversion canals and supplying water pumps would also encourage farmers to use irrigation. Field demonstration and training the farmers found nearby FSTP on how to use the compost on their farm plots and biogas to fuel their houses would also enhance the benefit.

9.3 Construction Phase Negative Impacts and Mitigation Measures

9.3.1 Resettlement and Compensation Issues

These are issues commonly associated resettlement of people within the project sites. The FSTP requires a total of 11 hectare of land. The ESIA study team observed that no residential house on the site except cultivated farmlands of 7 HHs. Therefore, at least 7 households will lose their crops and farmlands permanently. All of the likely displaced persons (economically or physically) and livelihoods have to be considered for compensation through Abbreviated Resettlement Action Plan (ARAP). Proper compensation in kind and cash has to be given for adversely affected livelihoods of PAPs.

The ESIA team conducted a meeting with PAPs and stakeholders independently. And a consensus has been reached to compensate all the PAPs at the proposed FSTP sites ahead of mobilization and commencement of construction works as per the World Bank policy on involuntary resettlement and Ethiopian laws on compulsory land acquisition.

Intensity of Impacts	Sensitivity of Receptor			
	Very low(1)	Low (2)	Medium (3)	High (4)
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)

The likelihood of the impact occurrence is **high** and 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**.

Mitigation Measures

- Create awareness to PAPs on the potential impacts of the project and compensation
- Detailed ARAP should be conducted in the project area by independent consultant before any construction;
- Give priority for the PAPs for job opportunities;
- Prepare and implement livelihood restoration program for PAPs;
- Vulnerable community groups like female headed HHs must get priority during compensation, land delivery and post livelihood rehabilitation works;
- The resettlement site must have access for social amenities at least proportionate to their original village;
- The date of commencement of the census of PAPs will be taken as Cut-off date.

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

9.3.2 Loss of Vegetation Cover

The natural vegetation surrounding the proposed FSTP site has been already cleared and the site is located on cultivated farmlands. During the vegetation survey very few individuals of *Acacia seyal*, *Cordia africana* and *Croton macrostachyus* were recorded. In addition Aloe, Cactus and Euphorbia, species were observed between farm borders and along the road sides. Therefore, the few remnant plants that can be removed during the project construction phase should be replanted on suitable part of FSTP. And hence, it acts as a buffer zone around the project site and it can also be used as a wind break and reduces potential bad smell produced from treatment plant.

Thus whatever very little vegetation may be affected by the proposed construction work, the **intensity of the impact** and the **sensitivity of the receptor** is assigned to be **low**. This results in **minor** impact **significance**.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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

- Planting of appropriate indigenous trees and shrubs species, which are friendly to the environment.
- For each individual species removed during construction phase at least ten individual seedlings shall be planted along with watering of the plants until it reaches to at least 1.5meters height.
- The selection of appropriate tree species and locations of planting shall only be done in consultation with the city EPA.

9.3.3 Impacts on Habitat and Fauna

The wildlife habitat has already been changed to agricultural land and settlement areas, like other parts of the country. Consequently, very few and common bird species were recorded in the project area. Similarly information from the residents' confirmed the presence of very few species of mammals in the area. Fortunately, there are no parks or any other forms of protected areas at or in the vicinity of the project impact. Therefore, the proposed project will have very low impact on the wild fauna of the area.

9.3.4 Impact on Soil

Potential impacts on soils during the project construction phase include soil compaction, soil erosion, and soil contamination by hazardous substances. Among the activities that would affect the soil resources include site clearing, stripping of topsoil, excavation, and loading of spoils and hauling of the same to disposal sites; these activities would involve operation of heavy-duty equipment and dump trucks. These undertakings have the potential to cause soil compaction as well as damages to soil structure and expose the soil to water erosion.

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

substances especially during maintenance of machinery and vehicles can contaminate the soil.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

Medium intensity of impact is expected since the construction of FSTP will be done by registered qualified contractor. The duration of exposure of stockpiles being relatively short and the proposed FSTP is farmland; the sensitivity of the impact occurrence is **medium**. Thus both **intensity of the impact** and **sensitivity of the receptor** are rated as **moderate**, localized and temporary this results **moderate** impact significance that can be reduced by applying the following mitigation measures.

Mitigation Measures:

- Develop excavated soil management plan before starting the construction activities;
- The construction work shall be done at the dry season in order to arrest sediment transportation enhanced with runoff;
- Prevent sheet and rill erosion of soil through the use of sand bags, diversion berms, culverts, or other physical means;
- Careful removal and proper stockpiling of the topsoil removed from the site and re-using it for site restoration when construction works are ended;
- Oil exchange should be taken place only in the pre-prepared workshop area.
- Washing of vehicles and machinery should only be conducted in the workshop area and never be done on open soils;
- Avoid using of old (> 10 years) and properly unmaintained machineries which can most likely lead to oil, grease and fuel leakages;
- Use only existing roads to the extent possible and do not drive through unpaved soil.

The adoption of the mitigation measures can reduce impact intensity to “**very low**” resulting in residual impact of “**minor** significance”.

9.3.5 Disturbance on Air Quality

The emission sources in the construction phase are emanated from site clearance, excavation and earth moving works, activities, vehicular traffic movements on unpaved roads and earth moving activities, gaseous emissions from vehicles and construction equipment and cutting and welding operations. Passage of increased number of vehicular traffic during construction time also will introduce higher levels of other pollutants such as emissions of exhaust fumes, lead and associated gases such as carbon monoxide, hydrocarbons, and nitrous oxides from vehicles entering and exiting the site along with the operation of necessary equipment. These will need to be monitored all through the construction period. This 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 nearby residents.

Considering the nature and extent of construction works and machineries involved, the air quality impacts associated with dust generation to the receptor sensitivity is considered to be **low**. The **intensity of impact** is assessed as **low** resulting into **minor** impact significance.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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

- Provide PPE for the construction crew and all visitors to the site.
- Limit speed of vehicles to 30km/hr on unpaved access roads especially in the vicinity of sensitive areas (residential and business areas, social services, religious places).
- Avoid using of old (>10years) or damaged equipment's ones; on weekly basis check every day proper functioning of all the machines on duty;
- Trucks will be covered during haulage of construction materials to reduce on spillage of materials and Use spray water for dust suppression over dusty areas

9.3.6 Noise Pollution

Noise pollution is anticipated both during construction and operation phases. Construction activities like foundation works, construction of auxiliary buildings and access roads, movement

of heavy duty trucks, machineries, and generators will be anticipated to create noise pollution on workers and nearby residents in the project area. Specially, high noise level above WHO and Ethiopian noise standards can cause health impact on recipients. The Ethiopian noise standard for daytime at residential area is 55 dB and for night times it is 45 dB.

The long-term exposure to noise level above this standard at residential areas is expected to cause health impact. Generally, construction phase noise level exceeding 75 dBA and 70 dBA during the day and night respectively has significant impacts on surrounding sensitive receptors within 50m of the construction site.

Intensity of Impacts	Sensitivity of Receptor			
	Very low(1)	Low (2)	Medium (3)	High (4)
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)

The noise pollution to the receptor sensitivity is considered to be **low**. The **intensity of impact** is assessed as **low** resulting into **minor** impact significance.

Mitigation Measures

- Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment
- Noise levels at construction sites should not exceed 75 dBA and 70 dBA during the day and night, respectively
- During periods of off work time, equipment's will be switched off during off work time whenever possible;
- Utilize well maintained and functional working equipment's;
- Provide the necessary PPE like ear muffs to workers whenever needed and as found appropriate;

9.3.7 Traffic Congestion and Accident Risks

During construction, vehicles and machinery movements are likely to increase traffic on the roads along the construction of FSTP. Contractor Heavy-duty truck traffic can obstruct or damage roads and increase the likelihood of accidents. Vehicles and trucks transporting construction materials to the site may result in community risk of traffic-related accidents and a

significant social impact and likely to affect children, women, disabled, elderly people and livestock.

Accidental risks associated with the subproject will be due to trenches created for the construction purpose but, people in the area including children moving for different purposes, domestic and wild animals are the victims by entering to the trenches. Although some effects of the accidents (for instance minor injuries) may be reversible, some, for example, loss of human life are irreversible.

Intensity of Impacts	Sensitivity of Receptor			
	Very low(1)	Low (2)	Medium (3)	High (4)
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)

The duration of the risk will be **short-term** occurring only during the construction phase. The **receptor sensitivity** is **Low** 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**.

Mitigation Measures

- Develop and implement traffic management plan and work in close coordination with local traffic police;
- Provision of awareness education to the employees and the local community about traffic accident management;
- The contractor should provide a protective wear to workers and temporary road signs or notices to indicate ongoing works;
- For the site traffic the contractor has to ensure that vehicles are operated only by qualified drivers and only park in designated parking areas;
- Employ youth to facilitate traffic management activities on either points of the construction site;
- Fencing or placing obstacles to trenches and ditches to avoid interference and accident of wild and domestic animals and children;

Adoption of these mitigation measures will reduce impact intensity to “**very low**” resulting in a residual impact of **negligible** significance.

9.3.8 Surface and Ground Water Pollution

During mobilization of machinery to the project area there could be release of pollutants like fuel and oil which eventually contribute to water quality deterioration. Washing of vehicles and other equipment outside the designated area could also cause water pollution. Furthermore, accidental oil spills, and petroleum products (amongst other liquid waste) particularly in areas of concentrated activities, may infiltrate into soils and cause soil pollution. This is only possible during the construction phase of the project and the impact is expected to be minor and highly localized, hence the impact is considered insignificant.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The likelihood of the impact on soil, surface and ground water pollution occurring is **moderate** and short term. However, the extent of the impact remains local. The **intensity of the impact** is assessed to be **medium**. The **sensitivity of the receptor** is also **medium** and this results in an impact significance of **moderate**.

Mitigation Measures

- Plan emergency response measures in case of accidental oil spills;
- Maintain and keep all construction equipment in standardized operating condition that can minimize oil, grease or fuel leakages to the environment;
- Perform routine maintenance of construction machinery and vehicles at a designated workshop or maintenance area and keep maintenance wastes separately;
- Adopt good site management that considers good pollution prevention measures such as locating storage areas and compounds away from watercourses, appropriate storage of fuel and materials, providing suitable facilities for workers and disposing of waste according to approved waste management plan (avoid open waste disposal practices);
- Never wash vehicles and other machinery outside the area designated for this purpose.

The adoption of the mentioned mitigation measures can reduce impact intensity to “**very low**” resulting in residual impact of “**minor**”.

9.3.9 Solid and Liquid Wastes

There is potential for contamination of soils and watercourses as a result of improper disposal of liquid and solid waste from construction activities. Open air burning of waste may emit air polluting substances and cause a nuisance to nearby communities. The waste should be disposed of in accordance with government regulations at designated sites. Non-compliance will lead to littering and pollution of the environment.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The likelihood of the impact occurring is **high**. The duration of the impact will generally be **medium term** if the soil and 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**. The **sensitivity of the receptor** is also **medium**. This results the impact significance of **Moderate**.

Mitigation Measures

- Prepare site waste management plan prior to commencement of construction work, including appropriate waste storage areas, collection and disposal schedule;
- Reuse excavation of the ground and foundation works materials for earthworks and landscaping;
- 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;
- The contractor should arrange temporary toilet for those who are working at the subproject site.

Adoption of the above mitigation measures will reduce sensitivity of receptor to low resulting in a residual impact of **minor** significance.

9.3.10 Hazardous Wastes

Hazardous waste mishandling and uncontrolled disposal would have major health impacts for on-site workers, inhabitants in the project's area of influence, people who get in contact with waste during transportation and disposal. In particular in the liquid form, 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.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The probability of impact occurrence is **medium**. The **sensitivity of receptors** is assessed as "**medium**" given that FSTP site is located inside farmland. The **impact intensity** is assigned **medium** rating resulting **moderate** impact significance.

Mitigation Measures

- Segregate and classify hazardous wastes from the non-hazardous and should be stored in suitable designated storage facilities at project site;
- Prepare a hazardous waste management (waste identification and classification, waste minimization, storage and transportation, treatment and disposal) plan;
- Solid waste storage bins and/or skips are provided at contractor's camp site and at the strategic constructions sites and ensure they are collected or emptied in time.

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

9.3.11 Occupational Health and Safety (OHS) Risks

During the civil works, public as well as construction staff safety risk may arise from various activities such as deep excavations, operations and movement of heavy equipment and vehicles, storage of hazardous materials and disturbance of traffic. If such activities are not properly controlled the associated risks may be higher. Likewise, poor supervision and lack of safety measures may increase the likelihood such impacts. 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 related to OHS includes lack of safety signage at specific and required areas, improper storage, handling and use of dangerous substances and

chemicals, inadequate lighting and ventilation in workplaces, lifting of heavy and sharp objects, misuse of equipment and materials for functions they are not designed and others.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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 **medium** given that although such impacts may be irreversible once they occur. The **impact intensity** is considered to be **medium** resulting **moderate impact significance**.

Mitigation Measures

- Implement internationally accepted standards and recognized OHS guidelines;
- Prepare site specific Health and Safety management Plan (work related accident, risk minimization, safe work practices and guidelines trainings);
- Assign a qualified health and occupational safety officer to oversee OHS matters on a daily basis;
- Monitor construction workers on safe work practices and guidelines (OHS) and ensure that they adhere to them;
- Provide first aid kits at workshops, construction worksites, and inside vehicles;
- Provided workers with appropriate Personal Protective Equipment (PPEs);
- Ensure that the campsite is fenced and hygienically kept with adequate provision of facilities (waste disposal receptacles, firefighting and others);
- Carefully record and keep all incidence of injuries and accidents including date, time, and place of occurrence, level of injuries, resources damage and people injured/dead.

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

9.3.12 Increased Incidences of Diseases

There is a potential induced impact during construction phase of high sexually transmitted diseases and HIV/AIDS due to new entrants in communities for employment. The socioeconomic environment created by the project, may encourage migrant labor directly or indirectly in search of new employment opportunities.

The project will employ more young workers at lower skill levels. These categories of workers are prone to engage in high risk sexual activity. Irresponsible sexual relationships in project communities can break 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.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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 also **medium**. **Sensitivity of the receptor** is rated **medium** given that both HIV/AIDS and other infectious diseases, if contracted, have a long-term effect. Therefore impact significance is **moderate**.

Mitigation Measures

- Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, awareness campaigns, multimedia and workshops or during community meetings;
- City health and HIV/AIDS Prevention and Control offices should work jointly to create positive impact and bring major attitudinal and behavioral changes;
- Install hand washing facilities with adequate running water and soap, or sanitizing facilities at entrance to work sites, around catering and sanitation areas

Adoption of the above mitigation measures will reduce impact intensity to low resulting in a residual impact of **minor** significance.

9.3.13 Gender-Based Violence (GBV)

Due to lack of awareness and understanding on gender and GBV by contractor and also the construction workers, female construction workers could face difficulties in their workplaces, such as, GBV, SEA, and sexual harassment. Hence, there is a potential that GBV might occur during the construction of the proposed FSTP through unequal distribution of work, sexual harassment, discrimination against women, and unequal pay for women among others.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The probability of impact occurrence is **medium**. The **sensitivity of receptors** is assessed as ‘**medium**’ given that the FSTP site is located near to the city. The impact intensity is assigned **low** rating resulting **moderate impact** significance.

Mitigation Measures

- Provide and avail a separate sanitation facility for women at the construction site;
- Provide women friendly safety equipment and materials;
- Assign women in works that do not affect their biological condition;
- Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all workers;
- Ensure equal pay for women and men for equal job;
- Providing support services, such as counseling, medical care, and legal aid, to employees who experience GBV.

9.3.14 Social Disharmony

The sudden influx of labor can have both positive and negative impacts on the local community. The increased labor force may violate some social norms of the society and may result risk of social conflict and sexual exploitation of community members by project workers as a result of increase in influx population.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The probability of impact occurrence is **medium**. The **sensitivity of receptors** is assessed as **‘medium’** given that the impact occurs in short term and reversible. The **impact intensity** is assigned **very low** rating resulting **minor** impact significance.

Mitigation Measures

- As much as possible, unskilled and skilled (if available) labor to be hired from the local community as far as possible to minimize on influx of labors into the community;
- Effective communication and collaboration are key to addressing the challenges and opportunities presented by an influx of labor;
- Any new employee will be required to sign a code of behavior;
- Awareness has to be given for the new comers about the norms of project host community; and
- The contractor should provide with proper identification and uniforms for workers to identify easily those with social problems;

Adoption of the above mitigation measures will reduce impact intensity to **“very low”** resulting in a **residual** impact of **negligible significance**.

9.3.15 Risk of Seismic Hazard

Shashemene city is located in Seismic zone, because it is part of Southern main Ethiopian Rift where there is seismic activities, therefore prospective control and consideration of seismic hazard during construction of any infrastructure including the present FSTP in the study area should be considered.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The duration of the risk will be **long-term** with the occurring probability of occurrence of 0.99 in 100 years. The receptor sensitivity is **medium** given that environmental changes exceed the existing limits of natural variations while the intensity is **medium** given that the city found in a seismic zone. 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**.

Mitigation Measures

- The structural design of FSTP engineering structures must consider the seismic probability in to account in determining materials of foundation and construction;
- Strictly follow up and monitor regularly the construction phase of FSTP by forming well equipped engineering technical team;
- Buffering a minimum of 50 meters from FSTP;
- Apply proper operation and regular follow up of functionality of the plant.

9.3.16 Physical Cultural Resources: Historical or Archaeological Artifacts

According to review of existing documentation and site observations, there are no identified cultural and archaeological sites at the proposed FSTP. However, the Project Contractor must take appropriate measures should not affect any cultural or archaeological assets found by chance or discovered during the project construction and report immediately to the Culture and Tourism Office.

Mitigation Measures

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

9.4 Operation Phase Negative Impacts and Mitigation Measures

9.4.1 Ambient Air Quality and Odor

The inherent presence of multiple contaminants (CH₄, CO₂, and H₂S) will be generated from FSTP and there will be a release of these gases into the atmosphere, and impact on the environment through generation of bad odors. There is likely to be an odor nuisance from FSTP when Anaerobic Ponds if not well managed during operation. This impact may affect the communities neighboring the FSTP project, workers and road users.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The likelihood of the ambient air quality and bad smell impact occurring is medium and its duration will generally be long term if the air is once polluted. The intensity of the impact is assessed as **medium**. The sensitivity of the receptor is **medium**. The impact significance is therefore **moderate**.

Mitigation Measures

- Trees should be planted along FSTP boundary;
- Provide at least 400 meter buffer zone between residential and FSTP site,
- Control the volumetric BOD loading to be between 100-400 gm³ in order to control odor release;
- Apply Ferric chloride (FeCl₃) to control the possible generation of hydrogen sulfide (H₂S) odor in the sludge digestion process;
- Regular maintenance (once per year) of FSTP stabilization ponds, removal of accumulated debris and other solids at the inlets and outlets.
- Regular monitoring of the ambient air including measuring H₂S presence in air;
- Control an aerobic digester parameter (pH, Temperature, Oxygen level etc.) for H₂S producing bacteria/microorganism (creating unfavorable environment);
- Provide workers with appropriate PPE including respirators.

Adoption of the aforesaid mitigation measures will reduce impact intensity to “**very low**” resulting in a residual impact of **minor** significance.

9.4.2 Overflowing of Sludge into the Surrounding Farms

The soil in the project sites should not be affected since FSTP is supposed to be carried inside waterproof and properly designed units. However, in the case of poor management, spillages and overflows, the risk will be high. The overflowing of untreated sludge may find to agricultural fields, water sources or roads. This may lead to the spreading of waterborne diseases such as cholera or impact fauna and flora.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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 soil and ground water from contamination. The extent of the impact is in limited area since the pollutants of surface and farmland may cover up to 2 km 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.

Mitigation

- Reduce the inflow of sludge into the treatment plant or storage facility.
- 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.

The adoption of the aforesaid mitigation measures can reduce impact intensity and Sensitivity of receptor to “**low**” resulting in residual impact of “**minor significance**”.

9.4.3 Ground and Surface Water Contamination

If the proposed sludge treatment plant does not function as planned, there may be pollution of soil and water sources including ground water. This can lead to the spread of waterborne diseases, such as cholera and typhoid fever.

There are neither surfaces nor ground drinking water sources like shallow or deep well, spring, or wetland sources in vicinity of the proposed FSTP site. The existing Bore Hole (BH) source in Sole and Awasho Kebeles are about 15 km away from the proposed site. The nearest Gogeti river is located nearly at 2 Km distance and hence a very low risk of contamination.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The likelihood of the impact occurring is **medium** and its duration will generally be long term if the water 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 **sensitivity of the receptor** is **medium** given that once, it is contaminated treatment measures would take some time; resulting in **moderate** impacts.

Mitigation Measures

- Establishing water and wastewater quality testing laboratory for the regular (quarterly) testing of the effluent;
- Work and ensure that the FSTP, facility's effluent complies with the national effluent discharge limit standards;
- Quarterly monitor the quality of effluent discharged from the septic tanks, FSTP, against the effluent with discharge quality standards;
- Utilize the treated fecal sludge for agriculture, industry, energy production and landscaping and reclamation rather than discharged directly into the nearby water body;
- The dried-up sludge cake shall further be used as a raw material in the production of fuel products as briquettes or compost fertilizer;

The adoption of the aforesaid mitigation measures can reduce impact intensity to “**very low**” resulting in residual impact of “**minor** significance”.

9.4.4 Occupational Health and Safety Risks

The FS 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 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 PPEs 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.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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 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.

Mitigation Measures

- Provision of adequate and appropriate PPEs to workers;
- Regular checking of the adequacy of the facility, particularly when beds are (nearly) full and during the rainy season;
- Organize and ensure medical checkup for the relevant employees at least on every six months;
- Develop and work on Environmental Health and Safety Plan (Hazard identification, risk assessment, emergency preparedness and response, monitoring and evaluation, including health and safety measures to avoid accidents and injuries);
- Providing appropriate training for workers at FSTP about ergonomic practices;
- Provide accessible first aid in the facility and immediate medical care in case of injuries and accidents;
- Vaccinate all labor working force (hepatitis) at the site and provide regular health examinations access.

The adoption of the aforesaid mitigation measures can reduce impact intensity to “**very low**” resulting in residual impact of “**minor significance**”.

9.4.5 Public Health Impact and Risks

There are many environmental and health risks that arise from incomplete/absence of sludge stabilization. In such cases, there is an increased risk that the sludge might contain high pathogen content. Potential health hazards to human and animal health could arise from the application of sludge to agricultural crops because dumping raw sludge on agricultural lands could lead to the production of contaminated crops, especially if applied directly to plants. The consumption of these crops, their handling by vendors, and any contact with soil by farmers may also have biological and health impacts. These are also considered as some of the main form of human exposure to agricultural sludge contaminants.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

The probability of impact occurrence is **medium**. The **sensitivity of receptors** is assessed as ‘**medium**’ given that farmers may use sludge for agriculture with incomplete/absence of sludge stabilization. In such case, there is an increased risk that the sludge might contain high pathogen content. The impact intensity is assigned **medium** rating resulting **moderate** impact significance.

Mitigation Measures

- Create appropriate awareness on preparation and utilization composts from such sources;
- Fecal sludge should always be treated prior to its use in agriculture. The most resistant organisms in treatment are eggs of parasitic worms, in particular those of *Ascaris lumbricoides* and Strongliods. These eggs can only be destroyed by exposure to temperatures above 60°C, by desiccation at moisture contents lower than 10%, or by awaiting the natural die off after at least ½ year.
- Use thermophilic composting. If composting is well done (the substrate has the right composition, moisture content and aeration are optimized) the temperature in the heaps usually rises above 55°C for several days and all pathogens could be destroyed.
- Avoid Use of untreated sludge for growing food crops and cattle feed;

- Organize MSEs and provide technical training on compost preparation and create a market linkage for compost produced.

The adoption of the aforesaid mitigation measures can reduce impact intensity to “**very low**” resulting in residual impact of “**minor** significance”.

9.5 Decommission Phase Impacts and Mitigation

After the lifespan of the FSTP is over, it comes with number of environmental and social issues. A proper plan for post closure activities needs to be made in advance for future use. During decommissioning, there would be some environmental and social impacts. 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.

9.5.1 Impacts on Soil and Water Bodies

Decommissioning a fecal sludge treatment plant can result in the release of contaminants or pollutants into the surrounding environment. Spillage of contaminated water, sludge, chemicals, grease or oil is the main cause of soil and water contaminations.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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**.

Mitigation Measure

- Develop a decommissioning plan that outlines the steps and working procedures;
- Conducting environmental quality assessment of the water body and the treated waste prior to the commencement of the decommissioning;
- Remove all the contaminated soil from the treatment plant site and dispose it at a designated waste disposal site or at sanitary landfill;
- Level the ground in such a way that it will be used for other purposes.

9.5.2 Occupational Health and Safety

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.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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's 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.

Mitigation Measures

- Proper induction/trainings of the workers about work related accidents prior to decommissioning commencement;
- Implementing engineering controls, such as ventilation systems and barriers, to reduce exposure to hazardous materials and physical hazards;
- Provide appropriate PPEs for the workers to be involved in decommissioning works.

9.5.3 Air Pollution

During the decommissioning, structures installed to aid the treatment plants will be dismantled and demolished, which will cause release of dust and other pollutants imbedded in the demolished structures.

Intensity of Impacts	Sensitivity of Receptor			
	Very low (1)	Low (2)	Medium (3)	High (4)
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)

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 **medium** given that the

impact to the natural environment is long term effect areas. Therefore, significance of the impact is rated as **moderate**.

Mitigation Measures

- Provide appropriate, adequate PPEs to the employees;
- Systematically demolish structures considering reuse of materials for other use;
- Wet the materials before demolishing to suppress release of dust;
- Avoid burning of any material;

9.5.4 Loss of Job Opportunity

During decommissioning of the fecal sludge treatment, previous jobs which were enjoyed by large number of skilled and unskilled workers during the operation phase will not be continued. This loss of jobs would adversely affected workers and their families who were dependent on it for their livelihood. 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 Measure

- Based on their skill, knowledge, experience and interest, vulnerable community groups must be transferred to in other related similar projects;
- Providing adequate provident fund/ pension for those who want to retire as per national laws;
- Organize, train and promote to establish their own small-scale enterprises through the facilitation of loan or financial support.

10. ENVIRONMENTAL and SOCIAL MANAGEMENT and MONITORING PLANS

Environmental Social Management and Monitoring Plan has been prepared in such a way that it precisely addresses: adverse environmental and social impacts associated with a project, their recommended mitigation measure, the roles and responsibilities of various bodies for implementation, schedule of implementation, indicators, monitoring and evaluation and the budget required for the implementation of the mitigation measure.

10.1 Environmental and Social Management Plan

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 social and economic outcomes.

Henceforward, this section discusses the proposed mitigation measures for each respective negative impact identified in the previous chapter. The proposed mitigations measures are designed to minimize or eliminate for impacts triggered by FSTP subproject. The detailed ESMP for the proposed FSTP subproject by containing impacts that will arise during the construction, operation and decommissioning and the proposed mitigation measures is precisely described in the Table 10.1.

10.2 Environmental and Social Monitoring Plan

Environmental and social monitoring needs to be carried out during the pre-construction, construction, operation and maintenance as well as decommissioning of the project in order to ensure that the identified mitigation measures are implemented in accordance with the preset schedule with the indicated responsible body for implementation to ensure environmental and social sustainability of the project under consideration. Thus, the detailed ESMP for the proposed FSTP subproject by containing impacts and the proposed mitigation measures is precisely described in the Table 10.2.

Table 10. 1: Summary of Environmental and Social Management Plan

S/N	Adverse Environmental/ Social Impact	Mitigation measures	Responsibility		Time of Execution	Budget in Birr
			Implementing Bodies	Supervision		
Construction Phase						
1.	Resettlement and Compensation Issues	<ul style="list-style-type: none">• Create awareness to PAPs on the potential impacts of the project and compensation issues.• Detailed ARAP should be conducted in the project area by independent consultant before any construction;• Give priority for the PAPs for job opportunities;• Prepare and implement livelihood restoration program for PAPs;• Vulnerable community groups like female headed HHs must get priority during compensation, land delivery and post livelihood rehabilitation works;• The resettlement site must have access for social amenities at least proportionate to their original village;• The date of start of the census of PAPs will be taken as Cut-off date.	SWSSE, PO, Municipality/ Mayor office & Land administration office	MoWE, WB, Grievance Handling Committee and Regional land administration	One-off	Part of the government ARAP cost
2.	Loss of Vegetation Cover	<ul style="list-style-type: none">• Planting of appropriate indigenous trees and shrubs species.• Planting at least ten individual seedlings for single removal of trees• Select appropriate tree species and locations of planting in consultation with the city EPA.	Construction Contractor,	Supervisory Consultant & EPA	During construction	35,000
3.	Impacts on Soil	<ul style="list-style-type: none">• Develop excavated soil management plan• The construction work shall be done at the dry season• Prevent sheet and rill erosion of soil through the use of sand bags, diversion berms, culverts, or other physical means;• Careful removal and proper stockpiling of the topsoil removed from the site and re-using it for site restoration when construction works are ended;• Oil exchange should be taken place only in the pre-prepared workshop area.• Washing of vehicles and machinery should only be conducted in the workshop area and never be done on open soils;• Avoid using of old (> 10 years) and properly unmaintained machineries• Use only existing roads to the extent possible and do not drive through unpaved soil.	Construction Contractor/ SWSSE & PO	Environmental protection and Agricultural Offices.	During construction	50,000
4.	Disturbance on Air Quality	<ul style="list-style-type: none">• Provide Personal Protective Equipment (PPE) for the construction crew and all visitors to the site.• Limit speed of vehicles to 30km/hr on unpaved access roads especially in the	Construction Contractor	Supervisory Consultant & Environmental	During Construction	67,000

		vicinity of sensitive areas <ul style="list-style-type: none"> • Avoid using of old (>10years) or damaged equipment's ones; on weekly basis check every day proper functioning of all the machines on duty; • Covered the trucks during haulage of construction materials and Use spray water for dust suppression over dusty areas 		protection office		
5.	Noise Pollution	<ul style="list-style-type: none"> • Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment • Noise levels at construction sites should not exceed 75 dBA and 70 dBA during the day and night, respectively • During periods of off work time, equipment's will be switched off during off work time whenever possible; • Utilize well maintained and functional working equipment's; • Provide the necessary PPE like ear muffs to workers whenever needed 	Construction Contractor	Supervisory Consultant & Environmental protection office	During Construction	55,000
6.	Traffic Congestion and Accident Risks	<ul style="list-style-type: none"> • Develop and implement traffic management plan and work in close coordination with local traffic police; • Provision of awareness education to the employees and the local community about traffic accident management; • The contractor should provide a protective wear to workers • The Contractor should provide temporary road signs or notices to indicate ongoing works; • For the site traffic the contractor has to ensure that vehicles are operated only by qualified drivers and only park in designated parking areas; • Employ youth to facilitate traffic management activities on either points of the construction site; • Fencing or placing obstacles to trenches and ditches to avoid interference and accident of wild and domestic animals and children; 	Construction contractor	Supervisory Consultant Traffic management office	During construction	145,000.00
7.	Surface and Ground Water Pollution	<ul style="list-style-type: none"> • Plan emergency response measures in case of accidental oil spills. • Maintain and keep all construction equipment in standardized operating condition that can minimize oil, grease or fuel leakages to the environment. • Perform regular maintenance of construction machinery and vehicles at a designated workshop or maintenance area. • Adopt good site management that considers pollution prevention measures. • Never wash vehicles and other machinery outside the designated area 	Construction contractor	Supervisory Consultant, SWSSE, Regional environmental office	During Construction	15,000.00
8.	Solid and Liquid Wastes	<ul style="list-style-type: none"> • Prepare site waste management plan prior to commencement of construction • Reuse excavation of the ground and foundation works materials for Earthworks and landscaping. 	Construction contractor	Supervisory Consultant, SWSSE,	During Construction	130,000.00

		<ul style="list-style-type: none"> • Solid waste collection bins shall be placed at strategic locations. • Arrange temporary sex segregated toilet for workers. 		Municipality and EPA		
9.	Hazardous Wastes	<ul style="list-style-type: none"> • Segregate and classify hazardous wastes from the non-hazardous and should be stored in suitable designated storage facilities. • Prepare a hazardous waste management plan. • Solid waste storage bins should be placed at the strategic constructions sites. 	Construction contractor	Supervisory Consultant, SWSSE and EPA	During Construction	30,000.00
10.	Occupational Health and Safety (OHS) Risks	<ul style="list-style-type: none"> • Implement internationally accepted standards and recognized OHS guidelines; • Prepare site specific Health and Safety management Plan • Assign a qualified health and occupational safety officer to oversee OHS matters on a daily basis. • Monitor construction workers on safe work practices and guidelines (OHS) and ensure that they adhere to them. • Provide first aid kits at workshops, construction worksites, and inside vehicles. • Provided workers with appropriate PPE. • Ensure that the campsite is fenced and hygienically kept with adequate provision of facilities. • Carefully record and keep all incidence of injuries and accidents 	Construction contractor	Supervisory Consultant, SWSSE, Municipality and Environmental protection office	During construction	55,000.00
11.	Increased Incidences of Diseases	<ul style="list-style-type: none"> • Sensitize workers and the surrounding communities on HIV/AIDS. • City health office and HIV/AIDS Prevention and Control Offices should work jointly to create positive impact and bring major behavioral changes. 	Construction contractor and Health office	Health office	During construction	75,000.00
12.	Gender-Based Violence (GBV)	<ul style="list-style-type: none"> • Provide and avail a separate sanitation facility for women. • Provide women friendly safety equipment and materials. • Assign women in works that do not affect their biological condition. • Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all workers. • Ensure equal pay for women and men for equal job. • Providing support services, such as counseling, medical care, and legal aid, to employees who experience GBV. 	Contractor	Supervisory Consultant and Office of Women, Children and Youth Affairs.	Prior to start & during construction	125,000.00
13.	Social Disharmony	<ul style="list-style-type: none"> • If possible, hired unskilled and skilled labors from the local community. • Effective communication and collaboration to addressing the challenges and opportunities presented by an influx of labor. • Any new employee will be required to sign a code of behavior • Aware the new comers laborers about the norms of host community. • The contractor should provide with proper identification and uniforms for workers to identify easily those with social problems; 	Contractor	Supervisory Consultant and Office of Labor and Social Affairs	Prior to start & during Construction	27,000.00

14.	Risk of Seismic Hazard	<ul style="list-style-type: none"> The structural design of FSTP engineering structures must consider the seismic probability in to account Strictly follow up and monitor regularly the construction phase of FSTP by forming well equipped engineering technical team. Buffering a minimum of 50 meters from FSTP Proper operation & regular follow up of functionality of the plant. 		Construction Contractor	SWSSE, Supervisory Consultant, EPA and construction offices	17,000.00
Operation Phase						
15.	Ambient Air Quality and Odor	<ul style="list-style-type: none"> Trees should be planted along FSTP boundary; Provide adequate buffer zone between residential and FSTP; Control the volumetric BOD loading to be between 100-400 gm3 in order to control odor release; Apply Ferric chloride (FeCl3) to control the possible generation of hydrogen sulfide (H2S) odor in the sludge digestion process; Regular maintenance (once per year) of FSTP stabilization ponds, removal of accumulated debris and other solids at the inlets and outlets. Regular monitoring of the ambient air including measuring H2S presence in air; Control an aerobic digester parameter (PH, Temperature, O₂ level etc.) for H2S producing bacteria/microorganism Provide workers with appropriate PPE including respirators. 	SWSSE, PO and FSTP Manager	SWSSE, PO and Environmental protection office	During the operation	120,000.00
16.	Overflowing of Sludge	<ul style="list-style-type: none"> Reduce the inflow of sludge into the treatment plant or storage facility. Upgrade the treatment plant or storage facility to increase its capacity 	SWSSE, PO and FSTP Manager	SWSSE, PO and EPA	During the operation	110,000.00
17.	Ground and Surface Water Contamination	<ul style="list-style-type: none"> Establishing water & wastewater quality testing laboratory Work and ensure that the FSTP, facility's effluent complies with the national effluent discharge limit standards. Quarterly monitor the quality of effluent discharged from the septic tanks, FSTP, against the effluent with discharge quality standards; Utilize the treated fecal sludge for agriculture, industry, energy production and landscaping and reclamation rather than discharged directly into water body. The dried-up sludge cake shall further be used as a raw material in the production of fuel products as briquettes or compost fertilizer. 	SWSSE, PO and FSTP Manager	SWSSE, PO and Environmental protection office	During the operation	220,000.00
18.	Occupational Health and Safety Risks	<ul style="list-style-type: none"> Provision of adequate and PPE to workers. Regular checking of the adequacy of the facility. Organize and ensure medical checkup for the relevant employees at least on every six months. Develop and work on Environmental Health and Safety Plan. 	SWSSE, PO and FSTP Manager	SWSSE, PO, Health office and Environmental protection	During the operation	180,000.00

		<ul style="list-style-type: none"> • Providing appropriate training for workers at FSTP about ergonomics • Provide accessible first Aid in the facility and immediate medical care in case of injuries and accidents. • Vaccinate all labor working force (hepatitis) at the site and provide regular health examinations access. 		office		
19.	Public Health Impact and Risks	<ul style="list-style-type: none"> • Create appropriate awareness on preparation and utilization composts from FS. • Fecal sludge should always be treated prior to its use in agriculture. • Use thermophilic composting. • Avoid Use of untreated sludge for growing food crops and cattle feed; • Organize MSEs and provide technical training on compost preparation and create a market linkage for compost produced. 	SWSSE, PO and FSTP Manager	SWSSE, PO, Health office and Environmental protection office	During the operation	285,000.00
Decommissioning						
20.	Impacts on Soil and Water Bodies	• Develop a decommissioning plan that outlines the steps and working procedures;	Contractor	SWSSE and Environmental Protection Office	During decommissioning	185,000.00
		• Conducting environmental quality assessment of the water body and the treated waste prior to the start of the decommissioning;	SWSSE			
		<ul style="list-style-type: none"> • Remove all the contaminated soil from the treatment plant site and dispose it at a designated waste disposal site or at sanitary landfill; • Level the ground in such a way that it will be used for other purposes. 	Contractor			
21.	Occupational Health and Safety	<ul style="list-style-type: none"> • Proper induction/trainings of the workers work related accidents prior to decommissioning commencement. • Implementing engineering controls, such as ventilation systems and barriers, to reduce exposure to hazardous materials and physical hazards. • Provide appropriate PPE for the workers to be involved in decommissioning 	Contractor	SWSSE, PO, Health office and EPA	During decommissioning	65,000.00
22.	Air Pollution	<ul style="list-style-type: none"> • Provide appropriate, adequate PPE to the employees; • Systematically demolish structures considering reuse of materials for other use. • Wet the materials before demolishing to suppress release of dust. • Avoid burning of any material 	Contractor	SWSSE, PO, Health office and EPA	During decommissioning	45,000.00
23.	Loss of Job Opportunity	<ul style="list-style-type: none"> • Based on their skill, knowledge, experience and interest, vulnerable community groups must be transferred to in other related similar projects; • Providing adequate provident fund or pension for those who want to retire. • Organize, train and promote to establish their own small-scale enterprises through the facilitation of loan or financial support. 	SWSSE and Job creation office	SCWSSE and Job creation office	During decommissioning	55,000.00
Total in birr			2,091,000			

10.3 ESMP Implementation Cost

The overall ESMP cost including mitigation, training, capacity building and monitoring during construction, operation and decommissioning phase is estimated to be about **7,712,500.00 (Seven Million Seven Hundred Twelve Thousands Five Hundred) Birr**. The price should be revised and adjusted across time horizon in accordance to the current market dynamics and complexity of the study. These costs will also include cost of supervision for implementation of mitigation measures.

10.4 Implementation Arrangements

In order to effectively implement a comprehensive ESMP, the coordination efforts of the various Federal and Regional Agencies is necessary. MoWE will supervise and monitor the overall implementation of the ESMP. SWSSE has an established position for environmental and social safeguards and already recruited, to provide oversight on the implementation of the environmental and social components of the subproject. Consequently, follow up on environmental issues will further be supported through the recruitment of additional environmental and OHS officers by the contractor and supervising consultant once the subproject starts the construction phase. At the subproject construction phase implementation of the suggested ESMP will be the responsibility of the contractor, SWSSE and the city's EPA and Health Bureau. However, the SWSSE will be the autonomous body during the operation and maintenance periods of the FSTP project. The Oromia Region EPA will be mandated in regulating the overall social and environmental performance of the project. More importantly, successfulness and sustainability of the designed FSTP project is highly dependent on the capacity of concerned institutions in Shashemene City. To this end, the SCWSSE should allocate the required finance for staffing, training and capacity building activities. Furthermore, proper water quality instruments (bacteriological and physicochemical) should be equipped.

10.5 Construction Monitoring

As the executing agency SWSSE will abide overall responsibility for monitoring the implementation of the ESMP. Besides, the relevant Shashemene City stakeholders' shall be engaged as deemed necessary. However, for day to day monitoring, it is expected that the supervising Consultant will hold the Contractor's accountable for all ESMP implementation requirements, including implementation of all approval conditions. The contractor should have a designated environmental officer to oversee day to day subproject construction activities.

Table 10. 2: Environmental and Social Monitoring Plan

S/N	Adverse Environmental /Social Impact	Mitigation Measures	Monitoring Indicator	Method of Monitoring	Monitoring institutions	Monitoring frequency	Budget in birr
Construction Phase							
1.	Resettlement and Compensation Issues	<ul style="list-style-type: none"> • Conducting ARAP by independent consultant • Vulnerable community groups like female headed HHs must get priority during compensation, land delivery and post livelihood rehabilitation works; • The resettlement site must have access for social amenities at least proportionate to their original village; • The date of commencement of the census of PAPs will be taken as cut-off date. 	<ul style="list-style-type: none"> • Approval of the ARAP document • No of vulnerable benefited & satisfied • No of people received compensation • No of resettlement site which fulfill for social amenities 	Observation, review of records, beneficiaries of interview, witness of PAPs & documentation	MoWE, Municipality, SWSSE, PO, and WB	One-Off	Part of the government ARAP cost
		<ul style="list-style-type: none"> • Create awareness to PAPs on the potential impacts of the project and compensation issues. • Give priority for the PAPs for job opportunities created by the project; • Prepare and implement livelihood restoration program for PAPs; 	<ul style="list-style-type: none"> • No of PAPs who receive awareness & promoted on agriculture • No of job created for PAPs and benefited by livelihood program 	Documentation and beneficiary witness	SWSSE, Women & youth, Job creation, Social affair and Land offices	Every quarter	324,000
2	Loss of Vegetation Cover	<ul style="list-style-type: none"> • Planting of appropriate indigenous trees & shrubs species; • For each individual species removed at least ten individual seedlings shall be planted • The selection of appropriate tree species should be done in consultation with the city EPA. 	<ul style="list-style-type: none"> • No of areas covered by indigenous & bushes • No of tree seedlings planted • No of tree species selected for planting 	Observations, surface area measurement & recording of trees planted	City EPA and agricultural office	As required during the contract period of the construction	60,000
3.	Impacts on Soil	<ul style="list-style-type: none"> • Develop excavated soil management plan • The construction work shall be done at the dry season in order to arrest sediment transportation 	<ul style="list-style-type: none"> • Excavated soil management plan document • Area of land clearing • Construction period/season 	Observation & documentation	SWSSE, PO and EPA	Monthly	150,000

		<ul style="list-style-type: none"> • Prevent sheet and rill erosion of soil through the use of sand bags, diversion berms, culverts, or other physical means. • Careful removal and proper stockpiling of the topsoil removed from the site and re-using it for site restoration • Oil exchange should be taken place only in the pre-prepared workshop area. 	<ul style="list-style-type: none"> • No of sand bags • diversion berms & culverts • Volume of top soil & areas of top soil protected from erosion • Presence of oil spills on the construction site 				
		<ul style="list-style-type: none"> • Washing of vehicles and machinery only in the workshop area and never be done on open soils; • Avoid using of old (> 10 years) and properly unmaintained machineries • Use only existing roads to the extent possible and do not drive through unpaved soil. 	<ul style="list-style-type: none"> • Availability of workshop for washing machineries • Average age of working machineries • Temporary access road demolished 	Age of machineries Documents & Maintenance reports			
4.	Disturbance on Air Quality	<ul style="list-style-type: none"> • Provide PPE for the construction crew and all visitors to the site. • Limit speed of vehicles to 30km/hr on unpaved access roads especially at sensitive areas • Avoid using of old (>10years) or damaged equipment's; on weekly basis check every day proper functioning of all the machines on duty; • Trucks will be covered during haulage of construction materials and Use spray water for dust suppression over dusty areas 	<ul style="list-style-type: none"> • Availability of PPE • No of workers used PPE • Exhaust emission levels generated by construction vehicles & machinery • Use of dust collectors or spray water systems during excavation & earth moving 	Observation, documentation, Recording of complains and Workers and local community opinions	PO, EPA	Monthly	150,000
5.	Noise Pollution	<ul style="list-style-type: none"> • Construction workers will be made aware of the permissible noise levels at the workplace and surrounding environment • Noise levels at construction sites should not exceed 75 dBA and 70 dBA during the day and night, respectively • During periods of off work time, equipment's will be switched off during off work time; • Utilize well maintained and functional working equipment's; • Provide the necessary PPE like ear muffs to workers whenever needed 	<ul style="list-style-type: none"> • Workers & local community opinions & suggestions on the contractor's efforts to regulate noise. • Noise levels at construction site • Equipment's work plan • Maintenance plan of vehicles & machinery • Availability and use of PPE like ear muffs and 	Observation, documentation, Recording of complains and Workers and local community opinions	PO, EPA	Monthly	170,000
6.	Traffic Congestion and	<ul style="list-style-type: none"> • Develop and implement traffic management plan & work in coordination with local traffic police; • Provision of awareness education to the 	<ul style="list-style-type: none"> • Traffic management plan and coordination document 	Documentation, physical inspection,	Supervisory Consultant & Traffic	Weekly	75,000

	Accident Risks	<p>employees and the local community</p> <ul style="list-style-type: none"> • The contractor should provide a protective wear to workers • The Contractor should provide temporary road signs or notices to indicate ongoing works; • The contractor has to ensure that vehicles are operated only by qualified drivers and only park in designated parking areas; • Employ youth to facilitate traffic management activities on either points of the construction site; • Fencing or placing obstacles to trenches and ditches to avoid interference and accident 	<ul style="list-style-type: none"> • No of workers who got traffic management & safety awareness • Availability of road traffic signs or notices • Code of conduct signed by the driver • No of risky construction sites fenced • Availability of designated parking areas 	accidents recorded and number of complaints	management office		
7.	Surface and Ground Water Pollution	<ul style="list-style-type: none"> • Plan emergency response measures in case of accidental oil spills. • Maintain and keep all construction equipment in standardized operating condition • Perform regular maintenance of construction machinery and vehicles at a designated workshop • Adopt good site management that considers good pollution prevention measures. • Never wash vehicles and other machinery outside the area designated for this purpose. 	<ul style="list-style-type: none"> • Availability of emergency responses plan • Maintenance records of vehicles and machines • Availability of site management plan • Presence of oil spillage due to the construction activities 	Physical inspection, number of complaints and documentation	SWSSE, EPA & Supervisory consultant	Monthly	90,000
8.	Solid and Liquid Wastes	<ul style="list-style-type: none"> • Prepare site waste management plan prior to commencement of construction work. • Reuse excavation of the ground and foundation works materials for Earthworks and landscaping. • Solid waste collection bins shall be placed at strategic locations. • Arrange temporary sex segregated toilet for workers. 	<ul style="list-style-type: none"> • Availability of site waste management plan • Availability of solid waste bins • Amount of soils reused for landscaping • Presence of sex segregated toilets 	Documentation and physical inspection	Supervisory Consultant, SWSSE, Municipality and EPA	Monthly	182,000
9.	Hazardous Wastes	<ul style="list-style-type: none"> • Segregate and classify hazardous wastes from the non-hazardous and should be stored in suitable designated storage facilities. • Prepare a hazardous waste management plan. • Solid waste storage bins should be placed at the strategic constructions sites. 	<ul style="list-style-type: none"> • Available segregated hazardous waste • Availability of hazardous waste management plan • Presence of dust bins 	Physical inspection and documentation	Supervisory Consultant, SWSSE, Municipality and EPA	Monthly	202,000
10.	Occupational Health and	<ul style="list-style-type: none"> • Implement internationally accepted standards and recognized OHS guidelines; • Prepare site specific Health and Safety 	<ul style="list-style-type: none"> • Availability of Health and safety plan • OHS training provided 	Site visit, interview of	Supervisory Consultant,	Weekly	198,000

	Safety (OHS) Risks	management Plan; <ul style="list-style-type: none"> • Assign a qualified health and occupational safety officer to oversee OHS matters on a daily basis; • Monitor construction workers on safe work practices and guidelines (OHS); • Provide first aid kits at workshops, construction worksites, and inside vehicles; • Provided workers with appropriate PPE; • Ensure that the campsite is fenced and hygienically kept with adequate provision of facilities. • Carefully record and keep all incidence of injuries and accidents 	for workers <ul style="list-style-type: none"> • Assignment of OHS officer • Presence of OHS monitoring plan and report • Availability of first aid kits and PPE • Availability of secured fence, sanitation facilities • Number of fatalities and accidents recorded 	workers and documentation	SWSSE, Social affairs office, Municipality and Environmental protection office		
11.	Increased Incidences of Diseases	<ul style="list-style-type: none"> • Sensitize workers and the surrounding communities on HIV/AIDS. • City health and HIV/AIDS Prevention and Control Offices should work jointly to create positive impact and bring behavioral changes. 	<ul style="list-style-type: none"> • No of workers who got training • IEC materials for workers and community • Coordination action plan 	Documentation, consultation of workers and community	Supervisory consultant and health office	Monthly	198,000
12.	Gender-Based Violence (GBV)	<ul style="list-style-type: none"> • Provide and avail a separate sanitation facility for women. • Provide women friendly safety equipment and materials. • Assign women in works that do not affect their biological condition. • Prepare and implement code of conduct that among others strictly forbid sexual harassment /GBV and to be signed by all workers. • Ensure equal pay for women and men for equal job. • Providing support services, such as counseling, medical care, and legal aid, to employees who experience GBV. 	<ul style="list-style-type: none"> • Availability of separate sanitation facility for women • Provision of women friendly safety equipment and materials • Assignment of women in works that do not affect their biological condition • Availability of code of conduct, counseling services and equal payment for women and men 	Physical observation, Interview staff and review employment records	Supervisory consultant and Women, child and youth office	Monthly	124,000
13.	Social Disharmony	<ul style="list-style-type: none"> • If possible labor (skilled and non-skilled) to be hired from the local community. • Effective communication and collaboration to addressing problems due to influx of labor. • Any new employee will be required to sign a code of behavior • Awareness has to be given for the new comers 	<ul style="list-style-type: none"> • No of workers employed from local community • No of grievances recorded by disgruntled works force & community • Signed Code of 	Interview staff and community member, review employment records	Supervisory Consultant and Office of Labor and Social Affairs.	Quarterly	95,000

		about the norms of project host community. • The contractor should provide with proper identification and uniforms for workers	Behavior (COB) • Trainings given for new comers				
14.	Risk of Seismic Hazard	• The structural design of FSTP engineering structures must consider the seismic probability in to account • Strictly follow up and monitor regularly the construction phase of FSTP. • Buffering a minimum of 50 meters from FSTP • Apply proper operation and regular follow up of functionality of the plant.	• Availability of FSTP structural design incorporate the risk of seismic hazard and of monitoring plan, report and feedbacks given • Presence of buffer zone	Documentation, physical inspection and observation	SWSSE, Supervisory Consultant, Environmental protection office	Monthly	37,500
Operational Phase							
15.	Ambient Air Quality and Odor	• Trees should be planted along FSTP boundary; • Provide adequate buffer zone between residential and FSTP site, • Control the volumetric BOD loading to be between 100-400 gm3 to control odor release; • Apply Ferric chloride (FeCl3) to control the possible generation of hydrogen sulfide (H2S) odor in the sludge digestion process; • Regular maintenance (once per year) of FSTP stabilization ponds, removal of accumulated debris and other solids at the inlets and outlets. • Regular monitoring of the ambient air including measuring H2S presence in air; • Control an aerobic digester parameter (PH, Temperature, O2 level etc.) for H2S producing bacteria/microorganism • Provide workers with appropriate PPE	• No of trees planted at FSTP • Existence of buffer zone at FSTP site • Available standardized working procedures • Test result of BOD loading • Application rate of FeCl2 for odor removing • No of complaints registered • FSTP operation, maintenance and monitoring plan	Physical inspection, Interview residents including workers and observation	SCWSSE, PO and Environmental protection office	During Operation time	280,000
16.	Overflowing of Sludge into the Surrounding	• Reduce the inflow of sludge into the treatment plant or storage facility during overflow. • Upgrade the treatment plant or storage facility to increase its capacity.	• Amount of inflow sludge control and availability of maintenance report of the facility	Physical inspection, Routine Audits, M & E reports	SCWSSE, PO and EPA	During operation and whenever there is overflowing	250,000
17.	Ground and Surface Water Contamination	• Establishing water & wastewater quality testing laboratory • Work and ensure that the FSTP, facility's effluent complies with the national effluent discharge limit standards	• Available standardize testing laboratory • Available laboratory test results • Amount of Utilize FS	Physical observation, documentation, monitoring and	SWSSE, PO and Environmental protection	During operation	197,000

		<ul style="list-style-type: none"> Quarterly monitor the quality of effluent discharged from the septic tanks & FSTP Utilize the treated fecal sludge for agriculture, industry, energy production and landscaping Use the dried-up sludge cake for the production of briquettes or compost fertilizer. 	for agriculture, biogas, soil amendment etc. <ul style="list-style-type: none"> Amount of briquettes or compost produced from FS 	audit reports and laboratory result report	office		
18.	Occupational Health and Safety Risks	<ul style="list-style-type: none"> Provision of adequate and PPE to workers. Regular checking of the adequacy of the facility. Organize and ensure medical checkup for the relevant employees at least on every six months. Develop and work on Environmental Health and Safety Plan. Providing appropriate training for workers Provide accessible first aid & immediate medical care during injuries & accidents. Vaccinate all labor working force (hepatitis) at the site and provide regular health examinations access. 	<ul style="list-style-type: none"> Available of PPE and first aid kits in FSTP Availability facility Periodic checking Occupational health examination records Environmental Health and Safety Plan document No of trainings for staff Type of vaccine and No of staff vaccinated 	Physical inspection, training attendance lists, occupational & health reports, and documentation	SWSSE, PO, Health office and Environmental protection office	Quarterly	270,000
19.	Public Health Impact and Risks	<ul style="list-style-type: none"> Create appropriate awareness on preparation and utilization composts from FS; FS should always be treated prior to its use Use thermophilic composting. Avoid use of untreated sludge for growing food crops and cattle feed; Organize MSEs and provide technical training on compost preparation and marketing. 	<ul style="list-style-type: none"> No of trainings provided on compost preparation from FS Compost used for agriculture produced from treated FS No of MSEs engaged in compost production 	Physical inspection, training attendance lists and documentation	SWSSE, PO, Health office and Environmental protection office	Monthly	134,500
Decommissioning							
20.	Impacts on Soil and Water Bodies	<ul style="list-style-type: none"> Develop a decommissioning plan that outlines the steps and working procedures. Conducting environmental quality assessment of the water body and the treated waste Remove all the contaminated soil from the treatment plant & dispose at a designated disposal site. Level the ground in such a way that it will be used for other purposes. 	<ul style="list-style-type: none"> Available decommissioning plan Laboratory test result Amount of contaminated soil and disposed properly Rehabilitated area 	Physical inspection Measuring rehabilitated area, water quality report and documentation	SWSSE, PO, and Environmental protection office	During decommissioning phase	234,000
21.	Occupational Health and	<ul style="list-style-type: none"> Proper trainings of the workers work related accidents prior to decommissioning 	<ul style="list-style-type: none"> No of trainings given Availability engineering 	Physical inspection and	SWSSE, PO, Health office	During decommissioning	67,000

	Safety	<ul style="list-style-type: none"> • Implementing engineering controls to reduce exposure to hazardous materials & physical hazards. • Trucks will be covered during haulage of materials to reduce dust emissions. • Provide appropriate PPE for the workers to be involved in decommissioning works. 	controls applied <ul style="list-style-type: none"> • Reduced emission from trucks • Availability and usage of appropriate PPEs 	documentation	and Environmental protection office	ng	
22.	Air Pollution	<ul style="list-style-type: none"> • Provide appropriate, adequate PPE to the employees • Systematically demolish structures considering reuse of materials for other use. • Wet the materials before demolishing to suppress release of dust. • Avoid burning of any material 	<ul style="list-style-type: none"> • Provision and use of PPE by workers. • Amount of demolish materials used for reused • Amount of water used to spray 	Physical inspection and documentation	SWSSE, PO, Health office and Environmental protection office	During decommissioning	28,500
23	Loss of Job Opportunity	<ul style="list-style-type: none"> • Vulnerable community groups must be transferred to in other related similar projects • Providing adequate provident fund or pension for those who want to retire • Organize, train and promote to establish their own small enterprises through the facilitation of loan or financial support 	<ul style="list-style-type: none"> • No of Supported workers • Amount of Provident fund given • No of MSEs established, job created and financial assistance given 	Physical observation, job creation records & reports and documentation	SWSSE and Job creation office	During decommissioning	154,000
Total Monitoring Cost						3,670,500	

Also, 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 desirable that, the site engineer has to work by considering environmental and social 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 staff 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.

10.6 Training and Capacity Building

For the effective and efficient implementation of this ESMP, providing appropriate training and capacity building on environmental and social safeguards for the project implementers and stakeholders is indispensable. Accordingly, it is recommended that capacity building interventions including training should be provided on the management of environmental and social issues at all levels i.e., CBOs, relevant regional and city level government officials (health, education, water and energy bureau, job creation, labor and social affairs, women and youth and Environment), community leaders, City WSSE management team, E&S safeguard experts. The training program for various role players will include an orientation program on the ESMP, Environmental and Social Assessment Processes and safeguards, OHS and Project Management and monitoring. The training on ESMP may be integrated with the ESMF and RPF and other related training program for cost-effectiveness.

Table 10. 3: Training and Capacity-building Requirement and Estimated Costs.

S/N	Training Topic	Participants	Time	Responsible Body	Cost Estimation
1.	Environmental and Social Mitigation of Impacts Supervision, Monitoring and Reporting <ul style="list-style-type: none"> • Public health and safety of FSTP management. • Social mitigations for environmental project • Community participation in environmental supervision monitoring • Supervision of contractors, 	Environmental and social safeguards staff of regional and City WSSE and other stakeholders who are going to engaged in the management and monitoring (total 15 participants)	<ul style="list-style-type: none"> • Soon after project commencement and during project implementation • Refreshment training during 	MoWE	205,000

S/N	Training Topic	Participants	Time	Responsible Body	Cost Estimation
	Subcontractors, and community representatives • Risk assessment, response, and control		operations		
2.	Implementation of Mitigation Measures • Overview and requirements of environmental and social monitoring • Role and responsibilities of contractors • Scope and methods of environmental and social monitoring • Response and risk control • Preparation and submission of reports • Risk of hazards • OHS and community health • Grievance handling and reporting • GBV reporting	• Local communities, SWSSE, Health Officers, municipality, urban infrastructure technicians, Engineers, E&S experts • On-site construction management staff; safeguard Staffs, Kebele & community leaders	• During construction and Operation • Refreshment training during operations (quarter based)	SWSSE together with MoWE	756,000.00
3.	Environmental and Social Safeguards • Safety and health issues • Environmental Pollution risks and management • Management of environmental safety and sanitation on work sites • Mitigation measures at construction sites • Procedures to deal with emergency situations	• Community representatives • Workers on transporting FS and FSTP	During operation (every six month)	SWSSE and other relevant stakeholders	204,000
4.	Environmental Sampling and Water and Wastewater Quality Monitoring	• SWSSE and FTP Operating staffs	During operation (every 6 month)	MoWE and SWSSE	333,000
5.	Safety Measures for Proper FS Emptying	• FSTP workers • Truck drivers for emptying sludge	Every six month during operation	SWSSE and other stakeholders	203,000
6..	Operation and Maintenance of Treatment Plant	SWSSE and FTP Operating staffs	Every quarter during operation	SWSSE and other stakeholders	250,000
Total Estimated Cost				1,951,000.00	

10.7 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. As required, discussion will be held on the reports between the zone/City EPA, project office, contractor and other stakeholders as necessary.

The Environmentalist and Social safeguard specialist for the supervising engineer will approve the contractor's monthly environmental and social monitoring report that will then be passed to

EPA and project office for final approval. The EPA's Environmental and Social safeguard specialist will also independently monitor the implementation of the ESMP and verify the accurateness and content of the contractor's monitoring report. Then, the report will be sent back to the project office. The compiled report will also be shared with the MoWE, WB and other relevant stakeholders at least on quarterly bases. Approval of the environmental monitoring report will be the basis for the supervising engineer to approve payment of the respective environmental and social Bill of Quantity (BoQ) items.

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

10.8 Environmental Audit

Audits will be necessary both during construction and subproject operation periods. 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 Shashemene City EPA.

10.9 Grievance Redressing Mechanisms

A grievance redress mechanism (GRM) is expected to outline procedures to respond to the subproject-related grievances in an efficient and effective manner. As per OP 4.12 of the WB, GRM should be accessible and appropriate to bring about remedial measures for complaints. The objective is to respond to the complaints of the PAPs efficiently, i.e., the mechanism to be easily accessible, transparent and fair and to avoid the need to resort to complicated formal channels to redress grievances.

According to the RPF (2016), a grievance redress committee needs to be established that consists of members from municipality representative as chairperson, community representative, PAPs, women affairs, two respectable citizens (one woman) and representative from implementing

agency as a secretary. It is essential to include representative of Implementing Agency and Land development and management office in the grievance redress committee so that essential information on inventories, entitlements, and compensation rates, etc. can be provided to the committee members for review of particular complaint. Provided that the importance of GRC in settling various disputes associated with privately owned land, since recent time most of the big cities and towns have established grievance handling office which is generally responsible for any grievances for betterment of good governance. This office could be taken as one of the grievance handling mechanisms before it goes to court though it has also its own limitation in providing timely action.

Steps of the Grievance Process

- Complainants can log/file their complaint(s) in written form, verbally, through telephone call, text message or any means of channels convenient to them. 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.
- Complain to be registered in a standard format prepared for the same purpose. Both the complainant and clerk of work or Grievance Redness Committee sign the log.
- The Clerk of Works or Grievance Redness Committee will determine a corrective action in consultation with the aggrieved person. Grievances will be resolved and status reported back to complainants within 5 days.
- 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.
- 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.
- 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.
- If the project office or contractor cannot solve the grievance within 15 days, S(He) will refer it to court through the safeguard and or occupational safety and health professional. It is believed that most of possible grievances can be solved at this level.

11. CONCLUSIONS AND RECOMMENDATIONS

This ESIA report on the construction and operation of a FSTP for Shashemene City intends to provide an objective assessment of the concerns raised during the scoping phase of the study as well as those noticed by the assessment team in the project area and during consultations. The purpose of this report is, to ensure that potential positive and negative impacts of the construction of the FSTP are identified at the early stage of a feasibility study in order to develop enhancement and mitigation strategies. Thus, the implementation of the FSTP should be carried out without creating much adverse impacts on the biophysical and socioeconomic environment. To this end, alternatives to the proposed subproject were also considered as well, including the “Do-Nothing Option”.

The findings of environmental impact assessment of the proposed subproject results both positive and negative impacts. The FSTP can contribute to sustainable development by improving public health, protecting the environment, recovering valuable resources (such as composting, biogas and reuse of treated waste water for agriculture), creating job and business opportunities, enhancing local economy, improving access to sanitation services, build capacities and create opportunities for local construction companies and their professionals and help in the transfer of new skill and knowledge to the city and the nation at large.

Likewise, the study identified major negative impacts during construction, operation and decommissioning phases as follow; resettlement, involuntary displacement, land expropriation, property damage, soil degradation and pollution, water, air and noise pollution, traffic congestion and accidental risks, OHS risks, GBV, increase incidence of diseases, social disharmony, bad odor, public health impact and risks, loss of job opportunity (during decommissioning), and overflowing of sludge into the surrounding farms. These impacts can be minimized by applying the indicated mitigation measures outlined in the ESMP of this report.

The subproject office, municipality, SWSSE 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 city's EPA, MoWE, and the WB in addition to the project office itself. The PAPs, the local community; particularly the youth, woman and vulnerable groups and Kebele leaders should be properly involved 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 requires utmost attention from all stakeholders. In addition, the seven households that are going to lose their cultivated lands as a result of the construction of the FSTP need to be properly consulted and compensated before the commencement of the subproject.

As clearly indicated, there is no any significant environmental or social issue that could avert the implementation of the subproject provided that all the mitigation measures are in place. 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.

The sub-project contractor once mobilized should also prepare site specific 'Construction Environmental and Social Management Plan (C-ESMP) before the beginning of construction works and this plan should be part of the contract. Additionally, the environmental management plans should be made part of contract documents of contractor so that ESMP compliance is ensured. The ESMP recommends social and environmental monitoring at the different phases of the project. The monitoring should be conducted to check the effectiveness of mitigation measures. Accordingly, the Environmental and Social Management and Monitoring Plan (ESMMP) needs to be precisely followed and implemented with the schedule and responsible body assigned.

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APPENDIXES

Appendixes	Title of Appendix	Attached Document
1.	The ESIA Team	Error! Not a valid link.
2.	Scoping Activities in the ESIA Study	Error! Not a valid link.
3.	Name of Individuals having Farm Lands around the FSTP	Error! Not a valid link.
4.	Community Consultation Minute	Error! No topic specified.
5.	Stakeholders Consultation Minutes	Error! No topic specified.
6.	Chance Find Procedure	Error! Not a valid link.
7.	Environmental Guideline for Construction Contractors	Error! Not a valid link.
8.	TOR	Error! Not a valid link.