

Environmental and Social Impact/Risk Assessment/Auditing and Mitigation Measures

For

Creating Opportunities for Municipalities to Produce and Operationalize Solid Waste Transformation (COMPOST) Project

By



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Striving for Quality Service



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IV. Acronyms and Abbreviation

AR5	Assessment Report 5
CH4	Methane Gas
CO	Country Office
CO2	Carbon Dioxide
COMPOST	Creating Opportunities for Municipalities to Produce and Operationalize Solid Waste Transformation
CRGE	Climate Resilient Green Economy
EFCCC	Environment, Forest and Climate Change Commission
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
HHs	Household
IPCC	Intergovernmental Panel for Climate Change
IPs	Implementing Partners
ISWM	Integrated Solid Waste Management
ISWM	Integrated Solid Waste Management
KII	Key Informant Interview
MFI	Micro-finance Institution
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOH	Ministry of Health
MOUDC	Ministry of Urban Development and Housing
MRV	Measurement Reporting and Valuation
MSEs	Micro and Small Enterprises
MtCO ₂ e	Metric Tonnes of Carbon Dioxide Equivalent
MTR	Midterm Review
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organization
PHI	Public Health Institute
PLC	Private Limited Company
PRA	Participatory Rural Appraisal
QDA	Quality Data Analysis
RAP	Resettlement Action Plan
RBM	Result Based Management

SBPDA	Sanitation, Beautification and Park Development Authority
SDG	Sustainable Development Goal
SES	Social and Environmental Screening
tCO ₂ e	Tonnes of Carbon Dioxide Equivalent
TOR	Terms of Reference
UGI	Urban Greenery Infrastructure
UNDP	United Nations Development Programme

V. Executive Summary

This consultancy work is undertaken by an independent consulting firm, Basal Consulting Plc for the contracting organizations United Nations Development Program (UNDP) and Ministry of Urban Development and Construction (MoUDC) for a GEF funded project known by abbreviation, NAMA COMPOST. The consulting team has used secondary data and primary data from field observation as well as KII and FGD of 55 and 172 people respectively in meeting objective of the study. Accordingly, the team has assessed and identified existing and potential environmental and social impacts of the ongoing project as well as risks that could affect sustainability of results achieved so far based on which an Environmental and Social Management Plan (ESMP) including implementation and monitoring plan is developed.

The NAMA COMPOST is designed and implemented with an objective of promoting greater use of Integrated Solid Waste Management and Urban Green Infrastructure approaches in six Ethiopian cities and towns (Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle) for a period of five years. The solid waste management component includes composting and recycling and both components are designed in such a way jobs are created along the value chain. At the end of the project lifetime is expected to result in annual emission reductions from UGI initiatives and ISWM equal to approximately 306,000 and 132,321 tCO₂e, respectively. These will accrue from the annual generation of 45,500 tonnes of compost from 152,000 tonnes of household organic waste, and the reforestation of 33,000 ha of degraded land by the end of the 5-year project lifetime.

Since the start of project implementation in 2017, remarkable achievements have been recorded in ISWM, UGI, GHG emission reduction and job creation. A total of 91,329.4 tons of compost has been produced from 300,456.9 tons of organic waste diverted from land fill, reforested/rehabilitated more than 20,000 ha of urban and peri-urban degraded areas and created jobs for more than 36,000 people in the six project intervention areas. The project has built capacity of federal and local government units and established system for better performance in waste management and urban greenery development.

Projects can have intended or unintended effect on society and the environment which could be positive or negative. Likewise, achievement of project objectives and sustaining its results can be hindered or promoted by the environment. The study on the project intervention areas in the six cities has found out considerable positive social and environmental impacts such as regeneration of biodiversity on areas that were degraded prior to project intervention; flooding, soil degradation and siltation on water bodies and urban infrastructure has been halted through building soil and water harvesting structures, area closure and afforestation; a number of former illegal waste dumping sites are now converted to nursery sites resulting in better community health as well as increase in land value; improving livelihood of many citizens through job creation; bringing attitudinal change and practice on local government and community towards waste management and urban greenery and reducing 128,089 tons of CO₂ equivalent GHG emission.

Similarly, though currently adverse negative impact is not observed, there are potential environmental and social impacts arising from waste management related interventions mainly composting for which management plan is developed to prevent the likelihood of adverse consequences. Such impacts are the result of not adhering to the Occupational Safety and Health standards by MSEs members and delay in constructing recommended structures such as leachate ponds in some of the composting shades. Such practice can have medium to significant impacts on soil quality, visual, on biological environment and utility. Moreover, severe impact is foreseen on water resource (underground and surface water), on air quality, and OHS related impacts if appropriate measures are taken. Proposed mitigation measures including action plan and monitoring plans is included in the report.

The major risks that could possibly affect project sustainability are illegal land grabbing related to UGI, limited supply of diverse vegetation for UGI, extended drought in Mekelle, Adama and Dire Dawa, health related risks to waste handling and processing, sustainability due to poor income generation of UGI, market problem for compost and risk of contamination of the compost due lack of segregation at source and separate transportation.

Concerning the views of the local community in the six cities towards the project, valuable information was obtained from public consultations made with concerned stakeholders and local government bodies. The residents welcome the project and appreciate the positive contributions it has made so far. Project sustainability is the major concern of the community mainly the MSEs due to lack of market for compost as raised above.

1 Introduction and Background

1.1 Introduction

The NAMA COMPOST is designed and implemented with an objective of promoting greater use of Integrated Solid Waste Management (ISWM) and Urban Green Infrastructure (UGI) approaches in six Ethiopian cities and towns (Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle). The solid waste management component includes composting and recycling and both components are designed in such away jobs are created along the value chain. Municipal Solid Waste Management including composting/recycling and Urban Green Infrastructure Development have their own positive and negative impacts on the environment and the society during implementation as well as years to come.

Municipal Solid Waste if not collected and well managed has an impact on environment by polluting rivers, lakes, underground water and the society by affecting their health because it creates favorable condition for vector of diseases, creates psychological dissatisfaction and cause flooding by blocking ditches and water canals that intern damages infrastructure. Similarly, if the waste management practice of the municipality is not properly designed and implemented, it will result in high environmental and social impact throughout the value chain including composting/recycling practices. This is how:

Generation – the municipality has to encourage reduction of waste and ensure economic activities do not generate hazardous waste as much as possible. However, so long as there is consumption and production waste generation are apparent. In order to avoid/minimize environmental and social impacts during generation, segregation is the next solution because waste segregation at source helps:

- To separately handle the waste accordingly to its nature during collection and transportation to avoid potential health impact on the collectors and people engaged on recycling or composting
- To separately treat the waste at landfill because different types of waste require different type of treatment techniques to avoid potential impact on health and environment
- To avoid possible contamination of the compost and recycled product to avoid potential impact on final users

Collection and transportation of waste – municipal solid waste has to be separately collected and hauled with appropriate means of transportation to avoid/minimize environmental and social impacts. The use of mixed transportation system has similar environmental and social impact as is un-segregated waste at source as well as discourages the community. In addition to this, if appropriate transportation system is not used, such as using uncovered vehicles, will pollute the city along the road and create bad odor. Moreover, people engaged in waste collection and transportation have to be aware of safety measures, supplied with Health and Safety Materials and ensure they adhere to the safety requirement all the time to avoid social impacts.

Composting/Recycling: waste generation as well as collection and transportation are the most determinant stages to avoid/minimize environmental and social impacts of composting/recycling. Source segregation and timely and separate transportation of waste plays major role to avoid potential health

hazards on people engaged on composting and recycling as well as final consumers of the product. Moreover, there are measures that have to be taken during composting/recycling:

- The composting ground has to be properly constructed according to the standard to avoid surface and underground water pollution.
- Windrow composting method generates leachate that can pollute surface and underground water. Therefore, proper leachate collection pond has to be constructed according to the standard
- Mixed or partially separated waste still has to be segregated to avoid incorporation of hazardous elements such as heavy metals and chemicals that could potentially affect health
- People engaged on the composting and recycling business have to be aware of OHS, supplied with safety materials and ensure they adhere to the safety measures
- Undertaking laboratory check minimizes potential environmental and social impact of the compost

Composting/recycling on the other hand can positively impact the environment and society by reducing emission of CH₄, CO₂ and GHG gases to the atmosphere from accumulation of waste in the landfill and burning by diverting the organic fraction of waste to produce compost and recycling the non-organic fraction. It can also contribute to livelihood improvement of people engaged in the composting/recycling business and urban food security through improving urban agriculture productivity by applying compost.

Dumping, Flaring and Burning– proper dumping in well designed and managed dumping sites, flaring, burning according to the standards and guidelines helps to avoid/minimize environmental and social impacts. Since this is outside of the scope of the consultancy work, it will not be covered in this report.

Urban Green Infrastructure Development, which is major component of the project, is expected to have positive environmental and social impact through enhancing ecosystem services; protecting siltation, carbon sequestration, protecting degradation and protecting flooding; creating good scenery by developing parks and job creation. However, looking from project perspective, UGI development may have negative social impact if community is relocated without proper Resettlement Action Plan (RAP) and compensation.

The other important aspect to making a city 'green' is the development of Urban Green Infrastructure (UGI) or urban greenery. Generally, UGI supports sustainable urbanization, health and mental well-being, social cohesion (e.g., public parks) and the preservation of the natural environment and ecology. Green infrastructure also plays a significant role in improving air quality and reducing vulnerability to climate change by absorbing pollutants such as ammonia, carbon dioxide and nitrogen dioxide. Moreover, it provides sustainable supplies of fuel wood for low-income Ethiopian households. Because biomass energy, mainly of fuelwood and charcoal, accounts for 92% of the country's energy supply in Ethiopia.

1.2 Project Background

The Ministry of Urban Development and Construction (MoUDC) of Ethiopia in collaboration with key stakeholders, including UNDP, has been implementing the GEF-financed project titled “Ethiopian NAMA: Creating Opportunities for Municipalities to Produce and Operationalize Solid Waste Transformation (COMPOST) to promote greater use of Integrated Solid Waste Management (ISWM) and Urban Green Infrastructure (UGI) approaches in six cities and towns (Dire Dawa, Hawassa, Adama, Bishoftu, Bahir Dar and Mekelle) since 2017.

The project has tried to achieve its objectives by creating linkage between waste management and Urban Green Infrastructure Development efforts while creating jobs by organizing people in to MSEs and helping them engage in both sectors. Through the use of compost, mainly by municipalities for reforestation activities, the project has simultaneously promoted urban greenery development to enhance ecosystem services (including carbon sequestration) while increasing solid waste management to strengthen greenhouse gas mitigation and environmental protection. The project has supported the transfer of technical expertise for developing a national standard for compost, as well as putting in place a quality assurance system.

The project intervention is built on four envisaged outcomes that contribute to the realization of the overall objectives of the project, as listed below:

1. The regulatory and legal framework, institutional and coordination mechanisms, and tools are established for supporting the national policy environment for integrating ISWM and UGI within urban systems in six selected cities and towns;
2. A market-based system is developed and participating micro and small enterprises (MSEs) are supported professionally to ensure financial sustainability of compost production and utilization;
3. A NAMA is designed and implemented to catalyze the transformational capacity of integrated urban systems to generate large emission reductions;
4. Proof-of-concept urban systems integrating ISWM and UGI are operationalized with quantified GHG emission reductions in a NAMA framework.

The realization of the above outcomes at the end of the project lifetime is expected to result in annual emission reductions from UGI initiatives and ISWM equal to approximately 306,000 and 132,321 tCO_{2e}, respectively. These will accrue from the annual generation of 45,500 tonnes of compost from 152,000 tonnes of household organic waste, and the reforestation of 33,000 ha of degraded land by the end of the 5-year project lifetime. By assuming a lifetime of 20 years for compost facilities and managed landfills as well as for carbon sequestration and the generation of renewable biomass for thermal energy, the direct emission reductions generated by the project was forecasted to be 8.33 MtCO_{2e}. The project is expected to produce co-benefits such as employment, increased resilience of urban areas to drought and flooding hazards, and improved quality of life in urban areas.

The project is financed by Global Environmental Facility (GEF), United Nations Development Program (UNDP) and co-financed by Ethiopian Government mainly the Ministry of Urban Development and Construction and the six cities. A Project Steering Committee with members drawn from MoUDC, EFCCC, MoF, three regional states and UNDP gives overall project leadership. The project is managed by a Project Management Unit staffed with Project Manager, ISWM and UGI experts and finance expert established at the ministry of Urban Development and Construction. The unit is responsible to head of Urban Resilience Bureau of MoUDC and Program Analyst of UNDP. Ground level implementation is undertaken by the six cities.

1.3 Project Rationale

Climate change is exacerbating sustainable green development of Ethiopian cities and towns. The National Policy and Strategy on Disaster Risk Management (2013) of the Government of Ethiopia (GoE) details how urban centres are exposed to increasing risks of floods and forest and bush fires due to climate change in the future. Stakeholder consultations with Ethiopian Government representatives indicates that removal of tree cover for urban expansion, charcoal production and agriculture is already a concern due to the resulting adverse impacts on the environment; urban heat islands are an expected outcome and are predicted to grow in size due to temperature increases. Similarly, increases in impervious surfaces associated with urbanisation are reducing soil infiltration and increasing surface runoff during storms. Consequently, flooding is common in dense urban areas. Extreme flooding conditions have contributed to erosion and loss of fertile topsoil. These conditions are already noted in the IPCC's 5th Assessment Report, AR5.

Ethiopia is one of the fastest-growing economies in the world. Ethiopian cities and towns currently produce 60% of the country's GDP and house approximately 19.5% of Ethiopia's economically-active population. In spite of its importance, urban growth has largely been unplanned and uncoordinated, giving rise to a range of problems, including poor land-use planning related to UGI, inefficient waste management, limited opportunities for employment and a deteriorating urban environment. Ethiopia's urbanisation growth rate reached 4.9% in 2013, leading to an increase in energy needs that has accelerated forest degradation to a rate as high as 5%/year in some regions due to the need for fuelwood and charcoal. The resulting deforestation has resulted in land degradation, landslides, flood risks and increased siltation in nearby water bodies. Rapid urbanisation is adversely impacting the urban and peri-urban environment through the loss of arable soils, loss of riparian buffer zones to absorb runoff and reduce impacts to sensitive fresh water bodies, and higher risks of shortages of water supplies for households and agricultural lands.

Economy (CRGE) vision of the Government of Ethiopia (GoE), With the country's focus on efforts towards developing a renaissance of its cities to contribute to building a green economy, and in addition to the CRGE, Ethiopia has developed a number of strategies supporting urban green development that cover both Integrated Solid Waste Management (ISWM) and Urban Green Infrastructure (UGI). The link between SWM and UGI comes through their integration under the pillar for Environmental Sustainability under the GTP II of the Ministry of Urban Development and Housing. Urbanisation is generating a range of environmental impacts from the perspectives of both ISWM and UGI, the principal ones being:

- Increasing volumes of solid waste generated in Ethiopian towns and cities: With municipal solid waste (MSW) collected and disposed of at landfills (semi-engineered or sanitary), this waste increases the generation of methane emissions;
- Increasing population in informal settlements, which do not necessarily benefit from the collection of MSW. The end-result is the dumping of waste in public spaces such as open areas and river banks, and the deterioration of urban open green areas and river banks;
- Increasing demand for primary energy in urban areas, predominantly in the form of non-renewable biomass, as well as the demand for timber for construction: Both are driving rapid forest degradation and deforestation in Ethiopia.

To support Ethiopia's CRGE vision for sustainable urban green growth and mitigate such an environmental impacts, Ethiopia must address significant capacity and financial gaps. Local governments within cities and towns lack the knowledge, capacity and financial resources necessary to implement significant greenhouse gas (GHG) emission reduction measures based on ISWM and UGI. In spite of a range of strategies and plans promoting urban greenery in Ethiopia, UGI activities are weakly enforced and given little importance. Dumping areas require cleaning to be able to support Ethiopia's UGI

Standards on urban greenery development in open green spaces and along river banks. Moreover, almost all cities and towns in Ethiopia collect and dispose of only half of the solid waste generated, and have little or no disposal infrastructure in terms of either well-designed and operated landfill sites or disposal through recycling or incineration of organic waste. A baseline assessment has been carried out on the SWM systems in the 6 cities and towns (Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle) targeted by the UNDP-implemented, GEF-financed COMPOST project, and it found that both the collection efficiency of MSW at the household level and the solid waste disposal rate at the landfill are, at most, 75%. With a low disposal rate (70%), these rates give an overall system efficiency of 52% of MSW being disposed of at landfills.

- ❖ **Generation** – MSW is not sorted at the household level in a systematic manner. With only an informal economy related to the collection of recyclable waste at the household level, MSW collection suffers from a lack of investment;
- ❖ **Collection and transportation of waste** – Primary waste collection can be characterised as crude in all cases, with door-to-door collection by micro and small enterprises (MSEs) with 2-wheel wheelbarrows, and MSE personnel employed under very poor conditions with little regard to occupational health and safety. The collection system has no transfer stations, and filled communal bins are then loaded by skip trucks owned by the municipality or city administration for dumping at a landfill. The major challenges regarding waste collection are: (1) cost recovery by either the MSEs or the city/town administration; and (2) a collection rate that is only approximately 75%;
- ❖ **Disposal of waste** – In most cities and towns, the solid waste is dumped at open landfills that are not fenced, permitting access to scavengers who pick waste that have commercial value. A significant fraction of MSW is dumped in open public spaces such as green areas and along river banks. The current regulatory framework is virtually silent on waste collection and disposal enforcement mechanisms.
- ❖ **Financial constraints** - There are several problems related to financing the SWM system, including: (1) due to socio-economic acceptability, not all cities and towns have recourse to the ‘water bill’ method, making cost recovery a problem; (2) in cases where the contractual agreement for household waste collection is between the households and the MSEs, there is a higher rate of waste dumping, and weaker oversight by the city administration or municipality on the quality of waste collection and disposal; and (3) there is no cost recovery by the city administration/municipality for waste that is transported from communal bins to the landfill.
- ❖ **Energy recovery** – There is no energy recovery at any of the waste disposal sites in the cities and towns considered in the baseline despite the fact that disposal sites such as in Adama and Hawassa were originally designed as sanitary landfills fitted with landfill gas capture equipment.
- ❖ **Enforcement of UGI designated areas** – The growth of urban centres places further pressure on UGI-designated areas to become human settlements. Personnel from urban local governments (ULGs) currently do not have the knowledge to enforce the proper use of UGI-designated areas. Over the past year, however, digitised cadastral maps with satellite imagery have now become available at the Land Registration Agency for use by municipalities as a tool for enforcing land uses within an urban area, notably the dedicated green areas that will be developed by this project.

To overcome the challenges of enforcing UGI-designated areas, training municipal personnel on the use of these cadastral maps to enforce land uses is required;

- ❖ **Insufficient number of technically-qualified stakeholders involved in UGI** – Most cities do not have a sufficient number of MSEs that are technically qualified to implement UGI projects involving nursery operations or the planting of trees and shrubbery. Meeting the demands for a 30% increase in UGI, as outlined in the GTP II, will require increased attention to the training of MSE personnel in nursery operations, plantation of reforested areas and maintenance of reforested areas;
- ❖ **No cost recovery for UGI initiatives** – The financing of UGI initiatives is primarily from locally-collected revenues. With limited capacities to leverage other sources of financing, ULGs are unable to implement a broader set or scale of UGI initiatives that meet the targets of GTP II. Furthermore, ULGs generally do not have a full understanding of the true costs of implementing and maintaining UGI initiatives, and hence cannot articulate these costs to potential funding sources.

In response to the already present and expected impacts of climate change, Ethiopia’s National Adaptation Programme of Action (NAPA) recommends increasing the use of sustainable biomass resources.¹⁶ The UNDP-implemented, GEF-financed COMPOST project directly addresses this recommendation by supporting the development of biomass-based compost market development. Through the use of compost, mainly by municipalities for reforestation activities, the project will simultaneously promote urban greenery development to enhance ecosystem services (including carbon sequestration) while increasing solid waste management to strengthen greenhouse gas mitigation and environmental protection. The project will support the transfer of technical expertise for developing a national standard for compost, as well as putting in place a quality assurance system.

1.4 Project Objective

Objective of the project is to promote significantly greater use of ISWM and UGI approaches in Ethiopian cities and towns in alignment with the national Growth and Transformation Plan for the urban sector.

The COMPOST project is designed to assist the Government of Ethiopia in achieving the objectives of its Growth and Transformation Plan (GTP II). This will be achieved through four outcomes:

- ❖ Strengthening the regulatory and legal framework and institutional coordination mechanisms to integrate ISWM and UGI within urban systems;
- ❖ A developed market-based system with micro and small enterprises (MSEs) that are supported professionally to ensure financial sustainability of compost production and utilization;
- ❖ Implementation of a Nationally Appropriate Mitigation Action (NAMA) that transforms the capacity of integrated urban systems to generate large emission reductions;
- ❖ Operationalized urban systems that integrate ISWM and UGI, with quantified GHG emission reductions, within a NAMA framework/ UGI 306,000 and ISWM 132,321 tCO₂e/

1.5 Objective of the Consultancy Work (The TOR)

1.5.1 Objective of the Assignment

The NAMA COMPOST project has been under implementation since 2017 and has passed through Midterm Review where its achievement was rated as satisfactory. Though development projects are designed to benefit the society, they might also have unintended negative impact on the society as well as the environment. Moreover, unforeseen risks might hinder progress of the project or its sustainability. The overall objective of this assignment is therefore, to assess current and future project impacts for which mitigation measure is developed to ensure the project does not have potential negative impacts on the society as well as the environment, project outcomes are sustainable and enhance positive impacts.

1.5.2 Specific Objective of the Assignment

Within the framework of the overall objective, the consultancy work aims at achieving the following specific objectives:

- To assess/audit the composting, urban greenery and related activities currently being undertaken in the six cities and determine their potential social and environmental risk.
- Develop management plan to minimize the potential social and environmental risk of the composting, urban greenery and related activities on the community and environment.
- Design environmental and social risk mitigation and monitoring plans to ensure proposed measures are undertaken.

1.6 Scope and Limitation of the Assignment

1.6.1 Technical Scope of the Assignment

The project has aimed at achieving annual emission reductions from integrated solid waste management equal to approximately 132,321 tCO₂e. These will accrue from the annual generation of 45,500 tonnes of compost from 152,000 tonnes of household organic waste, by the end of the 5-year project lifetime. By assuming a lifetime of 20 years for compost facilities and managed landfills, the direct emission reductions generated by the project will be 8.33 MtCO₂e. The project will produce co-benefits such as employment, increased resilience of urban areas to drought and flooding hazards, and improved quality of life in urban areas. Towards this end the project has constructed composting sheds in the six cities where production

of compost from organic fraction of municipal solid waste has already started by MSEs. Most of the sheds are constructed inside a waste landfill sites for which EIA has been already conducted. However, the sheds as well as their composting activities are not assessed for their existing as well as potential impacts. As a result, no management plan is developed for unidentified and potential risks to reduce the impact and there is no monitoring tool to track unnecessary side effects. The scope of the consulting firm's service work is therefore to assess/audit existing and potential risk of the UGI, composting and related activities on the environment as well as the community mainly the indigenous people, design the related management plan and develop a monitoring and tracking tool to minimize/avoid negative consequences that might possibly resulted from the on-going operations in the six project cities (Bishoftu, Adama, Bahir Dar, Dire Dawa, Hawassa, Mekelle). Moreover, the assignment also covers assessment of existing identified risks and/or identifying new risks and develops mitigation measures.

1.6.2 Spatial Scope of the Assignment

The study covers four region states and one city administration where target beneficiaries live and the intended project is under implementation (Mekelle, Bahir Dar, Bishoftu, Adama, and Hawassa cities and Dire Dawa City Administration). Therefore, the sampling technique and sampling size considered all target areas of the project.

1.6.3 Limitation of the Assignment

This environmental and social impact/risk assessment/audit aims at identifying existing and potential risks since start of project implementation as well as future undertakings. In carrying out the assignment, the team has faced the following limitations:

- There was high confuse whether to undertake Environmental and Social Impact assessment or auditing which usually have different objectives. Since the project has been under implementation in the past four years, impacts so far are audited and potential impacts are assessed. In this assignment, both terminologies are used interchangeably which might confuse the reader.
- The scope of the work didn't include laboratory test for compost (elemental analysis) which was one of the challenges that we face. This may be one of the key limitations of this study which is not resolved because of the additional cost and time it will impose on the firm. Laboratory analysis is very important to see the risk of compost and predict its environmental impact.
- The communication blockage at Mekelle was difficult to travel and/or hire somebody to conduct the study. But we have managed to reach one of our senior advisors based in Mekelle who travelled to access the tools send via email and go back to Mekelle to undertaken the assessment. However, despite of the efforts, he couldn't freely move and talk to people and staff of the municipality are out of work. The composting shed also is not under use due to the instability in the area.

- In some project sites such as Bahir Dar and Hawassa finding and talking to city leadership was difficult because of they were busy at work which may be considered as a gap to triangulate and to hear from the horse mouth. However, its impact is insignificant and can't affect the overall findings of the report.
- In Dire Dawa site, it was very difficult to conduct FGD and KII with municipality staffs, MSE working on compost shed and residents around the greenery area. The Compost shed was not functional at the time of data collection because the MSEs quite working due to high cost of transport and low income from compost. The team has tried its best to fulfil minimum requirement using different mechanisms.

1.7. Composition of the Report

This ESIA report has ten sections including annexure to the document. The first section details about the introduction and background overview of the project including project objective, purpose of the assignment, scope and limitations. The second section of the report presents descriptions of project target areas followed by a literature review about legal and policy frameworks. The fourth section of this report explain about method and approaches employed for the study followed by details of baseline information of the project in sections five.

Key deliverables presented starting from section six to section nine which changes presented in section 6 followed by ESIA and their mitigation measures in section 7 and project risks and proposed mitigation measures in section 8. The final sections, section 9 and 10 presents conclusion and recommendation as well as annexure part of the report respectively.

2 Description of Project Intervention Areas

2.1 Physical Environment

In this subsection, the physical environment includes land, air, water, plants and animals, and other natural resources that provide basic needs and opportunities for social and economic development in each project sites where NAMA COMPOST project is under implementation, namely, Mekelle, Bahir Dar, Bishoftu, Hawassa, Adama and Dire Dawa.

For this study only important physical environment factors have been reviewed as follows:

Table 1: Physical environment of target areas

City	Location	Climate and meteorology	Geological setting	Hydrogeology	Seismology
Mekelle	<ul style="list-style-type: none"> ❖ Around 780KM from Addis Ababa, ❖ Latitude: 13° 29' 48.01" N Longitude: 39° 28' 31.01" E ❖ Elevation of 2,254m (7,395 ft) above sea level 	<ul style="list-style-type: none"> ❖ Temperature: high temperatures year-round and distinct wet and dry seasons. All month's average above 18 °C or 64.4 °F, ❖ Rainfall: semi-arid climate receiving a mean annual rainfall of 530 mm ❖ Air quality: ❖ Acoustic environment 	<ul style="list-style-type: none"> ❖ Geology: Basement complex, Paleozoic - Mesozoic Sedimentary sequence, Cenozoic Trap Volcanic and Sediments of the Ethiopian Rift., ❖ Soil: 30-40% black cotton clay, 30.7% sandy soil and 10 to 20% for silty clays, and the reset loam soil 	<ul style="list-style-type: none"> ❖ Main water source is Groundwater (borehole ranging from 32-250m) they are over 17 in number ❖ Water quality --- good ❖ Has high shortage of water supply due to increased population and high demand for compensation 	<ul style="list-style-type: none"> ❖ Local with seismic zones the c ❖ Bedrock acceleration ratio ❖ Earthquake risk: Moderate
Bahir Dar	<ul style="list-style-type: none"> ❖ Around 567KM from Addis Ababa ❖ 11° 38'N, 37° 10'E ❖ Elevation of 1800m above mean sea level 	<ul style="list-style-type: none"> ❖ Temperature: average annual temperature is 18.7 °C 65.7 °F ❖ Rainfall: around 892 mm 	<ul style="list-style-type: none"> ❖ Geology: Made up of volcanic rocks, mainly basalts, most of the Tana basin is covered by Tertiary volcanic rocks ❖ Topography: Flat plan with pockets of conical hills, rugged and undulating features dotting the city's landscape, 	<ul style="list-style-type: none"> ❖ Groundwater from nearby catchment in the regions ❖ Lake tana catchment and another surface water such as enfrage are main water sources for the city 	<ul style="list-style-type: none"> ❖ Local with seismic zones court ❖ Earthquake risk: Moderate
Bishoftu	<ul style="list-style-type: none"> ❖ Around 61.9KM from Addis Ababa ❖ Longitude: 39.0085346 . Latitude: 8.7346496 ❖ Elevation: 1878m / 6161feet ❖ Elevation of 1920m above mean sea level 	<ul style="list-style-type: none"> ❖ Temperature: average ranges from 7.4°C to 30.2°C that make an average of 18.8°C ❖ Weather: fully sunny and dry wind ❖ Rainfall: around 860mm 	<ul style="list-style-type: none"> ❖ Geology: consists of an area of fissure-fed Holocene lava flows, cinder cones, tuff rings, and maars ❖ Soil: Light soils (Alfisol/Mollisols, 20 ha or 14%. Black soils (Vertisols) also constitute 127 ha, 86% 	<ul style="list-style-type: none"> ❖ Groundwater as a sources of water supply within 75–120-meter depth, ❖ Drainage: surface water drainage can be constructed 	<ul style="list-style-type: none"> ❖ Local with seismic zones the c ❖ Earthquake risk: Moderate

¹Seismic zones with bedrock acceleration ratio greater than 0.05 are considered as high seismicity

Hwassa	<ul style="list-style-type: none"> ❖ Around 273KM from Addis Ababa ❖ 7.0504° N, 38.4955° E ❖ Elevation of 1708m above mean sea level 	<ul style="list-style-type: none"> ❖ Temperature: average annual temperature is 19.2 °C 66.5 °F ❖ Rainfall: around 1007 mm 	<ul style="list-style-type: none"> ❖ Geology: pyroclastic deposits, trachyte, lacustrine and alluvial deposits, unsorted gravels, sandy gravel, clay and underlain basaltic rocks ❖ Located in the central part of the Main Ethiopian Rift Valley with a volcano-tectonic collapse, ❖ Soil: 40% black cotton, 30% red clay, 20% sandy soil and 10% silty 	<ul style="list-style-type: none"> ❖ Major water resources are surface water from rivers and lakes, deep groundwater and groundwater as springs, ❖ Drainage: there are a number of rivers such as Kedo, Boga, Afina and Abosa rivers in Awassa Zuria Woreda drain into Awassa lake basin 	<ul style="list-style-type: none"> ❖ Located within seismic zones the of ❖ Bedrock accessibility ❖ Earthquake risk: Moderate
Adama	<ul style="list-style-type: none"> ❖ Around 95.9KM from Addis Ababa ❖ 8.5263° N, 39.2583° E ❖ Elevation of 1712m above mean sea level 	<ul style="list-style-type: none"> ❖ Weather: windy with dust ❖ Temperature: average annual temperature is 20.5 °C 68.8 °F ❖ Rainfall: around 808 mm 	<ul style="list-style-type: none"> ❖ Geology: topographically flat and is covered by Lacustrine sediments, ❖ Whereas some parts are covered by ignimbrite, ash flow tuffs and unwelded tuffs, rhyolite domes and flows, and basalt unit ❖ Soil: Andosol, accounting for 74.3% of the land area of the district. Cambisols and Luvisols cover 25.7% 	<ul style="list-style-type: none"> ❖ Groundwater, ❖ Surface water for both drinking and irrigation purposes 	<ul style="list-style-type: none"> ❖ Located within seismic zones the of ❖ Earthquake risk: Moderate
Dire Dawa	<ul style="list-style-type: none"> ❖ Around 567KM from Addis Ababa ❖ 9.6009° N, 41.8501° E ❖ Elevation of 1,276 m above mean sea level 	<ul style="list-style-type: none"> ❖ Temperature: mean annual temperature ranges from 20 - 35°C ❖ Rainfall: mean annual average around 657 mm 	<ul style="list-style-type: none"> ❖ Geology: comprises various metamorphic, volcanic and sedimentary rocks ❖ Sedimentary rocks of the area include various sandstone, limestone, alluvial sediments and travertine ❖ sediments are composed of sands, silt and clay with minor wadi gravel 	<ul style="list-style-type: none"> ❖ water sources. Groundwater (there are two groundwaters, namely Escarpment Groundwater and Dire Dawa Groundwater Basin (Foot of the escarpment) ❖ Surface water: aggregate annual runoff from the main ephemeral rivers of DDAC amounts to 448 Mm³ 	<ul style="list-style-type: none"> ❖ Located within seismic zones the of ❖ Earthquake risk: Moderate

According to world health organization information published in 2010, Ethiopia is under seismic zones of medium and low or very low. However, majority of NAMA COMPOST project sites are under moderate risk of earthquake as almost all located in Great Rift Valley belt or very near to it except Bahir Dar.

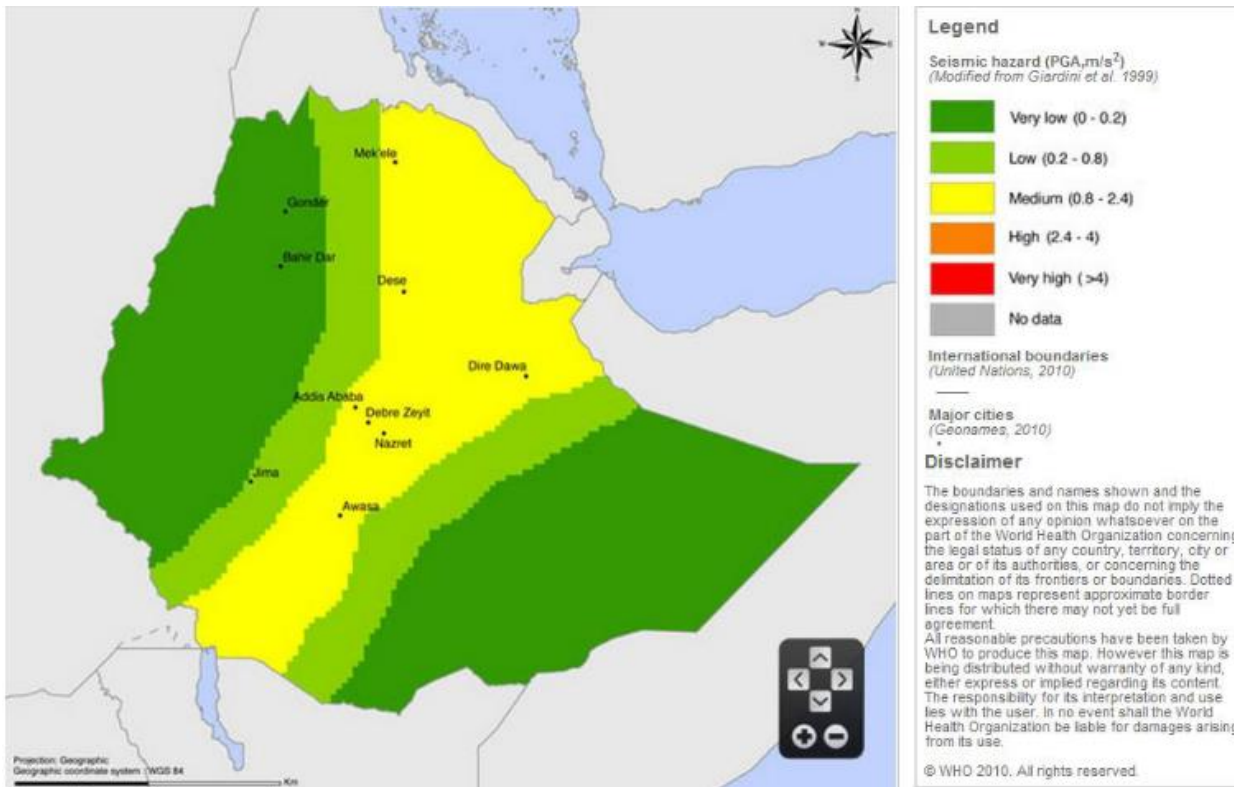


Figure 1: Target city in relation to seismic hazard

Source: World Health Organization, 2010. (<http://www.whoatlas.org/africa/countries/ethiopia/ethiopia-seismic-map.html>)

Figure 1 shows Ethiopia’s major cities in relation to seismic hazard. Notably the three most populous cities – Addis Ababa, Dire Dawa, and Mekelle are found in the most seismically hazardous areas – marked in yellow in the center of the country and categorized as having a “medium” risk of seismic hazard. The cities Addis Ababa, Adama, Dire Dawa and Hawassa are very near main fault lines where many earthquakes have previously occurred.

2.2 Biodiversity and Natural Habitat

Biological Environment of each project site varies as the six cities have different geographical location in the country. Like ways, the natural habitats within these target project sites are also varies depending on the geographic zone of each cities. The consulting team tried to summarize key biodiversity and natural habitats of project sites as follows.

Table 2: Study area Biodiversity and Habitats

Project Sites/Area	Biodiversity and Natural Habitat
Mekelle	Vegetation: The surrounding of Mekelle represents dry evergreen montane forest ecosystem type. Due to climatic and anthropogenic impacts the catchments of the town are degraded and as a result the development of the vegetation is very much stunted in the surrounding terrains. There are ongoing

Project Sites/Area	Biodiversity and Natural Habitat
	<p>efforts of catchment rehabilitation through terracing, reforestation and area closure. Eucalyptus camaldulensis is an example of better-established species in the degraded catchments. Representative species of the dry evergreen montane vegetation such as Olea europaea sub species cuspidata and Juniperus procera are found in the old Church yards and Palace of Mekele. In addition to this in human settlement areas (homestead plantations) are covered with species such as Schinus molle, Neem, Opuntia, Jacaranda, Casuarina equisetifolia, Ziziphium mucronata. The area outside Mekelle city has suffered considerably from over exploitation of natural forest resources. The original vegetation has been significantly disturbed due to the expansion of subsistence level agricultural practices that predominate in the area. The country side around Mekelle is almost completely denuded of trees except along the stream banks. With the exception of few and scattered bushes & shrubs the vegetation coverage of the area is insignificant.</p> <p>Wildlife: Human intervention in the area, consisting of expansion for agriculture and grazing practices and encroachment for fuel wood and construction has significantly affected the vegetation cover in the area. Hence, it couldn't provide a good habitat to support diverse wildlife species. However, species that are common in many parts of the country like spotted hyenas, hare, Fox, duiker, warthog, jackal, baboons, Dikes etc. are seen in the area. These are very common in many parts of the country. There are no rare or endemic animal species known to be in the Project Area. The population and diversity of Fauna in the study area is expected to be very low mainly because of the decline of their natural habitat. There are birds in the project area. However, according to Ethiopian Wildlife and Natural History Society (EWNHS, 1996), none of the 76 nationally designated Important Bird Areas are found anywhere in or near the project area.</p>
Bahir Dar	<p>The Bahir Dar city is dominated by the following tree species such as Lantana species, Cordia species, Croton species, Ficus species, Combretum species, Millettia species, Albizia species, Rose, Acacia species, Balanites species, Strychnos species, Carissa species, Podocarpus species, Justicia species, Erythrina species, Rhus species, Sterospermum species, prunus species, gardenia species, neem species, diospyros species, oxytenantha species, moringa species, grevillea species, mango species, avocado species papaya species citrus species, phoenix species, buddleia species, Euclea species and different shrub and grass plants. The main functions of the vegetation's are to keep soil moist and prevent excessive evaporation of the soil water; reduces soil erosion and keeps the soil particles intact; improve the soil fertility; provide livelihood options to the local people; maintains ecosystem and wildlife habitat; clean water; and increases water percolation capacity and ground water level.</p> <p>The urban agriculture also produces maize, millet, teff. Sorghums and different vegetables like cabbage, lettuce, Carrot and onion.</p> <p>There are also different terrestrial and aquatic animals in the urban area. Some of the list of fauna available in Bahir Dar city administration is Milk Cow, common pig, hyena, wild cat, monkey, hippopotamus, crocodile, snakes, lizards and different bird species.</p>
Bishoftu	<p>In the past, natural ecosystems were protected merely for economic or social value, but now days there is a growing momentum Pas are also used for the storing and sequestering carbon, and thus reducing the rate of climate change. Protected areas thus help both to preventing further losses of carbon to the atmosphere and contributing for a healthy ecosystem, by sequestering additional carbon (Dudley et al. 2009).</p>
Awassa	<p>Vegetation: The City of Hawassa including the Hawassa Zuria Woreda has an evergreen woodland and other vegetation cover. The vegetation coverage shows grass land of 30.7% and forest/bush land of</p>

Project Sites/Area	Biodiversity and Natural Habitat
	<p>12.7% from the total surface area. Arable land in Hawassa Zuria Woreda is some 32.5% of the total surface area. The Woreda has some 24.04% of the degraded, rock-out-crop, water bodies, built-up areas and settlement areas from the total surface area.</p> <p>The area has indigenous trees such as <i>Ficus sur</i>, <i>Ficus vasta</i>, <i>Carissa edulis</i>, <i>Croton macrostachys</i>, <i>Olea africana</i>, <i>Millettia ferruginea</i>, <i>Acacia mellifera</i>, <i>Rubus apetalus</i>, <i>Coffea arabica</i>, <i>Carica papaya</i>, <i>Cordia africana</i>, <i>Phytolacca dodecandra</i> and others. There indigenous grasses such as <i>Hyparrhenia rufa</i>, <i>Strychnos innocua</i>, <i>Lippia abyssinica</i>, <i>Festuca elatior</i>, <i>Brucea antidysenterica</i>, and others.</p> <p>Wildlife and Avifauna</p> <p>The wild animals around the project areas are Bushbuck, Dikdik, Hyaena, Monkey, Baboon, Colobus, Leopard, Snake, Python Snake, Scorpion, Porcupine, Mole-rats, Rat and Mice, Warthog, Waterbuck, Bush pig, Wild Cat, Fox, Civet, Lizard, Chameleon, Spider, Hippopotamus, Lion, Cheetah, Crocodile, Hare, Fishes of various types (such as Tilapia, Catfish and others), etc.</p> <p>The Avifauna around the project area are Bush-Crow, Bat, Bitter, Wattlebird, Kite, Eagle, Owl, Woodpecker, Sunbird, African Pitta, Duck Pochard, Dove, Goose, Francolin, Guinea Fowl, Parrot, Sparrow, Waldrap, Vulture, Ostrich, Bat and the like.</p>
Adama	<p>The urban forest of Adama has an estimated 525,200 trees with a tree cover of 20%. The three most common species are <i>Azadirachta indica</i> (14.8%), <i>Carica papaya</i> (6.8%), and <i>Acacia abyssinica</i> (5%). The i-Tree Eco model was used to organise output. A total of 214 sample plots were generated directly in the i-Tree Eco application using the random plots' generator via the Google Maps function. A 0.1 acre circular plot was used. A total of 805 trees were sampled across the 214 plots. Among the 86 species encountered in the sample plots, 68 (79%) were introduced and only 18 (21%) were native species. Most introduced trees originated from Asia (22%). The tree diversity calculated using the Shannon Weiner index (H') was 3.61 and the dominance of Simpson's value was 0.95. The evenness index of the plots sampled was 0.80. The study indicates the crucial role that urban forests play in maintaining and conserving urban trees and enhancing ecosystem services in urban areas.</p>
Dire Dawa	<p>Flora /forest resources: Ethiopia's diverse agro-ecology has resulted in diverse vegetation formation in the country, ranging from tropical rain and cloud forests in the southwest and on the mountains through the dens woodlands covering the northern, northwestern and southeastern parts to the desert scrubs in the east and north east and the parkland agro-forestry on the central plateau of the country (Demel et al., 2010, Mulugeta and Habtemariam, 2011, Adefires, 2016). From the 6,027 vascular plant species (including subspecies) reported in the Flora of Ethiopia and Eritrea, 5,757 vascular plant species (including subspecies) are found in Ethiopia (Kelbessa and Demissew, 2014). The diverse vegetation resources made Ethiopia to rank 25th in the world and 5th in Africa in terms of its biodiversity. The vegetation of is classified into nine broad vegetation types such as the dry evergreen Afromontane vegetation, <i>Combretum-Terminalia</i> (broad-leaved) deciduous woodland, <i>Acacia-Commiphora</i> (small-leaved) deciduous woodland, the lowland dry forests, the lowland semi-desert and desert vegetation, the evergreen scrub, wetland (swamps, lakes, rivers and riparian) vegetation, the moist evergreen montane forest, and Afroalpine and sub-Afroalpine vegetation (Zerihun, 1999).</p> <p>There is significant variation among agro-ecologies and regions in Ethiopia in terms of their vegetation types. For instance, dry land agro-ecologies are predominantly covered by dry forests such as Dry afro-montane forests, <i>Combretum-Terminalia</i> (broad-leaved) deciduous woodlands, <i>Acacia-Commiphora</i> (small-leaved) deciduous woodlands, the lowland dry forests, the lowland semi-desert and desert vegetation and lowland bamboo, among others. These vegetations are also not uniformly distributed across drylands in the country. DDA has vegetation formation characterized as arid and semi-arid vegetation which is highly variable, including cactus scrub, thorn scrub and areas dominated by woody species, and sparse grasses formations. In contrast to what is common in many regions in the country,</p>

Project Sites/Area	Biodiversity and Natural Habitat
	<p>there is no climax forest in DDA. The small exception is the remaining patches of <i>Junipers</i> open woodland with <i>Eucalyptus</i> plantations in the upper reaches of the western part of the escarpment and some <i>Acacia</i> dominated forests in the low lands. Below the escarpment and in the valleys between the ridges there is <i>Eucalyptus</i> wood lots. The ridges are largely devoid of vegetation with only scattered low shrubs and grass land. The plains to the north-east are also bare, whilst those to the south east are covered with low shrub land.</p> <p>According to the land cover mapping units of DDA, quantitatively, about 9.2% of the total area of DDA is covered by physiognomic vegetation, while an estimated 4.93% and 3.67 % is covered by <i>Prosopisjuliflora</i> plantation and other open shrubland, respectively. Whereas, the rest 0.58% and the vast majority of the land (60.48%) is covered with dense shrubland and exposed soil, sand or rock with scrubs and grasses, respectively. However, the natural forest of the Administration has been cleared to satisfy the demands of the ever-increasing population, such as construction material, fuel wood, fodder and agricultural expansion.</p> <p>Fauna /Wildlife/: A recent study on wildlife resource of DDA states that there was no nationally or locally known protected or conservation areas in Dire Dawa Administrative Council, and hence no conflict between conservation areas and other options of land uses like potential development ventures in the areas is expected to arise in the absence of one. Wildlife densities and diversities (larger mammals) in Dire Dawa Administration are currently quite low due to poaching and unregulated uses of their habitats. But still, there is a high potential if effective integrated and coordinated management and institutional arrangements are in place.</p>

2.3 Socio-economic Status

Socio-economic status of the project sites has been summarized as follows from different secondary data sources.

Table 3: Socio-economic status of target areas

Project Sites/Area	Socio-economic status
<p>Mekelle</p>	<p>Population dynamics: Though there is no detailed study on why the population of Mekelle city is growing rapidly, there are hypothetical reasons the city administration states. These are: • Change of boundaries: built up areas that emerged due to urban expansion and changes in political or administrative boundaries.</p> <p>Occupation, Income and Poverty: When we see the occupation pattern, income level and poverty line of the city according to the house hold survey done for the Mekelle Structural plan 2014, it can be presented as follows: Private business is the most common form of occupation with about 23.5% of the total respondents. This is followed by government employment which is only roughly one percent less from that of the private business. A point worth noting is that multiple employments are very small with only roughly 2.2% of the total and the size of dependents is quite big with a share of 20.8% of the total. The city has a fair degree of household income source diversification. Households with multiple sources of income have a significant contribution with roughly 23%. Salary is the most important income generating 31.7% of the total household income. It is followed by, as might be expected, income from trade which accounts for about 28.8% of the total household income.</p>

Land issues: In any big Ethiopian city, including Mekelle, the major formal land delivery system for residential housing and investment is through the lease system. According to Ethiopian law, land is a public property and an individual can enjoy only the right to the use of land under his/her possession. To legally own a plot of land for housing development and investment purpose is, thus, reliant on the effectiveness of the lease policy. The lease proclamation No 272/2002, which is the current active law regarding land provision, includes provisions on how an individual can acquire a piece of land. Under this proclamation, land can be acquired through an auction system, negotiation, lottery system and the award system. The price of lease in Mekelle, as in other Ethiopian cities, increased drastically during the last ten years. This makes it difficult for low-income groups to acquire land in the city. Currently, the city of Mekelle is expanding very fast with a rapid population growth as well as big migration from rural areas and other smaller nearby towns. This transformation is also bringing a high demand for land for residential and other functions. Due to this influx, the city is expanding to the neighboring rural towns incorporating them into the city.

Housing conditions: The Tigray vernacular architecture, including Mekelle, is well known for the use of stone as a main construction material. It is the most readily available material especially in the rural as well as city periphery areas. Looking at the housing conditions in the informal settlements in Mekelle, they are relatively well constructed compared to the chika houses (Mud and straw houses) in Addis Ababa or other cities in Ethiopia. However, some of the houses are poorly constructed which makes them require regular maintenance

General infrastructures: As in any informal settlement in other city, also the ones in Mekelle are characterized for not having proper infrastructures; the roads are mostly unpaved and irregular, and some of the houses do not have access to adequate water and electrical supply. Lack of proper sanitation is also an issue.

Bahir Dar

Population dynamics: Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), Bahir Dar Special Zone has a total population of 221,991, of whom 108,456 are men and 113,535 women; 180,174 or 81.16% are urban inhabitants, the rest of population are living at rural kebeles around Bahir Dar. Current forecast shows that at the town of Bahir Dar there are 155,428 inhabitants; the rest of urban population is living at Meshenti, Tis Abay and Zege towns which are part of Bahir Dar Special Zone. The three largest ethnic groups reported in Bahir Dar Special Zone were the Amhara (96.23%), the Tigrayan (1.11%), and the Oromo (1.1%); all other ethnic groups made up 1.56% of the population. Amharic was spoken as a first language by 96.78%, and 1.01% spoke Oromiffa; the remaining 2.21% spoke all other primary languages reported. The 1994 national census reported a total population for Bahir Dar of 96,140 in 20,857 households, of whom 45,436 were men and 50,704 women. The three largest ethnic groups reported in the city were the Amhara (93.21%), the Tigrayan (3.98%), and the Oromo (0.7%); all other ethnic groups made up 2.11% of the population. Amharic was spoken as a first language by 95.52%, and 2.93% spoke Tigrinya; the remaining 1.55% spoke all other primary languages reported.

Education and health services: According to communication office of Bahirdar annual bulletin publication which was published in 2009 EFY, there are 48 kindergartener school, 70 primary school and 17 secondary school. If we look at teaching staff at all level, at pre-primary level the number of teachers is M =8 F=324 T=333, at primary level M=658 F=833 T=1491 whereas at secondary level

	<p>M=518 F=188 T=706 teachers are working at the end of 2009 EFY. Whereas when we look at the enrolment rate of the city at pre-primary level, primary level, secondary level, the enrolment rate is 57.5%, 111.5%, and 90.32% respectively. Over a period, female participation rate has shown a tremendous change. The participation rate of female at pre-primary level, primary level, secondary level, preparatory level, it has been reached 49.1%, 50.9% 52.7% and 49.5% respectively. There are 124 health institutions existing in Bahir Dar city. Bahir Dar city has a total of 7 hospitals three government and four private owned hospital, 10 health centers, 49 clinics. In the category of Youth centre, Bahir Dar City Administration has 5 Youth centers among this Model Youth center is the Biggest in both service and number of buildings to provide the service to the city. Collectively the youth centers have 33 buildings and 3,811.13 m² area coverage. (source: AMP of Bahir dar,2009)</p> <p>Land use / Land cover: In metropolitan cities with high projected population and uncertain development dynamics, the task of land use analysis is more challenging since the drivers of land use change are more complex, interrelated and unpredictable. According to the structural plan, the land use of Bahir Dar was analyzed on a parcel basis based on nine parameters/standards that include location, shape, area, orientation, distribution, quantity, hierarchy, relation/integration, and incompatibility. Based on analysis, the land use is classified as Housing (H), Commerce, and Business & Administration (CBA), services (S), Recreation & Environmental Sensitive Areas (RE), Manufacturing and Storage (M), Transportation, Infrastructure, Utilities (TU), Cultural Village, Navigation Route, Nile Marathon, View & Ventilation Corridor (CNN) and Special Function (SF).</p> <p>Archeological, Cultural Heritage and Religious Sites: Bahir Dar is one of the leading tourist destinations in Ethiopia, with a variety of attractions in the nearby Lake Tana and Blue Nile River. The number of services providing Banks (both government and private), insurance companies, modern shops, government offices, business organizations, tour and travel agents, hotels, bars and restaurants are growing from time to time. The presence of the above-mentioned facilities in Bahir Dar is now hosting an ever-increasing number of inflowing domestic and international tourists almost throughout the year. Lake Tana in Bahir Dar city and Tis Issat falls 30 km from the city has attracted many visitors to the city. The major tourist attraction sites found in and around Bahir Dar include monastery of Kibran Gabriel, Churches and monasteries of Zegie peninsula at the south western side of Lake Tana, Ura Kidane Mihiret, Azwa Mariam and other monasteries that dates back to the 12th century. This place can be reached from Bahir Dar city mainly by boat. Sites of historical and religious heritages are commonly found inside the Tana Lake and its small islands. But the presence of such sites in the mainland of Bahir Dar town is less common.</p> <p>Infrastructures: In terms of road network, Bahir Dar is connected with Addis Ababa by a recently upgraded asphalted road, which is about 552km long. There are also several roads radiating from Bahir Dar and linking all the districts of the Bahir Dar Zone and Woreda.</p>
Bishoftu	<p>The landfill surrounding settlements has favorable climatic condition for agriculture crop production, Dairy farm, poultry production because of its accessibility and proximity to city capital market center and also agro processing are highly practiced in the city individually, at house hold level, at micro and small enterprise, cooperative and at huge investment level.</p> <p>Land use / Land cover: Previously the site is farming land and all necessary compensation was paid for the land owner to resettle them and some scattered settlements on the northern side of the site and relatively well-established settlements towards the northwestern of the site also relocated in the short and long run. The risks to public health and impacts on the areas surrounding the landfill can be limited by providing buffer zones between the landfill and sensitive areas.</p>
Hawassa	<p>Population, Nationality and Religion: As per the 1994 projection of the Population and Housing Census, the population of the city of Hawassa in the year 2000 is estimated to reach 107,700 having a growth rate of 4.11% per annum. The average household size is about 4.9. Some 70% of the households</p>

own the houses they live in. Regarding migration patterns, some 44% of the population is immigrants from rural parts of Hawassa Zuria Woreda and other areas. In recent years students enrolled to Southern University and to the other Colleges in the City contributed a lot to the surprising increment of immigrant numbers in Hawassa.

The major nationalities in the city of Hawassa are Amhara (31.4%), Wolayta (24.9%), Oromo (11.5%), Sidama (10.2%), Guraghe (5.4%), Kembata (4.9%), Tigray (4.6%), Siltie (2.2%), Hadiya (1.6%), and others (3.3%).

The majority of the people in the Woreda are Christians [Orthodox, Protestant, and Catholic (95.2%)], Muslims (4.1%). Also, there are some (0.7%) of the Woreda people who worship in other and traditional religions.

Economic Activities: The City of Hawassa is the capital of SNNP Region and can be characterized as the administrative center rather than the commercial or trade center. According to the 1994 Population and Housing Census, 46.5% of the adult population is economically active whereas 19.3% of the adults are unemployed. Almost 40% of the households in the city are earning their incomes from government employment (principal occupation). The main income source of the second largest group (about 24%) is a pension. Seasonal labor, artisans and business employees have income sources share of 9.3%, 7.3% and 7.3%, respectively.

Moreover, Hawassa has some industries such as sisal processing factory, ceramic factory, floor mill, agricultural development factory (oil production), cement products factory, textile factory (1&2), soft drink factory, tobacco and matches factory, etc. The economic base of Hawassa Zuria Woreda is crop farming and livestock rearing.

Social and Physical Infrastructure: The administrative setup of Hawassa City is currently divided in to seven sub cities namely: Addis Ketema, Haik Dar, Mahal Ketema, Bahil Adarash, Misrak and Menaheria sub cites. The seven sub cities comprise around 32 kebeles and have its local administration representatives elected from the community. The city is recognized for its attainment level of Municipality.

From a recent survey the city of Hawassa is known to have about 14,150 housing units, 177 shops/businesses, 72 hotels, 1 University, 2 Colleges, 16 schools, 20 kindergartens. There are also other infrastructures such as health centers, clinics, pharmacies, private offices, a market square, asphalt road crossing Hawassa city (main road from Hawassa to Dilla and other southern parts of Ethiopia), gravel roads, water supply, power supply, play grounds, commercial vehicles (buses, taxis and bicycles for rent), horse carts or Garis and abattoirs.

Housing Condition and Lighting: Nearly 99% of the houses in the city of Hawassa are non-story ground building blocks. Most houses have corrugated iron sheet roofing whereas some poor households at the periphery of the city have houses with thatched roofs. According to the 1994 Population and Housing Census report, the average household size is 4.9 whereas the latest other studies claim to be significantly higher than this figure. About 34.6% of the households own the houses they are living in whereas the rest 65.4% live in rental houses from government or private owners.

As per the Ethiopian Electric Light and Power Corporation (EELPC), some 95.2% of the total households in the city of Hawassa have electricity through shared or private meters.

Water Supply Facilities: The city of Hawassa gets its water supply from Kodo water treatment station by treating Kodo River at about 11 km south of the city at an elevation of 1811 masl. Water from Kodo

	<p>River is abstracted by tyrdan weir and the water is conveyed through PVC pipe to an adjacent well with a capacity of 15.63 m³.</p> <p>The existing water treatment plant was constructed some years back and comprises of operation building with chemical dosing system, sedimentation units, rapid sand filters, a balancing chamber, clear water reservoir and service water tank. Water production from Kodo water treatment plant is 3360 m³/day.</p> <p>Sanitation Condition: Safe and appropriate sanitation coverage of residents with toilets in the city of Hawassa is about 90% whereas the remaining 10% are residents without suitable toilet facilities. According to the 1999 Household Survey report, only 20% of the households in Hawassa city have proper bath facilities whereas most of the household use buckets for bath.</p> <p>Health Situation: The Hawassa ZuriaWoreda including Hawassa city has 2 hospitals (1 is a referral hospital) three health centers (two governmental and one non-governmental), 27 clinics (six governmental, four non-governmental and seventeen private) and 11 pharmacies (three governmental, one non-governmental and seven private). The health coverage in the city is 100%.</p> <p>The ten top diseases in the city and its surroundings are malaria, intestinal parasites including giardia, pneumonia, upper respiratory tract disease, gastritis, skin disease, diarrhea, all other parasites, disease of unknown origin and amoebiasis.</p> <p>Land use/Land cover: The land use/land cover types of Hawassa city Land use/Land cover Type and the respective relative area cover percent proportion in decreasing order accounts to: Urban Agriculture (42%), Entertainment (22%), Resident (16%), Road 11, Social Services (4%), Trade (2%), Improved Services (2%) and, Administration (1%).</p>
<p>Adama</p>	<p>Population dynamics: With an area of 29.86 square kilometers, Adama has a population density of 7,374.82; all are urban inhabitants. A total of 60,174 households were counted in this city, which results in an average of 3.66 persons to a household, and 59,431 housing units.</p> <p>Adama is a busy transportation center. The city is situated along the road that connects Addis Ababa with Dire Dawa. A large number of trucks use this same route to travel to and from the seaports of Djibouti and Asseb (though the latter is not currently used by Ethiopia, following the Eritrean-Ethiopian War). Additionally, the new Addis Ababa-Djibouti Railway runs through Adama</p>
<p>Dire Dawa</p>	<p>Population dynamics: Dire Dawa city is amongst the fast-growing urban centers in the country. According to the 2017 population estimate of CSA, the total population of Dire Dawa administration is about 479,000 out of which the urban population has been estimated to be 303,000 and that of the rural population has been founded to be 176,000. Similarly, the socio-economic profile of the city indicated that the city holds huge number of residential dwellings, diversified business activities, numerous industrial establishments, higher number of social services providing institutions and abundant urban agricultural activities. According to 2005E.C study of the Regional Gross Domestic Product (RGDP), The RGDP is estimated to be about Billon and per capita income is about 749.</p> <p>Economic Activities: The annual economic growth rate of the administration is computed to be about 11.74. Looking into the composition of total regional output, Service contributed to about 13% while the remaining balance attributed to Industry (10%) and Agriculture (7%). Though the growth of the economy increases the per capita income of the residents,</p> <p>Historic and Archaeological Heritage: Dire Dawa was established in 1902 as a relatively lowland link (1200 m) bypassing the higher, ancient city of Harar on the Djibouti - Addis Ababa railway an impressively planned city, its central straight avenues and quarters are a matched only by Addis Ababa. Growth has since been more organic, and dense unplanned settlements can be seen scattered throughout the city.</p> <p>Dire Dawa is primarily known as one of the oldest Ethiopia's trade centers. The city has numerous cultural heritages such as Laga-oda Ancient Cave, Africans Graveyard built after the Second World War, Italian Mosque found at the foothill of Ganda Gara, Ancient Catholic Church, Ancient Railway</p>

Station and Kezira (Afetessa) open market area and the natural hot spring found in the northwestern part of Gerba Aneno Kebele Peasants Association, that of course may have a healing power for certain ailments.
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3 Policy, Legal and Institutional Framework

This part is to provide a comprehensive review of the Ethiopia legal and institutional framework that is of particular relevance to the NAMA COMPOST project. The main aim is to ensure the compliance of the project with the national environmental legislation as well as international conventions, treaties and guidelines, and to adopt the best available techniques in solid waste management and best practices on COMPOST preparation and utilization at project areas in Ethiopia.

This section presents the international policy, national policy, Proclamations and regulations applicable to the project under the assessment.

3.1 The FDRE Constitution, 1994

The constitution has enshrined clearly on article 44 that all citizen has the right to live in clean and healthy environment. It also states that citizens who are affected or displaced due to any development programme have the right to commensurate alternative compensation. In addition to that article 92 of the constitution states that people have the right to full consultation and to the expression of views in the planning and implementations of environmental policies and projects that affect them directly. It is also the duty and responsibility of government and citizens to protect the environment. All local rules and regulation emanate from the constitution which will give direction to enactment of environmental legal frameworks.

3.2 Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia was approved by the Council of Ministers in 1997 is aimed at guiding sustainable social and economic development of the country through the conservation and sustainable utilization of the natural, man-made and cultural resources and the environment at large without compromising needs and ability of future generation.

The goal of the Environmental Policy of Ethiopia is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through sound management

of the environment and use of resources so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

The policy lists specific objectives encompassing wide range of environmental issues to be addressed through the adoption of the policy. It also provides overarching environmental guiding principles to be adopted to harmonize the environmental elements in sectoral and cross sectoral policies. The policy includes ten sectoral environmental policies (such as (i) Soil Husbandry and Sustainable Agriculture; (ii) Forests, Woodlands and Trees; (iii) Genetic, Species and Ecosystem Biodiversity; (iv) Water Resources; (v) Energy Resources; (vi) Human Settlement, Urban Environment and Environmental Health; (vii) Control Of Hazardous Materials and Pollution from Industrial Waste; (viii) Atmospheric Pollution and Climate Change; and (ix) Cultural and Natural Heritage); and ten cross-sectoral environmental policies (such as Pollution and the Environment; Community Participation and the Environment; Social and Gender Issues; and Environmental Impact Assessment).

3.3 Environmental Impact Assessment Proclamation No. 299/2002

According to the Environmental Impact Assessment Proclamation No. 299/2002, major development programs, plans and projects of the private or public enterprises shall be subjected to Environmental Impact Assessment study before their approval for implementation. This means that Environmental Impact Assessment is a proactive (not reactive) tool used to predict and manage the environmental effects of a proposed development activity during its design, construction, operation or an ongoing industry as a result of its modification.

The Environmental Policy provides a number of guiding principles that require adherence to the general principles of sustainable development. In particular, the need to ensure that Environmental Impact Assessment (ESIA) completes the following:

- ❖ Considers impacts on human and natural environments,
- ❖ Provides for early consideration of environmental impacts in project and program design,
- ❖ Recognizes public consultation processes as essential and mandatory to effective management,
- ❖ Includes mitigation and contingency plans,
- ❖ Provides auditing and monitoring plan

- ❖ A legally binding requirement.

The proclamation also provides a legal base for the effective means of harmonizing and integrating environmental, economic, cultural and social considerations in to the planning and decision-making processes thereby promoting sustainable development. The objective of undertaking the assessment study is to ensure the impacts of a development project and the incorporated mitigating measures for the adverse significant impacts, and policy programs are adequately considered while decisions are put into effect.

3.4 Health Policy

Ethiopia's health policy was issued in 1993, with the aim of giving special attention to women and children, to neglected regions and segments of the population, and to victims of man-made disasters. The priority areas of the policy are in the fields of Information, Education and Communication (IEC) of health to create awareness and behavioral change of the society towards health issues.

Therefore, emphasis is placed on

- The control of communicable diseases, epidemics, and of diseases that are related to malnutrition and poor living conditions
- Promotion of occupational health and safety
- The development of environmental health
- Rehabilitation of health infrastructures
- Appropriate health service management systems
- Provision of essential medicines and
- Expansion of frontline and middle level health professionals.

3.5 The Conservation Strategy of Ethiopia (CSE)

The CSE, approved by the Council of Ministers in 1996, provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross sectoral policies, action plans and programs as well as providing the basis for development of appropriate institutional and legal frameworks for the implementation (EPA/Ministry of Economic Development and Co-operation 1996, MoEDAC). It also deals with providing a strategic framework for integrating environmental planning into a new and existing policies and projects.

It mainly recognizes the importance of incorporating environmental factors into development activities from the beginning so that planners may take into account environmental protection as an essential component of economic, social and cultural development.

3.6 Public Health Proclamation No 200/2000

As stated in its preambles the purpose of this proclamation is to implement the health policy of the country and for promotion of public health and creation of healthy environment for the future generation thereby enabling it assume its responsibilities.

The proclamation states that any employer shall ensure availability of occupational health service to its employee for the health safety of work environment. It is also prohibited according to the law to use machinery which generates excessive noise. This Proclamation makes provision for the protection of public health. It establishes a Public Advisory Board at the Federal and Regional level for the purpose of advising the appropriate health authority in the proper implementation of this Proclamation. "Public Health Authority" shall be the Ministry of Health, or the Health Bureau of a Regional State or of a City accountable to the Federal Government. The Public Health Authority shall appoint qualified inspectors to implement the provisions.

The proclamation states that collection of waste should be in a designated place which does not affect the health of the public and disposition of waste shall be made in a manner that will not affect the environment or human health. Furthermore, the proclamation clearly states in its penalty clause that failure to abide by this proclamation on public health shall result in both civil and criminal liability.

3.7 Proclamation on Environmental Pollution Control (NO 300/2002)

This Proclamation is mainly based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment of the country and its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the violation of these standards a punishable act. The Proclamation states that the "polluter pays" principle will be applied to all persons. There are also penalties for offences in environmental pollution. A juridical person is liable on conviction to a fine of Birr 10000 to 20000. The proclamation under its penalty clause states that the officer who is in charge and who should have known the commission of the offence and who failed to fulfill his duty shall be liable to birr 5000 to 10000 fine or to two years imprisonment.

Based on this proclamation the council of ministers has issued a regulation (No 159/2008) on prevention of industrial pollution. The regulation has stated the following as a general obligation to prevent industrial pollution

- A factory shall prevent or if that is not possible shall minimize the generation of every pollutant to an amount not exceeding the limit set by the relevant environmental standard and dispose of it in an environmentally sound manner
- Every factory shall have the obligation to handle equipment inputs and products in a manner that prevents damage to the environment and to human and animal health
- Every factory shall notify the competent environmental organ any potentially pollutant, input or product under its possession

Regarding monitoring and environmental safety, the regulation under its article 9 states that a factory is required with a view to ensuring its compliance with the regulation to prepare and implement its own internal environmental monitoring system. Furthermore, the regulation states on reporting and information that any factory shall keep written information describing the equipment and input it has used, the product it has produced, the pollutant it has generated, and the disposal mechanism it has used to dispose of pollutant and other related matters. It shall submit annual report to competent environmental organ describing how it is complying with the provision of this regulation.

The provision of this regulation applies to factory which is listed in industrial sector. The regulation states that a factory shall prevent or if that is not possible shall minimize the generation of every pollution to an amount not exceeding the limit set by relevant environmental standards and expected to dispose in an environmentally sound manner.

3.8 Solid Waste Management Proclamation (No. 513/2007)

This proclamation aims to prevent environmental damage from solid waste while harnessing its potential economic benefits. It defines solid waste management as the collection, transportation, storage, recycling or disposal of solid waste. The proclamation states that solid waste management action plans designed by, and implemented at, the lowest administrative units of urban administrations can ensure community participation and it is essential to promote community participation in order to prevent the adverse effects and enhance the benefits resulting from solid waste.

As it is clearly indicated all project activities must make sure their waste meets environmental standards, and obtain a permit before discharging any liquid waste in any case. On the other hand, project stakeholders must monitor the composition of its waste, keep records and report periodically to the Environmental Protection Authority where the project is under implementation.

Solid wastes can be transported from one regional state or urban administration to another regional state or urban administration only if the recipient regional state or urban administration has notified the sender in writing of its capacity to recycle or dispose of it in an environmentally sound manner. The Proclamation has also listed the management of different solid wastes such as glass containers and tin cans, plastic bags, used tires, food related solid wastes, construction debris and demolition wastes.

3.9 Solid Waste Management Standards in Ethiopia

There is a Solid Waste Management Standard developed by the Ministry of Urban Development and Construction but was not adopted by the cities until recently. The project has transposed this standard to the six cities on which municipal staff are trained and supported to develop related plan. We also have examined the legal system that governs waste such as solid waste management proclamation and environmental pollution control proclamation (Table 4).

Table 4: Breakdown of Solid Waste Management Proclamation No. 513 and the Environmental Pollution Control proclamation

Solid waste management Activity	Law or Act	Description
Source reduction/segregation - households	Solid Waste Management proclamation, Article 11.1	Households shall ensure that recyclable solid wastes are segregated
Collection and storage	Solid Waste Management proclamation, Article 11.2	Urban administration shall ensure that adequate HH solid waste collection facilities are in place to ensure the installation of marked waste bins by streets and in other public places guaranteeing the collections of solid waste from bins with sufficient frequency
Transportation	Solid Waste Management proclamation, Article 13.2	Urban administration shall set the standards to determine the skills of drivers and equipment operators and prevent overloads of solid waste
Treatment	Environmental Pollution Control Proclamation, Article 5.1	All urban administrations shall ensure the collections, transportation, and, as appropriate, the recycling, treatments or safe disposal of municipal waste through the institution of an integrated municipal waste management system
Disposal/Landfill	Solid Waste Management proclamation, Article 14,15	Construction of solid waste disposal sites and auditing existing solid waste disposal waste
Recycling and reuse	Solid Waste Management proclamation, Article 7.1	Manufacturer or importer of glass container or tin cans shall...collect and recycle glass or tins
Hazardous waste	Environmental Pollution Control Proclamation, Article 4.2	Any person engaged in the collection, recycling, transportation, treatment or disposal of any hazardous waste shall take appropriate precaution to prevent any damage to the environment or to human health or well-being.

3.10 Proclamation on Hazardous Waste Management and Disposal Control No. 1090/2018

The purpose of this proclamation is to prevent and control problems of environmental pollution caused by the mismanagement and disposal of hazardous waste. It is also to control the generation, storage, treatment, recycling and reuse of hazardous waste in order to prevent harm to human and animal health as well as the environment.

The proclamation applies to a legal person who generates reuses, recycles, stores, transports or disposes hazardous waste at large in the country.

Regarding the management of waste, the proclamation directs that the waste producer has to minimize the release of hazardous waste by reducing hazardous substances in raw materials during production. The proclamation clearly stipulates the responsibility of the waste generator as follows:

- Collect, segregate and dispose or to be disposed of hazardous waste by authorized body
- Ensure that the container of hazardous waste is properly packed and carefully labeled with Amharic and English language
- Keep record of the type of hazardous waste that exist in the temporary container and show at any time when requested by appropriate inspector
- Not to store hazardous waste for more than one month

The proclamation states that reuse of hazardous waste is allowed provided it does not make harm to the human, animal health and environment. However hazardous waste must be removed properly if it is proved it is impossible to recycle after treatment.

In accordance with this proclamation, the movement of hazardous waste is illegal if it is carried out without the permission of authorized body. It is also deemed to be illegal if it contravenes the Basel convention ratified by Ethiopia and other national laws related with hazardous waste.

In its penalty clause the proclamation clearly put that the authorized ministry may suspend a person trading license for 15 days if it fails to comply with requirements and conditions of transportation, storage and recycling of hazardous waste. It also states that storing, transporting and recycling of hazardous waste without obtaining authorization from pertinent government body shall be punished with rigorous imprisonment of 5 years and a fine of birr 500,000. The same penalty applies for releasing untreated hazardous waste into the environment.

3.11 Compost Preparation Standard, MUDH November 2017

This standard document specifies requirements, sampling & testing methods, selection of composting site & technology, land use & composting process and composting site management system which is applicable on organic municipal solid waste.

As a general requirement the standard indicates that composting site shall be built far from human activities in order to minimize the effect of bad smelling, dust, littering, and noise pollution. Regarding site selection the standard clearly states the proximity of compost site to the following residential area and amenities 400 meters from residential area, 300 meters from commercial centers, lakes and industries, 150 meters from rivers, springs and well.

Furthermore, the standard put the composting technology to be used and technology selection shall consider the following criteria:

- A. Able to produce high quantity of compost.
- B. Cost-effective.
- C. Able to serve long time.
- D. Availability of spare parts.
- E. Environmentally friendly.

In addition to this external condition like climate and geological condition, characteristics of organic solid waste, level of organic waste pollution, human resources and finance, health and environment condition, compost market and demand have to be considered in compost technology condition.

The standard also sets the following requirements for compost site. Waste that is generated in composting site shall be managed according to the following standard:

- Composting site shall be clean at any time.
- Composting site waste management includes cleaning of composting beds, stores, parking lots, garage, administrative office, road & curb sides, drainage, green area and dust bins.
- Waste generated from composting site shall be managed according to Solid Waste Management Standard no. MUDH 07:2007.
- Organic waste generated from composting site shall be used as composting input.
- Inorganic waste, weather it is generated within the composting site or brought in, shall be managed according to Solid Waste Management Standard code no. MUDH 07:2007.
- Dustbins shall be availed inside composting site and designed in accordance with solid waste management Standard code no. MUDH 07:2007.
- Liquid Waste generated from administrative building and public toilet shall be managed in accordance with public and communal toilets & shower serves standard code no. MUDH 28:2007.
- In order to manage leachate, the compost site shall have an oxidation pond.
- The compost site shall have toilet and bathrooms in accordance with the public and communal toilets & shower standard code number MUDH 28:2007.

In addition, the composting site administration shall have the responsibility to beautify the compound. Indigenous & ornamental plants shall be planted every 30 centimeters within the compound and trees shall be planted every 3 meters around the composting site for shade and wind break.

As general requirements first aid kit shall be available and the composting site management shall provide soap and tissue paper for personal hygiene & sanitation as well as detergents & disinfectants to remove bad odor and microorganisms.

Safety & personal protective equipment and accessories like leather or plastic boots, heavy duty hand glove, mask, helmet and eyeglass/goggle/ shall be provided for workers engaged in composting. In addition, cleaners and guards of the composting site shall have heavy duty glove, boots, mask, uniform, umbrella, rain coat and hand torch as appropriate.

Workers shall get medical examination from the composting enterprise to the minimum twice a year (every six months). And Workers shall get health insurance from the composting enterprise. Furthermore, to protect the health of workers, a minimum of one liter of milk per day shall be provided. The concerned composting site managers shall have risk management (accident registration, investigation & mitigation) system.

All Workers of the composting site shall be provided with complete personal hygiene and safety equipment's and obliged to use it.

Regarding safety requirements firefighting equipment shall always be available at the composting site and the source of the fire hazard shall be identified and taken under control.

The standard has clearly described the following measures to be taken to avoid the problems associated with the compost production:

For reducing gas & bad odor emissions: increasing aeration, preventing water logging, reducing moisture content, minimizing the volume of compost input storage and installing odor controlling device.

For reducing adverse effects of ammonia and amines: Balancing Carbon to Nitrogen ratio.

For reducing dust particles and pathogens- Covering the compost material, sprinkling water on dusty areas, planting open spaces, paving composting area, input storage and loading and unloading spaces, planting wind break trees and vacuum cleaning;

To protect the adjoining properties from noise pollution created by vehicles & machineries appropriate buffering shall be applied as per sub-clause 5.3.2 of this standard document.

3.12 International Conventions and Protocols

3.13.1. Kyoto Protocol to the UN Framework Convention on Climate Change

To further strengthen the commitments of countries to implement the Convention on Climate Change there was a need for a refined protocol that helps in implementing and elaborating policies and measures in accordance with national circumstances. The Kyoto protocol promotes sustainable development through protection and enhancement of sinks and reservoirs of greenhouse gases.

Ethiopia has ratified the protocol through proclamation and it provides for the ratification of the Kyoto protocol to the United Nations Framework Convention on Climate Change and authorizes the environmental protection authority to take, in cooperation with the appropriate federal, regional and city administration government organs, actions necessary to implement the protocol.

3.13.2. International Convention on Biodiversity

The Objective of this convention is the conservation of biological diversity. The sustainable use of its components and the fair equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies.

The Principle of the conventions point out that states have, in accordance with the charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction.

3.13.3. United Nation Convention to Combat Desertification

The serious degradation of land and the appearance more and more arid areas has threatened livelihood of over 900 million people in about 100 countries or 25% the total land area of the planet. Main reasons of the desertification are the unreasonable use of land and natural resources plus unusual changes of the global climate. Desertification is synonymous with increasing diseases, hunger and poverty and low food productivity threatening hundreds of millions of poor to migrate for their livelihoods. To enable joint action of the international community to combat desertification, the draft of UNCCD was submitted for consideration in the Summit Meeting on Environment and Development held in Rio de Janeiro, Brazil in June 1992. After one year for consulting contribution from more than 100 countries, the UNCCD was at last completed in June 1994 and opened for all UN party countries signing on 14-15 October 1994. In December 1996, only 50 countries acceded, but the number of UNCCD party reached 191 countries. That reconfirmed the desertification to be a worldwide problem, which, the whole world community has been aware of a joint action to combat.

The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective

action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas.

Achieving this objective will involve long-term integrated strategies that focus simultaneously, in affected areas, on improved productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, in particular at the community level.

Objectives of United Nations Convention to Combat Desertification:

- Develop National Action Programme, Sub-Regional Action Programme (SRAP) and Regional Action Programme (RAP) to prevent and combat drought and desertification;
- Call for financial aid from international community to combat desertification;
- Exchange of information and technologies in field of combating desertification;
- Preventing bad consequences of desertification leading to mass migration of people, extinction of many species of fauna and flora, and changes of climate, etc.

The convention has a number of articles which discuss about different issues. In this convention, article five and six points out the obligations of affected country parties and developed country parties which is presented as follows:

Obligations of affected country Parties:

In addition to their obligations pursuant to article 4, affected country Parties undertake to:

- Give due priority to combating desertification and mitigating the effects of drought, and allocate adequate resources in accordance with their circumstances and capabilities;
- Establish strategies and priorities, within the framework of sustainable development plans and/or policies, to combat desertification and mitigate the effects of drought;
- Address the underlying causes of desertification and pay special attention to the socio-economic factors contributing to desertification processes;
- Promote awareness and facilitate the participation of local populations, particularly women and youth, with the support of nongovernmental organizations, in efforts to combat desertification and mitigate the effects of drought; and
- Provide an enabling environment by strengthening, as appropriate, relevant existing legislation and, where they do not exist, enacting new laws and establishing long-term policies and action programmes.

Obligations of developed country Parties:

In addition to their general obligations pursuant to article 4, developed country Parties undertake to:

- Actively support, as agreed, individually or jointly, the efforts of affected developing country Parties, particularly those in Africa, and the least developed countries, to combat desertification and mitigate the effects of drought;
- Provide substantial financial resources and other forms of support to assist affected developing country Parties, particularly those in Africa, effectively to develop and implement their own long-term plans and strategies to combat desertification and mitigate the effects of drought;
- Promote the mobilization of new and additional funding pursuant to article 20, paragraph 2 (b);
- Encourage the mobilization of funding from the private sector and other non-governmental sources; and
- Promote and facilitate access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how

3.13.4. UNDP safeguard policies and procedures

UNDP 's Programme and Operations Policies and Procedures (POPP), for Programme and Project Management includes a policy statement requiring that environmental sustainability must be mainstreamed in UNDP 's Programme and Project Management cycles. In this regard, the POPP will be updated to include a required environmental screening procedure for projects to determine if further environmental assessment is required.

UNDP safeguard policies and procedures focus on the following key points:

- A. ENVIRONMENTAL ASSESSMENT: Overarching Objective: To help ensure the environmental and social soundness and sustainability of investment projects and to support integration of environmental and social aspects of projects into the decision-making process.
- B. NATURAL HABITATS: Overall Objective: To promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.
- D. INVOLUNTARY RESETTLEMENT: Overarching Objective: To realize the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.
- D. INVOLUNTARY RESETTLEMENT: Overarching Objective: To avoid or minimize involuntary resettlement and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.
- E. INDIGENOUS PEOPLES: Overarching Objective: To design and implement projects in a way that fosters full respect for Indigenous Peoples 'dignity, human rights, and cultural uniqueness and so that they: (a) receive culturally compatible social and economic benefits; and (b) do not suffer adverse effects during the development process.

- F. PHYSICAL & CULTURAL RESOURCES (PCR): Overarching Objective: To assist in preserving physical cultural resources and avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.

In addition to the safeguard policies and procedures, UNDP’s social and environmental standards (SES) underpin our commitment to mainstream social and environmental sustainability in our Programmes and Projects. The objectives of the standards are to:

- Strengthen the quality of programming by ensuring a principled approach;
- Maximize social and environmental opportunities and benefits;
- Avoid adverse impacts to people and the environment;
- Minimize, mitigate, and manage adverse impacts where avoidance is not possible;
- Strengthen UNDP and partner capacities for managing social and environmental risks; and
- Ensure full and effective stakeholder engagement, including through a mechanism to respond to complaints from project-affected people.

The SES are an integral component of UNDP’s quality assurance and risk management approach to programming. This includes UNDP’s social and environmental screening procedure.

The standards are underpinned by an accountability mechanism with two key functions:

1. A Stakeholder Response Mechanism (SRM) that ensures individuals, peoples, and communities affected by UNDP projects have access to appropriate procedures for hearing and addressing project-related grievances; and
2. A Compliance Review process to respond to claims that UNDP is not in compliance with UNDP’s social and environmental policies.

Through application of the SES and Accountability Mechanism, UNDP enhances the consistency, transparency and accountability of its decision-making and actions, improves performance, and strengthens achievement of positive development outcomes

3.13.5. IFC Environmental Health and Safety Guidelines on Noise Management

The IFC guideline provides that the preferred method for noise reduction is from stationary source. It has indicated the reduction option to be considered like selecting equipment with lower sound levels, installing silencers for fans, installing suitable mufflers on engine exhaust and compressor components, improving the acoustic performance of constructed building, apply sound installation, relocating noise sources to less sensitive areas and reducing project traffic routing through community areas where possible.

According to IFC standard on noise level in the industrial and commercial areas the dB level should not exceed 70dB as indicated below.

Table 5: IFC standard on noise level

One hour (dBA)

Receptor	Day time	Night time
Residential, institutional and educational areas	55	45
Industrial and commercial areas	70	70

3.13.6. IFC Environmental Health and Safety Guidelines on Waste Management

Waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring. Facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements.

Hazardous waste should be stored so as to prevent or control accidental releases to air, soil, and water resources. On-site and Off-site transportation of waste should be conducted so as to prevent or minimize spills, releases, and exposures to employees and the public.

Vehicles and other equipment used for collection industrial non-hazardous wastes should not be used for collection of MSW without prior cleaning to remove waste residues.

In the absence of qualified commercial or government-owned waste vendors (taking into consideration proximity and transportation requirements), facilities generating waste should have the technical capability to manage the waste in a manner that reduces immediate and future impact to the environment.

3.14. Urban Greenery Legal Framework and Urban Land Plan Policy

Study shows that urbanization induced high pressure on natural resources and threats to compromise the quality of life within urban areas. Urban green infrastructure is identified as an alternative nature-based and cost-effective remedy to some of these negative consequences of urbanization and over population. Urban green infrastructure has been suggested to provide multiple benefits to urban residents' through creation of interconnected network of green spaces.

Ethiopia has number of policy and legal framework on urban greenery infrastructural development and green space planning to make cities good for human living and to reduce the consequence of over population because of urbanization. The following are some of the policy frameworks of Ethiopia regarding UGI:

- The Environmental Policy of Ethiopia, which was formulated in 1997, has an objective to plan and create green spaces within urban areas that provide recreational activities, habitats for plants and animals and ameliorate urban microclimates,
- The Urban Greenery and Beautification strategy, which was formulated in 2015, has an objective to develop green spaces, which reduce environmental degradation, pollution, urban floods, and which promote environmental sustainability in the urban area

- The Ethiopian National Urban Green Infrastructure Standard, which was formulated in 2015, has an objective to create ecologically well-functioning, aesthetically pleasing, and socially beneficial green spaces in cities and provide suitable, sufficient and ecologically viable green spaces for recreational, social, economic and environmental needs of the community.
- The Green Infrastructure Based Landscape Design Supporting Manual, which was developed in 2011, also proposes to develop street tree plantings for shading, mitigating the urban heat island effect reducing runoff and sequestering carbon,

Ethiopia urban greenery policy and strategies are not well implemented in urban areas. However, some the planning documents, which relate to current green space planning practices, have considered the issue of social inclusiveness in different ways. For instance:

- The Ethiopia National Urban Green Infrastructure Standard states that urban green infrastructure shall be managed and administered in the interests of the local community and shall address its needs. The long-term collective interests of the local community shall be prioritized over the interests of any specific interest group or sector of society.
- The Growth and Transformation Plan (II) that was formulated in 2016 by the National Planning Commission of Federal Democratic Republic of Ethiopia has planned to increase the coverage of green infrastructure and recreational areas in urban centers of the country. Enhancing the awareness and participation of the community and stakeholders has been identified as important measures of green space planning in the document.
- The Urban Greenery and Beautification Strategy has an objective to involve the community and stakeholders in sustainable ways during the development of urban green spaces. Moreover, the strategy states that urban greenery planning can be successful only when there is active participation of the community and the stakeholders.
- The Participatory Urban Planning Manual that was formulated in 2007 by the Ministry of Urban Development and Housing has the objective of involving disadvantaged groups into decision-making during urban plan preparation, which includes planning of green spaces. Moreover, the manual has an objective to pay attention to the priorities, needs and constraints of the city's population, especially to low-income groups during urban plan preparation, which includes green space planning.

Thus, NAMA compost project objective is inline with Ethiopia urban greenery infrastructure development policy and in line with urban land plan policy. Therefore, NAMA compost will definitely contribute to the national effort in urban greenery infrastructure development.

3.15. Administrative and Institutional Framework

Ethiopia's solid waste management proclamation was issued in 2018 with the aim of to enhance capacities to prevent the possible adverse impacts while creating economically and socially beneficial assets out of solid wastes.

The main authorities involved in the Ethiopia solid waste management sector are Ministry of Urban Development and Housing (MoUDC), Regional Bureau of Urban Development and Construction, Micro and Small Enterprises (MSEs) Agencies, United Nations Development Programme (UNDP) and concerned municipalities at each regional state or cities. In addition, formal government organizations or structures involved in solid waste management includes City Administration; Sub-city administrations; District (kebele) administrations; Sanitation, Beautification and Park Development Authority (SBPDA); Environmental Protection Authority and others. Other institutions are indirectly involved, mainly the Ministry of Finance (MoF), Ministry of Agriculture (MoA), Public Health Institutions (PHI) or Ministry of Health (MoH), Environment, Forest and Climate Change Commission (EFCCC) and others. Having several institutions and authorities involved in the SWM sector results there are several uncertainties regarding the roles and responsibilities and the levels of authority.

Although a legal framework for Solid Waste Management in Ethiopia is new (proclaimed in 2018), Ministry of Urban Development considered SWM as one of the priority themes in its annual work plan and committed to work with relevant governmental and non-governmental organization like UNDP. The legal framework in general and the work plan in particular aims to enhance capacities to prevent the possible adverse impacts while creating economically and socially beneficial assets out of solid wastes.

The correspondent administrative and institutional roles and duties with respect to the ongoing project are specified below.

1. Ministry of Urban Development and Construction/Housing (MoUDC/
2. Ministry of Finance (MoF)
3. Micro Finance Institutions (MFI)
4. Micro and Small Enterprise Agency
5. Ministry of Agriculture (MoA)
6. City/Town Administration
7. United Nations Development Programme (UNDP)
8. National and International NGOs

Table 6: Administrative and institutional roles and responsibilities

No	Stakeholders	Roles and Responsibilities	Remark
		The MoUDC is the principal federal Government organ responsible for UGI and ISWM and to provide coordinated support to urban centers to make them capable of influencing their surroundings in implementing UGI into ISWM	

1	MoUDC	<p>initiatives. MoUDC is the lead implementing body for the Government’s national initiative on Green Infrastructure. Its Urban Planning, Sanitation and Beautification Bureau manages urban waste and greenery initiatives. It also oversees land-cover and housing projects, and is active in supervising MSE activities. In the context of this project, MoUDC will coordinate with competent authorities such as Regional Bureaus and City Administrations to undertake management of UGI/IWSM elements during project implementation.</p> <p>In addition, the Urban Planning, Sanitation and Beautification Bureau of the MoUDC is responsible for overall project coordination – i.e. for sharing project reports, involve stakeholders to contribute at different stage of the project implementation, and to collaborate with stakeholders to find alternatives solutions if and when problems arise. It will also coordinate Government ministries and stakeholders in UGI/ISWM activities; and liaise with donors and potential participants in the voluntary carbon offset market. The MoUDC will play a catalytic role in the implementation of the national voluntary carbon offset scheme through the provision of cash co-financing to operationalize it.</p> <p>MoUDC will assure the social and environmental safeguards of the project are implemented in the intervention cities.</p>	
2	MoF	<p>MoF oversees the Climate Resilient Green Economy (CRGE) Facility. The Facility has been established in order to channel international financing for the implementation of Ethiopia’s Green Economy Strategy. The project will work with the Ministry to better integrate ISWM and SWM into the CRGE Strategy.</p> <p>MoF will oversee project budget utilization, integrating the MoUDC MRV mechanism with that of the CRGE facility through EFCCC. It will also be involved in the project phase-out period to assure sustainability of the project with MoUDC’s day-to-day operations.</p>	
3	MoA	<p>The Ministry of Agriculture will provide technical guidance on sustainable urban agriculture and composting. The project will collaborate with the Agricultural Transformation Agency during composting quality testing.</p> <p>The MoA is also responsible for developing work owner/process for urban agriculture, investigating the soil condition of the urban area where horticultural products could be produced, promoting and creating market opportunities to sell the products; and providing extension services on composting.</p> <p>The project will link with MoA under the Soil Fertility Department for wider dissemination of quality compost into urban and peri-urban agriculture. The MoA will also be involved in establishing field trials on the use of compost in urban agriculture, and in the dissemination of the results to farmers. Its agricultural extension services will act as an outlet for marketing of compost in urban agriculture.</p>	
4	MFI	<p>MFI are delivering financial services in Ethiopia with particular emphasis on rural and urban poor households, the promotion of both credit and savings products, and a strong focus on sustainability.</p>	

		MFIs have the experience of providing financial support to MSEs carrying out urban solid waste collection at the household level. Discussions with one of the largest MFIs in the Region of Oromia ⁷⁰ has revealed that it will be willing to lend to MSEs engaged in composting if the activity is supported by a sound financial and business model (as is the case with the COMPOST project).	
5	MSEs Agency	The objective of MSE is to encourage, coordinate and assist institutions engaged in service provision to the development and expansion of Micro & Small Enterprises in the country. MSE will support the MSEs that are engaged in the solid waste value chain (particularly in compost making and urban greenery development) in the 6 target cities to have access to micro-credit.	
6	City Administrations	<p>The 6 cities and towns are the main beneficiaries of the COMPOST project. For instance, all of the investment under Component 4 – which accounts for 62% of all GEF funding – will take place in the urban cities and towns. The municipalities of Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle will be implementing ISWM and UGI initiatives. These municipalities will directly recruit MSEs to implement streamlined waste collection services, rearing of seedlings in nursery operations, and the plantation of seedlings for urban green shrubbery and trees in public areas.</p> <p>Further, each one of the 6 cities and town will integrate project activities with regional universities to undertake R&D, capacity building and information sharing. These universities are: Adama University for the City of Adama and Bishoftu town; Wondogenet University for the City of Hawassa; Haramaya University for the City of Dire Dawa; Mekelle University for Mekelle City and Bahir Dar University for Bahir Dar City.</p> <p>The cities and towns will also be responsible for selecting and providing incentives for source sorting of household waste; providing or facilitating the provision of licenses to MSEs engaged in composting and UGI activities; and awareness creation at household level regarding ISWM, among others.</p>	
7	UNDP	<p>The UNDP Country Office (CO) has been supporting the Government of Ethiopia with strengthening institutional capacity for carrying out evidence-based policy planning to enhance the resilience of Ethiopia against shocks. The UNDP support is discussed below while drawing immediate links with the COMPOST project.</p> <p>UNDP will monitor the implementation of the COMPOST project, review progress in the realization of the project outputs, and ensure the proper use of UNDP/GEF funds. Working in close cooperation with MUDH, the UNDP CO will provide support services to the project - including procurement, contracting of service providers, human resources management and financial services - in accordance with the relevant UNDP Rules and Regulations, Policies and Procedures and Results-Based Management (RBM) guidelines.</p> <p>UNDP CO also provides its services through technical advice, facilitating change processes, support to mechanisms for advocacy, networking and partnership building including intermediation for information, expertise and funds, and knowledge development and dissemination.</p> <p>It will also contribute directly to the implementation of several outputs through the provision of parallel financing.</p>	

8	Beneficiary Households	Households are one of the main stakeholders in ISWM. They generate SWM and the project will rely on their participation through the segregation of organic waste from other solid wastes at the household level. They will be incentivized by the project for segregating household waste according to established guidelines.	
9	National and Local NGOs	<ul style="list-style-type: none"> • Collecting funds • Undertaking awareness campaigns • Implementing Solid Waste projects at the national level. 	

Source: NAMA COMPACT Project Document

4. Methodology and Approach

4.1 Study Area

The study covered four and one city administration where target beneficiaries live and the intended project is under implementation. The study covered six cities namely, Mekelle, Bahir Dar, Bishoftu, Adama, and Hawassa cities and Dire Dawa City Administration.

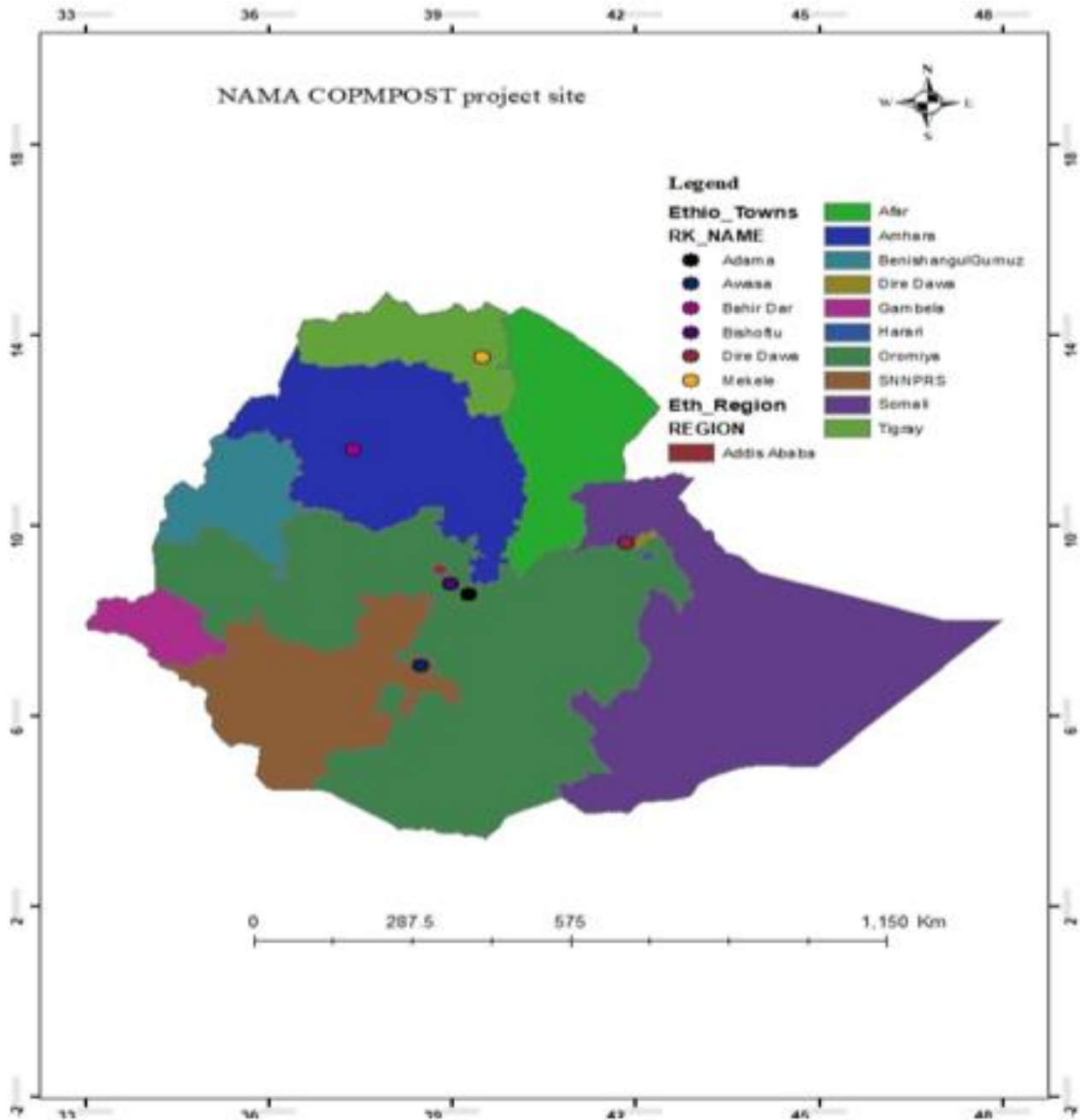


Figure 2: The geographical locations of the six cities and towns included in the NAMA COMPOST Project

Most of the primary and secondary data collected from five city administrations but only some secondary data obtained from Mekelle due to the recurrent conflict. Of course, there is no an information gap regarding the project since UNDP programme manager and his team have sufficient information which the consulting team required about Mekelle.

4.2 Conceptual Framework

The study adopted conceptual framework for both environmental and social risk and environmental and social impact assessment/auditing of Solid Waste Management mainly composting activities as well as urban green infrastructure development of the ongoing project. The conceptual frameworks are derived from United Nations Development Programme (UNDP) and other international organizations framework.

4.2.1 Environmental and Social Impact Assessment Conceptual Framework

Environmental and Social Impact Assessment (ESIA): For this study, the consulting team adopted UNDP’s social and environmental assessment conceptual framework- figure below. The ESIA will further identify and assess social and environmental impacts of the project and design appropriate avoidance, mitigation, management, and monitoring measures. It will address all relevant issues related to the SES Overarching Principles and Project-level Standards, providing input into the ESMP.

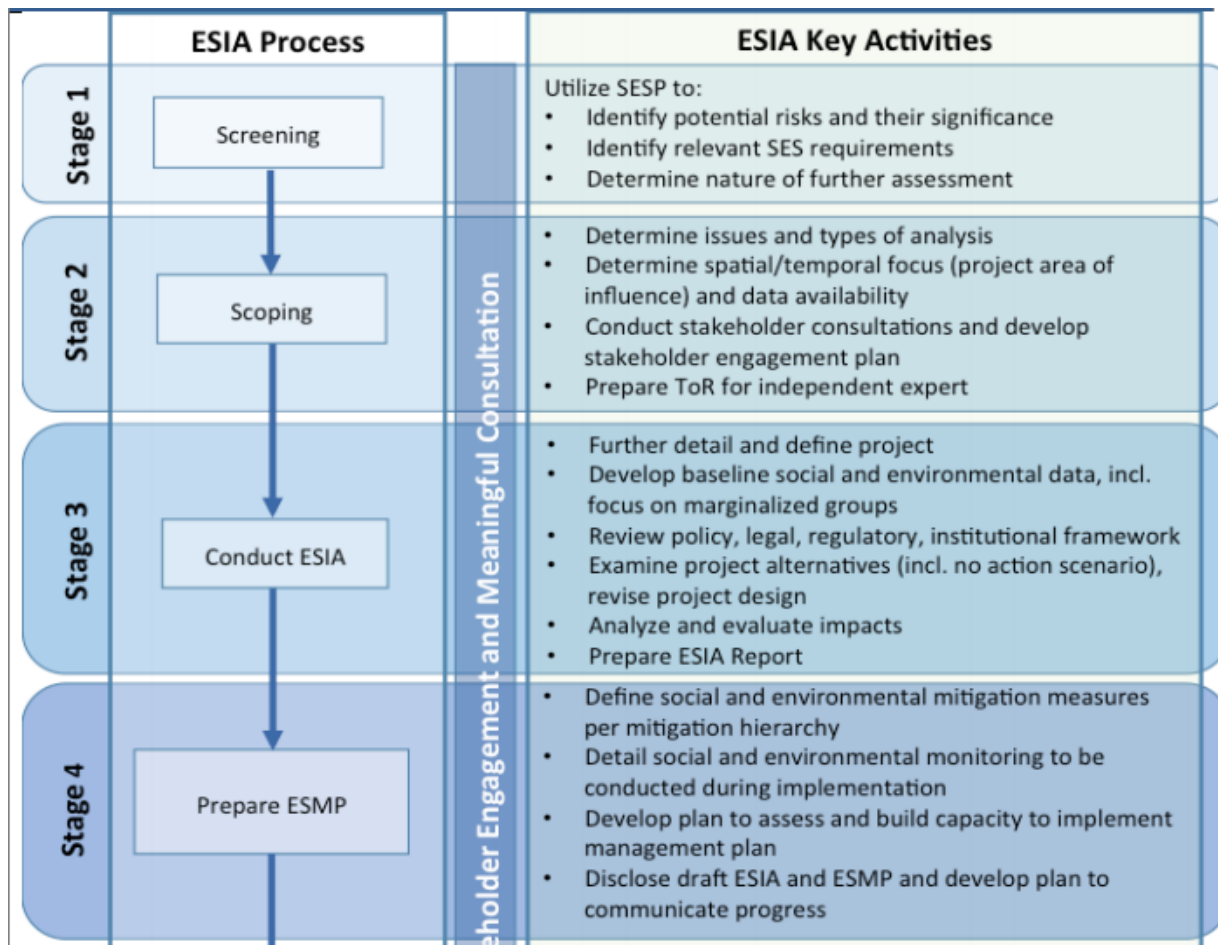


Figure 3: Key steps of ESIA, Adopted UNDP 2016

However, since the project is already started and is under implementation, almost all environmental and social issues of the project are already identified during project development phase. However, actual impact of the identified issues resulting from project execution is not known and still new unforeseen issues might have arisen in the past 4 year. In addition, newly emerged environmental and social negative or positive impacts during project implementation were not addressed. Thus, the consulting team focused on key social and environmental risks (identified or new) and undertake assessment on major impacts based on the standard checklist prepared for this purpose which is adopted from UNDP SES.

4.2.2 Environmental and Social Risk Auditing Conceptual Framework

Social Impact Assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative, of the project and any social change processes invoked by project activities under implementation.

Risk assessment process has followed the following key steps. Potential risk was identified, then the team in consultation with stakeholders were determined who might be affected (at risk) following it assess how sever the risk will be, finally formulate proper risk mitigation action designed to address major risks.



Figure 4: Environmental Risk Assessment Conceptual Framework

As the project is under implementation since 2017, the consulting team understands that potential risks have been identified before project appraisal. Thus, at this stage of the project the consulting team has undertaken assessment on materialized risks of the project and how the project is working to address these risks. However, the consulting team was also identified newly emerged risks and major impacts of the project as main deliverable of the assignment.

4.3 General Study Approach

This study employed cross sectional study which involves both qualitative and quantitative methods. The consulting team used participatory and technically effective assessment tools to understand and identify key environmental and social impacts/risks of the project intervention in the target project sites. In addition to this the study was expected to identify newly emerged and/or unidentified risks during project development phase and development appropriate mitigation plan to curve environmental and social negative impacts of the project in the project areas.

Thus, the study team employed a mixed-method approach for data collection, analysis and triangulating qualitative and quantitative data collected from: project staffs, target beneficiaries (MSE in ISWM and UGI), respective government sector offices (Municipalities), and secondary data from project office focusing on quantitative data.

As mentioned, the consulting team used a wide variety of data sources and data collection methods as needed and at every stage of the study process. Primary data was collected through key informant interviews (KII), focus group discussions (FGD) and collection and review of documents from different sources and stakeholders. In addition, physical observations were conducted in almost all project sites to witness project activities at field level which helped the team to triangulate secondary information with the reality. The general study conceptual framework represented by the following diagram:

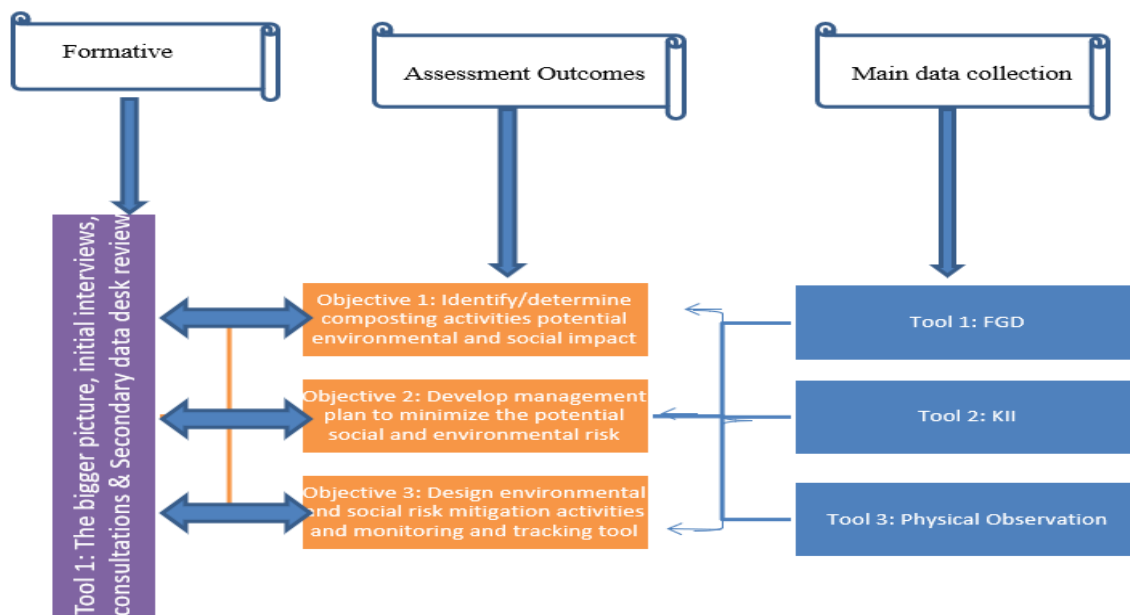


Figure 5: General study conceptual framework

For the intended purpose questionnaires/ checklists/ guides and different formats were designed to gather the required information on the set of variables identified to understand the current situation of the project impact/risk (both positive and negative) in each target project sites that can help to design appropriate environmental management and risk mitigation plan at city administration level. In general, the study accomplished following four successive phases, namely: preparation phase, data collection phase, data analysis phase, and report writing phase.

4.4 Preparation

Document review, preparation of tools for data collection, sampling of KII and FGD and inception report submission were accomplished before commencing the data collection at field level. The consulting team reviewed different documents such as: national policy, regulation and strategies, different framework and strategies for ESIA, similar studies focusing solid waste management and composting activities, national and international experience in the process of composting, and ISWM,UGI practices, Compost marketing and value chain development, regional and city administration priorities and actions made to mitigate climate change, reduce effects of pollution and other negative effects of solid waste and other related issues have been reviewed.

Solid waste management and environmental related literatures, study reports, policy and strategy papers and other relevant documents have been reviewed and analyzed for the intended purpose.

Based on a clear insight gained during document review and as per the agreed methods, tools (detail questions) for both quantitative and qualitative data collection was prepared. Different checklist/guides were developed to collect qualitative and some quantitative data from representative sector offices and individual interviewees in selected target project areas. Data collection tools such as focus group discussion guide and key informants' interview checklists used to collect qualitative data from the target respondents and key government and stakeholders' staffs. Physical observation checklist used to record key information at each project sites that the team observed during data collection. A cross checking table has been used to check whether the tools (checklist/ FGD/KII guide/format) are complete enough to address all study questions.

4.5 Sampling Technique and Sample Size

4.5.1 Sampling Technique

For this study the consultant employed two stage cluster sampling technique (area sampling) to get representatives from each city administration. In each cluster the consulting team will use random sampling technique to select interviewees from beneficiary list of each group and random sampling was employed to draw participants of indirect beneficiaries in each city administration.

4.5.2 Sample Size

The project has both direct and indirect beneficiaries in project sites. Most of these beneficiaries are a member of MSE engaged in UGI and ISWM and indirect beneficiaries of the project in city administrations. Thus, the total beneficiaries of the project vary in each city administration and even in

each group of respondents. Therefore, the consulting team decided to consider many of the group members as KII and FGD participants together with indirect beneficiaries. The total KII participants were more than 52 from five city administrations from direct and indirect beneficiaries, key stakeholders and implementing institutions. To supplement the qualitative data collection, process the consulting team will also conduct at least three FGDs in each city administrations represented from direct beneficiaries (MSE groups) and indirect beneficiaries. Thus, total FGD discussion conducted was 15 with a total member of a minimum 172 participants in five project sites except Mekelle (Table 6).

4.6 Data Collection (Field Work)

4.6.1. Focus Group Discussions (FGDs)

FDG was conducted with UGI and ISWM group members and indirect beneficiary communities in the project sites that include women, men, youth, community figures, members and project staff and project leaders at each city administration except Mekelle. The consultants conducted each FGD with 7-12 (9 participants per FGD on average) participants, by using the FGD guide checklist developed for the purpose.

Table 7: Number of FGDs conducted per City Administrations

Project Sites	Number of participants	Sex		Total
		Male	Female	
Bahir Dar	13	5	3	13
Bishoftu	44	37	7	44
Awassa	35	28	7	35
Adama	36	25	11	36
Dire Dawa	44	32	12	44
Total	172	127	40	172

Sources: FGD Participants list December, 2020.



Figure 6: Some of FGD Participants at Bahir Dar left and Adama right



Figure 7: Some of FGD Participants at Bishoftu left and Dire Dawa (Harla Rural Kebele) right
 Source: FGD Participants list, December 2020.

Focus group discussions were held in five project cities (except Mekelle). The discussion was facilitated and lead by lead consultant, in each FGD the following key topics have been discussed.

Table 8: Key FGD Discussion Topics used as a checklist

FGD Discussion Topics for each Project Sites
Activity-waste sorting, transportation, composting, marketing and compost application
Major economic, social and cultural risks and impacts on community
Major risks and impacts on MSEs engaged along the value chain of solid waste management Major risks and impacts on the environment (direct and indirect as well as reversible and irreversible)
Major risks and impacts on compost users
Major Social and Environmental risks on project implementation and sustainability
Activity: plant nursery, afforestation/reforestation, land rehabilitation
Major Economic, Social and Cultural risks and impact on the community
Major risk and impacts on MSEs engaged along the value chain UGI
Major risks and impacts on the environment (direct and indirect as well as reversible and irreversible)
Major Social and Environmental risks on project implementation and sustainability
Activity: stakeholder engagement and perception

Sources: Study Inception Report December, 2020.

4.6.2. Key Informants Interviews (KIIs)

Key Informant Interview (KII) was conducted with federal government offices (MoUDC), UNDP manager, city administration staffs, project staffs, MSEs (ISWM and UGI) representatives and other community members.



Figure 8: Some KII Pictures

The aim of conducting KII was to incorporate the knowledge and perspectives of decision makers, experts and special/subject matter advisors, semi-structure interviews questions were developed and KIIs were conducted with different institutions and individuals at federal and regional city administration level.

Table 9: KII conducted at federal and city administration level

Project Site	Number of participants	Sex		Total
		Male	Female	
Bahir Dar	10	7	3	10
Bishoftu	10	6	4	10
Hawassa	11	7	4	11

Adama	10	9	1	10
Dire Dawa	12	7	5	12
Federal	2	1	1	2
Total	55	37	18	55

Source: KII Survey, December 2020



Figure 9: Some KII participants

4.6.3. Physical observation

The consultancy team observed target sites both Composing shed and UGI and took photos as well as documented some business activities. The team visited business activities of UGI, project activities of some key partners and government supported projects, and general situations in and around the project sites.



Figure 10: Pictures of physical observation by the consulting team

4.7 Data Analysis and Report Write Up

Qualitative data collected using mixed data collection methods analyzed and report has been compiled as a final and one of the key deliverables. The collected data has been cleaned and analyzed using qualitative data analysis method detailed below.

The collected qualitative data has been analyzed content-by-content to triangulate and further elaborate the findings of the assessment. Qualitative Data Analysis (QDA) is the process of turning written data such as pictures/audio-video records, interviews/records and field notes from observations, FGDs & KIIs into findings. Qualitative data analysis has been carried out following the steps given in Figure below.

Diagram which shows the steps followed during qualitative data analysis

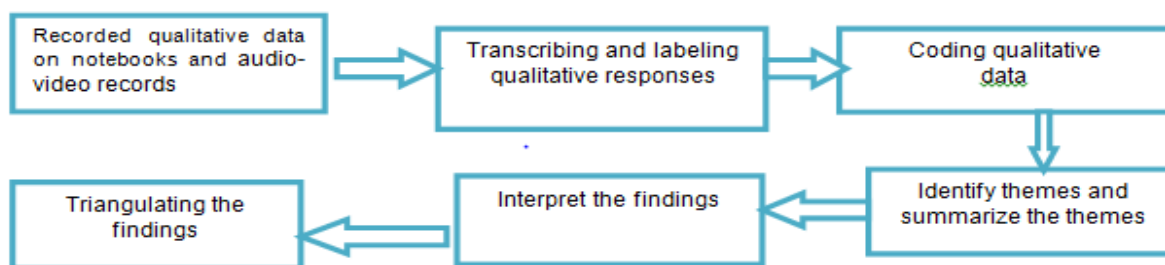


Figure 11: Qualitative Data Analysis

Then, final Environmental and Social Impact/audit assessment report has been written and submitted to MoUDC and UNDP for validation and approval

4.8 Managing Potential Limitations

The consultants in collaboration with key stakeholders have exerted maximum efforts to get the most reliable data. Appropriate data collection time was selected by considering stakeholders, MSEs involved in UGI and ISWM group suitable time, allocate enough time for interview, considering number of respondents at particular project site against total beneficiaries' respondents. These have helped to avert the potential limitations such as lack of quality due to time constraint and miss representation of appropriate number of respondents. Participatory techniques used to engage all FGD participants in all the discussion and there was probing and follow up questions to encourage all participate in the discussion. Sometimes, consultants probe those participants a bit of silent in the discussion. To the extent possible, consultants encouraged all to participate by probing and calling their names to provide their thoughts and responses so that the data is believed as good representation of the target community.

5. Baseline Information on Project Intervention Areas Prior to Project Intervention

5.1 Environmental and Social-Economic Baseline of ISWM Intervention Areas

Environmental and Social baseline as related to Integrated Solid Waste Management in the project intervention areas is established based on information provided during focus group discussions with staff of the municipalities and project management unit, project beneficiaries and community representatives of the six cities. In addition to that, baseline information collected during project document preparation is taken from the project document as secondary source of data. Accordingly, the environmental and socio-economic baseline of the six cities as related to the Integrated Solid Waste Management can be stated as follows:

There were Solid Waste Management related policies, strategies, regulations at federal level prior to project intervention. However, those were not transposed and integrated to local level administration to guide and regulate cities' solid waste management practices. Moreover, local governments within cities and towns lack the knowledge, capacity and financial resources to enforce the existing regulations.

The cities and towns collect and dispose of only half of the solid waste generated and had little or no disposal infrastructure in terms of either well-designed and operated landfill sites or disposal through recycling or incineration of organic waste. Moreover, there were increasing populations in informal settlements, which do not necessarily benefit from the collection of MSW management. A baseline assessment carried out on the SWM systems in the 6 cities and towns (Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle) during project development of NAMA COMPOST found out that both the collection efficiency of MSW at the household level and the solid waste disposal rate at the landfill were at most 75%. With a low disposal rate (70%), these rates gave an overall system efficiency of 52% of MSW being disposed of at landfills.

There were no Municipal Solid Waste sorting practices except only an informal economy related to the collection of recyclable waste at the household level. Primary waste collection was crude in all cases, with door-to-door collection by micro and small enterprises (MSEs) with 2-wheel wheelbarrows, and MSE personnel employed under very poor conditions with little regard to occupational health and safety. The collection system had no transfer stations, and filled communal bins are then loaded by skip trucks owned by the municipality or city administration for dumping at a landfill.

As stated in the project document, there were several problems related to financing the SWM system due to socio-economic acceptability, not all cities and towns had recourse to the 'water bill' method making cost recovery a problem; household waste collection at households done by the MSEs who charge higher rate and there was weak oversight by the city administration or municipality on the quality of waste collection and disposal; there was no cost recovery by the city administration/municipality for waste that is transported from communal bins to the landfill.

There were no composting and recycling practices in the six cities except small scale composting exercise in Bahir Dar using pit method and recycling of selected materials such as metal by individuals. Individuals engaged in the composting and recycling business were not well organized under MSEs, were not trained

in how to run the business or safely operate had no access to loan or support with the necessary basic materials and had very weak market linkages. There was illegal dumping of waste everywhere and the municipality had been the only entity that was collecting and transporting the waste to the landfill.

There were MSEs engaged in door-to-door waste collection but aware not well trained on Occupational Health and Safety Measures and provided with safety materials regularly. Usually, people engaged in waste management related economic activities were people with low literacy rate, low self-esteem and it was the most neglected business by the society as stated by the MSEs during Focus Group Discussion.

There was some training on Integrated Solid Waste Management field of operation. However, it was not systematically organized; proficiency level was not seriously evaluated and was not regularly conducted. There was no compost standard and guideline neither was there proper training on quality compost production. Moreover, there were no well-established composting facilities in all of the six cities and knowledge and skill to guide it.

5.1.1 Environmental Baseline

As a result of reasons raised above coupled with rapid urbanization in the six cities and towns that resulted in ever increasing waste generation, illegal dumping and high accumulation of waste at landfill had a range of environmental impacts the principal ones being:

- Waste used to be dumped in public spaces such as open areas and river banks that was deteriorating the urban open green areas and riparian corridors. River banks were full of PET water bottles and plastic waste that are carried by flooding during rainy seasons. For instance, Migara pond formed by rain water runoff from Adama city, Lake Hawassa and Lake Tana were full of waste especially PET water bottles.
- With municipal solid waste (MSW) collected and disposed of at landfills (semi-engineered or sanitary), there is an increasing generation of methane and other Green House Gases from accumulated waste that pollute the atmosphere.
- The compost sheds are constructed within the landfills (except Adama) for which environmental impact assessment was conducted. There were not residents, no vegetations, water body or natural elements that could be affected as a result of construction of the sheds.
- There was no waste segregation practice nor separate transportation in the six cities that pose difficulty to separately treat the waste according to its character. This had an increasing environmental pollution.
- Transfer station was not common in the six cities and even the existing ones were not well managed. The mixed waste collected from the source is temporarily stored in those transfer stations (when available) and transported to the land fill mixed where it pollutes the environment, air and surface water.

5.1.2 Socio-Economic Baseline

The inefficiency in waste collection and illegal dumping of waste in public spaces such as open areas and river banks had been affecting the society in many aspects. Land value of plots and rental prices of houses found around illegal dumping sites was very low. People living around and passing through these dumping areas were seriously affected by the bad smell from the accumulated waste. The illegal dumping sites also had impact on community health such as breathing related, water borne diseases and illness transmitted by fly, rodents and other vectors. Uncontrolled dumping and improper waste handling used to cause water contamination; people were being affected by flooding due to blocked drainage canals or gullies and causing damage on infrastructure such as road.

There were only few MSEs engaged in house-to-house waste collection business while no registered MSE was working on composting or recycling business. Economical contribution of waste related activities was therefore very low and government had never considered it as one of the jobs creating sectors. Since the MSEs had no proper training on Occupational Health and Safety (OHS) and regularly provided with OHS materials, their health was at risk. The improper handling and disposal of hazardous waste was resulting in health and safety hazards from fires or explosions.

5.2 Environmental and Socio-Economic Baseline UGI Intervention Areas

Environmental and Social-economic baseline as related to Urban Green Infrastructure Development in the project intervention areas is established based on information provided during focus group discussions with staff of the municipalities and project management unit, project beneficiaries and community representatives of the six cities. In addition to that, baseline information collected during project document preparation is taken from the project document as secondary source of data.

Like in the case of waste management, Urban Green Infrastructure Development Related strategies, policies and standards were available at federal level. But they were not fully integrated at city level and properly enforced. As a result, urban land was not properly utilized for UGI due to an increase in illegal holdings, weak enforcement and given little importance. Many plots which had been allocated for green area development were actually been illegally occupied and used. Consequently, people were living in fragile and environmentally important areas such as on-stream banks, which should have been reserved for vegetation growth to help with flood control.

The consulting team who developed the project document had noticed that the growth of urban centers was placing further pressure on UGI designated areas to become human settlements. Personnel from urban local governments (ULGs) hadn't the required knowledge to enforce the proper use of UGI-designated areas despite of the availability of digitized cadastral maps with satellite imagery for use by municipalities as a tool for enforcing land uses within an urban area, notably the dedicated green areas.

The cities didn't have sufficient number of MSEs that are technically qualified to manage UGI sites and run nursery areas. The then exiting MSE's personnel engaged in nursery business like in Bishoftu were not trained in nursery operations, plantation of reforested areas and maintenance of reforested areas. The local governments were sole entities to reforest and manage greenery areas with low/no community and

other stakeholders' participation. The financing of UGI initiatives is primarily from locally-collected revenues. With limited capacities to leverage other sources of financing, ULGs were unable to implement a broader set or scale of UGI initiatives.

In addition to the expansion illegal settlement in the greenery areas increasing the demand for fuel wood and charcoal in urban areas as well as the demand for timber for construction were major driving factors for forest degradation and deforestation in the cities. Moreover, there was no urban and peri-urban forest area dedicated for firewood plantation to minimize the pressure on UGI dedicated areas.

There was no experience of compost application on urban greenery areas, install watering system in place except using shower trucks, water and soil conservation structures and appropriate management system that resulted in low survival rate of trees. There were well planned and committed afforestation/reforestation efforts of on peri-urban areas by the cities except some seasonal plantation of trees without follow up and management system in place. The available green areas had no legally defined boundaries that made law enforcement difficult.

Two cities; Adama and Bishoftu had nursery sites with annual seedling raising capacity of 240,000 and 350,000 respectively. The remaining four cities had no any and therefore were buying seedling, mainly ornamental trees from Bishoftu traveling up to 400KMs which is too costly.

5.2.1 Environmental Baseline

Caused by reasons mentioned above environmental conditions of Urban Greenery related project intervention areas and UGI practices of the six cities can be explained as follows:

- There was increasing surface runoff during storms that results in flooding causing erosion and loss of fertile topsoil on cliffs surrounding the cities that led to further degradation to decrease survival rate of vegetation. Moreover, impacting the urban and peri-urban environment through the loss of arable soils, loss of riparian buffer zones to absorb runoff and reduce impacts to sensitive fresh water bodies, and higher risks of shortages of water supplies for households and agricultural lands was expected
- There was increasing land degradation, landslides, flood risks and increased siltation in nearby water bodies (lake Hawassa, Lake Tana, Blue Nile River and Awash River) as a result of deforestation in the peri-urban and urban forests
- The cities were getting hotter from time to time resulting in formation urban of heat islands which was predicted to grow in size due to temperature increase
- There was high deforestation resulted from cutting of trees for fire wood and charcoal making on naturally afforested areas and city parks because the greenery areas had no legally defined boundaries to enforce law and there was low sense of community ownership. In addition, there were no forest areas dedicated for fire wood plantation which could reduce the pressure on the urban parks and protected forest areas.

- High wind cyclone in the cities due to lack of trees that could serve as wind breaker mainly in Adama and Mekelle was common. Environmental condition of the following selected project sites prior to project intervention was as follows:

Table 10: Environmental Condition of Greenery Areas Prior to Project Intervention

No	Condition of the Urban Greenery Area Prior to Project intervention	Size in Ha
1	Urban and peri-urban areas with no clearly demarcated boundary and title deed to support law enforcement	33,000
2	Urban and peri-urban areas highly degraded as a result of unsustainable resource use, illegal dumping of waste and erosion	5,921
4	Urban and peri-urban areas partly covered with forest but not well protected, exposed to degradation by erosion and invasive species	14,107
5	Urban and peri-urban riparian corridors degraded by erosion and illegal dumping of waste	480

5.2.2 Socio-Economic Baseline

The socio-economic baseline is formed based on information found in the project document as secondary source of data as well as first-hand information gathered from storytelling by community representatives, project beneficiaries and staff of the municipalities through Key Informant Interview and Focus Group Discussion. Accordingly, UGI related socio-economic baseline of the project intervention areas is detailed as follows:

- There was increasing surface runoff during storms that results in flooding along roads and slum settlement areas with high impact on traffic movement and houses especially in Bahir Dar, Dire Dawa and Adama. Major causes of the flooding were lack of vegetation on surrounding cliffs to absorb rain water and retain the soil from being washed away and clog water canals. Flooding imposes additional costs associated with repair of water drains, pit latrines, sewers and dams that lead to contamination and shortage of water supplies impacting community health such as incidences of diarrheal illnesses.
- Urban greenery was not source income and employment opportunities. There were no people engaged in nursery except few in Bishoftu, urban greenery and urban landscaping business to support their livelihood.
- There was no stakeholder participation in urban afforestation and management activities that resulted in high burden on local governments to cover all costs and low sense of ownership by the community. This led to low protection on existing urban and peri-urban greenery areas causing deforestation on naturally forest areas without a reforestation/rehabilitation plan.
- Local governments were buying and transporting seedlings mainly ornamental trees for urban greening from Bishoftu traveling more than 400 KM that made cost per tree too high. The only cities with nursery sites were Bishoftu and Adama with annual seedling raising capacity of 240,000 and 350,000 respectively

- Compound greening culture of the community was very low caused by low awareness on benefits of forest and availability of seedling was minimal. The urban community had no parks and green spaces for refreshment except Hawassa and Bahir Dar which are endowed with nature
- Impacts on sensitive fresh water bodies, and higher risks of shortages of water supplies for households and agricultural lands as a result of urban and peri-urban environmental degradation through the loss of arable soils, loss of riparian buffer zones to absorb runoff and reduce erosion was forecasted. Moreover, climate change was likely to affect water bodies, primarily through flood damage which can increase sedimentation and pollution, thereby increasing treatment requirements or forcing service providers to find alternative water sources.
- All greenery areas rehabilitated and reforested/afforested by the project in the six cities were not legally or illegally occupied places and therefore there were settlements within the intervention areas prior to project intervention. Few areas however were under use by the local community for grazing and as source of fire wood for household consumption and sales.

6 Findings and Discussion (Project Intervention Results and Changes Observed)

The section of the report presents major development changes/results of the project. The overview focused on key results on integrated waste management, Urban Green Infrastructure Development, Positive and negative changes on the environment and society, important risks which needs attentions and other major changes are detailed. In addition, under this section for each impacts and risks, the consulting team in collaboration with concerned body proposed mitigation plan as needed.

6.1 Results and Changes in Integrated Solid Waste Management

The project has been under implementation since 2017 undertaking activities related to Integrated Solid Waste Management in the six cities (Adama, Bahir Dar, Bishoftu, Dire Dawa, Hawassa and Mekelle) which could positively and negatively impact the environment. Project intervention along the value chain of Municipal Solid Waste Management of the six cities and changes observed as a result are presented here below.

6.1.1 Generation

The project has undertaken community awareness raising activities through door-to-door communication, school outreach programs, using posters, community sensitization workshops as well as using national and local print and non-print media such as radio and television on waste handling in general and waste segregation in particular. The awareness raising effort is augmented by distribution of colored bags mainly to 58 model Villages in the six cities with 200,566 households to encourage segregation. Primary waste collecting MSEs are also made responsible to teach and lobby the community to segregate waste at source. Similarly, colored dustbins are erected on pedestrians along streets with high traffic. As a result, behavioral change is observed in the community mainly in the model villages who has started segregation of waste at source as well as proper disposal of waste from their houses. There was no source segregation practice in all of the six cities prior to the start of project intervention as discussed in the baseline. The model

villages are regularly cleaning their surroundings and there is no illegal dumping of waste in these areas. Some of the households, with enough space in their compound have started small scale composting in their house and use it for their gardening and greening.

6.1.2 Collection and Transportation

The sources of solid wastes are mainly households and commercial areas and both mixed at transferring station and during transportation. Door to door collection of waste is undertaken by MSEs using hand pushed carts for a monthly fee of up to USD 1.5 for household and USD 8 to 13.5 for business firms such as hotels in all cities except Mekelle where door to door collection is done by private organization and paid by the municipality. Then the waste is transported to transfer stations or land fill depending on the contractual agreement entered between the municipality and MSEs/private companies using tractor pulled trailers, animal pulled carts and tracks. All cities do not have separate transportation facility except Adama where the MSEs engaged in composting separately transport organic waste directly from households to the composting shed. Solid wastes are mixed up after segregation by MSEs at the transfer station when it transports to the landfill. The MSEs working on compost shed then again segregates the wastes at the land fill to use organic wastes for compost preparation. The municipality and private organizations contracted by the municipality transport the remaining waste from the transfer stations to the land fill using skip loaders or Lorries designed for such purposes. The municipality is also responsible for collecting waste from communal areas such as streets and illegal dumping areas. Staff of the municipalities have witnessed that the project has contributed to the changes observed in solid waste collection and transportation in the cities as a result of support provided in:

- Transposing the federal Integrated Solid Waste Management Standard to city level on which staff of the municipalities are trained and supported to develop waste collection and transportation plan
- Arranging training on solid waste management to staff and leadership of the municipality including exposure visiting to countries with better waste management system
- Organizing MSEs, creating market linkages and helping them to start recycling and composting in the cities that has led to better collection of recyclable waste by MSEs and scavengers for its economic value. Still there is a problem of market linkage in most cities and the problem is magnified after the occurrence of COVID 19 pandemic .



Figure 12: Plastic waste collection and transportation for recycling (Hawassa)

- Training people engaged in Solid Waste Collection and Transportation and helping them to pass through Certificate of Competency (from level 1 to level 3) has resulted in knowledge-based operation. The project has also provided training on Occupational Health and Safety procedures and distributed safety materials to enhance safety of people engaged in this business. However, the team has understood that people are not using safety materials all the time in all cities
- The project has also supported the municipalities in cleaning illegal dumping sites mainly river banks found within the center of the cities and converted them into nursery sites and youth recreational areas through MSEs who provide coffee services and sale seedlings. The team has also observed mass mobilization on cleaning of streets, riverbeds, water canals and illegal waste dumping areas using additional funding secured from UNDP in response to COVID 19 in five cities.



Figure 13: Waste Collection and Transportation to dumping site (Bahir Dar)

6.1.3 Composting and Recycling:

The project has supported construction of six composting sheds with total area size of 15,900 m² and annual composting capacity of 26,000 tons of waste. All the sheds are constructed within landfills except for Adama which is constructed at the outskirts of the city. The lands on which the sheds are constructed are not environmentally sensitive such as forest areas, water point, river, and wildlife habitat or biodiversity important areas. Two of them (Bahir Dar and Hawassa) are still under construction. The sheds have concrete floor to protect percolation of leachate to ground water, concrete wall to protect entrance of rodents, mesh wire to ensure ventilation, roofed and fenced to protect entrance of scavengers such as hyena. They also have additional facilities such as rest rooms, showering place, office, store and waste segregation areas. However, two sheds (Adama and Dire Dawa) do not have leachate collection ponds and the additional facilities though the municipalities have said their construction is about to start. In Bishoftu, leachate pipes are damaged and not maintained (Figure 14). In addition to constructing the sheds, the project has supported development of composting standard and manual, arranged hands on training to the MSEs on compost preparation, provided basic composting equipment such as semi-automated composting machine that has improved quality and quantity of compost, compost flees, thermometer etc. to the MSEs.



Figure 14: COMPOST shed and its damaged leachate pipes at Bishoftu

The MSEs collect organic waste from households, vegetable market, urban farming areas and by segregating from transfer stations and landfill which is transported to the composting sheds either by

themselves mainly in Adama to which they are paid by the city administration or by the municipalities' vehicles. Major buyers of the compost are the city administration for plant nursery and urban greening, urban safety net program for urban greening, business firms for compound greening and individuals for home gardening. Laboratory test on CH ratio, PH value and moisture is conducted on sample compost with the support of the project (two times) and the MSEs have established relationship with nearby agricultural research institutions and universities for similar support. However, no test has been conducted on chemical composition of the compost.

The project has also contributed to the start and strengthening of solid waste recycling in the six cities. MSEs are organized and supported to collect and sale (semi processed or as it is) recyclable waste such as paper, PET plastic water bottles, materials made of HDPE, metal etc. to business companies operating in the recycling business.



Figure 15: Composting at Adama and Bishoftu

So far 68,830 tone of compost has been produced from 210,460 tons of waste and 6,436 tone of non-organic recyclable waste has been collected and sold. Similarly, temporary and permanent job has been created to 18,850 people (50% women). Even though people engaged in composting and recycling business are trained on Occupational Health and Safety procedures and provided with safety materials, the team has observed that some of them are not careful about their safety. The team has also understood that despite of efforts done by the project and the city administrations, there is no enough market for compost that has forced the MSEs to operate under capacity and earn low income.



Figure 16: Produced compost ready for market (Bishoftu and Adama)

6.2 Results and Changes in Urban Green Infrastructure Development

Federal level Urban Green Infrastructure Development Standard has been transposed to the six cities on which staff of the municipality and relevant stakeholders such as urban environmental protection, urban land management and urban agriculture offices are trained with the support of the project. Cities are using the standard to guide their planning and implementation of urban greening activities.

The project has supported the start of new nursery sites in three cities; Mekelle with seedling raising capacity of 1,500,000/year, Dire Dawa 2,600,000/year and Bahir Dar 2,000,000/year. Moreover, seedling raising capacity of two nursery sites, Bishoftu and Adama has increased by 800% and 600 %, respectively. The project has also identified tree species suitable for agro-ecological condition of each city to guide species selection in raising seedlings, provided water reservoirs, trained and certified people employed in the nursery sites.



Figure 17: Seedling production at Adama, Dire Dawa and Bishoftu respectively from left to right

As a result of repeated awareness raising programs and by providing seedling for free, community of the six cities are planting trees in their compound and surrounding areas. Community participation during tree plantation is increasing from time to time as informed by the municipality. Waste dumping sites have been

rehabilitated, degraded areas have been restored and peri-urban areas reforested. As a result, greenery coverage of the cities is improving from time to time.

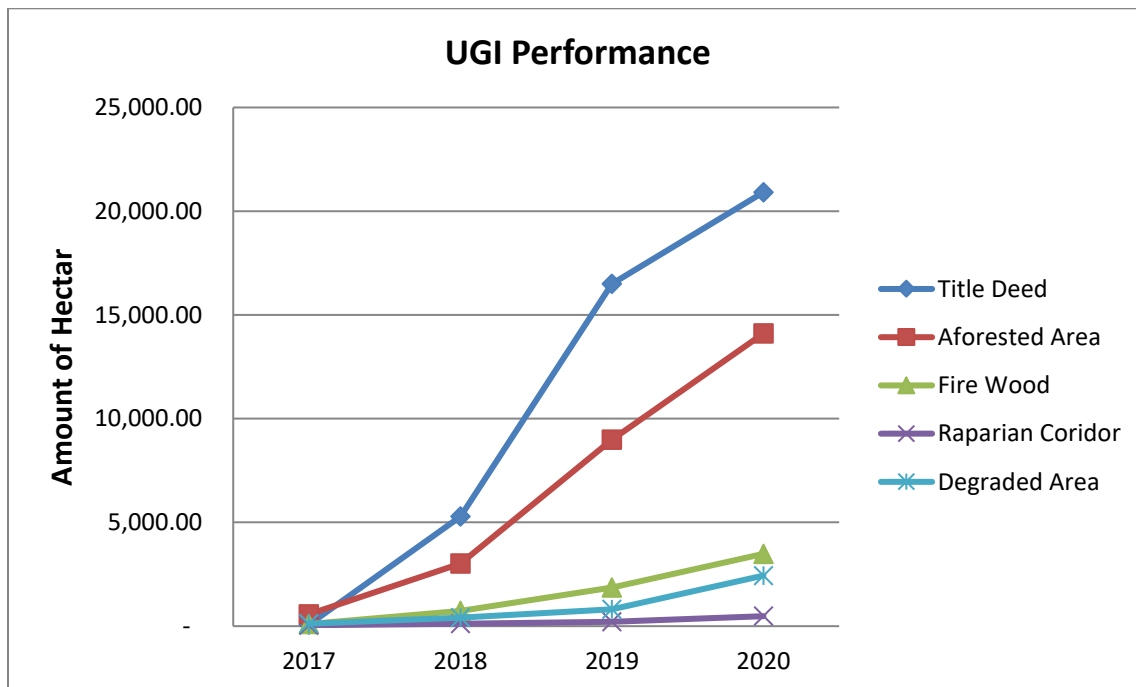


Figure 18: UGI Performance

People engaged in urban greening business and employed in government nursery sites are well trained and certified (level 1 to level 3) after passing through Certificate of Competency (COC) evaluation process. So far, a number of people (both men and women) are certified. This has narrowed the existing skill and knowledge gap in urban greenery practices and made the sector more successful.

Participation of MSEs in urban greenery related business; seedling raising and sales, landscaping, park management has increased. Temporary and permanent jobs are created to more than 36,000 people (50% women) in this sector. Bishoftu used to be the only source of seedling in the country and cities were forced to travel more than 400 Km to buy seedling which made cost per tree planted very high. With the support of the project however, the remaining five cities have now become source of seedling to themselves as well as neighboring cities and towns. MSEs are supported to start plant nursery business and create market linkage with afforestation program of the project that helped them continue operating until they find additional market.



Figure 19: Rehabilitated Urban Greenery Sites at Adama

The project has used afforestation and reforestation approach different from the usual practice which has made the intervention successful. Various mechanisms have been used to ensure survival rate of trees and sustainability of the urban greenery areas. Towards this end:

- Title deed is secured for more than 20,914 ha of afforested/reforested and rehabilitated degraded areas in the six cities to support the law enforcement effort.
- Diversified management entities are emplaced; city administration by planting trees through community mobilization, fencing and emplacing guards for the sites; MSEs whose members are selected from the local community who manage and generate income through cut and carry of grass for sale as well as for their livestock, collecting fees from visitors and organizing events such as wedding, providing cafeteria services and bee hiving based on clearly stated Memorandum of Understanding given by the city administration; local community by developing the areas and

using it for reading, social gathering and children play ground and private and government organizations who cover cost of plantation and management.

- Rehabilitating degraded land using area closure, constructing soil and water conservation structures, availing sustainable water source and plantation of edible fruits for the local community



Figure 20: Rehabilitated Urban Greenery Site at Bahir Dar Diaspora Sefer

7 Project Environmental and Social Impact Audit Findings and Proposed Mitigation Measures

7.1. Impact Analysis

Once all the important impacts have been identified, their potential size and characteristics were predicted and evaluated systematically by the environmental specialists based on physical, biological, socio-economic data to estimate the likely characteristics and parameters of impacts (e.g. magnitude, spatial occurrence etc.). For this analysis weighted matrix was used to assist the total impact estimation (as well as assign values). The analysis uses Inter-American Development Bank –Manuel. This uses universal accepted requirements for an effective environmental impact assessment through: a) a comprehensive environmental analysis, including the basic aspects of the assessment. The result analysis is displayed in table below:

Table 11: Impact Classification

Character (C)	Level of Impact		
	Disturbance (D)	Important (3)	Regular (2)
Significance (S)	High (3)	Medium (2)	Low (1)
Occurrence (O)	Very probable (3)	Probable (2)	Unlikely (1)

Extension (E)	Regional (3)	Local (2)	Specific (1)
Duration (D*)	Permanent (3)	medium- term (2)	Short -term (1)
Reversibility (R)	Irreversible (3)	Partial (2)	Reversible (1)
Total	18	12	6

The total impact for the identified anticipated impacts was assessed by using below formula. If environmental disturbances (D) occur too frequently or occur multiple times during an ecosystem's recovery period classified as important. If disturbances occur in periodic and predictable manner it is called regular and the disturbance occur in limited time and area it is called limited.

$$\text{Total Impact (TI)} = C \times (D + S + O + E + D^* + R)$$

The result is interpreted as follow:

Table 12: Impact Analysis Result Interpretation

Negative (-) impact	Positive (+) impact
Sever (≥ -15)	High (≥ 15)
Moderate ($-15 > -9$)	Medium ($15 > 9$)
Compatible (≤ -9)	Low (≤ 9)

Source: Inter-American Development Bank, 2002)

Table 13: Impact analysis of the proposed project (UGI)

Identified Impacts	C	D	S	O	E	D*	R	TI	Remark UGI
Income generation	+	2	2	3	2	2	2	(+13)	Medium
Job opportunity	+	2	2	2	2	1	1	(+10)	Medium
Social benefits	+	1	3	3	2	3	3	(+15)	High
Environmental benefit	+	3	3	3	3	3	3	(+18)	High
Impact on soil quality	+	3	3	3	2	2	2	(+15)	High
Impact on water resource	+	3	3	3	3	2	3	(+17)	High
Impact on air quality	+	3	3	3	2	3	3	(+16)	High
Impact on noise environment	+	3	3	3	3	3	3	(+18)	High
Visual impact	+	3	3	3	3	3	3	(+18)	High
Impact on land use and local livelihood	-	2	1	2	2	3	2	(-12)	Moderate
Impact on Biological Environment	+	3	3	3	3	2	2	(+16)	High
OHS risks	-	1	1	1	1	1	1	(-6)	Compatible
Impact on displacement	-	1	1	1	1	1	1	(-6)	Compatible
Impact on Utility (water)	-	2	3	2	2	1	1	(-11)	Moderate

Where, C=Characteristics, S=Significance, D=Disturbance, O=Occurrence, E =Extension, D*=Duration, R=Reversibility

Table 14: Total impact analysis of the proposed project compost Activity

Identified Impacts	C	D	S	O	E	D*	R	TI	Remark, Compost
Income generation	+	-2	3	3	3	2	1	(+10)	Medium
Job opportunity	+	3	3	3	2	3	2	(+16)	High
Social benefits	+	3	3	3	3	3	3	(+18)	High
Environmental benefit	+	3	3	3	3	3	3	(+18)	High
Impact on soil quality	+	2	3	3	2	3	2	(+15)	High
Impact on water resource	-	1	1	1	2	2	3	(-10)	Moderate
Impact on air quality, bad odor	-	2	2	2	1	2	1	(-10)	Moderate
Impact on noise environment	-	1	1	1	1	1	1	(-6)	Compatible
Visual impact	-	2	1	1	1	1	1	(-7)	Compatible
Impact on land use and land cover	-	1	1	1	1	1	1	(-6)	Compatible
Impact on Biological Environment	-	2	2	1	2	2	1	(-10)	Moderate
OHS risks	-	2	3	1	1	2	2	(-11)	Moderate
Impact on displacement		0	0	0	0	0	0	(0)	Neutral
Impact on Utility (water)	-	2	2	1	1	2	2	(-10)	Moderate

Where, C=Characteristics, S=Significance, D=Disturbance, O=Occurrence, E =Extension, D*=Duration, R=Reversibility

7.2. Positive Impacts of the Project

The project has undertaken various activities and provided support to the six city administrations achieving remarkable results and introduced changes throughout the value chain of solid waste management; generation- collection/transportation – recycling/composting as discussed in detail in this report.

7.2.1. Income Generation

The project has played a significant role in income generation for youth and women. More than 108 MSEs are established along the value chain of ISWM and UGI. According to the information from municipalities, all MSEs have a proof of existence of legal business license from concerned government institutions. This implies that the project is contributing to government income since these MSEs are paying annual income tax which has positive impact on the country economy growth.

According to Project Implementation Review (PIR) report for 2020 of NAMA COMPOST project, the MSEs have generated more than 560,000.00 USD from sales of compost, recyclable waste, waste transportation services and sales of tree seedlings.

7.2.2. Employment Generation

Based on the assessment, the project has created a direct job opportunity (both temporary and permanent) for 38142 citizens of which 50% of are women. Assuming that 50% of these beneficiaries are head of

households and considering average Ethiopian family size 5, the project has benefited more than 95, 355 citizens directly or indirectly. Accordingly, this project has significant role in unemployment reduction which is one of the national challenges now a days.

7.2.3. Social Benefits

Positive social changes have been achieved since the implementation of the project. Since 50% MSEs members are local women with less opportunity of getting other job opportunities, the project implementation would benefit through ensuring job security for them. **Urban green space**, such as parks, playgrounds, and residential **greenery**, can promote mental and physical health and reduce morbidity and mortality in **urban** residents by providing psychological relaxation and stress alleviation, stimulating **social** cohesion, supporting physical activity.

“We are now feeling the effect of trees planted by the community in their compounds, road sides, parks and areas surrounding the city. During this season of the year, Adama used to be hot and people sleep necked as a result. But now it is getting colder that we are now sleeping under blanket” an expert from Adama City Administration has said. This is a good indication that the project is contributing to prevention of extreme heat and hence enhancing urban resilience to climate change in the six cities.

Various models have been formulated to explain the relationship between green space and health. Hartig *et al.* (2014) suggested four interacting pathways through which green space can affect health and well-being: (1) improved air quality, (2) enhanced physical activity, (3) stress compensation and (4) greater social cohesion. Lachowycz and Jones (2013) proposed physical activity, engagement with nature, relaxation, and social interactions as major pathways to health. Villanueva *et al.* (2015) argued that urban green spaces mitigate the urban heat island effect providing protection from heat-related health hazards, improve social capital and cohesion, and enhance physical activity.

Community attitude towards economic activities related to waste management was negative as informed by beneficiaries and staff of the municipalities. The few people working on this sector used to be with low educational background and no other means of income. Since the start of the project however, attitudinal changes are being observed in that youth graduates are now joining the compost and recycling. One of the MSEs in Adama has a slogan in their shed that says “waste is money”.

In addition to job creation, the start of the recycling and composting business is reducing waste collection and transportation related cost of the government. Derived by the income they generate from sales of waste, the MSEs are contributing their share towards cleaning of the cities that again contributes to

minimization of damage on infrastructure caused by waste induced flooding and hence minimization of maintenance cost as well as reduction of community health risks.

7.2.4. Environmental Benefit

Positive environmental impacts are evident as an outcome of all these efforts exerted in the past four years. The change seen in waste segregation and proper disposal of waste has resulted in positive environmental impact through reducing illegal dumping of waste by households and reducing the difficulty municipalities had to separately treat the waste according its nature.

The introduction of both composting and recycling have improved waste collection rate in the cities which has positively impacted the environment. As explained by staff of the municipalities during focus group discussion, PET water bottles used to be the biggest problem of the city by blocking drainage canals and rivers causing flooding in the city. A pond formed by rain water runoff from the city which is called “Migra” in Adama and Lake Hawassa were full of such kind of plastics. Since the start of waste recycling business however, such type of wastes are no more a problem because the MSEs and scavengers collect and sale them from which they are generating income.

Composting contributes to GHG emission reduction by diverting the organic fraction of waste from land fill which otherwise would emit CH₄ to pollute the air. It also protects environmental pollution by using compost as replacement instead of chemical fertilizer. The project has achieved a total of 128,089 tons of CO₂ emission reduction so far from both the greenery and composting activities.

The compost is used for plant nursery as well as urban and peri urban land rehabilitation and afforestation/reforestation activities. Application of compost has made the greening effort more successful indirectly contributing to environmental protection. **Compost** application can improve **soil** quality and productivity as well as sustainability of agricultural production by replenishing **soil** organic matter and supplying nutrients. Organic matter is a vital component of a healthy **soil** as it plays an important role in **soil** physical, chemical and biological fertility.

More than 20,000 ha of land has been afforested/ reforested with the support of the project. Part of this was seriously degraded area and illegal dumping sites as discussed in this report. Lake Hawassa of Hawassa city, Lake Tana of Bahir Dar, rivers such as Blue Nile and Awash to which rivers from those cliffs surrounding the cities drain were being affected by siltation as a result of soil erosion and landslides in these areas. The gullies and degraded areas are now rehabilitated through constructing soil and water harvesting structures, areas closer and plantation of trees that defiantly has reduced siltation on those water bodies caused by extreme flooding mainly during raining season.

Three new plant nursery sites have been established in three cities and seedling raising capacity of two nursery sites have significantly increased. Moreover, the cities have been providing seedlings to the community for free and to a recent government initiative of 10 Billion tree plantation program. This has defiantly increased forest coverage in the cities as well as surrounding areas that contributes to environmental protection.

7.3. Negative Impacts of the Project

7.3.1. Impact on Soil Quality

It is very challenging to completely eliminate chemical, biological and physical pollutants in composts made from mixed waste. Mixing up of commercial wastes are taken place during transportation of solid wastes from transferring station to land fill and segregation of wastes are taken place in land fill in all cities except Adama. Elemental analysis of compost quality was not assessed that implies the compost itself can be a potential source of contaminants. The impacts of this project can therefore, poses a threat on soil quality if the facility is not properly managed and if the produced compost does not meet the predefined set of standards.

The soil can be significantly affected in the case of continued application of compost which is made of waste that is not segregated at sources. Moreover, soils situated near poorly managed composting facilities may become contaminated with natural phenolic compounds and nitrates. Chemical contaminants which include toxic organic chemicals and heavy metals (i.e. lead, chromium, nickel, zinc, cadmium, copper and mercury) have more adverse effects on the soil environment.

However, the consulting team has observed that the project has taken mitigation measures such as source segregation, use of separate transportation and production of compost in confined area that made the negative impact moderate.

7.3.2. Impact on Water Resource

Three composting sheds; Adama, Mekelle and Dire Dawa do not have leachate collection ponds. The pipes of Bishoftu leachate collection pond are also damaged and can be potential source of soil contaminants. Potential threats can arise when the sorting process is poorly practiced. Wastewater generated from composting facilities is reasonably expected to contain elevated organics, nutrients, and to a lesser degree salts, metals and microbiological organisms which need to be appropriately manage to prevent impacts to the surface and groundwater. The major sources of potential adverse impacts on water resources can be either leachate from feedstock loading and composting areas, contaminated runoff from compost operation, or contaminated storm water runoff. Bishoftu, Bahir Dar and Hawassa are rich in surface water resources and therefore, the operation activities shall be conducted safely to prevent any impact on water quality from surface and ground water resources. Some of the leachate (Bishoftu and Bahir Dar) drainage system of the compost shed are clogged and/or plugged. Even though the consulting team didn't observe outflow of leachate outside of the shades during its site visiting program, as production increases and during rainy season when moisture of the waste increase however, there is a flow of leachate from the composting process. Such fluid has potential negative environment impact through contaminating surface and underground water.

The project is producing compost in a shed with plastered basement and two of the cities (Bishoftu through with broken pipe and Hawassa) have leachate ponds that has minimized the adverse impact on water.

7.3.3. Impact on Air Quality

Adverse impacts of the project towards air quality are related to composting process. The main operation process, composting, is associated with the generation of by-products including heat, carbon dioxide, water vapor, and odorous compounds. Odors have been one of the major operation challenges for compost shed. Almost all compost sheds are constructed in and near to the land fill and the impact is cumulative. Several compounds are commonly associated with odors at composting facilities: Hydrogen sulfide (H₂S), Thiols, Dimethyl Disulfide (DMDS), Carbon disulfide (CS), Ammonia (NH₃), Amine, Indoles, Volatile fatty acids, Terpenes, Ketones, Aldehydes, and Alcohols. The type of feedstock handled determines the type of odors generated. For example, waste rich in protein are considered sources of volatile nitrogen compounds (ammonia, amines and indoles) and possibly volatile sulfur compounds (organic sulfides, mercaptans and hydrogen sulfides). Other factors may also affect the formation of odorous compounds namely, the amount of surface area of stacked organic materials exposed to the external environment, oxygen level, aeration, turning frequency, moisture level, bulk density and porosity, temperature, pH...(Integrated Waste Management Board, 2007). Moreover, another concern is airborne particles or bioaerosols (i.e. bacteria, fungi, viruses, allergens, bacterial endotoxins, antigens, toxins, mycotoxins, glucans, pollen, plant fibers, etc.). Bioaerosols, also known as “organic dust” can cause a wide range of adverse effects on human health (Taha *et al.*, 2006).

7.3.4. Impact on Biological Environment

Water contamination mainly surface water as discussed above might pollute water sources such as rivers that can affect aquatic life. Moreover, the use of immature compost can damage plants because of excessive levels of C:N ratio, ammonium and volatile organic compounds.

7.3.5. OHS Risks

The most critical factor is the occupational health and safety hazards due to onsite odor and accidents. Such accidents are mostly related to practices that involve cutting machinery handling and those posed by bioaerosols, dusts, noise, and vibration. Compost is produced from organic waste segregated from mixed waste at transfer station or land fill in all of the cities except Adama where the MSEs separately transports segregated waste directly from households, urban farms or vegetable markets. MSEs working on Compost shed have been segregating wastes from the landfill and workers as well face some hazards which include tissue damage, respiratory infection, injuries from glass, razor blades and syringes, as well as parasite infections caused by skin contact with organic pollutants. Injury of deep tissue may result in tetanus to the workers. Though workers use protective measures such as gloves and nose masks, the chance of occurring these impacts will be high if segregation of wastes is not conducted at household level and wastes transported separately from households. Another occupational health concern in the operation of all composting facilities is the presence of bioaerosols, organisms that can act as toxicants, pathogens, and allergens when inhaled in sufficient quantities. Bioaerosols include bacteria, fungi, actinobacteria,

arthropods, endotoxins, microbial enzymes, glucans, and mycotoxins. Fire can pose a risk to the local air quality and human health, the facility and surrounding residential.

The project has provided continues trainings on the importance and use of Occupational Health and Safety measures as well as provided with safety materials to minimize waste related activities impact workers health. However, the team has observed that not all workers are adhering to the safety measures as per the standard and procedures.

7.3.6. Impact on Utility

UGI and compost utilized significant amount of water and both facilities are dependent on public water for its operation and this creates additional pressure on the city administration. Water received from a public source using a shower truck is stored in water reservoirs using plastic tanks for compost piles watering and greenery areas. Based on the assessment, each compost shed utilizes an average of 1,365 M³ of water per year. The team witnesses that as mitigation measure the project has constructed soil and water conservation structures for the urban greenery and roof water harvesting mechanism for compost.

7.3.7. Impacts on Land-use / Land Cover Impact

Even though most of the urban greenery areas were highly degraded due to human activities such as overgrazing and deforestation, some of the urban greenery sites used to be free grazing areas as communal land and serve as source of fuel wood harvesting. Now due to the project, the land use pattern is changed to greenery areas where free grazing and fuel wood collection is prohibited. But during consultation, community representatives has shown us that they are now more benefited than before because there is more grass and they are allowed to feed their animal using cut and carry system. However, there is still a fear of ownership in the future and limited number of individuals might be benefited from the greenery sites.

8. Impact Mitigation Measures

8.1. Soil Quality Impact Mitigation Measures

- Construct leachate collection ponds in Adama, Mekelle and Dire Dawa city administration,
- Segregate wastes at household level in each city administration; and
- Regular maintenance of leachate collection ponds is required particularly Bishoftu Compost shed; and
- Conduct elemental analysis (laboratory) of the compost to see the quality of it,
- If possible, Magnetic separation takes place prior to composting in order to remove heavy metals,
- Regular compost examination (one times a year) would eliminate such negative effect,
- Segregated wastes should be stored in a shed until used for composting to avoid run off during rainy season,

8.2. Water Resource Impact Mitigation Measures

- The leachate collection pond unit should be properly operated, maintained and managed to prevent any contamination of water quality with the storm water during the rainy season. Accordingly,

constructed ponds can be used to receive site runoff and reduce the impact of runoff and leachate on nearby water courses, thus, the separation of leachate and storm water is ensured; and

- Segregated wastes should be stored in a shed until used for composting to avoid run off during rainy season,
- The facility should store and process incoming feedstock on a low permeability liner with a 2% minimum drainage gradient that directs wastewater to a leachate collection system, and
- Contaminated storm water runoff should be diverted and stored in leachate collection pond, if possible

8.3. Air Quality Impact Mitigation Measures

- Promote OHS specially use of face masks by MSEs engaged in compost production to prevent from bad odor coming from landfill in all cities except Adama,
- Ensure that the areas surrounding the sheds are regularly cleaned from waste,
- Ensure the waste is dumped at the far side of the landfill to keep enough space between the shed and accumulated waste to reduce bad odor,
- Preventing excessive odors requires consistent management of the composting process, starting with prompt attention to incoming ingredients. Wet materials should be mixed with a porous bulking amendment to provide the necessary pre-conditions for oxygen transport, and then must be aerated or turned as required during the active stages of the composting process to decrease excessive odor.

8.4. Biological Environment Impact Mitigation Measures

- Proper management of composting process, in addition to monitoring and labeling of compost, can be the remedy to biodiversity reduction,
- Regular compost examination (one times a year) would eliminate such negative effect,
- The leachate collection pond unit should be properly operated, maintained and managed to prevent any contamination of water quality with the storm water during the rainy season, and
- Segregated wastes should be immediately processed to avoid attraction of opportunistic species.

8.5. Occupational Health and Safety Impacts Mitigation Measures

- Implement faster compaction and coverage of waste to effectively reduce the odor emissions;
- All workers of the composting and temporary waste storage sites should receive adequate training on the types of hazardous waste that could be handled, the type of hazards and the appropriate methods of handling,
- Awareness of hazardous waste generators regarding the sorting at source in order to avoid a mixing of hazardous and non-hazardous waste,
- All workers in the composting and temporary waste storage sites should be provided with anti-puncture gloves, steel-toe shoes, overalls and masks. Strict supervision on the compliance of hand sorters to this should be practiced,
- Prepare a documented emergency response plan to any fires and injury; there should be enough tools for fire extinguishing,

- First aid kit should be available to all compost shed and at least two individuals from the members should take first aid training,
- Workers shall get medical examination from the composting enterprise to the minimum once a year, and
- Provide sufficient potable water for drinking and personal hygiene purposes,
- Prohibit smoking as well as litter or weed build-up in the area as these may pose fire risk

8.6. Impact on Utility

- Constructing roof water harvesting structures in each shed for compost production,
- Dry clean-up methods should replace wet cleaning methods whenever practical (sweeping, dust collection vacuum, wiping...etc.).
- Promote use of rainwater harvesting such as storage vessel, constructed ponds and others in water scarce area such as Mekelle and Dire Dawa,

8.7. Impacts on Land-use / Land Cover Impact

- Plant palatable tree species including shrubs that are fed livestock from greenery areas and protected lands using cut and carry system as alternative source of animal feed,
- Farmers should be allowed to feed their animal using cut and carry system from UGI,
- Local community around the greenery area shall be allowed to be a member of MSEs to ensure sustainability. In addition to this, the selection criteria for membership of MSE should be transparent and agreed by the local community to be a member of the UGI,
- Strengthen the existing different types of administration mechanisms like community, MSEs and organizations; securing title deed for the areas; making the local community beneficiary as well as mobilizing stakeholders to ensure the urban and peri-urban greenery areas are rehabilitated, well managed and sense of ownership is created.

9. Project Risk Assessment and Proposed Mitigation Measures

This part of the report tried to detail project risks which were identified during project appraisal and newly identified risks of the project with their possible mitigation measures.

9.1. Risks Identified and Measures Taken by the Project during Implementation

There were about five risks rated as medium to high which are identified during project development. The consulting team has read reports done by the project on progress these risks and conducted field level monitoring for triangulation. The risks and respective measures taken by the project to avoid or minimize their impact are discussed here below.

Risk 1. Loss of livelihood and economic impoverishment resulting in resistance by marginal groups to their removal from illegally occupied public lands such as riparian corridors, peri-urban forests and urban green spaces:

The consulting team, during its field visits, has observed that there are still number of urban and peri-urban greenery areas occupied by illegal settlers. However, the project has avoided intervention in those areas which even were targeted by the project and invest on areas that are not occupied by settlers. The justification given by the project for such action is due to lack of interest from the government to relocate people being afraid of aggravating the current country political situation. As a result, there is no any person relocated and or whose livelihood is negatively affected duet to project intervention. There was no any complain heard from the local community during our Key Informant Interviews nor during Focus Group Discussion undertaken with representatives.

Risk 2. Reforestation plans of the 6 cities do not include sufficiently diverse species of vegetation to promote the sustainable management of natural resources.

In response to this risk, the project has identified diverse tree and shrub species suitable for agro-ecology of each city in collaboration with the support of greenery expert of the project and local forest experts. From its field level observation to the nursery sites and afforested areas as well as discussion with staff of the city administrations, the team has understood that cities are raising seedlings and planting trees according to the recommendations.

Risk 3. Areas that are to be reforested may be sensitive to climactic extremes, notably periods of extended drought that some parts of Ethiopia (e.g. Regions in the North and East of the country) have already experienced.

Discussion with the project team as well as people consulted during field visit have proved that this risk is one of challenges the project has faced in all cities which is affecting survival rate planted trees especially in Bishoftu and Mekelle. However, the team has understood that the project is fighting to minimize the impact of water shortage in those cities through development of soil and water conservation structures on greenery areas, procuring and installing water tanks that are regularly filled with water by the city administrations and used for irrigating plants by MSEs and installing water pipes wherever possible. This has increased survival rate of trees by protecting runoff and conserving rain water in the structures and watering plants during dry season. Tree species which are drought resistant are also planted in these areas.

Risk 4. Exposure of MSEs to waste hazards during waste handling, including waste collection, waste transporting and composting activities.

The project is trying to minimize health related risk on MSEs engaged along the value chain of waste management through providing training on Occupational Health and Safety Measures and providing (the municipality also) personal safety protective materials such as gloves, cloths, safety shoes, gloves and face masks. However, the consulting team has observed during its field mission that the MSEs are not fully using the safety materials taking the weather condition in the cities as a reason.

Risk 5. Food contamination produced in urban agriculture due to contaminated compost.

The team has understood that compost is not being used for food crop production so far except for “chat” farms in Bahir Dar. Major customer of the compost is the city administration for plant seedling raising and urban greening. The MSEs are also closely working with universities and agricultural research institutions to check its quality through laboratory test and by applying on model farms. The project as well has supported two times laboratory tests on sample taken from all composting sheds. But the risk is still there since there is no much source segregation and separate transportation.

9.2. Newly Identified Risks/Not Fully Addressed Risks/ and Proposed Mitigation Measures

Risks that could potentially hamper project progress were identified during project development for which mitigation measures were proposed. The project has tried to mitigate these risks during implementation and progress towards its targets during the past four years. Through time however, many things do not remain the same causing new risk to appear. Project implementation therefore has to be flexible enough to address new challenges and take advantage of new opportunities to achieve its mission.

Risk 1: Sign of Illegal Settlement in Hawassa and Dire Dawa: Towards this end the project has targeted areas with no legal or illegal settlements in order to avoid social risk as a result of people displacement. A number of urban and peri-urban areas designated for greenery are saved from land encroachment through fencing, clearly demarcating and legalizing their boundaries and placing appropriate management such as

community, MSEs or watchmen hired by the municipality. Yet expansion of illegal settlements is still observed to some greenery areas mainly in Hawassa and Dire Dawa.

Mitigation: NAMA Compost project by itself can't able to stop this sign of illegal settlement around the UGI in the two cities. However, it needs to work closely with concerned government bodies by strengthening the legal enforcement in the area. In addition to this, continuous follow up and taking immediate measure is recommended to mitigate the challenge before the areas are occupied by more people to make law enforcement more difficult.

Risk 2: Poor income generation from UGI: Micro and Small Enterprises engaged in forest protection are not generating income at the moment since the fruit trees need some time to harvest, bee hives are not yet introduced and sales of fire wood is not yet started except some fees paid by the municipality for their labor during land rehabilitation and tree plantation. Similarly, people engaged in compost production and recycling are not generating income enough to lead their lives due to lack of market. This has a risk on continuation of project outcomes and results gained so far. The municipalities are therefore advised to engage the MSEs in additional alternative income generating activities (example waste collection in addition to composting) and support the MSEs in finding market for their products such as through creating linkage with governmental or non-government organizations that support urban agriculture, rural farming and forest development. MSEs engaged in recycling business can also be supported to start the next level of production than collecting and selling the waste as it is.

Mitigation: Improve access to loan to UGI and MSE in collaboration with MFI. Link the project with other key stakeholders, micro finance institutions and potential buyers to enhance income generating ability of the MSE engaged on compost production. As a best experience, Adama city administration tried to link the urban greenery infrastructures with national and international NGOs to contribute their stake which makes the infrastructure very effective. One organization constructed the different facilities such as houses, gravel road, and toilet and related infrastructures, the other provided startup capital in the form of grant for MSE working in the UGI centers, and NAMA COMPOST project undertake all the greening works in collaboration with municipality. This can be taken as a good exemplary to sustain the project results in one way and to resolve major financial constraints of the MSEs. In addition to this, MSE can access loan from micro finance institutions to expand their business. However, they need collateral to get the loan from such institutions.

Risk 3: Poor demand and Market for Compost: According to the information obtained from key informants and FGD participants, even though MSE produced compost, there is no or very little demand for their product at local market level. Because of this, members of the MSE frustrated for the continuation of their business. So far only municipality of the respective city and some very few organizations purchase their product for urban greenery and homestead garden purpose. Due to this income generated from sale of compost will not able to cover even monthly expense of the business (salary, maintenance and other costs).

Mitigation: Potential Market search and promotion to increase number of potential buyers at local market in each respective city will reduce the problem. Many of the cities have a number of industries and other factories, Agricultural research institutes, and other potential buyers for greenery and other purposes. In addition to this, there should be strong promotion for farming families to use organic fertilizers which sustains the businesses. According to the information gathered from KII and FGD participants, almost all compost producing MSE requested loan from different microfinance institutions. However, due to collateral obtained loan except loan for vehicle purchase. Therefore, it will be good if loan access to these MSE facilitated by the government.

Lack of market, there is also additional factor that can potentially hinder continuation of the composting business. The first factor is health of people involved along the value chain of composting might be affected because they are not following Occupational Health and Safety procedures during waste segregation, transportation and turning of windrows.

Mitigation: Following OHS procedures at all time in the process of waste collection and transportation as well compost preparation must be a pre requisition for all MSE members. In addition to this, training and workshops should be organized on OHS and related issues to bring behavioral change on this practice.

Risk 5:Weak Segregation and separate transportation of waste: The other factor is since source segregation of and separate transportation of organic waste is not yet introduced, except in Adama and to some extent Bishoftu, there is more likely for the compost to be contaminated that will lead to bad customer attitude.

Mitigation: The proposal is for the municipality to emplace mechanism to ensure source segregation of waste and introduce separate transportation system (Adma's practice discussed in this document can be taken as good practice in this regard). Moreover, undertaking laboratory chemical analysis on the compost and promoting the result is recommended.

10. Environmental Management Plan

Environmental management plans for the significant negative impacts (Medium and Sever) identified on the previous sections has been proposed for both compost and UGI. Efforts have been made to associate the impacts identified, mitigation measures proposed and associate costs including management and monitoring. The principal stakeholders responsible for implementation of the mitigation measures and monitoring are included in the activity schedule. Therefore, this development process obeys and is committed to the proper implementation of the environmental policy, legal rules and regulations related to solid waste management and UGI.

Table 15: Environmental management plans for compost and UGI

Project Phase	Impacts	Major Mitigation Measures	Residual impacts	Institutional responsibility	Cost Estimation (\$)
Operation	Impact on Soil Quality	<ul style="list-style-type: none"> Promote segregation of wastes at household level in each city administration and use magnetic separation method when possible 	<ul style="list-style-type: none"> Possible contamination of soil and water 	<ul style="list-style-type: none"> MSEs all city in all city administrations 	50,000
		<ul style="list-style-type: none"> Conduct elemental analysis (laboratory) of the compost 	<ul style="list-style-type: none"> Possible contamination of soil and water 	<ul style="list-style-type: none"> City administrations 	30,000
		<ul style="list-style-type: none"> Separate transport of organic waste from transferring station to compost shed except Adama 	<ul style="list-style-type: none"> Possible contamination of soil and water 	<ul style="list-style-type: none"> All five-city administrator MSEs 	200,000
	Water Resource Impact	<ul style="list-style-type: none"> Construct leachate collection ponds and maintain regularly 	<ul style="list-style-type: none"> Negative Public health implication Degradation of water and soil quality 	<ul style="list-style-type: none"> Construction (Mekelle, Bahir Dar, Dire Dawa and Adama) Maintenance, All city administrations 	95,000
		<ul style="list-style-type: none"> Construct leachate and storm water separation structure 	<ul style="list-style-type: none"> Degradation of water and soil quality 	<ul style="list-style-type: none"> All city administrations MSE 	60,000
	Operation		<ul style="list-style-type: none"> Promote use of OHS specially face mask by MSEs 	Health impact	<ul style="list-style-type: none"> City administrations MSEs,
		<ul style="list-style-type: none"> Ensure that the areas surrounding the sheds are regularly cleaned from waste, 	Degradation of water and soil quality	<ul style="list-style-type: none"> City administrations MSEs, 	-
		<ul style="list-style-type: none"> Ensure the waste is dumped at the far side of the landfill to keep enough space 	<ul style="list-style-type: none"> Health hazards Fire hazards 	<ul style="list-style-type: none"> City administrations MSEs, 	-

Project Phase	Impacts	Major Mitigation Measures	Residual impacts	Institutional responsibility	Cost Estimation (\$)
	Air Quality Impact	between the shed and accumulated waste to reduce bad odor, <ul style="list-style-type: none"> Frequently turning the wind to improve aeration 	<ul style="list-style-type: none"> Air quality deterioration 		
Operation	Biological Environment Impact	<ul style="list-style-type: none"> Regular compost examination (one times a year) would eliminate such negative effect, 	<ul style="list-style-type: none"> Disturbance of the surrounding environment 	<ul style="list-style-type: none"> MSE City Administration 	Include above
		<ul style="list-style-type: none"> The leachate collection pond unit should be properly operated, maintained 	<ul style="list-style-type: none"> Disturbance of the surrounding environment 	<ul style="list-style-type: none"> City Administration MSEs 	Include above
		<ul style="list-style-type: none"> Segregated wastes should be immediately processing to avoid attraction of opportunistic species, 	<ul style="list-style-type: none"> Disturbance of the surrounding environment 	<ul style="list-style-type: none"> MSEs, City Administration 	-
	OHS impacts	<ul style="list-style-type: none"> Implement faster compaction and coverage of waste All workers of the composting and temporary waste storage sites should receive adequate training on the types of hazardous waste that could be handled, the type of hazards and the appropriate methods of handling, Awareness of hazardous waste generators regarding the sorting at source in order to avoid a mixing of hazardous and non-hazardous waste 	<ul style="list-style-type: none"> Health problems Injuries or other health related problems 	<ul style="list-style-type: none"> MSEs, City Administration MSE 	- 50,000
		<ul style="list-style-type: none"> All workers in the composting and temporary waste storage sites and UGI should be provided with anti-puncture gloves, steel-toe shoes, overalls and masks. 	<ul style="list-style-type: none"> Injuries or other health related problems 	<ul style="list-style-type: none"> City Administration 	10,000

Project Phase	Impacts	Major Mitigation Measures	Residual impacts	Institutional responsibility	Cost Estimation (\$)
		Strict supervision on the compliance of hand sorters to this should be practiced,			
	OHS impacts	<ul style="list-style-type: none"> Prepare a documented emergency response plan to any fires and injury; there should be enough tools for fire extinguishing, 	Injuries or other health related problems	<ul style="list-style-type: none"> City Administration 	500
		<ul style="list-style-type: none"> First aid kit should be available to all compost shed and UGI and at least two individuals from the members from MSEs should take first aid training, 	Injuries or other health related problems	<ul style="list-style-type: none"> City Administration UNDP 	10,000
Operation	OHS impacts	<ul style="list-style-type: none"> Workers shall get medical examination from the composting enterprise to the minimum once a year, and 	Injuries or other health related problems	<ul style="list-style-type: none"> City Administration MSEs 	12,000
		<ul style="list-style-type: none"> Provide sufficient potable water for drinking and personal hygiene purposes, 	health related problems	<ul style="list-style-type: none"> City Administration 	300
		<ul style="list-style-type: none"> Prohibit smoking as well as litter or weed build-up in the area as these may pose fire risk 	Fire risk	MSEs	-
	Impact on Utility	<ul style="list-style-type: none"> Constructing roof water harvesting structures in each shed for compost production 	Increase water assess	City administration except Bishoftu	6000
		<ul style="list-style-type: none"> Dry clean-up methods should replace wet cleaning methods whenever practical (sweeping, dust collection vacuum, wiping...etc.). 	<ul style="list-style-type: none"> Excessive consumption of water 		

Project Phase	Impacts	Major Mitigation Measures	Residual impacts	Institutional responsibility	Cost Estimation (\$)
		<ul style="list-style-type: none"> Promote use of rainwater harvesting such as storage vessel, constructed ponds and others in water scarce area such as Mekelle and Dire Dawa, 	<ul style="list-style-type: none"> Excessive consumption of water 	<ul style="list-style-type: none"> City Administration 	12,000 -
	Land-use / Land Cover	<ul style="list-style-type: none"> Plant palatable tree species including shrubs that are fed livestock from greenery areas and protected lands using cut and carry system as alternative source of animal feed, Farmers should be allowed to feed their animal using cut and carry system from UGI, 	<ul style="list-style-type: none"> Displacement from grazing land Job security 	<ul style="list-style-type: none"> City Administration MSE 	24,000
		<ul style="list-style-type: none"> Local community around the greenery area shall be allowed to be a member of MSEs to ensure sustainability. In addition to this, the selection criteria for membership of MSE should be transparent and agreed by the local community to be a member of the UGI, Strengthen the existing different types of administration mechanisms like community, MSEs and organizations; securing title deed for the areas; making the local community beneficiary as well as mobilizing stakeholders to ensure the urban and peri-urban greenery areas are rehabilitated, well managed and sense of ownership is created. 	<ul style="list-style-type: none"> Displacement from grazing land Job security 	<ul style="list-style-type: none"> City Administration MSE 	-
		Total			571,800.00

11. Monitoring Plan

Environmental monitoring is one of the most important parts of an efficient and compatible operation of a project. All environmental requirements and restrictions from authorities, project owners and local communities are interlinked. Implementation of environmental techniques and modalities became a common ground for all involved parties as it commonly serves in the execution and operation of the project. It is important to note that the assessment of all proposed measures is imperative to ensure their proper implementation and the optimal operation of the project. Monitoring aims at optimizing the process design and provides quantitative and qualitative data that help in accurately communicating the performance of the project with regulators, the public or other stakeholders. Monitoring is ideally performed along the execution of the project: before, during and after construction.

The overall objective of environmental monitoring is to ensure that mitigation measures are implemented and that they are effective. Monitoring involves the observation, review, and assessment of onsite activities (including parameters) to ensure adherence to regulatory standards and the suggestions made to lessen negative impacts.

Table 16: Environmental and social impact monitoring plan

Impacts	Mitigation Measure	Indicators	MOV	Frequency	Responsible body	Monitoring Cost (\$)
Soil Quality Impact	<ul style="list-style-type: none"> Promote segregation of wastes at household level in each city administration and use magnetic separation method when possible 	<ul style="list-style-type: none"> Soil chemical level, pH LCP 	Report, PO	Every six month	<ul style="list-style-type: none"> EPA UNDP CA 	150
	<ul style="list-style-type: none"> Conduct elemental analysis (laboratory) of the compost 	<ul style="list-style-type: none"> Undamaged LCP 	<ul style="list-style-type: none"> Report PO 	Every year	<ul style="list-style-type: none"> All city administration (CA) MSEs 	300
	<ul style="list-style-type: none"> Separate transport of organic waste from transferring station to compost shed except Adama 	Low heavy metal content,	<ul style="list-style-type: none"> Report, Physical observation (PO) 	Every three month	<ul style="list-style-type: none"> MSEs CA 	1,200
Water Resource Impact	Construct leachate collection ponds and maintain regularly	<ul style="list-style-type: none"> BOD,COD, pH, Soil chemical level, 	Report	Every year	<ul style="list-style-type: none"> UNDP EPA CA 	450
	Construct leachate and storm water separation structure	Undamaged LCP	<ul style="list-style-type: none"> Report PO 	Every year	<ul style="list-style-type: none"> All city administration (CA) MSEs EPA 	300
Air Quality Impact	<ul style="list-style-type: none"> Promote use of OHS specially face mask by MSEs Ensure that the areas surrounding the sheds are regularly cleaned from waste, Ensure the waste is dumped at the far side of the landfill to keep enough space between the shed and accumulated waste to reduce bad odor, Frequently turning the wind to improve aeration 	Presence of odor	<ul style="list-style-type: none"> Report PO 	Every three month	<ul style="list-style-type: none"> EPA CA UNDP 	1,800

Impacts	Mitigation Measure	Indicators	MOV	Frequency	Responsible body	Monitoring Cost (\$)
Biological Environment Impact	Regular compost examination (one times a year) would eliminate such negative effect,	BOD,COD, pH, Soil chemical level,	Report	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	The leachate collection pond unit should be properly operated, maintained	Undamaged LCP	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • CA • EPA 	300
	Segregated wastes should be immediately processing to avoid attraction of opportunistic species,	Absence of opportunistic species for three days	PO	every six month	<ul style="list-style-type: none"> • EPA 	300
OHS impacts	Implement faster compaction and coverage of waste	Absence of odor complain	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	<ul style="list-style-type: none"> • All workers of the composting and temporary waste storage sites should receive adequate training on the types of hazardous waste that could be handled, the type of hazards and the appropriate methods of handling, 	No of accident occurred	<ul style="list-style-type: none"> • Report 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	Awareness of hazardous waste generators regarding the sorting at source in order to avoid a mixing of hazardous and non-hazardous waste	Availability of PPE	<ul style="list-style-type: none"> • Report • PO 	Every six month	<ul style="list-style-type: none"> • UNDP • EPA • CA 	900
	All workers in the composting and temporary waste storage sites and UGI should be provided with anti-puncture gloves, steel-toe shoes, overalls and masks. Strict supervision on the compliance of hand sorters to this should be practiced,	<ul style="list-style-type: none"> • Presence of ERP and Fire extinguisher 	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	Prepare a documented emergency response plan to any fires and injury; there should be enough tools for fire extinguishing,	Availability of emergency response plan	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450

Impacts	Mitigation Measure	Indicators	MOV	Frequency	Responsible body	Monitoring Cost (\$)
	First aid kit should be available to all compost shed and UGI and at least two individuals from the members from MSEs should take first aid training,	Availability of FAK	<ul style="list-style-type: none"> • Report • PO 		<ul style="list-style-type: none"> • UNDP • EPA • CA 	500
OHS impacts	Workers shall get medical examination from the composting enterprise to the minimum once a year, and	No of cases	<ul style="list-style-type: none"> • Report 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	Provide sufficient potable water for drinking and personal hygiene purposes,	No of complaint	<ul style="list-style-type: none"> • Report • PO 	Every three month	<ul style="list-style-type: none"> • UNDP • EPA • CA 	1,800
	Prohibit smoking as well as litter or weed build-up in the area as these may pose fire risk	Presence of sign	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	1,800
Impact on Utility	Constructing roof water harvesting structures in each shed for compost production	Presence of ground water	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	1,800
	Dry clean-up methods should replace wet cleaning methods whenever practical (sweeping, dust collection vacuum, wiping...etc.).	Presence of sweeping material	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • CA 	300
	Promote use of rainwater harvesting such as storage vessel, constructed ponds and others in water scarce area such as Mekelle and Dire Dawa,	Presence of storage vessel	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450
	Constructing roof water harvesting structures in each shed for compost production	No of complaint	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • CA 	550
Land-use / Land Cover	<ul style="list-style-type: none"> • Plant palatable tree species including shrubs that are fed livestock from greenery areas and protected lands using cut and carry system as alternative source of animal feed, 	<ul style="list-style-type: none"> • No of complaint • Type & no of plants 	<ul style="list-style-type: none"> • Report • PO 	Every year	<ul style="list-style-type: none"> • UNDP • EPA • CA 	450

Impacts	Mitigation Measure	Indicators	MOV	Frequency	Responsible body	Monitoring Cost (\$)
	<ul style="list-style-type: none"> Farmers should be allowed to feed their animal using cut and carry system from UGI, 					
	<ul style="list-style-type: none"> Local community around the greenery area shall be allowed to be a member of MSEs to ensure sustainability. In addition to this, the selection criteria for membership of MSE should be transparent and agreed by the local community to be a member of the UGI, Strengthen the existing different types of administration mechanisms like community, MSEs and organizations; securing title deed for the areas; making the local community beneficiary as well as mobilizing stakeholders to ensure the urban and peri-urban greenery areas are rehabilitated, well managed and sense of ownership is created. 	<ul style="list-style-type: none"> No of complaints Number of local residents participated 	<ul style="list-style-type: none"> Report PO 	Every year	<ul style="list-style-type: none"> UNDP EPA CA 	450
Total						16,500

12. Public and Stakeholder Consultation Views

Since the project sustainability depends on participation of the concerned stakeholders, interested and affected community. We have conducted stakeholder meeting and consultation with Composting workers, city administrators and residents around the project site. The meetings were relevant to identify the main issues and concerns of the workers related to occupational health and safety practice and NAMA: COMPOST project management.

12.1. Workers View and Concern

Consultation of workers in compost and green area revealed that they appreciate the implementation of the project as it creates significant amount of job to local citizens throughout the value chain of compost and Urban greenery and nursery sites. They have appreciated the positive impacts of the project to the environment by increasing soil productivity and decreasing surface by flooding in all cities.

In addition to the job created by NAMA: COMPOST project, UGI in the project has been building the soil and water conservation structures on hill sides and tree plantation activities which have been under taking by daily laborers who are paid according to payment regulation of the city administrations. Moreover, security guards are employed to protect the greenery areas and people are supported to form MSEs on seedling raising business, provision of cafeteria services in the parks, fire wood plantation and use forest products such as grass from the greenery areas. As a result, it is expected that temporary and permanent jobs created for more than 36,280 people.

The major concern for MSEs working on compost in all city administrations e is market linkage. The most preferable purpose of compost usage is for: environmental beautification, coffee plantation and, nearby farmers use as substitute of inorganic chemical fertilizers (Henok Dongto, a leading speaker). However, there have been gaps to maximize compost production and earn the potential profits. This mainly is because of poor market linkage and incentive mechanisms, in that the MSEs by their own effort observed an increasing awareness level of potential buyers.

Other concerns include mixing up of household wastes with commercial wastes, at the transferring station and during transportation in all cities except Mekele. Separate transportation of segregated wastes from the household is very important to improve the quality of compost and avoid re-segregation of wastes at the landfill and related occupational health and safety impacts.

12.2 Stakeholder Consultation with City Administrators

The field team conducted consultation with city administration environmental protection office, City Beautification and Greening Bureau, health office and social affairs office and all shares the same views related to the project achievements in the Urban Infrastructure and have observable positive socio-economic and environmental impacts of the project.

- Flooding caused by surface runoff is decreasing in the cities as a result of the water and soil conservation structures built on the cliffs surround the cities and the increase in vegetation resulting from areas closure and tree plantations. City Beautification and Greening Bureau Team Lead of Adama has said “we have never experienced heavy rain as was last summer. But there was no much flooding in the city. Prior to the start of project intervention, small rain was enough to create huge flood on roads and slum areas in our city”. This has reduced damages on city infrastructure such as roads, ditches and water lines as well as houses caused by flooding which ultimately has reduced maintenance costs of the government and negative consequences on community livelihood. The same vies have also raised in Dire Dawa city administration. The cities are now experiencing low flooding and colder weather as compared to pre-project intervention as a result of the urban and peri-urban afforestation and trees planted on road sides, parks and individual compounds as discussed previously in this report. This is a good indicator that the project is contributing to resilience capacity of the urban community in the six cities to extreme weather condition such as flooding and high heat cause by climate change.
- As a result of intervention by NAMA COMPOST project, vegetation cover and rehabilitated land in the six cities is increasing from time to time. From such progress, they conclude that underground water is increasing and hence availability of fresh water for household use, livestock and urban agriculture is improving.
- Following establishment of three new plant nursery sites and increase in seedling raising capacity of two nursery sites, the city administrations have been providing seedlings to the community for free. Moreover, selected model villages in the six cities have been supported to green their neighborhood and some urban greenery areas have been given to the community for administration and use. All these project efforts have contributed towards community attitudinal change and enhancing community understanding on benefits of greening the environment that has resulted in actual observable changes in these cities; green compound and surroundings.
- The soil and water conservation structures built on hill sides and tree plantation activities were undertaken by daily laborers who are paid according to payment regulation of the city administrations. Moreover, security guards are employed to protect the greenery areas and people are supported to form MSEs on seedling raising business, provision of cafeteria services in the parks, fire wood plantation and use forest products such as grass from the greenery areas. As a result, temporary and permanent jobs created for more than 36,280 people and livelihood of the fittest ones has improved.
- As a result of establishment of plant nursery sites in the cities and start of MSEs in the seedling raising business, government cost of urban greenery mainly amounts of money used to be spend for buying and transportation of seedling has reduced.
- Some of the rehabilitated areas and areas given to the MSEs for plant nursery were illegal waste dumping sites and two of them were open landfills that people used avoid passing through and living closer to these places. After rehabilitation however, these places are no more health treats rather are used by the community to conduct special occasions such as wedding and graduation ceremony and value of land and rental price of houses close to these areas has increased.

12.2. Public Consultation

The field team conducted public consultation with residents live around compost shed and UGI sites in five city administrations (Hawassa, Dire Dawa, Bahir Dar, Bishoftu, and Adama) to see their views and concerns about the project. The NAMA: COMPOST project in all six cities didn't dislocate the community and lose of livelihood. As a result, there was no significant negative social or economic impact associated with project interventions in the six cities. Some of the areas were under use for livestock grazing by the local community. Most of the concerns raised were related to the land fill which is out of the scope of the study. But our discussion with community representatives about NAMA COMPOST and UGI has shown us that they are now more beneficiary than before because there is more grass and are allowed to feed their animal using cut and carry system. And significant amount of jobs are created throughout the compost value chain and daily laborers during making of conservation structures built on hill sides and tree plantation activities. Moreover, security guards are employed to protect the greenery areas and people are supported to form MSEs on seedling raising business, provision of cafeteria services in the parks, fire wood plantation and use forest products such as grass from the greenery areas.

The only concern is that, only limited number of local residents is participated in MSEs and a concern about dislocation from their grazing land use of fire wood. Therefore, the city administration should consider the local community and affected residents during formation of MSEs in UGI and the community should also involve in the management of the parks.

13. Conclusion and Recommendation

13.1. Conclusion

The consulting team has used three types of source of information to construct the environmental and socio-economic baseline condition of the intervention areas prior to project intervention so as to analyze the positive and negative impacts imposed on the area as a result of undertaking various activities. Our major source of information is the project document that has clearly indicated solid waste practices as well as greenery management of the six cities and potential impact on the environment, society and the economy. The second source of information is the community, micro and small enterprises, project staff and people from the municipality who gave the team clear information on conditions of the intervention areas such as how those areas were affecting the community (health, living condition, livelihood etc.), efficiency and effectiveness of solid waste management practice of the municipalities, livelihood of members of the MSEs and environmental condition of the greenery and composting areas prior to project intervention. The third source of information as regard of baseline establishment were satellite image and photographs that shows how the environmental condition of the intervention sites mainly of the greenery areas were.

Having a clear baseline information of intervention sites, the team then has observed sites where project activities are being undertaken to understand physical condition of the areas, conducted focus group discussion and key informant interview with community representatives, beneficiaries and implementers to gain their perspective on how they are positively or negatively affected by the project; observe working environment and how the MSEs do their job to understand impact of the economic activity on their health and read all project performance reports produced by the implementer. The information gained from all these sources is compared with the baseline information to understand the changes observed as a result of project intervention and how these changes have impacted or could likely impact the environment, the society and the economy. Similarly, the team has also tried to analyze to what extent risks foreseen during project development have materialized as well as any newly developed risks that could affect project sustainability.

Accordingly, the team has concluded that as a result of project ISWM and UGI development related interventions in the six cities, there are a number of positive currently observed and potential impacts on the environment, water, infrastructure, community, air and economy. The rehabilitated and afforested/reforested peri-urban areas have reduced rapid runoff of rain water preventing soil erosion that protected damage on infrastructure, reduced flooding of residential areas and its impact on community livelihood, serve as wind break, its cooling effect on the weather and contributing to climate change mitigation efforts through sequestration of CO₂. Moreover, the rehabilitated illegal waste dumping sites have reduced health risk on people living around and passing through those areas while at the same time increase land value the surrounding places.

The awareness raising efforts, distribution of plant seedlings for free and enhancing seedling raising capacity of the cities has brought attitudinal change and enhanced greening practice of the municipalities and the community. As a result, private and business compounds, neighborhoods, peri-urban areas, city

parks, road medians and city peripheral areas in the six cities are now greener as compared to four years back. People are witnessing change in weather condition as a result in the six cities expressed as cooler and less windy compared to previous years.

Efforts done towards improvement of waste management practices of the cities, community awareness raising on waste handling, introduction of waste recycling and composting business and trainings of staff and leadership of the municipalities including exposure to well advanced cities has resulted in better waste management in the six cities. This lowers environmental pollution including water, reduces GHG emission from landfill and results in better community health and satisfaction. Permanent and temporary jobs created in seedling raising, land rehabilitation, afforestation and reforestation activities, along the value chain of waste management, composting, waste recycling and other economic activities has contributed to livelihood improvement of people engaged in these businesses.

Since the project is phasing out within a year, the team has also tried to analyze existence of risks that could potentially reverse improvements seen in ISWM and UGI as a result of project intervention. There are conditions observed by the team based on which to conclude project results and outcomes will continue. The government owns the composting sheds and greenery areas and has co-financed the investment that implies high sense of ownership. There is no doubt on continuation of the composting and recycling business as long as the MSEs earn enough income out of it. Moreover, the project has introduced mechanisms like entitlement of clear and legal boundary, introduction of different management system such as community, government, companies and MSEs, fencing and introducing community benefit schemes to the greenery areas to ensure better protection and sustainability of the sites.

Despite of the positive impacts realized as discussed above, the team has tried to uncover existing and potential unintended negative environmental and socio-economic impacts of project intervention in the six cities as well as specific sites. As informed by the project manager, the project has used different strategies to minimize potential negative impacts during implementation such as intervening in areas where there are settlements to avoid displacement of people, construct the sheds within landfills for which EIA is already conducted to avoid environmental impact of composting, provide OHS trainings and materials to MSEs engaged in economic activities along the value chain of waste management and introduce waste segregation practices, undertake laboratory check on compost as well as use it only for plant nursery and urban greenery to avoid health impact. The team, from its onsite observation and discussion with people, as well has understood that the project had no significant negative impact during implementation; no person is displaced or livelihood affected as a result of project activities, the composting and recycling business does not have much residue to pollute underground or surface water, no person has been reported seriously ill caused by his/her engagement in the waste management or recycling activities and all the project activities have no emissions to pollute air.

However, as compost production increases and its application on farming starts, there is possibility to affect community health and pollute surface and underground water for which we have recommended to construct leachate ponds according to the standard (Adama, Dire Dawa, Bahir Dar and Mekelle), enforce waste segregation at source and separate transportation and continuous laboratory taste on compost.

Moreover, the team has also understood that the MSEs engaged in solid waste management, composting, and recycling are not adhering to the OHS measures that could potentially affect their health. The recommendation is for the city administration to take measure on those who are not obedient to the safety rule.

The team has understood that the project is using different mechanisms to sustain project outcomes. However, there are still risks that could reverse the results gained so far. The MSEs engaged in composting and recycling business are not generating enough income to support their life due to lack market for their product and hence have doubt to stay in the business. The municipalities, who are going to take over the activities following project phase out, are advised to continue helping the MSEs in finding more market mainly by creating linkage with urban/rural agriculture and environmental protection agencies. Trespassing legal boundary of some greenery areas, mainly in Hawassa and Dire Dawa by illegal settlers is observed and government is not taking measure to reverse the situation being afraid of social unrest. The team would like to advise the municipalities to regularly check and enforce the law before more and more people entered the greenery areas that might worsen the situation.

The positive impacts of the project are associated with employment generation, social benefits, economic impacts, and environmental benefits. The major significant negative impacts of the project include soil quality impacts, water resource impacts, air quality impacts, visual impacts, impact on biological environment, OHS impacts and impact on land use and land cover.

The major risks related to the project are illegal land grabbing related to UGI, limited supply of diverse vegetation for UGI, extended drought in Mekelle, Adama and Dire Dawa, health related risks to waste handling and processing, sustainability due to poor income generation of UGI, market problem for compost and risk of contamination during transportation.

Based on the social impact assessment, and stakeholder consultation, most residents welcome the project and appreciate the positive impacts. Analysis indicated that all impacts are within the range from low to severe significance. Impacts with medium impact significance include soil quality impacts, visual impacts, impact on biological environment and utility impact. Impacts with severe impact significance include water resource impacts, air quality impacts, impact on land use land cover, and OHS impacts.

The main mitigation and monitoring measures to minimize or reduce the environmental and social impacts especially for those with medium and severe level impacts will be implemented based on the project mitigation and management plans. Similarly, implementation of the mitigation measures will be verified through environmental social monitoring plan using the specified budget.

In summary, the team has concluded that environmental and socio-economic impact of the project in the past four years is significantly positive and if project outcomes are sustained, it will continue to benefit the community, the economy and the environment. The foreseen risk and negative impacts can be minimized with minimum investment and efforts by the municipalities as recommended in this document.

13.2. Recommendation

Finally, it is important to point out some of the critical recommendations which the project management group should follow. Implement environmental monitoring during operation, Implement an environmental management system which ensures environmental responsibility at all levels, Maximum safety and health procedures should be followed in compost shed during collection, segregation and process of compost. Special attention should be given to the primary collection system being the most visible part of the service and wastes should be segregated at house level in all city administrations and separate transport services should be arranged in Mekelle, Hawasa, Bishoftu, Dire Dawa and Bahir Dar.

Elemental Analysis of compost quality in all compost sheds should be done to determine the actual risk of compost.

Market linkage and demand of organic fertilizer is the major challenge for project sustainability. Assessment of the effects of substituting equal amounts of mineral fertilizer with organic compost should be done in the farmers land on the yield, dry matter (DM), and nitrogen (N) uptake of spring and on the mineral N (N_{min}) distribution in the soil profile and productivity in general. Therefore, the farmers can have confidence to use organic fertilizer based on the result obtained from the assessment.

In general, the consulting team recommends the following major recommendations.

- There is some interest conflict especially in and around greenery areas where most of them were communal lands. Therefore, strengthen title deed and promoting cut and carry feeding system can help to reduce the interest conflict
- The project in collaboration with key stakeholders shall give due attention protecting the intention of illegal settlement in some project sites by legal enforcement
- UGI are not yet able to generate income for members thus to sustain the project in general and UGI in particular there should be some mechanism to diversify income sources of members as well as enhance access to loan and other financial services for MSE
- Promote organic fertilizer in collaboration with Agriculture office and agricultural research institutions to create demand for compost which is directly linked with market and sales income from it.
- Promote Segregation and separate transportation of waste at household level by providing and/or promoting incentivize to encourage households for enhanced solid waste management
- Capacitate local implementing partners and private solid waste collectors to sustain the project results

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15. Annexes

15.1. Sample Maps of Urban Greenery Infatuation

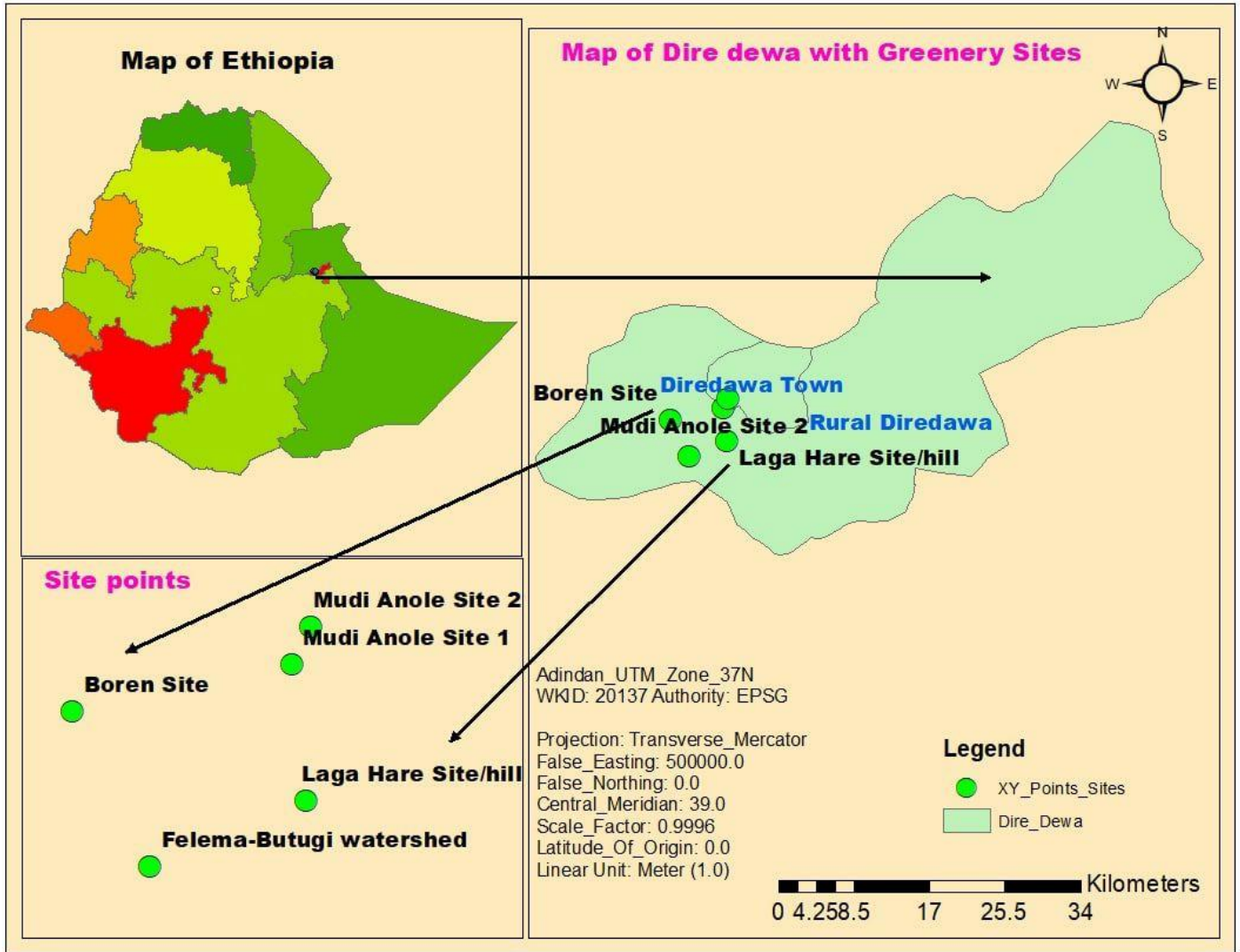


Figure 21: Dire Dawa Urban Greenery Sites

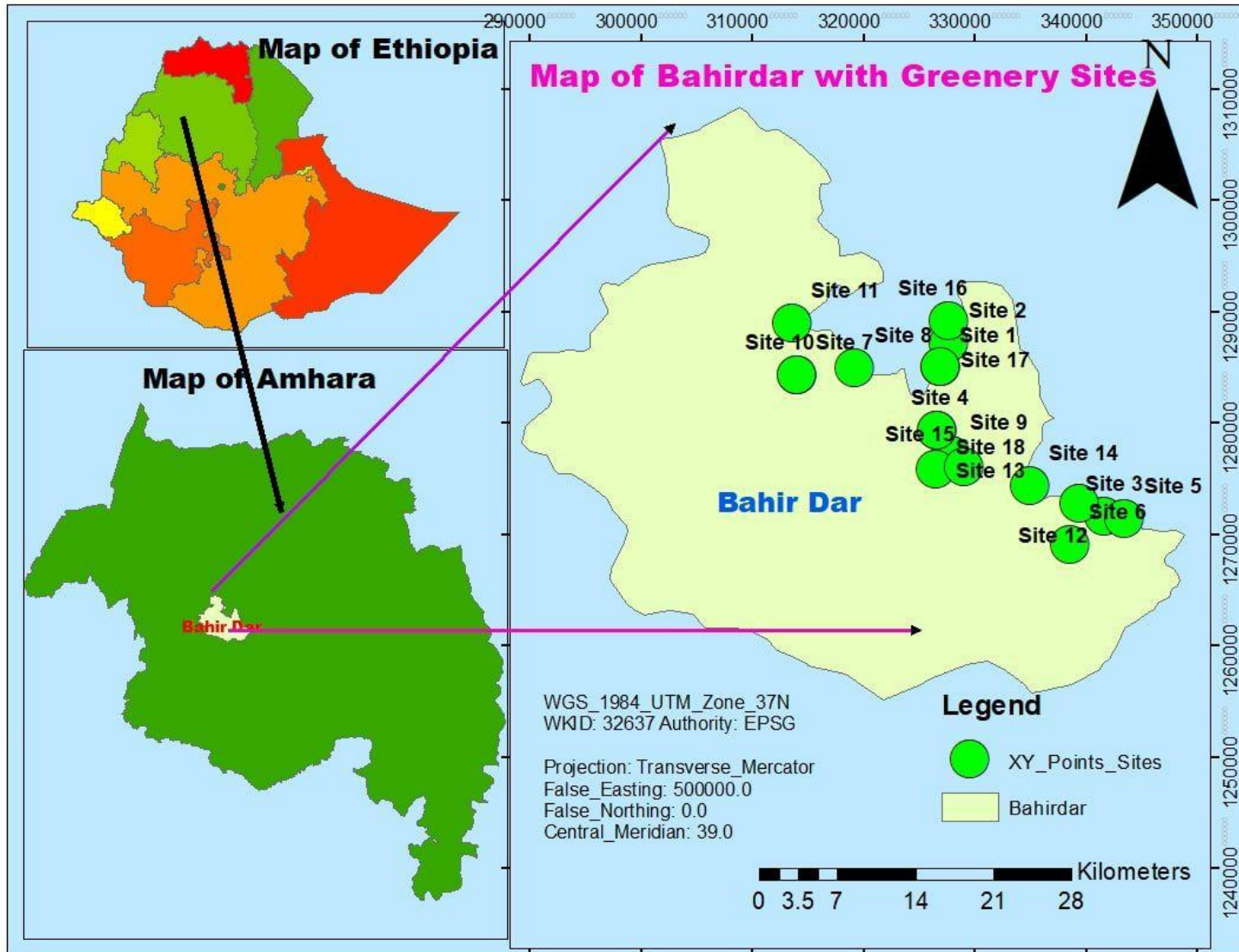


Figure 22: Map showing Bahir Dar Urban Greenery Sites

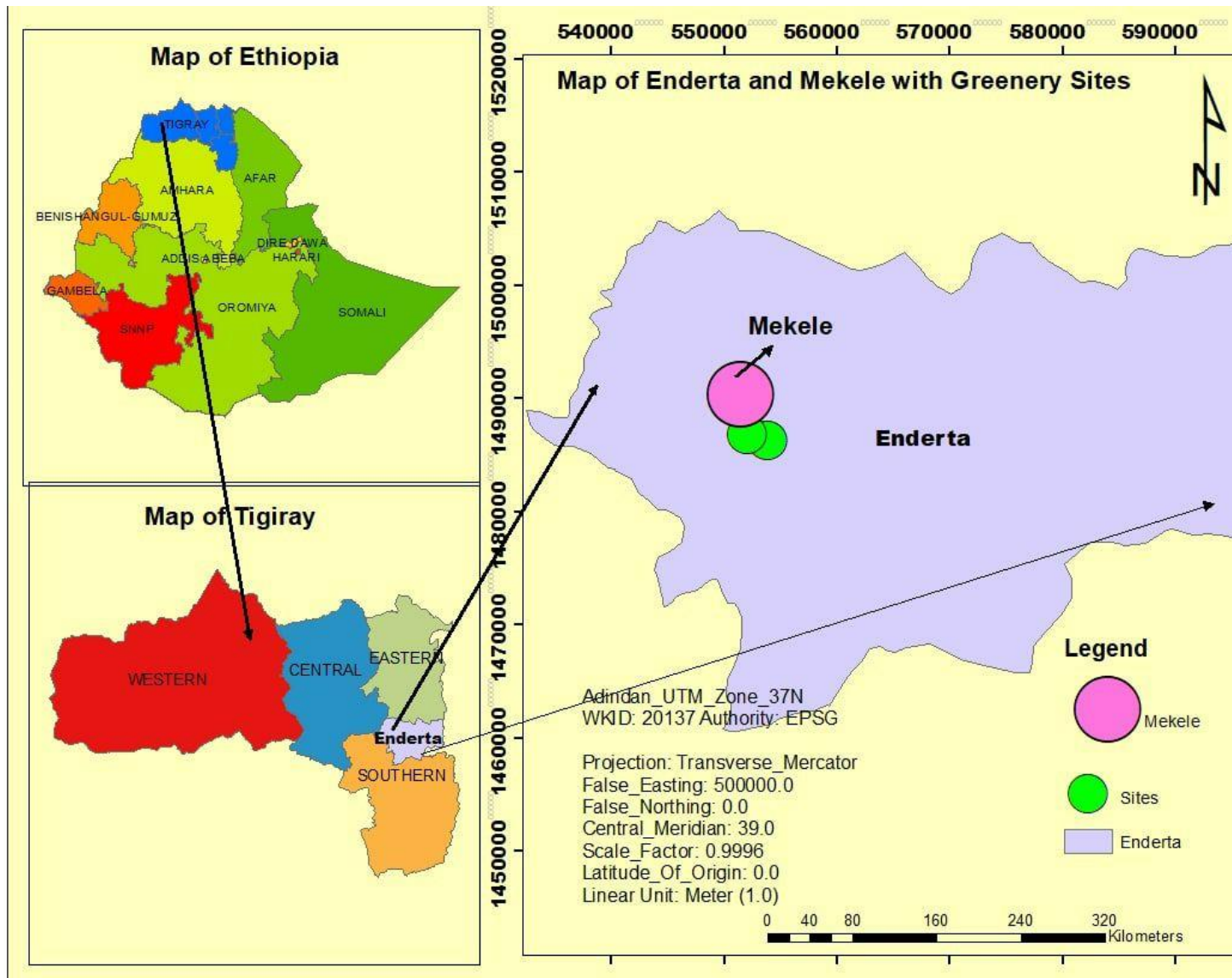


Figure 23: Map showing Mekelle Urban Greenery Sites

15.2. Sample Title Deed Certificates for UGI

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

Wajjiira Bulchiinsa Fi Itti Fayyadama Lafa Magaalaa Adaamaa
አዲስ አበባ የግብርና ልማት ሰጠታ ሰጪ ስራ ቤቅ
Adama City Urban Land Use And Administration Office

SURRAA
 30x40mm

WARAQAA RAGAA QABIYYEE LAFI MAGAALAA KARAAN BULAN
URBAN LAND RENT HOLDING CERTIFICATE

Bulchiinsa Mootummaa Naannoo Oromiyaa
 Labii Lakk. 179/2005 Aangoo fi Gabee hojii
 Ejjansi Misoomaa fi Manaajimantii Lafa
 Magaalaa marreessuf bahe irratti hundaa'uuu,
 Lafa (no) 19501045, 3 Bulchiinsa Magaalaa
Adaamaa Ganda Bokuu keessatti
 argamu Obboo/Anddee/Dhaa
 W/Name, Gopheessa B/M Adamaa y
 Tajaajila Magarisa y
 X/Name akka itti fayyadaman warqaan ragaa kun
 kennameera.

Teessuma Iddoo fi Mana
 Position of Parcel and House

Daangeessitoota
 Relative Location

Kaarbaan Karaa
 North Karaa
 East Karaa
 South Karaa
 West Karaa

X=526506.3767 Y=938209.5741
 X=526506.3800 Y=938209.5742
 X=526561.8589 Y=938211.0217
 X=526589.9567 Y=938260.7781
 X=526615.7945 Y=938306.5326
 X=526683.7791 Y=938426.9221
 X=526683.7833 Y=938426.9368
 X=526691.2961 Y=938453.3529
 X=526723.1492 Y=938565.3524
 X=526742.1992 Y=938616.1525
 X=526749.7308 Y=938625.2959
 X=526843.1549 Y=938712.6874
 X=526979.7209 Y=938783.5296

Magaalaa City
 Sub-City
 Ganda/Kibbe
 Land Use
 Tajaajila Lafa
 Land Function
 Sadarkaa Land
 Land Code
 Olfantaa/Height
 Height Requirement
 Bafaa Lafa
 Parcel Area
 19501045.3

Kan Qopheessa / Prepared by: **Binyan Salomon**
 Maqaa / Name: **Koussa Birkaw**
 Gabee Hojii / Position: **QIDA KIBBE**
 Mallattoo / Signature: **DIRQAMA ABBAA QABIYYEE**

Kan Quilqeessa / Checked by (Urban Planner): **Koussa Birkaw**
 Maqaa / Name: **Koussa Birkaw**
 Gabee Hojii / Position: **QIDA KIBBE**
 Mallattoo / Signature: **DIRQAMA ABBAA QABIYYEE**

Kan Mirkaneeffa / Approved by: **Koussa Birkaw**
 Maqaa / Name: **Koussa Birkaw**
 Gabee Hojii / Position: **QIDA KIBBE**
 Mallattoo / Signature: **DIRQAMA ABBAA QABIYYEE**

1) Bu'uurra Eeyyama jjaarusa kennameen iddoo kana irratti jira Diigdamii Afur(24)0, Saffaama Jaha(36)0, Afurtamii Saddeet(48)0 keessatti gabbasuu qabu;
 2) Yeroo kennameef keessatti bu'ura Labii liizii lakk. 721/2004, Dambii liizii lakk. 155/2005 fi Ojjeelama liizii lakk. 12007 ttiin qabeenya kun hin qabachifne yoo ta'e
 ragaan kun tajaajila hin kennu.

Mallattoo Abbaa Qabiyyee / Signature

Scale 1:500

Figure 24: Magra Greenery Area Title Deed Certificate, Adama


15.3. Signed FGD minutes and List of People Contacted

ገጽ 6 → ተፅዕኖና አገልግሎት

- ገጽ 5 ላይ የፎካል ቡድን ስራ ስለተፈጸመ ስለሚለኩት በገጽ 6 ላይ ስራው ላይ ተጨማሪ መረጃዎች ማስጨማሪያ ማድረግ

1) የአገልግሎት ለውጥ (landfill) አገልግሎት
2) የአገልግሎት ለውጥ: ከሁለት ዓመታት በፊት
3) የአገልግሎት ለውጥ: ከሁለት ዓመታት በፊት
4) አገልግሎት ለውጥ (ገንዘብ ገቢ ማረጋገጥ)

የአገልግሎት ለውጥ: አገልግሎት ለውጥ ማድረግ
የአገልግሎት ለውጥ: አገልግሎት ለውጥ ማድረግ
የአገልግሎት ለውጥ: አገልግሎት ለውጥ ማድረግ
የአገልግሎት ለውጥ: አገልግሎት ለውጥ ማድረግ
(preventive measures) ከፊት ማድረግ
(mitigation measures) ከፊት ማድረግ
ስለገቢ: አገልግሎት ለውጥ ማድረግ



Minister of Natural Resources and Environmental Conservation
የፌዴራል ሚኒስቴር
የፌዴራል ሚኒስቴር
የፌዴራል ሚኒስቴር

ቀን 19/04/2013 ዓ.ም

ቦታ: ሀዋኝ መካከለኛ የገቢ ስራ ማድረግ

አገልግሎት: የሀገር ገቢ ማድረግ

ተጠቃሚዎች:

- 1) ሀዋኝ ስራ
- 2) ሀዋኝ ስራ
- 3) ሀዋኝ ስራ
- 4) ሀዋኝ ስራ
- 5) ሀዋኝ ስራ
- 6) ሀዋኝ ስራ

ዘርዘር ጉዳዮች:

- 1) አገልግሎት ለውጥ ማድረግ
- 2) አገልግሎት ለውጥ ማድረግ
- 3) አገልግሎት ለውጥ ማድረግ
- 4) አገልግሎት ለውጥ ማድረግ
- 5) አገልግሎት ለውጥ ማድረግ
- 6) አገልግሎት ለውጥ ማድረግ

የተጠቃሚው ስም: ሀዋኝ ስራ

- 1) ሀዋኝ ስራ - አገልግሎት ለውጥ ማድረግ

አገልግሎት ለውጥ ማድረግ

አገልግሎት ለውጥ ማድረግ

Meeting Minute format for FGD undertaken in each city administrations

- Meeting date 25/4/2012
- Time 4:30 - 4:45
- Place Bishopton
- List of participants

Name of participant	Organization/Position	E-mail address	Tel/Fax	Signature
Addisu Melka	Project Focal	Melka.addisu	0923509503	[Signature]
Feyze Mammo	SWM Teamleader	@74mo.com	0911827656	[Signature]
Canat Canasu	SWM Expert	-	0913990697	[Signature]
Dereje Abera	Greenery expert	-	0911975327	[Signature]
Tyfit Jona	"	-	0911987665	[Signature]
Teffaye Abebe	SWM Expert	-	0911664602	[Signature]
Tesfay Gyuma	"	-	0910249001	[Signature]
Bahfeto Bereta	"	-	0920650402	[Signature]

- Agendas: To Assess Environmental and social impact of NMP project.
- Findings: To identify mitigation measures of composting sheds & urban greenery interventions.
- Findings: The implementation of degraded land rehabilitation and integrated solid waste management facilities from source to end.
- Mitigation: Performing of urban waste handling at household level and carry out urban greenery development with degraded land rehabilitation activities.
- Summary

Agendas	Findings	Mitigation measures/comments proposed
Assess Environmental & social impact of project	* low performing of waste handling & source sorting	Increase number of MSE door & separate waste for 2R
Mitigation measures of composting sheds & urban greenery development	* lack of compost market link	water pipe line maintenance & display shops for compost demonstration activity for sell
Other comments :	* low survival rate of greener	performing water availability by using water tanker selection of appropriate tree species for mountain areas.

- * sanitary landfill fence maintenance is performed
- * Water availability in compost production areas must be installed by pipe line or underground water borehole.
- * For perfect degraded land rehabilitation water should be available by water tanker on the hill side areas with continuous work activities.

