Federal Democratic Republic of Ethiopia
Addis Ababa Cleansing Management Agency

Federal Democratic Republic of Ethiopia
Solid Waste Management Advisor
for Addis Ababa City

Project Completion Report

April 2024

Japan International Cooperation Agency (JICA)

Kokusai Kogyo Co., Ltd.

GE
JR
24-037

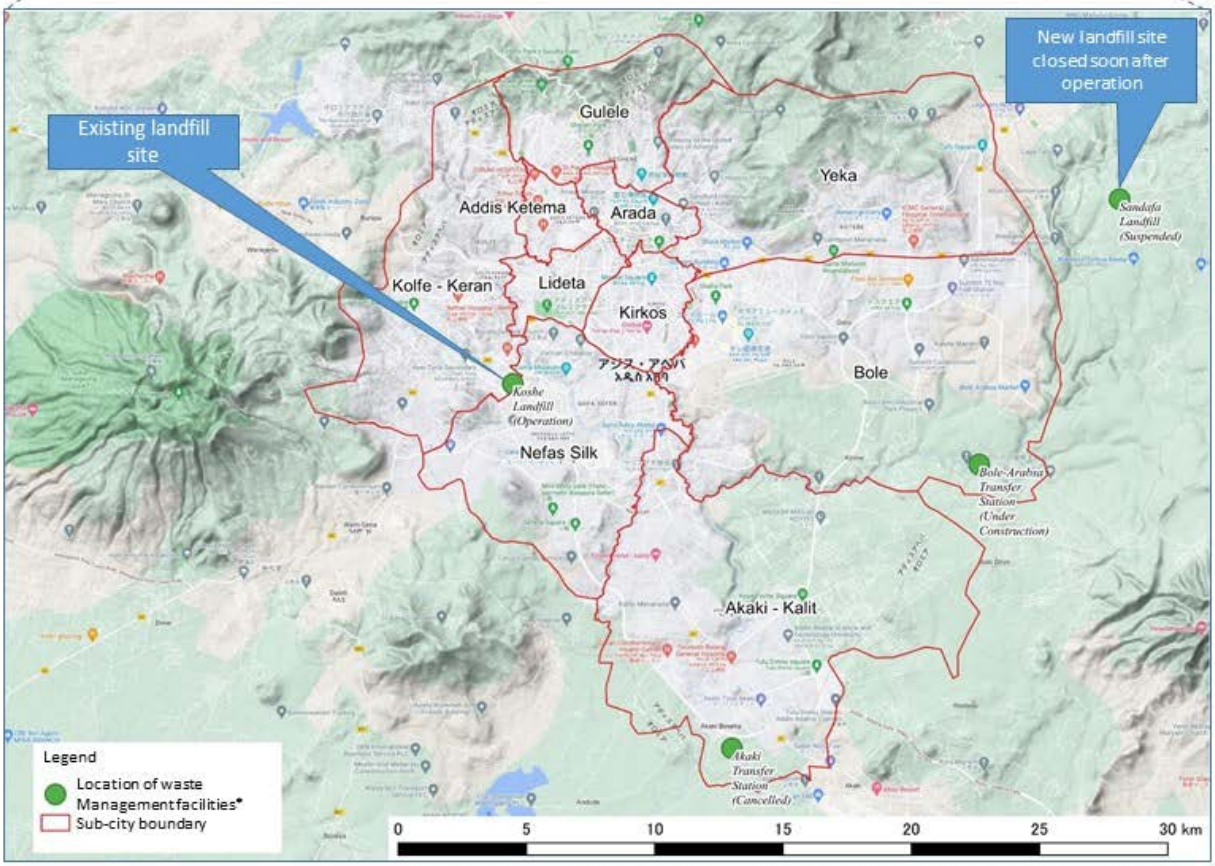
Contents

Figure Contents

Table Contents

Project Target City Location Map

Created by the JICA expert team based on OpenStreetMap



Created by the JICA expert team based on Google Maps

* DATA COLLECTION SURVEY ON MUNICIPAL SOLID WASTE MANAGEMENT IN AFRICAN CITIES

Abbreviations

Term	English
AACMA	Addis Ababa Cleansing Management Agency
AAWSA	Addis Ababa Water and Sewage Authority
CAPEX	Capital Expenditure
C/P	Counterpart
CMO	Cleansing Management Office
EC	European Commission
EEP	Ethiopian Electric Power Corporation
EPA	Environmental Protection Authority
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
FS	Feasibility Study
GIZ	Deutsche Gesellschaft fur Internationale Zusammenarbeit
HH	Household
ISWM	Integrated Solid Waste Management
JICA	Japan International Cooperation Agency
MoUDC	Ministry of Urban Development and Construction
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
NatuReS II	Natural Resources Stewardship Programme II
NGO	Non-governmental Organization
OPEX	Operating Expenditure
PET	Polyethylene Terephthalate
SME	Small and Medium-sized Enterprises
SNS	Social Media
ST	Strategic Theme
WtE	Waste to Energy

1 Outline of the Project

1.1 Background of the Project

Addis Ababa, the capital of Ethiopia, has seen a significant population increase of one million over the 10 years since 2012, with the population reaching around 5.2 million by 2022[1]. The amount of waste generation has also increased significantly, in line with the country's economic growth. Currently, the city generates an estimated 3,300 tons of waste per day, an amount that is expected to increase further. However, it has become quite difficult for the Addis Ababa Cleansing Management Agency (AACMA), a core administrative body, to handle the increasing volume of waste in an adequate manner. In addition, waste dumping has been causing adverse effects on the environment and the deterioration of public health.

In the city, containers are installed in each of 11 sub-cities and small and medium-sized enterprises (SMEs) entrusted by the AACMA office in each sub-city provide primary collection using wheelbarrows. Private companies are then entrusted by the AACMA to engage in secondary collection of the waste from the containers and transport it to the landfill site, using collection equipment owned by the companies or the AACMA. Although the estimated waste collection rate is reported to have reached approximately 75%, it is still difficult to say that an appropriate collection and transportation system has been fully established, for illegal dumping has still been detected in the city and is causing problems[2]. In addition, a waste incineration and power generation plant (with an incineration capacity of 1,400 tons per day and power generation capacity of 50 MW) has been in operation since 2019 as an intermediate treatment facility; however, the actual volume of waste processed at the plant has been significantly lower than its capacity, and several issues have been found in the operational management technology and safety management.

The Koshe landfill site is the only final disposal site in the city. It has been mostly used as an open dumping site and, in 2017, an accident occurred in which part of the landfill site collapsed as a result of waste that had piled up in a disorderly manner. The site has been in use for more than 50 years, exceeding its service life, but there are no plans to construct a new landfill site. Furthermore, while there is an urgent need to reduce the amount of waste, no source separation system has been introduced. In addition, the recycling industry in the private sector is still in its infancy; therefore, only a small percentage of waste is recycled.

The AACMA is currently studying new policies and strategies to improve waste management; further, it is in the process of developing an Integrated Solid Waste Management (ISWM) strategy based on the promotion of the 3Rs (Reduce, Reuse, Recycle) and the introduction of appropriate waste management technologies. However, in order to make this ISWM strategy effective and sustainable for handling the accumulating operational challenges mentioned above, it is essential to improve the technical and financial management capacity of the AACMA as a waste management administrative body[3]. The purpose of the "Advisory Project on the Waste Management in Addis Ababa City" (hereinafter, "the Project") is to provide support on capacity building through the dispatch of a Japan

[1] Macrotrends. <http：//www.macrotrends.net/>（referred data accessed 16th September 16, 2022).
[2] JICA. (2022). "Information Collection and Verification Survey on the Project Formulation for the Solid Waste Management in Africa".
[3] Gelan, E. (2021). "Municipal Solid Waste Management Practices for Achieving Green Architecture Concepts in Addis Ababa, Ethiopia". Technologies, 9(3), 48.
World Bank. (2021). Towards a Trash-Free Addis Ababa Pathways for Sustainable, Climate-Friendly Solid Waste Management.

International Cooperation Agency (JICA) expert team (advisors) to analyze the current status of and the issues related to waste management in Addis Ababa City, examine improvement measures, and formulate an action plan for the promotion of the ISWM strategy.

1.2 Objective of the Project

Overall Goal

Continuous efforts to promote the ISWM strategy are practiced in Addis Ababa City.

Project Goal

An effective draft strategic plan will be developed for AACMA to promote ISWM.

Expected Outputs

The following three outputs are expected in the Project.

Output 1: The current status and issues related to waste management in Addis Ababa will be identified.

Output 2: The selection and improvement methods of appropriate waste management technologies for each stage of waste management will be examined.

Output 3: Policies to improve the technical and financial sustainability of AACMA are identified.

1.3 Scope of the Project

(1) Target Area

The target area of the Project is Addis Ababa City.

(2) Target Agency

The main counterpart (C/P) of the Project is Addis Ababa Cleansing Management Agency (AACMA).

1.4 Implementation Structure of the Project

(1) Implementation Structure

The Project will be implemented by the JICA expert team within the following structure.

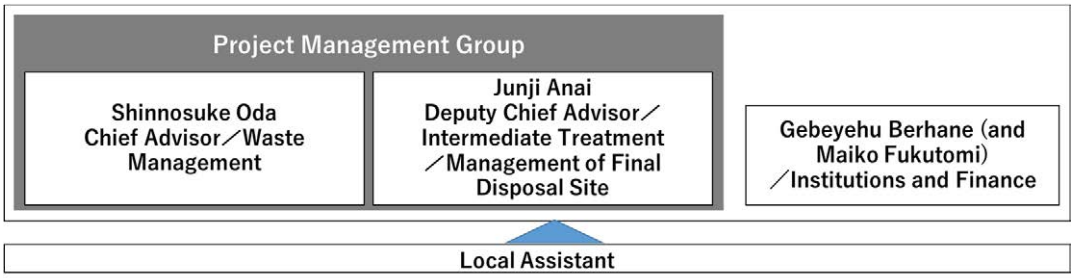


Figure 1-1 Implementation Structure

(2) Members of the JICA Expert Team

The JICA expert team consists of the following members. The experts will advise the C/P based on his/her own expertise.

Table 1-1 JICA Expert Team

Name	Position	Company
Shinnosuke Oda	Chief Advisor / Waste Management	Kokusai Kogyo Co., Ltd.
Junji Anai	Deputy Chief Advisor / Intermediate Treatment / Management of Final Disposal Site	Kokusai Kogyo Co., Ltd.
Gebeyehu Berhane /Maiko Fukutomi	Institution and Finance	Kokusai Kogyo Co., Ltd.

2 Project Activities

2.1 Activities Related to Output 1

Output 1: The current status and issues related to waste management in Addis Ababa will be identified.

2.1.1 Summary of Activities

Activities related to Output 1 were conducted as shown in the table below.

Table 2-1 Summary of Activities Related to Output 1

Activity	Contents
Activity 1-1	Based on existing data, support analysis of the current status and challenges of waste management operations (collection, transportation, intermediate treatment, and final disposal) in Addis Ababa City. First, the results of studies of waste amount and composition and the latest data on waste collection amount and final disposal amount were obtained and organized. Subsequently, interviews and on-site visits were conducted with the Cleansing Management Offices (CMOs) of the AACMA's relevant departments, sub-cities and Woredas to understand the actual situation with regard to waste collection and transportation, final disposal, and recycling. The information and data obtained were carefully reviewed in collaboration with the AACMA to create a current waste flow and to clarify and analyze current challenges to waste collection and transportation, intermediate treatment, and final disposal. Current challenges at transfer depots[4] and the landfill site were to be visualized using drones, but this could not be realized because national policy restricts bringing drones into Ethiopia from overseas countries. As an alternative, a location survey on transfer depots was conducted using GPS, and a satellite photo was utilized to analyze the remaining capacity of the existing landfill site.
Activity 1-2	Assist in identifying issues related to budget and organizational structure for waste management. The organizational structure and roles of the AACMA, the agency responsible for waste management in Addis Ababa City, and its relationship with sub-cities and Woredas, were clarified. In addition to gaining a grasp of the actual financial situation of the AACA and Woredas, the structure of SMEs and private companies, and the finances for sustaining waste collection and transportation utilizing them, was understood. Regarding the legal framework for waste management in Addis Ababa City, the relevant laws, regulations, and ordinances were organized at the global, national, and city levels. Based on the strategies and goals outlined in the Addis Ababa City Waste Management Ten-Year Development Plan (2020/21-2030/31), the current challenges for waste management were identified based on the results of analysis of the information and data collected.

[4] The explanation and categories of transfer depots is described in the 2.1.2 (5).

Activity 1-3	Share case studies of waste management improvement in Japan and other developing countries to deepen understanding of necessary initiatives. Based on the current state of waste management in Addis Ababa City, identified in Activity 1-1, the necessity of waste reduction was confirmed. It was determined that lessons from case studies involving community participation in waste separation, home composting, the improvement of collection systems involving communities, and consensus-building with local residents in waste treatment facility planning would be valuable. In this light, the lessons identified in JICA projects in Indonesia, Fiji, and Kosovo, as well as in case studies in Japan, the activities of which were conducted in the field of waste management, were summarized to share their experiences and insights. The factors improving and inhibiting matters with regard to the challenges faced in each case study were explained to the C/P, with opinions being exchanged to identify the challenges faced by waste management in Addis Ababa City and to discuss methods for improvement, with the aim of facilitating the formulation of a draft strategic plan.

2.1.2 Current Situation and Challenges of Waste Management in Addis Ababa

In Activity 1-1, data and information were collected through interviews with the AACMA, sub-cities, Woredas, and concerned organizations to analyze the current situation and challenges related to waste management in Addis Ababa City. Based on the collected data and information, discussions between the AACMA and JICA expert team were held to ensure mutual understanding of the current situation and analyze challenges, with the findings summarized in the “Waste Management Profile Report”. Additionally, in Activity 1-3, the case studies of improvement in other developing countries facing challenges in waste management similar to what the city has been facing, as identified in the previous studies, were presented to the AACMA as references. The current situation in the city and the challenges identified in this activity are described as follows.

(1) Organizations and institutions

① Organizational structure to control waste management

The AACMA is the supervisory body responsible for managing the waste management system in Addis Ababa City. Established in 2018 and based on Proclamation No. 58/2018 promulgated by the city, the AACMA was formed by reorganizing the Addis Ababa Solid Waste Recycling and Disposal Project Office. The AACMA is responsible for overall waste management services across the city. Meanwhile, each sub-city and Woreda has its own Community Management Office (CMO), with each CMO responsible for monitoring and supervising sanitation services. The AACMA operates closely with the CMOs of the sub-cities and Woredas to achieve the strategic waste management objectives of the city. Additionally, the CMO in each Woreda has an obligation to report to the sub-city CMO, ensuring close coordination and collaboration among them for effective waste management in the city.

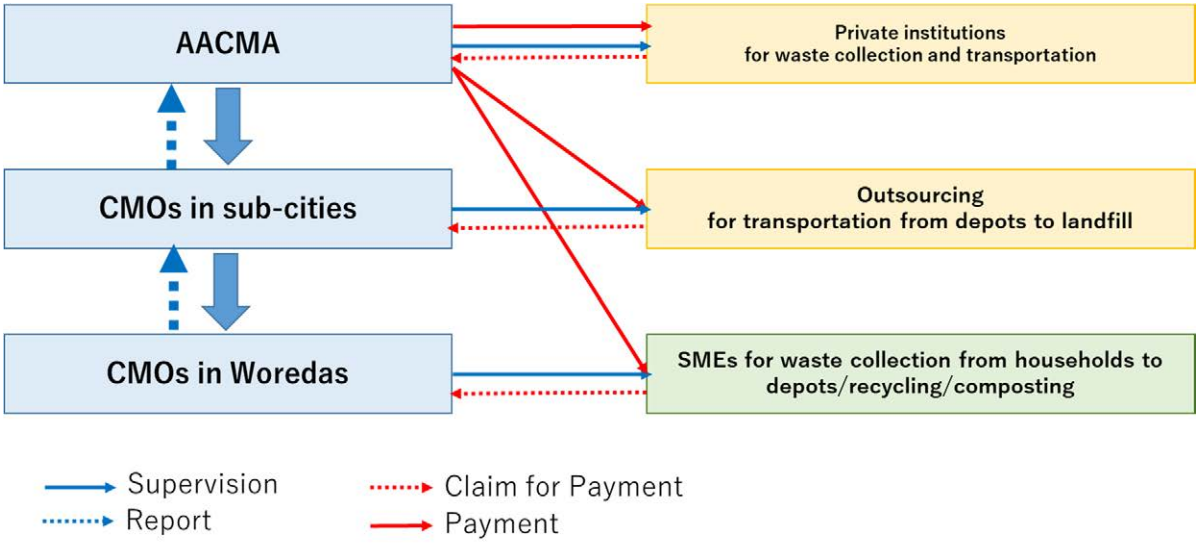


Figure 2-1 Structure of Supervision and Chain of Command for Waste Management in Addis Ababa City

As of May 2023, the AACMA has a staff of 304 employees. The organization is structured with the Secretary-General at the top and divided into two departments, the Finance Management Department and the Service Provision Department, comprising a total of 15 directorates.

The Financial Administration Department includes seven directorates responsible for management tasks such as personnel, finance, planning, and budget management. Within the Service Provision Department, there are five directorates responsible for waste management services such as reuse and recycling, collection and transportation, and landfill management. The specific duties of each directorate within the Service Provision Department are outlined in the table below.

In the AACMA, more than half of the staff members are engaged in the Service Provision Department, of which the Landfill Administration Directorate is the largest section, with 103 members.

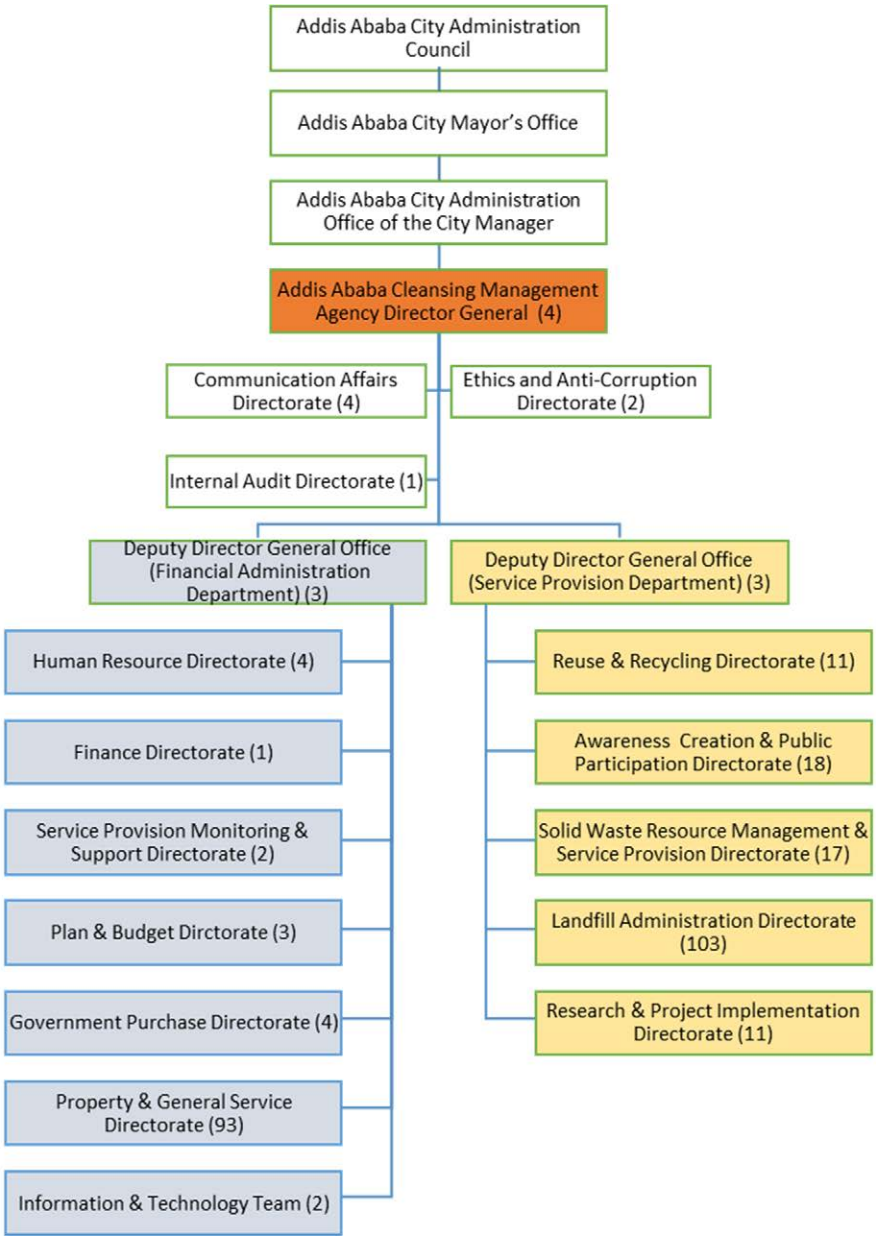


Figure 2-2 Organizational Structure of the AACMA

Table 2-2 Key Functions of Individual Directorates of Solid Waste Service Provision Department

Name of Directorate	Key Functions
Landfill Administration Directorate	• Receive solid waste delivered to the landfill sites and issue receipts • Link delivery information with the fleet management system • Check the appropriateness of the solid waste to be dumped at the landfill • Spread and level dumped solid waste, cover the waste with soil and perform compaction; • Control pollutants originating from the landfill • Implement disposal methods to control pollution • Perform treatment of liquid waste originating from the landfill before releasing it • Perform preventive maintenance work for machinery • Perform repair and maintenance for machinery
Reuse & Recycling Directorate	• Produce various products from solid waste (compost, bricks, ornaments, etc.) • Organize unions and provide support for them to participate in recycling • Through reuse and recycling, create market linkage • Check the appropriateness of the quality of the solid waste and receive after measuring its weight • Organize solid waste information and connect with the center of the fleet management system
Solid Waste Resource Management & Service Provider Directorate	• Collect solid waste • Transport solid waste • Use fleet management system (for effective collection and transportation of solid waste)
Awareness Creation & Public Participation Directorate	• Create awareness • Perform facilitative functions to gain the participation of the community and other stakeholders • Perform functions to increase awareness to reduce solid waste at the source • Perform functions to increase awareness to segregate solid waste at the source
Research & Project Implementation Directorate	• Conduct studies on solid waste management • Perform technological innovation, copying and adaptation; • Formulate and implement projects • Construct recycling centers • Construct disposal sites • Construct solid waste transit centers

Source: Prepared by the JICA expert team based on data provided by the AACMA.

② Sub-cities

As of April 2023, there are 11 sub-cities in Addis Ababa City. Each sub-city has a CMO in its jurisdiction responsible for local waste management in the area. In general, a CMO consists of three departments: Reuse and Recycling, Collection and Transportation, and Awareness Creation. Approximately 15 staff members are allocated to each department.

The major roles of the sub-cities in waste management are: 1) to supervise the Woreda in each area that is responsible for door-to-door waste collection and the transportation of waste to the transfer depot; 2) using their own vehicles to provide transportation service to transport collected waste from the waste depot to the final disposal complex; 3) to supervise outsourced transportation service to private service providers for waste that the sub-city cannot deal with due to a lack of transportation vehicles owned by the sub-city; and 4) using their own vehicles to manage road cleaning service, with the Woredas in each sub-city hiring cleaners and taking responsibility for manual road cleaning. In addition to the roles mentioned above, the sub-cities also serve the function of being intermediary organizations that promote coordination between the AACMA and Woredas.

③ Woredas

In Addis Ababa City, it is estimated that approximately 120 Woredas exist under the sub-cities, which means that each sub-city has more or less 10 Woredas in its jurisdiction. Positioned at the forefront of municipal waste management, the Woredas play an important role in supervising SMEs that provide household collection and transportation to a transfer depot that exists in each Woreda. As mentioned before, with regard to road cleaning, Woredas hire cleaners to implement this activity, while the sub-cities are responsible for road cleaning, using vehicles to do so.

The organizational structure of Woredas is also similar to that of sub-cities, whereby a CMO exists in each territory, consisting of three departments responsible for Reuse and Recycling, Collection and Transportation, and Awareness Creation. The number of staff members at each CMO is estimated to be approximately 30.

④ Unions (Comprised of Three or More SMEs)

In the city, it is estimated that approximately 97 unions have been engaged in waste collection service, creating employment opportunities for around 7,020 people in the city. Several SMEs create a single waste collection union, and provide door-to-door waste collection service for households. Based on recorded waste collection amounts issued at the final disposal complex, a waste collection union individually claims payment through the Woreda; payment is eventually made by the AACMA after the entire accreditation process is conducted by the Woreda, sub-city, and AACMA. In addition to the unions providing waste collection service, there are other unions/SMEs working in the recycling and composting market.

Table 2-3 Number of Waste Collection Unions Providing Waste Collection Service

Sub-city	Number of Unions	Number of Permanent Members of Unions	Number of Temporary Members of Unions on Contract Basis
1 Arada	4	293	46
2 Addis Ketema	15	616	47
3 Lideta	4	332	39

4 Kirkos	3	314	82
5 Yeka	10	570	37
6 Bole	10	546	164
7 Akaki Kality	11	851	25
8 Nifas Slik Lafto	11	837	60
9 Kolfe Keraniyo	11	612	121
10 Gulele	9	867	10
11 Lemi Kura	9	551	0
Total	97	6,389	631

⑤ Outsourcing / Private Companies

The private companies engaged in waste management in the city can be largely divided into two categories. One category is for companies providing waste transportation service from transfer depots in each Woreda to the final disposal complex under an outsourcing agreement with the AACMA. These companies are basically under the supervision of the sub-cities and remuneration is provided from the AACMA after the approval of the sub-cities is given. In the city, it is estimated that approximately 34 such companies are engaged in this activity. The other category is for private companies serving business institutions by providing waste collection and transportation as one stream; this is directly supervised and paid for by the AACMA. It is said that around 30 such companies exist in the city. In the city waste management context, the former category is identified as “Outsourced” and the latter as “Private”, although both are private and play an outsourcing role.

(2) Waste Fee and Budget Related to Waste Management

① Waste Fee

In Addis Ababa City, the waste fee is included in the water bill and collected together with it. According to the Addis Ababa Water and Sewage Authority (AAWSA), the revenue collected from the waste fee totals 459.4 million birr from 2019/20 to 2021/22, with an average of 153 million birr per year. Waste fees collected through the water bill are deposited in the general account of the city and disbursed to the AACMA as a budget for waste management. Except for overhead costs required for CMOs in the sub-cities and Woredas, all expenses necessary for managing waste management services, including waste collection and transportation, landfill, subsidies for recycling, and composting, are covered by the budget allocated from the city.

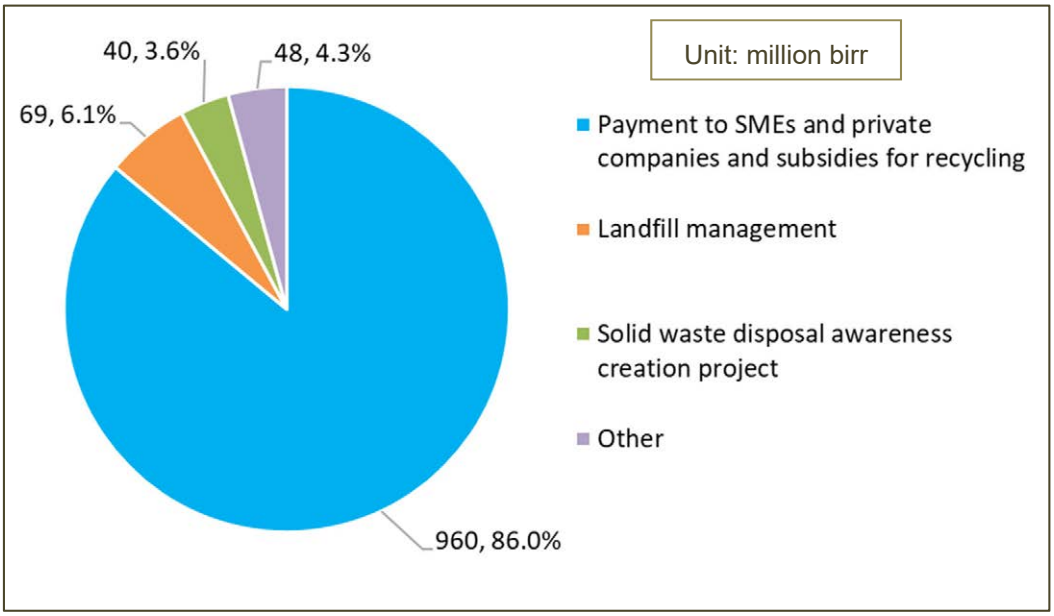
Table 2-4 Revenue for Waste Management Collected Together with Water Bill (2019/20-2021/22)

Year	2019/20	2020/21	2021/22
Amount in birr (million)	141.6	158.3	159.6

Source: AAWSA

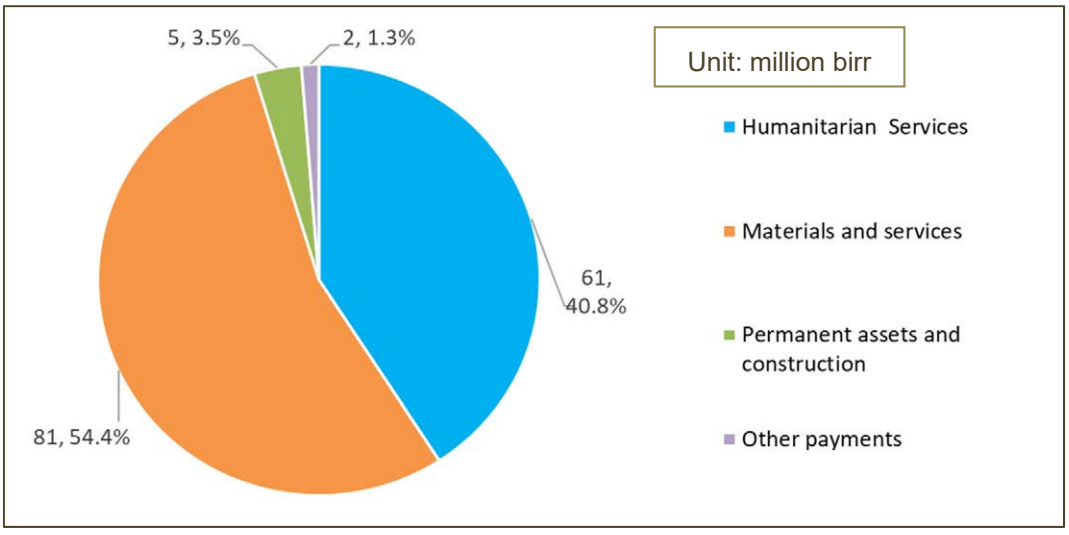
② AACMA's Budget for Waste Management Service

The total budget of the AACMA in the Ethiopian fiscal year of 2022/23 was 1,265 million birr. The capital budget was 1,116 million birr, accounting for 88% of the total budget, while the recurrent budget was 149 million birr. The majority of the capital budget is allocated to "Payment for SME and Private Companies and Subsidies for Recycling" at 960 million birr (86.0%), followed by "Landfill Management" at 69 million birr (6.1%), "Awareness Creation Projects" at 40 million birr (3.6%) and others at 48 million birr (4.3%). The recurrent budget mainly comprises "Material and Services" at 81 million birr (54.4%), "Humanitarian Service" at 61 million birr (40.8%), "Permanent Asset and Construction" at five million birr (3.5%), and other expenditures at two million birr (1.3%).



Source: Prepared by the JICA expert team based on data provided by the AACMA.

Figure 2-3 Breakdown of Capital Budget



Source: Prepared by the JICA expert team based on data provided by the AACMA.

Figure 2-4 Breakdown of Recurrent Budget

③ Sub-cities' Budgets

According to the "Proclamation No. 76/2022" (2022/23), a budget plan (2022/23) announced by the city, the total budget allocated for sub-cities in 2022/23 is 29,831 billion birr, of which 24,331 billion birr is allocated to the recurrent budget. Out of this amount, 1,910 billion birr is disbursed for the budget for waste management activities of the CMOs in the 11 sub-cities, and some of this is further allocated to the CMOs in Woredas. In short, approximately 8% of the recurrent budget of the sub-cities is allocated to waste management.

④ Expenditure on the Waste Management Service (Year 2022/23)

Based on the unit cost for waste management service obtained from the AACMA and the waste amount calculated from the Waste Flow Diagram, AACMA expenditure on waste management service is calculated as follows. In summary, the AACMA's operation costs for waste management service are about one billion birr per year, of which the highest expense is "Waste Collection and Transportation" at 728 million birr (72.3%), followed by "Recycling" at 143 million birr (14.2%) and "Landfill" at 135 million birr (13.5%). Expenses for landfill management are considerably smaller than those of other developing countries. Apart from these AACMA expenditures, incineration plant operation costs 800 million birr per year according to Ethiopian Electric Power Corporation (EEP) officials. The unit cost can be 4,903 birr/ton, which is considerably higher than other fundamental services discussed above.[5]

Table 2-5 Estimated Cost for Waste Management Service

Service	Unit Cost (birr per ton)	Amount (tons per day)	Cost (day per birr)	Cost (year per birr)
Waste Collection and Transportation				
Waste collection by SME	880	1,448	1,274,240	465,097,600
Transportation by outsourcing companies	426	438	186,588	68,104,620
Transportation by sub-city	unknown	1,010	-	-
Waste collection and transportation from institutions	880	608	535,040	195,289,600
Sub-total				728,491,820
Recycling				
Subsidiary for recycling (paper only)	1,500	63.7	95,550	34,875,750
Subsidiary for composting	4,000	26.7	106,800	38,982,000
Subsidiary for polyethylene terephthalate (PET) plastic bottles	2,000	95.3	190,600	69,569,000
Sub-total				143,426,750
Landfill				
Landfill operation	218	1,710	372,225	135,862,094
Sub-total				135,862,094
Total				**1,007,780,664**

Unit cost source: the AACMA, except for landfill operation. Landfill operation unit cost is determined by taking the landfill-related budget from the 2022/23 budget and dividing the sum total by landfill amount.

[5] Energy sale profit is not counted in the calculation.

(3) Legal Framework, Strategies and Targets

① Laws, Regulations and Policies Related to Waste Management

Ethiopia has different levels of policy and legislative framework for solid waste management. At the international level, Ethiopia has ratified two international conventions, the Basel Convention in 2000 and the Rotterdam Convention in 2003, to control the transportation and importation of hazardous wastes. At the national level, under the Ethiopian Constitution, which aims to ensure a clean and healthy living environment for citizens, "Environmental Policy in Ethiopia, 1997" was formulated to promote a sustainable society and economy, which became a fundamental basis of waste management in Ethiopia. In addition, other laws and regulations such as the "Criminal Code of the FDRE, 2004" and "Solid Waste Management Proclamation No. 513/2007" have been established to regulate hazardous waste as well as to specify the responsibility of the municipality on waste management. At the level of Addis Ababa City, regulations such as "Regulation No. 100/2018 Revised ISWM Regulation" and "Regulation No. 54/2012 Code Enforcement of Addis Ababa City Government" were formulated to specify the roles and responsibilities of the AACMA and other concerned agencies in waste management, and to establish penalties for waste management violators.

Although several laws and regulations have thus far been established to regulate waste management, it has been pointed out that their relevance and the procedure to ensure their execution remain unclear.[6]

Table 2-6 Laws, Regulation, and Policies for Solid Waste Management

Level	Legal Framework
International	• **Basel Convention (December 2000)** A multilateral treaty to protect human health and the environment against the adverse effects resulting from the generation, transboundary movement and management of hazardous wastes and other wastes.
	• **Rotterdam Convention (September 2003)** A multilateral treaty to promote shared responsibility and cooperation among parties in addressing the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm.
National	• **Constitution of FDRE, 1994** Article 43 "The Right to Development" and Article 44 "Environment Rights" affirm that all people in Ethiopia have the right to access improved living standards as well as a clean and healthy environment. Article 92 "Environmental Objectives" states that the government shall endeavor to ensure all people in Ethiopia live in a clean and healthy environment.
	• **The Criminal Code of the FDRE, 2004** The Criminal Code specifies the actions to be punished in relation to management of the hazardous waste and Environmental Impact Assessment.
	• **Environmental Policy in Ethiopia, 1997**

[6] *Community Participation in Cleansing Mobilization for the Sustainable Management of Solid Waste in Addis Ababa City Administration*. Final Report, Center for Environmental Sciences College of Natural and Computational Sciences, Addis Ababa University, April 2023,

	This policy aims to enhance the health and quality of life of people and to promote sustainable social and economic development through the adoption of sound environmental management principles.
	• **Solid Waste Management Proclamation No. 513/2007** This proclamation specifies the obligations of urban administration in solid waste management. It also provides clear guidelines to properly manage urban waste as well as hazardous waste.
	• **Proclamation No. 300/2002 Environmental Pollution Control** This proclamation provides the obligations of citizens to protect the environment in the country by adopting polluter pays principles.
	• **Proclamation No. 1090/2018 Hazardous Waste Management and Disposal Control** This proclamation specifies the responsibilities of hazardous waste generators to ensure proper management and disposal.
	• **Health Policy FDRE, 1993** This policy focuses on fiscal and political decentralization by increasing the distribution of the primary health care system and encouraging partnerships and the participation of nongovernmental actors.
	• **FDRE, Regulation Number 299/2013** This regulation prohibits the disposal of contagious waste without obtaining a permit. It also states that people engaging in recycling activities or disposal of hazardous wastes should obtain permit from the appropriate agency.
	• **Urban Waste Management and Green and Beautification Draft Strategy, 1991** This strategy aims to create sustainable urban waste management system and develop the capacity of cities and towns as per environmental legislation.
	• **Ethiopia National Urban Green Infrastructure Standard, 2015** This standard shows a number of approaches to address challenges in urban waste management.
	• **Solid Waste Management Manual, 2012** This manual is intended to provide a guideline for professionals in government or the private sector in urban planning and increase awareness in solid waste management.
Addis Ababa City	• **Proclamation No. 35/2012 of the City Re-amendment of the Addis Ababa** This proclamation specifies the power and duties of public administrative organizations, including the Addis Ababa Cleansing Management Agency.
	• **Regulation No. 100/2018 Revised ISWM Regulation** This regulation established the modern solid waste management system. It specifies regulations on waste management as well as obligations for the people engaged in the waste management in the city.
	• **Regulation No. 54/2012 code enforcement of Addis Ababa City Government** This regulation provides the conditions for penalties to prevent or control code violations in waste management. It also indicates the working procedure of the Office of the Code Enforcement Service when codes are violated.

Source: "Review of Solid Waste Management System Legal Frameworks in Addis Ababa, Ethiopia" issued by the AACMA in November, 2021.

② Regulation No. 100/2018 Addis Ababa City Government Revised Integrated Solid Waste Management

Regulation No. 100/2018 is the latest regulation which specifies the functions, roles, and responsibilities of each organization in the city, including the AACMA, that play a major role in the waste management. In Part Eleven of the regulation, the powers and duties of organizations are provided. According to this part, the AACMA shall control and follow-up on overall sanitary service, including recycling and reuse, whereas Woredas shall control these matters at the grassroots level, including creating awareness among residents and the proper operation of a temporary waste storage area. The CMOs of sub-cities have the duty to lead, coordinate and control sanitary work for Woredas in the sub-cities.

Under this regulation, the Office of the Code Enforcement Service is responsible for controlling illegal activities such as illegal dumping and transfer; further, it has been given the responsibility for taking lawful measures against any illegal waste-related issues. In this way, illegal dumping and transfer are restricted by regulations, but actual challenges remain: there is a shortage of human resources and an absence of appropriate penalties. Thus, there is inadequate monitoring and enforcement of regulations by the Office of the Code Enforcement Service, limiting the effective control of illegal activities.[7]

Table 2-7 List of Parts in Regulation No. 100/2018

Part One	General Provisions
Part Two	Handling, Separation, Transportation, Reusing, Recycling and Disposal of Solid Wastes
Part Three	Solid Waste Disposal
Part Four	Utilization and Management of Dustbins Cans for Small Solid Wastes
Part Five	Waste Management of Cleaning Service Providing Associations/Organizations
Part Six	Management and Disposal of Solid Wastes Generated from Various Places
Part Seven	Management and Disposal of Hazardous Waste
Part Eight	Deciding Cleaning of Various Places and a Permanent Sanitation Day
Part Nine	Using Safety Protection and Creating Awareness
Part Ten	Obligations for Organizations Engaged in Solid Waste Cleaning Service
Part Eleven	Power and Duties of the Agency and Other Organs
Part Twelve	Incentives and Service Charges
Part Thirteen	Administrative Penalty and Measure
Part Fourteen	Miscellaneous Provisions

[7] *Community Participation in Cleansing Mobilization for the Sustainable Management of Solid Wastes in Addis Ababa City Administration*. Final Report, Center for Environmental Sciences, College of Natural and Computational Sciences, Addis Ababa University, May 2023.

③ Goals of Waste Management in Addis Ababa City

The AACMA has formulated the Addis Ababa City Waste Management Ten-Year Development Plan (2020/23-2030/31) as the municipal waste management plan, setting goals to be achieved by 2030. Specifically, the plan includes four strategic themes: 1) increasing community awareness and participation; 2) recycling and reuse of solid waste; 3) coordinating waste management operations; and 4) reducing the amount of disposable waste by utilizing it to generate power. The goals and key points outlined in this plan are summarized in the table below. Since these goals represent the official waste management objectives for Addis Ababa City, they were taken into consideration in formulating the draft strategic plan for the period up to 2035/2036.

Table 2-8 Key Objectives States in the Ten-Year Development Plan 2020/21-2030/31 G.C[8]

Objectives	Content
Strategic Theme	・ Increasing community awareness and participation ・ Recycling and reuse of solid waste ・ Coordinating solid waste management operations ・ Reducing the amount of disposable waste by utilizing it to generate power
Strategic Result	・ Creating a city that is clean and suitable for living ・ Converting solid waste to resources ・ Modernizing service
Objective of Development Plan	・ Modernizing solid waste management operations, coordinating awareness activities by involving the community and providing service as per standards to create a clean and beautiful city ・ Reducing the amount of disposable waste by reusing and recycling solid waste that is collected in the city and using it as a source of energy
Vision	Make Addis Ababa City a model of a clean city in Africa that has benefited from solid waste resources
Mission	Addis Ababa City aims to keep the city clean by increasing the awareness and involvement of residents, making solid waste services modern, efficient, and effective, and converting solid waste into resources.
Values	Institutional values: transparency, accountability, equality, preparation for change, working with knowledge and honesty, developing a work-loving culture, promoting the idea that waste is wealth, cleanliness and modernization
Strategic Goals	Goal 1 Creating a society that manages solid waste properly and promoting a culture of cleaning by improving the level of awareness in the community Goal 2 By modernizing the solid waste management operation, increasing capacity to collect from the current 80% to 100% as per standard Goal 3 By modernizing the management system of the solid waste service, increasing the efficiency of transportation to improve capacity from the current 85% to 100% Goal 4

[8] G.C. means Gregorian Calendar

	Increasing solid waste recycling capacity from the current 6.3% to 18% Goal 5 Utilizing 100% of the solid waste generated in the city for energy sources, which is currently at 50%

(4) Waste Collection and Transportation

In Addis Ababa City, waste collection service for residents is provided as door-to-door collection by SMEs. There are 97 unions currently working as front-line workers for waste collection service providers. They bring collected waste to transfer depots that exist at 163 different places throughout the city; most of the SMEs are based at these transfer depots.

The major transfer depots[9] are distributed at an average of one depot per Woreda; therefore a Woreda office manages approximately one depot. The frequency of waste collection service varies depending on the area of the city. However, in most cases, it is provided three times per week in the center area and two times per week in outer area of the city. Generally, waste collection service is provided using small open trucks and push carts for inaccessible areas in the city.

Table 2-9 Number of Transfer Depots in Addis Ababa City

Sub-city	Unprotected Transfer Depots	Protected Transfer Depots	
		Fenced or Walled (Partly or Completely)	Permanent (in Building)
1 Arada	2	7	0
2 Addis Ketema	1	10	2
3 Lideta	0	4	1
4 Kirkos	0	5	2
5 Yeka	0	8	1
6 Bole	3	8	2
7 Akaki Kality	31	8	1
8 Nifas Slik Lafto	21	12	1
9 Kolfe Keraniyo	3	8	2
10 Gulele	2	7	1
11 Lemi Kura	0	8	2
Total	63	85	15

Source: AACMA

[9] The majority of transfer depots is classified as protected depots.

(5) Transfer Depots

Transfer depots are divided into two categories. One category is protected depots which function as the major transfer depots in the city. The other is unprotected depots which only have containers placed on the ground. With regard to the protected depots, there are two types: those surrounded by walls or fences and those accommodated in a building. The protected depots play a role as the base of SMEs' activities and are supervised by Woredas.

Table 2-10 Type of Transfer Depots

Unprotected Transfer Depots (Container Skip Point)	Fenced Transfer Depots (Protected Transfer Depots)	Permanent Transfer Depots (Protected Transfer Depots)
		
		

Transportation from transfer depots to a final disposal complex is performed under the responsibility of sub-city governments, whereas carrying collected waste to the transfer depot is the responsibility of Woredas (in practice operated by SMEs). Transportation is conducted by bigger capacity trucks such as compactor trucks of 15 m^3 or 18 m^3 rather than trucks for collection service, so that transportation is efficient. Sub-city government trucks are usually engaged in the transportation. For sub-cities that have little capacity, outsourced trucks procured by the AACMA provide the transportation under the control of the AACMA. According to performance records, in 2002 about 1,000 tons of waste were transported daily by sub-city governments, while 734 tons of waste were transported by outsourced/private trucks. As for separate waste collection, it has been not conducted in the city except for some projects at the pilot scale or a certain amount of organic waste collected by composting SMEs from the market.

It is estimated that the waste collection coverage rate by population in the city is almost 100%, while the waste collection rate is 86% according to waste management performance records. The waste collection service system in the city is well-established at the level of sub-cities and Woredas under supervision by the AACMA, with shared responsibilities among relevant organizations. However, most of the transfer depots still work in a temporary manner, as most of them have been operated without proper approval for land use. In practice, only a few of protected transfer depots have been operated with official approval for land use and building facilities that can accommodate showers, restrooms and office space. Some of the sub-cities are attempting to increase the number of this type of transfer depot (so-called "permanent transfer depots"). Few existing permanent transfer depots are equipped with mechanical facilities for loading and unloading, which most transfer stations in other developing countries have. SME workers are forced to work in poor working environments while not wearing proper safety gear. Most of the work is done manually without the use of mechanical tools.

Table 2-11 Collection vs. Transportation in Addis Ababa City

Service	Acting Body	Methodology	Place	Responsible Organization
Collection	Collection SMEs (unions)	Collecting waste from households door to door.	From households to transfer depots	Woreda
Transportation	Sub-city government or outsourced trucks*	Transporting waste accumulated at transfer depots to final disposal complex	From transfer depots to final disposal complex	Sub-city
Collection and Transportation	Private companies	Collecting waste from major commercial facilities	From each facility, building to final disposal complex	AACMA

*In cases where there is a shortage of outsourced truck capacity, private companies help with the transportation work.

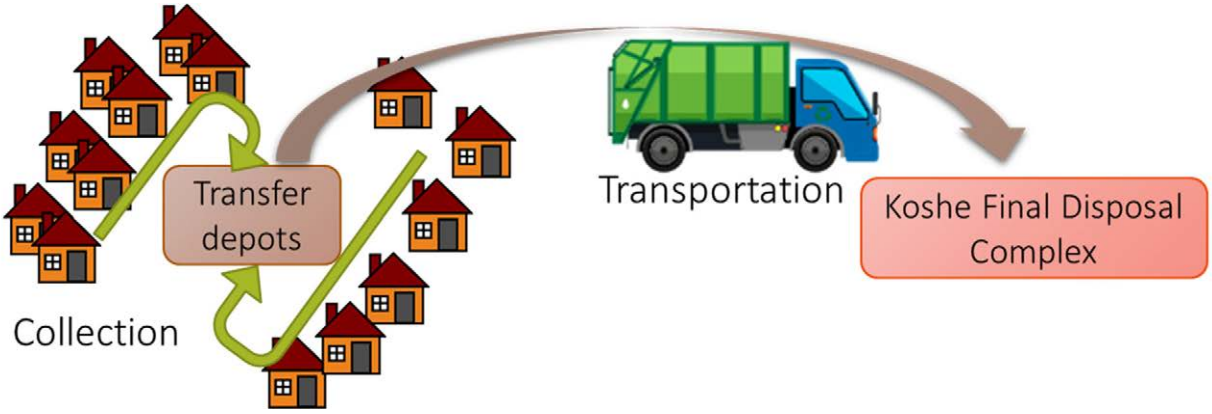
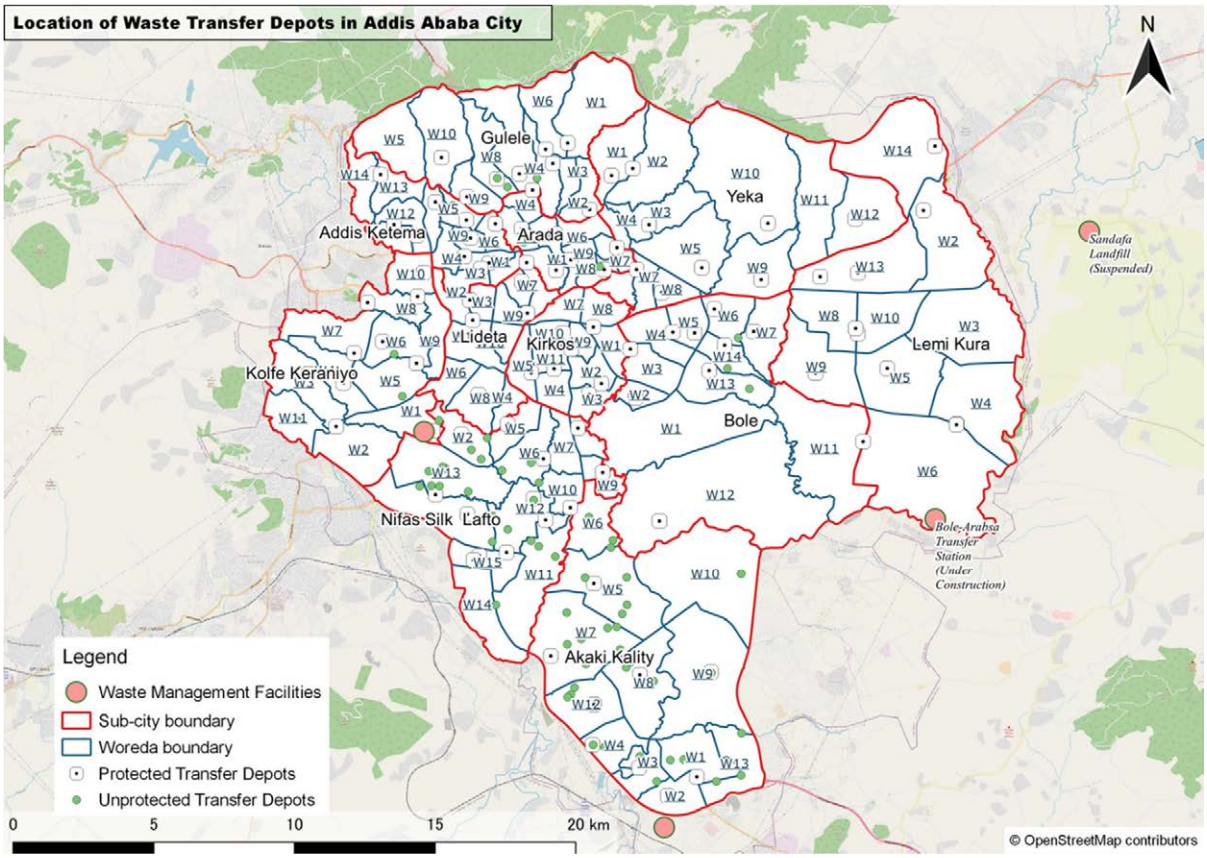


Figure 2-5 Door-to-Door Collection Diagram

Table 2-12 Photos of Collection and Transportation

	
SMEs collecting waste from residents	Residents coming out after they have heard the sound of a traditional horn

	
Unloading waste collected from residents at a transfer depot	Loading waste on a compactor truck at a transfer depot, which will transport the waste to the final disposal complex



*The transfer depot location mapping survey was conducted only for protected transfer depots.

Figure 2-6 Location of Waste Transfer Depots in Addis Ababa City

(6) Transportation Efficiency

Transportation for the sub-cities of Arada, Bole, Lemi Kura, and Yeka is conducted by outsourced trucks at a share higher than other sub-cities. These sub-cities, except for Arada, are located in the far eastern area of the city, on the opposite side of the Koshe landfill site. This means that the city transportation system has been managed efficiently, utilizing outsourced trucks, which have higher transportation capacity, in sub-cities that are a long distance from the landfill site. Outsourced trucks transport 10.82 tons, whereas sub-city government trucks transport 3.89 tons.

Table 2-13 Percentage of Transported Waste Amount by Sub-city

Sub-city	Percentage of Transported Waste Amount by Sub-city	Outsourcing
Addis Ketema	71%	29%
Akaki Kality	60%	40%
Arada	24%	76%
Bole	16%	84%
Gulele	100%	0%
Kirkos	100%	0%
Kolfe Keraniyo	99%	1%
Lemi Kura	3%	97%
Lideta	57%	43%
Nifas Silk Lafto	89%	11%
Yeka	36%	64%
Total	57% 993 ton/day	43% 743 ton/day

*Private companies providing collection and transportation service from commercial facilities are not classified by truck scale data. Thus this analysis only includes transportation from transfer depots.
Source: Analyzed based on the truck scale data (July 2022-March 2023).

Table 2-14 Average Weight per Trip by Transporter

Transporter	Average Weight per Trip from Transfer Depots to Final Disposal Complex
Sub-city	4.06 tons/trip
Outsourced/ Private	11.53 tons/trip
Private	5.75 tons/trip (collection and transportation from commercial facilities and institutions)

Transportation efficiency in each sub-city is calculated in the following table dividing total distance by total weight. Among the sub-cities, the transportation efficiency of Kirkos and Kolfe Keraniyo resulted in a higher rate. For outsourced trucks, the rate of transportation efficiency is better than that for sub-city trucks on average. Among the sub-cities, Lideta and Nifas Silk Lafto are ranked the best

and second-best for outsourced trucks: Kolfe Keraniyo is not included in this analysis as the transportation distance to landfill site is limited. While a detailed analysis based on the specifications of transportation vehicles has not been conducted, it is assumed that the trucks of sub-cities with higher transportation efficiency tend to transport a larger amount of waste at one trip.

Table 2-15 Efficiency of Waste Transportation by Woreda

		Total Distance (km/year)		Distance Efficiency (tons/km)	
Sub-city	Average Distance to Landfill Site	Sub-city	Outsourcing	Sub-city	Outsourcing
Addis Ketema	10.3 km	53,673	10,619	0.54	1.12
Akaki Kality	17.7 km	126,254	21,523	0.20	0.80
Arada	12.7 km	23,800	21,742	0.25	0.88
Bole	17.9 km	47,757	92,955	0.20	0.55
Gulele	16.7 km	156,379	0	0.22	-
Kirkos	8.2 km	21,746	0	1.15	-
Kolfe Keraniyo	4.8 km	66,206	96	0.84	3.09
Lemi Kura	23.7 km	13,983	101,792	0.12	0.54
Lideta	7.6 km	22,124	6,946	0.62	1.49
Nifas Silk Lafto	7.3 km	115,369	4,373	0.49	1.63
Yeka	20.4 km	102,449	50,041	0.16	0.58

Source: Analyzed based on truck scale data for the entire year of 2022.

(7) 3R Activities

The recycling rate is 10% of the generation amount. The collection amount of recyclables by the SME are recorded, with the SME receiving an incentivized payment from the AACMA in exchange for submission of its receipts. There are three main types of recyclable streams that have been found through the Project, shown in the table below. An exception is composting, which will be discussed later in this section.

Table 2-16 Photos of Transfer Depots

	
A business yard of a reuse & recycling SME. This is located just opposite of a transfer depot	Recycling materials in storage at transfer depots

Table 2-17 Types of Recyclable Material Streams

Types	Acting Body	Main Target Material	Main Area	Description
Stream A	Waste collection service SMEs	PET bottles and metals that are frequently discharged from households	Transfer depots	Collection service SMEs segregate valuable recyclable material at transfer depots from waste collected door to door.
Stream B	Recycling SMEs	Paper and cardboard that are less frequently discharged from households	Recycling SMEs yard	Recycling SMEs look around town to get recyclable materials that are not collected through door-to-door service.
Stream C	Waste pickers	All type of recyclable materials come to the landfill site	Koshe landfill site	Informal waste pickers collect recyclable materials beside landfill operations in unsafe and unsanitary conditions.

In Addis Ababa City, there are 35 composting unions/SMEs working in the city as reported by the sub-cities. Most of those that collect organic waste from markets nearby do composting with a simple and manual method in order to sell the compost product to farmers and NGOs. The sale price is subsidized by the AACMA with 3 birr per kg, similar to recyclable material trading. The typical trading rate is 4 birr per kg, which means that 7 birr can be obtained in total. One issue was reported by a composting SME: to receive the subsidy, a trading receipt indicating a sale is required, but such receipts are rarely issued by individual farmers and residents who are potential customers for compost product. In this situation, most SMEs sell the product to agricultural NGOs which can issue a trading receipt. Owing to the AACMA's subsidy system, 24.0 tons of organic waste per day were composted in 2022. Apart from composting organic waste from markets by the SMEs mentioned above, the AACMA implemented compost activities at the household level by promoting the separation of organic waste at the generation source in the community on a pilot scale.

Table 2-18 Photo of Composting SME

	
Composting yard of a composting SME	Sawdust and husks at the same yard

(8) Intermediate Treatment

In Addis Ababa City, a waste treatment facility exists approximately seven to eight kilometers away from the city center. The facility is regarded as a final disposal complex with the Koshe landfill site and the Reppie waste-to-energy (WtE) facility on the same premises. The total land area of the facility is 39 hectares, of which seven hectares are dedicated to the incineration facility. According to documents issued by the city, this area has been utilized for waste disposal for over 50 years.

Figure 2-7 Photo of Waste Treatment Infrastructure

Construction of the Reppie WtE facility was completed in 2018 and full operation commenced in 2019. The facility is owned by EEP, which operates the power generation business. There is a kind of trade-off relationship between EEP and the AACMA, where no direct compensation is exchanged for waste processing. EEP benefits from obtaining waste as a raw material for free, while the AACMA benefits from reducing waste that would otherwise be disposed of in landfills through incineration. The plant has an incineration capacity of 1,400 tons per day, which means 420,000 ton per year on the basis of a 300-day operation, and produces 185 GWh annually. This incineration capacity covers approximately 70% of the waste transported to the final disposal site in 2022.

Table 2-19 Photos of Reppie WtE facility

<table>
<tr><td colspan="2">  </td></tr>
<tr><td colspan="2">Reppie WtE facility</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Waste pit</td><td>Control room</td></tr>
</table>

As stated above, incineration capacity covered about 70% of waste transported to the final disposal complex in 2022. However, records show the incineration ratio against the waste amount transported to the final disposal complex at 56% in 2020, decreasing to 22% in 2022 from 33% in 2021. These records show that waste has not been incinerated as planned due to the instability and low amount of waste incinerated. Officials at the plant said that the waste quality of calorific value is too low to generate power in an efficient way and that the running costs are too high compared to the power generated. In addition, according to the waste handling operator of the waste pit, it is reported that about five days are necessary to remove the water content from the waste after the receipt. The moisture content of the waste is estimated at 74.3%, which is extremely high for incineration without

removing the water. Out of two incinerators, only one line is currently operational due to trouble with the transformer, which is expected to be replaced with alternative parts procured from China.

While the high reduction rate in waste amount is considered as one of the major benefits of incineration treatment, analysis of truck scale data reveals that the proportion of incineration residue (ash) to amount of incoming waste at the Reppie WtE facility has increased from 16% in the initial operational year of 2019 to 22% from 2021 onwards. Considering the recent advancements in incineration technology that have improved reduction rates to around 90%, the current figures appear low, indicating a need to improve the reduction rate of incineration treatment.

Table 2-20 Specific Information on the Reppie WtE Facility

1. General Profile	
Owner	Ethiopian Electric Power (EEP) Waste Disposal Partner Municipality: Addis Ababa City Administration (AACA)
Total investment	USD 95,880,000 + ETB 434,530,557
Commencement date	September 24, 2014
Construction area	53,120 m^2
2. Technical Data	
Number of lines	2
Thermal energy capacity per line	36.3 to 55.0 MWth (Megawattes thermal)
Electrical capacity	185 GWh / year
Waste disposal capacity	1,400 tons per day
Capacity for 300 days (7200 hrs. operation)	420,000 tons per annum
Number of truck scales	2 (maximum weighing value of 50 t with accuracy of 20 kg)
Waste pit or bunker capacity	22,000 m^3
Number of tipping platforms	6 waste tipping platform gates
Trucks allowed	>4 t trucks (16 t compactor IVECO trucks replacing fleet)
Tipping hall dimensions	75.6 m x 24 m x 7 m
Combustion system	
Type	Air-cooled step grate
Grate design	SITY2000 – MARTIN GmbH Licensed
Grate manufacturer	Sanfang - Covanta
Max grate capacity per line	678 tons per day
Grate size per line	9.7 m x 10.6 m

Source: Brochure for Reppie WtE facility

Table 2-21 Amount Treated in Final Disposal Complex Each Year

	Unit	2019		2020		2021		2022	
(a)Transported waste	tons/day	1,850	100%	2,048	100%	2,066	100%	2,057	100%
(b)Incinerated waste	tons/day	1,310	71%	1,148	56%	674	33%	447	22%
(c)Landfilled ash	tons/day	214	16%	237	21%	147	22%	100	22%
(d)Landfilled raw waste	tons/day	540	29%	899	44%	1,391	67%	1,610	78%
(e)Final disposal amount	tons/day	754	41%	1,136	55%	1,538	74%	1,710	83%

* (a), (b), (c) based on truck scale data, (d) = (a) – (b), (e) = (c) + (d). The percentage (%) represents the proportion of incineration residue (ash) to the amount of incinerated waste.

The fuel characteristics of household waste in Addis Ababa City were determined as indicated above. The moisture (W) rate is 52.3%, which is higher than the 50% of the indicative figure for what is feasible for combustion without auxiliary fuel, according to a World Bank report. That means there is room to improve fuel quality by reducing moisture content. Since 67% of the waste is organic, reducing the amount of organic waste could be one option to lower the moisture content of the waste. The low calorific value is 5,334 KJ/kg, which is less than the 6,300 KJ/kg feasible for energy generation. This might also come from the high rate of food waste and moisture content.

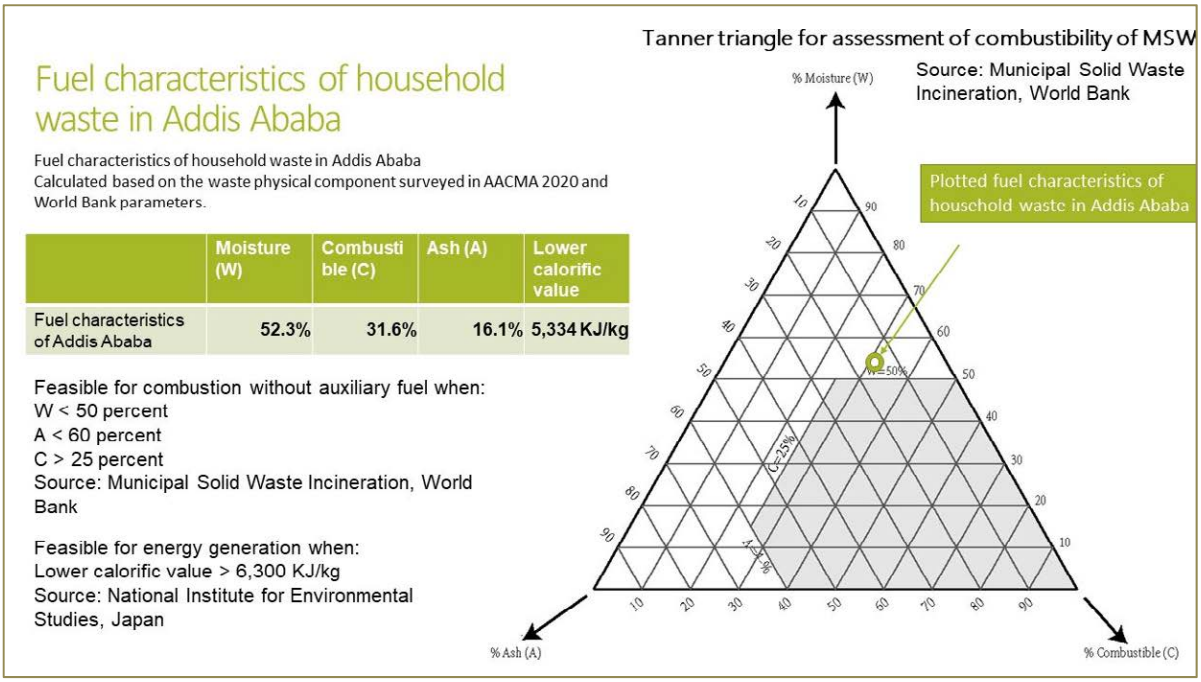


Figure 2-8 Fuel Characteristics of Household Waste of Addis Ababa

Table 2-22 Fuel Characteristics of Addis Ababa Household Waste Calculation

Physical Composition	%*	Weight (g) per 1,000g	Moisture (g)	Combus tible (g)	Ash (g)	Lower Calorific Value (KJ/kg)
Food waste	52.8 %	528.4	349	109	70	1,010
Paper waste	5.0%	49.9	23	24	3	321
Textile waste	2.2%	22.1	7	14	1	261
Plastic waste	9.6%	96.1	28	61	7	1,936
Glass waste	1.3%	13.2	0	0	13	(1)
Metals & aluminum	1.3%	12.5	1	0	12	(2)
Leaves/grass waste	10.3 %	103.3	36	62	5	962
Diapers & sanitary napkins	7.1%	70.7	54	14	3	261
Other (leather waste, wood, rubber waste, bones, ceramics)	3.0%	30.2	3	19	8	431
Ash/fine waste	6.1%	61.3	20	14	28	158
Miscellaneous	1.2%	12	1	0	11	(3)
Total	100%	1,000	522.6	316.2	160.9	5,334
			52.3%	31.6%	16.1%	

*Percentage of physical composition is calculated applying the results of Municipal Solid Waste Generation Rate and Characterization Study Report, Nov 2020.
The rate for fuel characteristics is calculated based on the parameters provided by Municipal Solid Waste Incineration, World Bank. For diapers only, the following parameters[10] are applied, since they were not specified in the report: 76.1% (moisture), 19.7% (combustible), 4.2% (ash) and 3,686 KJ/kg (lower calorific value).

(9) Landfill Site

① Koshe Landfill Site

The Koshe landfill site has long served as the sole waste disposal facility for Addis Ababa City; however, its capacity is reaching its limit. It is operated by the AACMA Landfill Directorate, which consists of more than 100 employees working alternately in three shifts.

At the landfill site, the equipment recently procured by the AACMA, two excavators, one bulldozer, and one landfill compactor, are regularly used for landfilling operations. In addition, three dump trucks and one wheel loader are used to load dirt onto trucks as well as to move incinerated ash. Besides the equipment mentioned above, there is other heavy equipment at the landfill site as shown in the table below; however, over the half of the equipment has been abandoned due to malfunctioning. The majority of breakdowns occur due to the lack of spare parts replacement, leading to deterioration of heavy machinery as being left exposed to rain and dirt for a long period of time. This can be attributed to the vulnerability of maintenance and management systems, where the facilities for repair and

[10] https://www-cycle.nies.go.jp/magazine/kenkyu/201308.html. National Institute for Environmental Studies, Japan.

adequate equipment are lacking. Additionally, a budget for landfill operations remains quite low at 218 birr per ton[11]; therefore it is necessary to reinforce financial basis.

As stated above, the limited availability of heavy machinery makes it difficult to conduct daily landfill operations and poses a significant constraint on implementing planned landfill management. Furthermore, the waste unloaded from trucks is simply scattered around the landfill site because there are no operators with the skill to handle the heavy machinery. Therefore, the supervisors at the landfill site have to monitor the site continuously to prevent accidents.

Since there is no leachate treatment system installed at the Koshe landfill site, the environmental impact of the waste remains unidentified.

Table 2-23 Status of Landfill Equipment as of October 2023

Equipment	Maker	①Total number of machine	②Number of active machine	③Number of Defective machine	④Percentage of available equipment
1. Bulldozer	CAT	4	2	2	50%
	Komatsu	2	2	0	100%
	Total	6	4	2	67%
2. Excavator	VOLVO	4	2	2	50%
	COBELCO	2	2	0	100%
	Total	6	4	2	67%
3. Landfill compactor	CAT	3	2	1	67%
	BOMAG	2	0	2	0%
	Total	5	2	3	40%
4. Wheel loader	VOLVO	2	1	1	50%
	SKEEP	1	0	1	0%
	Total	3	1	2	33%
5. Dump truck	Volvo(16m^3)	2	1	1	50%
	IVECO (8m^3)	1	0	1	0%
	Total	3	1	2	33%

[11] According to Table 5.2 Typical Waste Management Costs by Disposal Type in *What a Waste 2.0* issued by the World Bank, transitioning cost from controlled landfill to sanitary landfill in Ethiopia, which is classified as a low to middle-income country, is estimated to range from $15 to $40 per ton (840 to 2,230 birr per ton).

Figure 2-9 Aerial Photo of Koshe Landfill Site

At the Koshe landfill site, waste pickers are engaged in collecting recyclable materials. It is said that about 1,000 waste pickers are usually active. They work in unsafe and unsanitary conditions near heavy machinery without wearing any safety gear. It is believed that these waste pickers are collecting a significant amount of recyclable materials. Although it is not an ideal situation, waste pickers play a part in resource recovery in Addis Ababa City.

Table 2-24 Photo of Waste Pickers at Koshe Landfill Site

	
Waste pickers flocking to unload garbage. This is very dangerous and hinders landfill work.	Waste pickers scavenging for metals from incinerated ash.

② Remaining Capacity of Landfill Site

The layout plan for the landfill is proposed as shown below. According to the plan, it is estimated that landfill capacity will reach 2.5 million cubic meters within three to four years based on the assumption that 1,710 tons of waste will be received with a density from 0.8 to 1.0 ton/m^3 (specific gravity) from May 2023 onward. Therefore, there is an urgent need to reduce the amount of waste disposed of at the landfill, and waste reduction through the promotion of the 3R (Reduce, Reuse, Recycle) initiative, as currently being implemented in the city.

With the rapid increase in waste generation accompanying urbanization, the depletion of landfill capacity is accelerating. Considering that it takes time for the outcome of waste reduction activities through 3R promotion to emerge, the impact of activities to prolong the lifetime of the Koshe landfill site remains limited. Thus, the limited landfill capacity of the Koshe landfill site poses a serious challenge for Addis Ababa City, which is recognized as an issue to be addressed as soon as possible by the city.

Figure 2-10 Image of the Final Landfill Shape of the Koshe Landfill Site

*The layout plan is not yet finalized, since the coverage area varies depending on actual landfill conditions. This calculation gives an idea of the remaining capacity.

(10) Waste Management Infrastructure

Compared with other waste management areas in Addis Ababa City, waste management infrastructure is seen as a point of weakness. The vulnerability of the landfill site, including remaining capacity and treatment facilities, is recognized as one of the most serious and urgent issues in the city. Therefore, reduction of the waste disposed of at the landfill site is regarded as a priority initiative among the several initiatives being undertaken by the city.

The establishment of an incineration facility may be one of the biggest initiatives for reducing waste; as mentioned earlier, the facility operated well for first couple of years or so. If the incineration amount is unstable, the amount of food waste landfilled may exceed the estimated volume, which gives a serious impact on the remaining capacity of the landfill as well as the environmental burden to the landfill site, making it impossible to take appropriate environmental measures. The city government

conducted a feasibility study for the next incineration facility; however, assurance that it can be carried out has not yet been received. Even if the new facility were built and operated well, the lifetime of the Koshe landfill site will certainly come to an end one day not far from now. On top of reduction initiatives such as incineration and recycling, the construction of a new landfill site must be considered in light of lessons learned from past failed projects.

(11) Community Involvement

In Addis Ababa City, communities actively contribute to keeping the city clean through participation in cleaning campaigns and are involved deeply in the city's waste management. Supervised by the sub-cities, Woredas closely collaborate with the local communities, with approximately 3,000 staff assigned to the CMO in 119 Woredas for waste management operations. While working collaboratively, Woredas and sub-cities conduct cleaning campaigns in communication with the AACMA. These three administrative bodies, the AACMA, sub-cities, and Woredas, collaborate well together in the coordination of each task under a decentralization initiative driven by the city government in recent years. Each Woreda has an average of 15 awareness creation officers at CMOs who are responsible for promoting community participation and awareness raising. It is reported that the total number of awareness creation officers in Woredas is 1,884.

Community awareness-raising activities have always been considered a priority action by the city government and the AACMA, as written in the current Ten-Year Development Plan and other relevant documents. In addition, the aforementioned cleaning campaigns are frequently conducted in collaboration with the AACMA, sub-cities and Woredas, with articles on these activities frequently shared on social media by the AACMA. The following table shows activities conducted by the AACMA and CMOs from July to December 2022 to raise community awareness of waste management issues. In addition to promoting community involvement, waste separation and composting have been conducted. It can be seen that significant effort has been made to increase community participation and public awareness to improve waste management issues.

Table 2-25 Plan and Result of Awareness-Raising Activities Conducted by the AACMA (July-December 2022)

Plan to increase community awareness from 65% to 67.5%*. Achievement was 66.4%.
• House-to-house awareness-raising activities were planned for 608,553 households. In actuality, 647,402 households have been visited for house-to-house awareness.
• The carrying out of separation at the generation source was planned for 135,580 households. In actuality, 186,975 households have conducted segregation at generation source.
• The performance of home composting was planned for 20,000 households. In actuality, 17,478 households have conducted home composting.
• Twelve public awareness events (panel discussions) were planned. In actuality, 12 events have been organized.
• Plans were made for 260 social media posts for public awareness. In actuality, there have been 261 social media posts.
• The printing of 66 types of educational materials for public awareness was planned. In actuality, 66 types of educational materials for public awareness have been printed.

- One educational visit for stakeholders was planned. In actuality, one educational visit has been conducted.
- Training for 15,000 people by the AACMA and sub-cities was planned. In actuality, 21,523 people have been trained.

*The percentage of people participating in community awareness campaigns

(12) Social Impact of Waste Management

In Addis Ababa City, there is an increasing recognition of SMEs due to the introduction of a system for hiring SMEs as door-to-door collection service providers to create employment and reduce the AACMA's burden. This approach has created a substantial number of job opportunities for people; 6,800 people are engaged in collection service, earning 500-600 million birr annually, paid from the AACMA budget allocated by the city government. Payments are calculated based on weight, which provides waste collectors with incentives to collect waste from every corner of the city. The collection areas for SMEs are generally divided by Woreda.

The Labor Enterprise and Industrial Development Bureau under the government of Addis Ababa City provides support mechanisms not only for SMEs engaged in waste management but also for SMEs in various other sectors. With approximately 30,000 SMEs operating in agriculture, services, manufacturing, trade, and other fields, the main roles of this bureau for SMEs include: 1) organizing SMEs; 2) facilitating credit provision to SMEs; and 3) providing training. The bureau has assigned officials to all 119 neighborhoods in the city, ensuring deep communication with SMEs at the grassroots level. Some SMEs have been able to procure collection vehicles using loans from the bureau.

In Addis Ababa City, while SMEs engage in waste collection activities as legal entities, waste pickers still work in the informal sector and remain socially vulnerable. An accurate number of waste pickers in the city remains unknown; however, it is estimated that about 3,000 waste pickers exist in the city according to AACMA officials. Generally, the working conditions of waste pickers are poor and unsafe, as they collect recyclables near heavy machinery that is performing landfill operations. The next challenge lies in institutionalization or formalization of waste pickers collecting the recyclables, which would be otherwise end up in the landfill site, by establishing certain rules rather than allowing an unregulated waste picking. Additionally, a part of the activities of waste pickers can be integrated into SMEs.

(13) Update of Existing Waste Flow Diagram

Based on the data collected from Activity 1-1 with concerned organizations, the existing waste flow has been updated as shown in the diagram below. The results found that 2,647 tons of municipal waste are generated daily in the city, with approximately 2,251 tons per day collected, accounting for about 85%. Furthermore, 2,092 tons per day, which represents 80% of the waste generated, are transported to the final disposal site. The amounts generated or processed at each stage are shown in the diagram.

Waste in Addis Ababa City is largely divided into two categories at the generation source: "Household Waste" and "Commercial & Institutional Waste". Household Waste is collected by SMEs and transported to intermediate bases called transfer depots. From the transfer depots to the landfill site, the waste is either transported by sub-city trucks or outsourced to contractors if sub-city resources are insufficient. On the other hand, Commercial & Institutional Waste is collected and transported to the final disposal site by private contractors directly commissioned by the AACMA.

At the final disposal complex, 394 tons per day of waste are incinerated at the Reppie WtE facility located adjacent to the landfill site, while the remaining 1,698 tons per day that are not incinerated are disposed of at the landfill site. From the incinerated waste, approximately 85 tons per day of incineration ash are generated, which is either buried at the landfill site or partially utilized as road materials.

The amount recycled in the city is estimated to be 228 tons. In addition, 24 tons of organic waste is composted. The amount recycled at the landfill site is as yet unknown; however, it is estimated that a considerable amount of recyclables is collected by waste pickers.

In summary, the amount of waste generated within the city is captured at a relatively good rate of 85%. That is consistent with the fact that scattered or illegally-dumped waste is hardly found in the city, except for a small amount thrown away near the riverside. Door-to-door waste collection service is widely available to households, while transfer depots are evenly distributed to most Woredas in the city. Additionally, the capture of recyclable waste functions well, despite there being no official recycling system introduced. The incineration reduction rate, excluding ash, is 15%, so large quantities of waste therefore need to be landfilled.

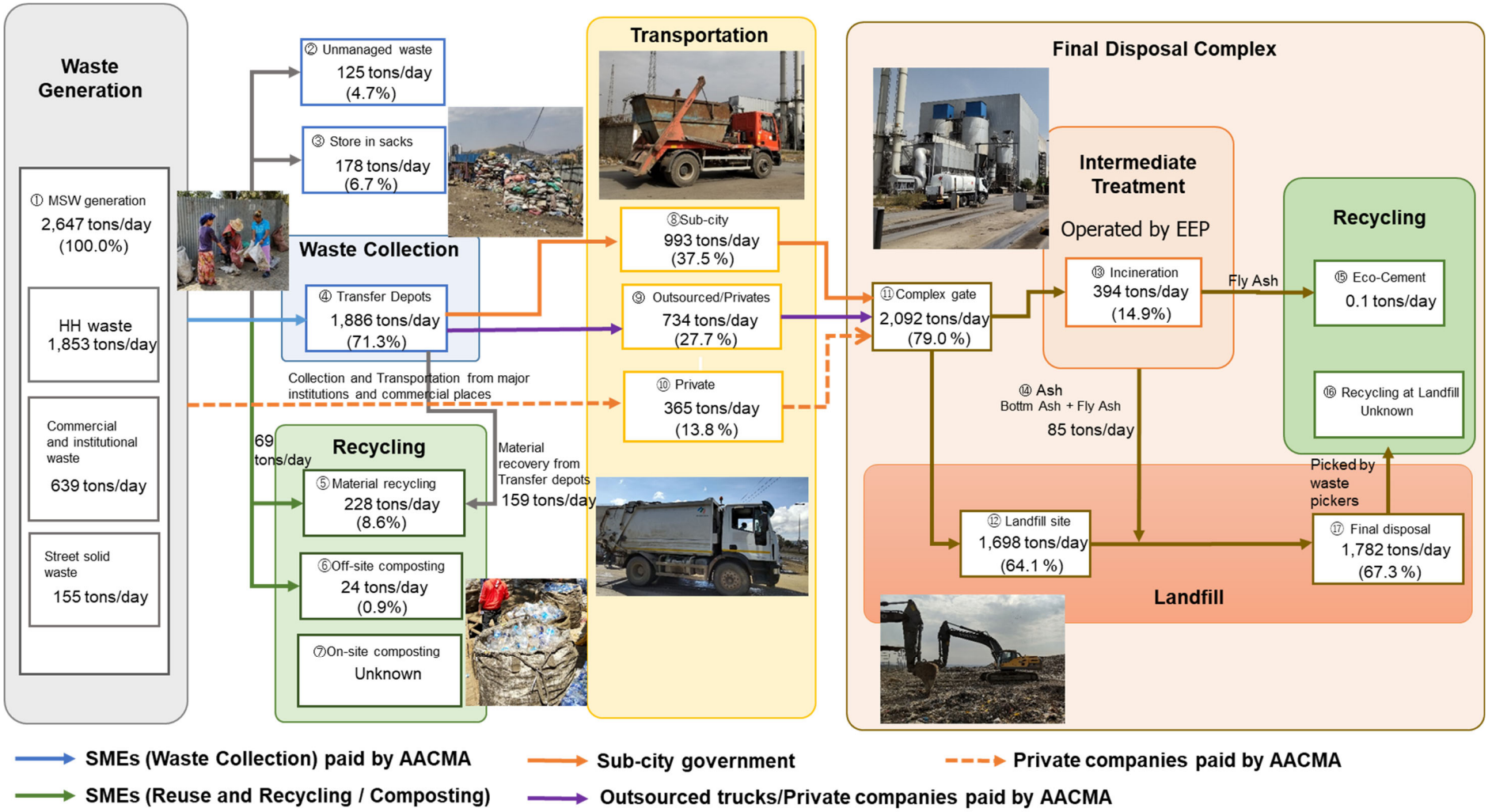


Figure 2-11 Waste Flow Diagram for Addis Ababa City 2022/23

Table 2-26 Waste Flow Diagram Calculation Methodology

No.	Items	Tons/day	Calculation Method
①	Municipal solid waste (MSW) generation	2,647	ⓐ HH waste + ⓑ Non-HH waste
	ⓐ Household (HH) waste	1,853	HH waste generation rate*1 /person/day x Population*2
	ⓑ Non-HH waste	794	Assumed 30% of MSW generation*6
	ⓒ Commercial & institutional waste	639	ⓑ Non-HH waste - ⓓ Street cleaning waste
	ⓓ Street cleaning waste	155	Street cleaning waste generation rate*1 (kg/km/day) x Length of street (km)*3
②	Unmanaged waste	125	② = ① - ③ - ⑤ - ⑥ - ⑦ - ⑧ - ⑨ - ⑩
③	Stored in sacks	178	Assumed 9.6% of HH waste generation is stored in sacks*1
④	Transfer depots	1,886	ⓔ + ⓕ
	ⓔ Waste amount transported from transfer depots to final disposal complex	1,727	⑧Sub-city +⑨ Outsourced/Private
	ⓕ Recyclable collected from HHs	159	Assumed that 70% of the total recycled amount is from households
⑤	Material recycling	228	Determined by AACMA report*4
⑥	Off-site composting	24	Determined by AACMA report*4
⑦	On-site composting (home composting)		This figure is unknown.
⑧	Transported by sub-city government	993	Determined by truck scale original data*5
⑨	Transported by outsource or private	734	Determined by truck scale original data*5
⑩	Collection and Transportation by private	365	Determined by truck scale original data*5
⑪	Complex gate	2,092	⑧Sub-city +⑨ Outsourced/Private + ⑩Private
⑫	Landfill site	1,698	Determined by truck scale original data*5
⑬	Incineration	394	Determined by truck scale original data*5
⑭	Bottom ash + fly ash	85	Determined by truck scale original data*5
⑮	Eco-cement	0.1	Determined by truck scale original data*5
⑯	Recycling at landfill site		The amount of recyclable material picked by waste pickers is unknown.
⑰	Final disposal	1,782	⑫Landfill + ⑭Bottom ash + fly ash - ⑯Recycling at DS

*1 Municipal Solid Waste Generation Rate and Characterization Study Report, 2020, AACMA.
*2 Population Projections for Ethiopia 2007-2037, Central Statistical Agency.
*3 Total road length obtained from sub-cities.
*4 AACMA recycling summary report 2022 based on the information from sub-cities.
*5 Truck scale original record of from July 2022 to March 2023 assured by the AACMA.
*6 “Waste Wise Cities Tool”, UNHABITAT.

(14) Summary and Challenges

① Organization and Finance

- The organizational hierarchy for controlling waste management is well-established in Addis Ababa City. The AACMA, the agency responsible for waste management, implements waste management services in coordination not only with SMEs and private companies but also with the sub-cities and Woredas. The decentralization initiative has been working effectively due to the efforts made by the city over the past decade.

- The annual budget for waste management allocated to the AACMA is 1.265 billion birr. A breakdown of the budget includes 58% for collection and transportation, 11% for recycling, and 8% for landfilling. However, the budgets for human resources and part of transportation conducted by city government are not included, for they are allocated from the city to sub-cities directly (1.9 billion birr were allocated to CMOs in 2022). While two different streams for budget allocation overlap, the negative impacts remain minimal. Additionally, the cost of incineration is currently borne by EEP at approximately 800 million birr annually, which is equivalent to more than 60% of the AACMA’s total budget.

- The AACMA has prioritized four goals in its development plan from 2020 to 2030: 1) community awareness, 2) reuse and recycling, 3) operational coordination, and 4) waste reduction.

② Waste Collection and Transportation

- Door-to-door collection service is provided to almost the entire city, covering almost the entire population. The waste collection rate stands at 85% of the waste generation amount. 94 unions provide collection service based at transfer depots which exist approximately 163 locations in the city. About 100 of transfer depots are categorized as “protected”, while the reaming 63 are“unprotected” (only containers are placed). The volume that can be transported by containers is limited.

- Over the past decade, SMEs have been significantly revitalized following the city’s employment creation initiatives. However, challenges still remain in the area of working environment and working conditions. Transfer depots play a crucial role in collection and transportation, but most of them are utilized on a “temporary” basis.

- Outsourced trucks, which have large transportation capacities, contribute to transportation from transfer depots to the final disposal complex, especially for the sub-cities which have longer transportation distances. Additionally, sub-cities also manage transportation from transfer depots to the final disposal complex by sharing duties with outsourced trucks.

③ Recycling and Composting

- The recycling rate in the city stands at 10% of the waste generation amount. The recycling rate is considerably higher than cities of other developing countries where recycling legislation systems are unestablished. The provision of subsidies in Addis Ababa City may have become an incentive for SMEs to collect recyclable materials, which consequently has contributed to the current

recycling rate.

- Recyclable materials are converted into resources by SMEs, including those involved in reuse and recycling. Moreover, waste pickers also participate in this process.
- In the city, there are 35 composting unions/SMEs, collecting organic waste from the market and producing compost products through simple manual processes performed outside. These compost products are then sold to farmers and NGOs. In 2022, 24.0 tons per day of organic waste were composted.
- Separation at generation source is not implemented, with the exception of some pilot-scale or household composting activities, so it remains a challenge.
- While waste pickers remain neither organized nor formalized, SMEs are legally authorized to collect recyclable materials.

④ Incineration and landfills

- The city's waste generation amount is 2,647 tons per day. Out of this amount, 85% is collected and transported to the final disposal complex.
- Incineration is expected to be a powerful means to reduce the amount of waste disposed of in landfills. However, in reality, as of 2022 it has only reduced less than 20% of the total waste transportation volume.
- The fuel characteristics of household waste are unsuitable for incineration. Due to the high proportion of organic waste, the moisture content exceeds the specifications for incineration outlined by the World Bank.
- The remaining capacity of the Koshe landfill site is estimated to be approximately 3.2 to 4.0 years if the disposal rate remains the same as in 2022. However, there is a possibility that the decrease in capacity could be accelerated due to the factors such as population growth, economic development, and few improvements in waste reduction and collection.
- Due to the limited availability of heavy machinery at the landfill, daily disposal operations are quite challenging. In addition, operators are insufficiently skilled in handling heavy equipment, resulting in waste unloaded from trucks merely being scattered around the landfill. This has led to the creation of a precipitous drop off at the edge of the landfill site that requires the supervisors to monitor the site continuously to prevent accidents.
- Communities are frequently involved in cleaning activities in the city in collaboration with sub-cities and Woredas through cleaning campaigns that are organized on a frequent basis.

2.2 Activities Related to Output 2

Output 2 : The selection and improvement methods of appropriate waste management technologies for each stage of waste management will be examined.

2.2.1 Outline of Activities

Activities related to Output 2 were implemented as shown in the table below.

Table 2-27 Summary of Activities Related to Output 2

Activity	Content
Activity 2-1	Support the study of waste management plans based on waste amount and composition. The data and information obtained from Activities 1-1 and 1-2, which include data on waste amount and waste composition, population, machinery for waste collection and transportation, transportation amount obtained from truck scales, incineration amount, and final disposal amount, are essential data for formulating future waste management plans and for assessing the progress of future achievement. Interviews with the C/P confirmed that most of this information and data is being accumulated and managed within the AACMA. Based on this fact, the JICA expert team advised that quantitative assessments of waste management operations should be regularly conducted using these data to improve the efficiency of collection service.
Activity 2-2	Support the study of methods to improve the efficiency of waste collection Discussions were held with the relevant department of the AACMA about the current state of the collection system and challenges faced by it, revealed in Activity 1-1, to pursue methods for improving the inefficient collection system operated by SMEs using hand-pulled carts. There was further discussion of the necessity of expanding the door-to-door collection area by introducing small collection vehicles, as well as by consolidating several transfer depots to increase transportation efficiency among the 163 transfer depots scattered throughout the city. It was agreed to reduce the number of transfer depots to one per Woreda (a total of 120) by 2035. Moreover, about 40% of these transfer depots are classified as non-protected, with only containers placed at them, raising concerns about worker safety and sanitation. Among these non-protected transfer depots, it was agreed that those considered necessary from a waste collection perspective will be upgraded as protected transfer depots, while the rest will be removed by 2030. Although relatively well-equipped transfer stations are classified as protected, more than 90% are operated in open areas without fences, necessitating measures to reduce adverse impacts on the surrounding environment. Furthermore, while the number of protected transfer depots with permanent buildings has increased to 15 at present, it was advised that the number of such transfer depots should be further increased.
Activity 2-3	Support the study of intermediate treatment technologies and recycling methods, and their introduction and management plans. Facing the fact that the remaining capacity of the Koshe landfill site is reaching its limit, the AACMA acknowledged that waste reduction is the most crucial issue to be tackled. As specific waste reduction measures, it was advised to plan the promotion of composting at the generation source as well as the off-site collection and composting of recyclables to increase the recycling rate from approximately 10% of the 2022 generation amount to 30% by 2035. On the other hand, analysis of the fuel characteristics of the waste being transported to the WtE facility revealed that its lower heating value falls below the 6,300KJ/kg required for energy generation. Since waste

	incineration is expected to be most effective method for waste reduction, the C/P was advised that another effective option is to improve the fuel characteristics of the incoming waste to make the incinerator functional.
Activity 2-4	Follow up on the activities of returned trainees who learned about waste management through the Fukuoka method landfill management technology, and support the formulation of a plan for landfill management. The AACMA and the JICA expert team organized two seminars to promote the sharing of training experience and knowledge between the C/P and the trainees who participated in the waste management trainings in Japan in 2022 and 2023. Additionally, three workshops were held regarding the plan to extend the lifespan of the Koshe landfill site, which was compiled by the JICA expert team while exchanging opinions with the trainees who developed the draft strategic plan to improve the landfill site during the training in 2021. The seminars and workshops were as follows: (1) First seminar: Sharing of training outcomes by 2022 trainees (June 15, 2023) (2) Second seminar: Sharing of training outcomes by 2023 trainees (March 19, 2024) (3) Sharing of the improvement plan for extending the lifespan of the Koshe landfill site (May 25, June 5, and October 13, 2023)

2.2.2 **Output**

As a result of activities 2-1, 2-2, and 2-3, an investigation and an analysis were conducted on the current state and challenges of waste management in Addis Ababa. Potential recommendations and challenges for the "Improvement of Collection and Transportation Services", "Waste Reduction", and "Sustainable Final Disposal" were compiled as summarized in the table below. Additionally, discussions were held with the AACMA to utilize these findings as the basis for formulating a draft strategic plan of the Project.

Table 2-28 Challenges and Possible Recommendations for Formulating a Draft Strategic Plan

	Possible Recommendation	Challenges to be Tackled
Improvement of Collection and Transportation Services	・ Minimizing the number of unprotected transfer depots to centralize transfer depots. This could improve transportation efficiency. To minimize the number of transfer depots, the waste collection which is currently manually done with hand carts should be replaced with small collection vehicles to enhance collection efficiency without reducing the coverage of waste collection services. ・ Upgrading of protected transfer depots with	・ About 63 unprotected transfer depots are existing. This is about 40% of total number of transfer depots. In sub-cities which have old housing district with narrow roads, primary waste collection is carried out using hand carts, resulting in smaller coverage areas served by each waste transfer depot. Additionally, due to difficulties in securing land for transfer depots, many unprotected transfer depots are scattered around, which have only containers on the ground. This not only reduces the efficiency of management by decentralizing

	buildings and mechanical equipment.	supervision and operational tasks by sub-cities and Woredas, but also reduces transportation efficiency as the amount of waste accumulated at these non-protected transfer stations is also low. ・ On the other hand, more than 90% of protected transfer depots are operated in open areas that may have an adverse impact on the surrounding environment due to odor and a large outbreak of flies. In addition, the fact that the collected waste is exposed to rain reduces the fuel characteristics for incineration.
Waste Reduction	・ Composting organic waste in order to reduce the amount of waste to be landfilled and improve the quality of waste for incineration. ・ Studying the waste separation of recyclable materials. ・ Improving the existing incineration plant and planning a new incineration plant. However, this item is not exclusively the role of the AACMA.	・ Waste minimization is indispensable to complying with the limitations of landfill capacity. The fuel characteristics of household waste in Addis Ababa City are inadequate. The main reason for this is the high rate of organic waste with high moisture content. ・ Waste separation at source is not yet applied except for a certain attempt at the pilot scale. Waste minimization by incineration is currently not in effect. Only about 20% of incoming waste was incinerated in 2022.
Sustainable Final Disposal	・ Making urgent improvements to the existing Koshe landfill site to prolong its lifetime. ・ Enhancing the capacity of landfill operations, such as expert training and the procurement of heavy machinery and equipment. ・ Immediately commencing a study for candidate for a new landfill site. ・	・ The remaining capacity of the existing landfill site may be 3.2 to 4.0 years. In order to use the Koshe landfill site as long as possible, the efficient use of remaining land is very important. However, a proper waste disposal plan has not been formulated. In addition, landfill capacity, including the expertise of staff and their ability to conduct the operation and maintenance of heavy equipment, is insufficient ・ Construction of a new landfill site is one of the top priorities for the city. However, the process of creating a construction plan has not started yet due to the limited availability of land within city boundaries.

2.2.3 Follow up the Activities of Return Trainees Who Learned Waste Management through the Fukuoka Landfill Management Method

a. First Seminar: Sharing of Training Outcomes by the 2022 Trainees (June 15, 2023)

The AACMA organized a seminar on June 15, 2023 to share knowledge and experience gained from the 2022 country training program held in Fukuoka City in Japan. Approximately 80 people participated, including AACMA staff, sub-city officials, and attendees from private companies and concerned municipal agencies. The seminar began with opening remarks by the JICA Ethiopia Office, followed by a two-hour presentation by the former Deputy Director of the AACMA's Service Provision Department (now the Deputy Director of the Administration Department) on behalf of the Japanese training participants to introduce what was learned during the training. The Chief Advisor of the JICA expert team then gave an outline of the Project and introduced some examples of waste management projects conducted by JICA.

The former Deputy Director explained not only the Fukuoka method but also gave a broad introduction to ordinary waste management practices implemented in Japan and the lifestyles of people and local customs actually observed during the training. The seminar concluded with a speech emphasizing aspirations to reach the high standards observed in Fukuoka City's waste management, despite the current gap in levels. In the subsequent Q&A session, participants, including those from SMEs/unions and private companies, provided various comments on the current waste management situation in Addis Ababa City. Following the Q&A session, the City Manager's Advisor commented that the city must make an overall effort to reach a level similar to Japan. In his closing remarks, the current Deputy Director of the Service Provision Department appreciated the active discussions among stakeholders during the seminar and emphasized the need for further efforts based on the lessons learned from the training in Japan.

Table 2-29 Seminar Agenda: Sharing Knowledge and Experience Obtained from Training in Japan

No.	Agenda	Time	Presenter
1	Welcome guests	8:30-9:00	
2	Opening remarks	9:00-9:05	JICA Ethiopia Office
3	Presentation on waste management in Japan	9:05-10:00	Former Deputy Director of the Service Provision Department (present Deputy Director of the Administration Department)
4	Break	10:00-10:15	
5	Introduction of the Project by JICA advisor	10:15-10:35	JICA expert team
6	Q&A session	10:35-12:30	Former Deputy Director of the Service Provision Department (present Deputy Director of the Administration Department)
7	Closing remarks	12:30-12:35	Present Deputy Director of the Service Provision Department

Table 2-30 Seminar Photos

	
View of the seminar in progress	Trainees making a speech on the stage

b. Second Seminar: Sharing of Training Outcomes by 2023 Trainees (March 19, 2024)

The JICA expert team invited Mr. Anteneh Tiruneh Worku, an Ethiopian from Hawassa, who participated in a JICA training program called "Training for Improvement for Solid Waste Management through the Fukuoka Method" in 2023, to Addis Ababa City to share the results of his training with AACMA staff responsible for landfill site management. The schedule was as follows.

Table 2-31 Seminar Agenda: Sharing Knowledge and Experience Obtained from Training in Japan between Hawassa Trainee and AACMA

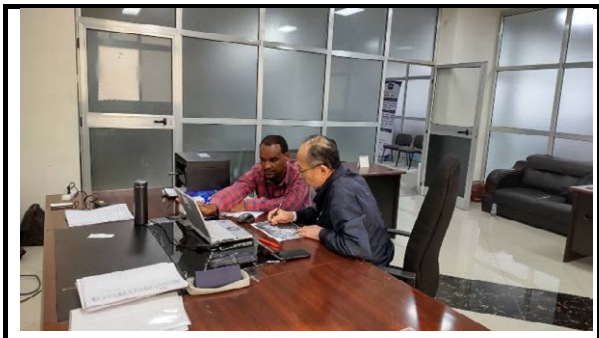
Date	Time	Activity	Venue
March 18, 2024	10:30	Arrival from Hawassa to Addis Ababa	
	11:30 - 13:00	Briefing by JICA expert on the improvement work of collapsed slope carried out by UN-Habitat in 2018 using the Fukuoka method. Discussion with JICA expert on the challenges of the Diaspora final disposal site in Hawassa	AACMA Office 8F
March 19, 2024	09:00 - 12:00	At the Koshe landfill site, the operation manager of the landfill site gave an overview of the landfill site, including the landfill management facilities, landfill equipment, landfill sections, and leachate treatment facilities, and had Q&A sessions.	Reppie field office at the Koshe landfill site
	14:00 -17:00	Observation of actual daily landfill operations at the Koshe landfill site.	
March 20, 2024	11:50	Return to Hawassa	

On the first day, the trainee from Hawassa came to the JICA expert team's office at the AACMA and received a briefing from AACMA staff members responsible for final disposal regarding the improvement work of collapsed slope carried out by UN-Habitat from 2018 to 2019 using the Fukuoka method. The trainee from Hawassa then exchanged views with the JICA expert team on the draft strategic plan for the improvement of the Diaspora final disposal site, prepared by the trainee in Hawassa through the training, regarding the challenges and measures to be taken based on the satellite images. The JICA experts explained how to confirm the coordinates and elevation of any random point on satellite images and how to use the data to create a landfill plan, using actual examples from the Koshe landfill site.

On the following day, March 19, the trainee from Hawassa, the JICA expert team, and staff members from the JICA Ethiopia Office gathered at the Koshe landfill site and visited the access road, landfill section, the site of improvrment work for collapsed slope by UN-Habitat, and leachate treatment facility (under testing) at the landfill, with guidance from AACMA staff members in charge of the landfill site. Observing the site of the leachate treatment facility (an oxidation pond and wetland) that the AACMA is constructing on a trial basis as a measure to address the problem of leachate flowing out of the landfill area, some participants proposed that the AACMA monitor the quality of the leachate (before and after treatment).

Consequently, the seminar served as a platform for the exchange of opinions at the level of those in charge of landfill operations facing common problems, with the participants having constructive discussions based on their experiences in solving these problems. The participants also promised to continue exchanging information in the future. All told, the first step was taken toward the formation of an information network in Ethiopia.

Table 2-32 Photos of the Training

	
A trainee receiving a briefing on improvement work of collapsed slope using the Fukuoka method at the Koshe landfill site at the JICA expert office at the AACMA.	JICA staff and the trainee from Hawassa receiving an explanation from AACMA staff on the improvement site of collapsed slope.

	
The trainee from Hawassa observing the leachate treatment facility (wetland method).	A group photo of participants, including the trainee from Hawassa, AACMA staff, and JICA staff in front of the field office at the Koshe landfill site.

c. Sharing of Improvement Plan for Extending the Lifespan of the Koshe Landfill Site (May 23, June 5, and October 13, 2023)

The final disposal amount was clarified and analyzed in Activity 1-1 and the situation at the Koshe landfill site was confirmed through the on-site visit. Based on these, the remaining landfill capacity was calculated by the JICA expert team based on the current shape of the landfill and an assumed final landfill shape. Furthermore, an estimate was made of the remaining lifespan of the landfill site based on the disposal amount per day obtained from truck scale data. On May 25, 2023, discussions were held with AACMA officials from the Landfill Administration Directorate, under the title “Study Conference on Landfill Site Management”, about the calculation methods and results. Following the initial discussions, additional measures for extending the lifespan of the landfill were formulated, on the precondition that additional land is secured for landfill use. On June 5, 2023, further discussions were held with officials from the Landfill Administration Directorate to finalize the concept of the improvement plan for extending the lifespan of the Koshe landfill site.

During the second workshop held on October 13, one of the JICA expert team explained to the officials from the City Manager’s Office that the limited remaining capacity at the Koshe landfill is a significant problem for the city and that the development of a new landfill site is urgently required. In response, the Deputy City Manager expressed his gratitude for the expert’s observations.

① Understanding the Remaining Capacity of the Koshe Landfill Site

The following calculation methods were explained to the C/P by the JICA experts: an estimation of the remaining capacity of the landfill site using satellite photos and the remaining lifespan based on the daily disposal amount obtained from truck scale data. It was understood by the C/P that the estimated remaining years were three to four years as of the end of May 2023, but this could be worsened to two to three years if the area of the landfill gas recovery project, which has already been completed, cannot be utilized. This led to a recognition of the urgent need to develop a new landfill site.

② Proposed Schedule to Achieve Sustainable Final Disposal Management

The development of a new landfill site requires a series of steps, including site selection, an environmental impact assessment that includes topographical and geological surveys, land

acquisition, tenders for design and construction work, and construction work itself. It is estimated that at least five years will be required to complete these processes. Therefore, assuming the commencement of operations of the new landfill site in early 2028, a schedule table was compiled showing when these activities need to be implemented.

③ Measures for Extending the Lifespan of the Koshe Landfill Site

Not only the staff of the Landfill Administration Directorate, but also most of the staff members of the AACMA recognize that the development of a new landfill site by the end of 2027 is an extremely challenging task. Therefore, it was acknowledged that it is necessary to maximize of the use of the Koshe landfill site for as long as possible. During the on-site visit, it was confirmed by the JICA experts that an area adjacent to the northern part of the landfill site, where several households had relocated since the 2017 collapse at the site, had become vacant. In light of this, the JICA experts created a development plan for the landfill site encompassing this vacant area (approximately 4.5 hectares) and reevaluated its remaining capacity and life. As a result, it was determined that the revised development plan could extend the life of the landfill site for five to six years beginning in June 2023.

④ Creating a Concept for Improving the Koshe Landfill Site

At the Koshe landfill site, incoming waste is properly weighed and categorized as controlled dumps. However, problems in landfill management were found in the following points: leachate discharged without any treatment, a thousand of waste pickers scavenge for valuables, and a large number of birds pick at the waste due to the lack of cover soil. In response to these problems, in addition to the initial concept — which aims mainly at extending the life of the landfill site to secure landfill capacity — a proposal has been made to improve towards a sanitary landfill considering the introduction of the Fukuoka method in addition to the initial concept which mainly aims at extension of the lifespan of landfill site to secure the landfill capacity.

Figure 2-12 Concept for Improving the Koshe Landfill Site by Extending its Life

Table 2-33 Photo of Presentation by JICA Expert

A JICA expert explaining the improvement plan for extending the life of the Koshe landfill site at the City Manager's Office

2.3 **Activities Related to Output 3**

Output 3：Policies to improve the technical and financial sustainability of AACMA are identified.

2.3.1 **Outline of Activities**

Activities related to Output 3 were implemented as shown in the table below.

Table 2-34 Summary of Activities Related to Output 3

Activity	Contents
Activity 3-1	Draft strategic plan is formulated by AACMA to address priority issues. With the support of the JICA expert team, the C/P conducted a progress review of the policies and action plans outlined in the Waste Management Ten-Year Development Plan (2020/21-2030/31). Firstly, the relationship between strategic themes and goals were clarified, and then the progress of activities prepared for each goal was evaluated in light of the current situation identified in Activity 1-1 and in reference to the targets. Based on this evaluation, the C/P selected priority issues to be addressed and set long-term goals, aiming at forming a sound material-cycle society by 2035/36. In alignment with the long-term goals, short-term (2025/26) goals and medium-term (2030/31) goals were created accordingly as a draft strategic plan. In addition, the JICA expert team simulated the future waste flow of Addis Ababa City under three scenarios: 1) maintaining treatment capacity as of 2022/23 (without additional investment); 2) maintaining the treatment rate as of 2022/23 (with the waste management budget increasing proportionally to the increase in waste generation); and 3) actively investing to form a sound material-cycle society. These three scenarios were explained by the JICA expert team, upon which it was agreed that the AACMA would develops the draft strategic plan based on Scenario 3.

Activity 3-2	Identify the budget, organization, technical capacity, etc. for implementing draft action policy, then analyze and evaluate its financial sustainability and technical adequacy. The costs required to implement the proposed draft strategic plan developed in Activity 3-1 were estimated by the JICA expert team, taking into account unit prices set based on the 2022/23 budget and documentation from the European Commission (EC). Meanwhile, budget data for the 2023/24 fiscal year was obtained from the AACMA, confirming a significant increase compared to the previous year and indicating a substantial allocation for the implementation of the Ten-Year Development Plan. Additionally, reports on GDP growth rates from the African Development Bank and the World Bank confirmed that Ethiopia's economy has maintained a favorable level of growth at a rate of 5.3% in 2022, slightly lower than the previous year but still robust. Given this economic background, it was determined that it would be feasible to secure the planned budget.
Activity 3-3	Finalize the draft action policy for priority issues by examining methods for inter-organizational coordination and mobilization of funds. Based on the current budget (2023/24), the possibility of budgetary measures within Addis Ababa City was studied to make a rough estimate of the costs required for realizing the proposed draft strategic plan. As a result, it was judged that improvement activities within the scope of routine management could be covered by the financial capacity of the city. However, it was affirmed that technical support is required in waste reduction activity due to a lack of experience in this area. On the other hand, regarding the construction of new disposal sites and the new WtE facility, as envisaged in the proposed draft strategic plan in light of the limited treatment capacity of existing facilities, cost estimation was conducted separately from the aforementioned routine management costs since their exact location is currently undecided and the timing of their implementation is uncertain. Since these costs significantly exceed the scale of budgets for routine management, the JICA experts advised the AACMA that it is necessary to secure funding sources if these facilities are going to be constructed. In addition, coordination with other domestic agencies and cooperation with relevant agencies must be considered to mobilize funds from other countries and donors, as well as to request cooperation.
Activity 3-4	The finalized draft strategic plan will be shared with both domestic stakeholders and donors. Facilitate inter-organizational coordination and fund mobilization, share the finalized draft strategic policy with relevant domestic organizations and donors. Major donors involved in the urban waste management sector have included UN-Habitat, the World Bank, and GIZ. However, as of now, GIZ is the main donor engaged in supporting activities. GIZ is implementing the Natural Resources Stewardship Program II (NatuReS II), which is a multi-stakeholder partnership project aimed at promoting the sustainable management of natural resources in Ethiopia, Zambia, South Africa, and Tanzania. A partnership for circular value chains in Addis Ababa City is one of the multi-stakeholder partnerships based on NatuReS II with participants from public institutions, policymakers, private recyclers, and civil society organizations involved since 2020. Specifically, the partnership aims to

	safeguard employment in recycling activities in solid waste management and establish business collaborations based on business skills, thereby promoting and supporting circular value chains by utilizing the principles of a circular economy. Since this support activity also relates to waste reduction through the promotion of the 3Rs in the proposed draft strategic plan, future collaborations are anticipated.

2.3.2 **Workshop to Formulate Draft Strategic Plan**

In the Project, five workshops were held as shown in the table below for the draft strategic plan to achieve Scenario 3, which was agreed upon in Activity 3-2. These workshops were held to build consensus within the AACMA, the implementing body, and Addis Ababa City, including in the City Manager's Office, the higher-level organization.

Table 2-35 Summary of Workshops Held to Formulate the Draft Strategic Plan

Date	Objective and Agenda	Participants
1st Workshop September 29, 2023	Formulation of draft strategic plan by AACMA ・ Explanation and discussion of a rough concept and formulation of initial plan ・ Setting of target goal	AACMA Director, deputy directors (2), managers (5) and middle-level managers (11), JICA (2), JICA experts (4) Total: 25
2nd Workshop October 13, 2023	Consensus building within Addis Ababa City ・ Explanation and discussion of initial draft strategic Plan ・ Verification of target goal	City Manager's Office (5), AACMA (3), JICA (2), JICA experts (3) Total: 13
3rd Workshop March 15, 2024	Finalization of draft strategic plan by AACMA ・ Confirmation of current status and target goal to be achieved ・ Explanation and discussion of draft strategic plan as well as finalization of draft strategic plan. ・ Examination of how JICA can assist implementation of the draft strategic plan	AACMA managers (4), middle-level managers (8), JICA (2), JICA experts (4) Total: 18
4th Workshop March 7, 2024	Finalization of draft strategic plan by AACMA ・ Confirmation on target goal ・ Explanation and discussion of draft strategic plan as well as finalization of draft strategic plan ・ Examination of how JICA can assist	AACMA Director, deputy directors (2), managers (5), middle-level managers (9), JICA (2), JICA experts (4) Total: 23

	implementation of the draft strategic plan	
5th Workshop March 20, 2024	Consensus building on final draft of draft strategic plan within Addis Ababa City ・ Explanation and discussion of final the draft strategic plan ・ Examination of feasible JICA support framework and schedule	City Manager's Office (1), AACMA (14), JICA (2), JICA experts (4) Total: 21

Table 2-36 Photos of Workshops and Discussions with the AACMA

1st workshop (September 29, 2023)

2nd workshop (October 13, 2023)


3rd workshop (March 5, 2024)


4th Workshop (March 7, 2024)


5th Workshop (March 20, 2024)

2.3.3 **Draft Strategic Plan**

a. A Review of the Progress of the Ten-Year Development Plan for Waste Management in Addis Ababa City

With regard to a waste management plan for Addis Ababa City, a Ten-Year Development Plan (2020/21-2030/31) has been developed by the AACMA. In this regard, it is therefore ideal that the draft strategic plan for improving waste management for 2035/2036 be formulated in alignment with

the goals and policies outlined in the Ten-Year Development Plan. Moreover, the draft strategic plan created should serve as a reference for future revisions of the Ten-Year Development Plan. Considering that the draft strategic plan should be discussed based on the progress of the Ten-Year Development Plan, an analysis of the current situation in Addis Ababa City was conducted to confirm the progress and achievements of the Ten-Year Development Plan.

The Ten-Year Development Plan establishes four strategic objectives along with five strategic goals. These objectives and goals are interconnected, with indicators set for each goal to achieve the strategic objectives.

Table 2-37 Strategic Themes and Goals of AACMA Ten-Year Development Plan 2020/21-2030/31 G.C

Strategic Themes (ST)	
1) Increasing community awareness and participation; 2) Recycling and reuse of solid waste; 3) Coordinating solid waste operations; and 4) Reducing the amount of disposable waste by utilizing it to generate power.	
Strategic Goals	Related ST
Goal 1 Creating a society that manages solid waste properly and promoting a culture of cleaning by improving the level of awareness in the community	1
Goal 2 By modernizing the solid waste management operation, increasing the capacity to collect from the current 80% to 100% as per standards	3
Goal 3 Modernizing the management system of the solid waste service and increasing the efficiency of transportation to improve capacity from the current 85% to 100%	3
Goal 4 Increasing solid waste recycling capacity from the current 6.3% to 18%	2
Goal 5 Increasing the utilization of the solid waste generated in the city for energy sources, of which only 50% is currently utilized, to 100%	4

Analysis results found that the progress of the Ten-Year Development Plan has proceeded mostly as scheduled, as shown in the table below. It should be highlighted that the goals related to awareness raising among residents, waste collection and transportation, recycling, and composting have been largely achieved. Furthermore, the formulation of a master plan is also on track. On the other hand, concerning the items for which the goals have not been achieved, the targets related to construction

issues have been largely unmet, with most of these being related to activity under Goal 5. In particular, the goal of establishing a new sanitary landfill site, which was expected to launch operation in 2024/25, has been not achieved at all. Lastly, the goal regarding incineration capacity has also not been met. It is possible that these issues may affect the progress of the Ten-Year Development Plan; action is required to put the things on the right track.

Table 2-38 Review of Ten-Year Development Plan (Goal 1)

Goal 1		Target	Current Situation (2022/23)	Achievement as Planned
Activity 4	Provide door-to-door awareness service for 901,930 households	608,553 households in 2022/23	Almost achieved 608,035 households in 2022/23	Yes
Activity 5	By creating intensive awareness, have 381,551 households start waste sorting/segregation from the source	271,161 households have started by 2022/23	Almost achieved. 270,782 households started by 2022/23	Yes
Activity 6	Produce a 75,000 house-to-house composite using various methods by creating awareness in society	40,000 households that produce or engage in composting by 2022/23	Almost achieved. 39,680 households engaged by 2022/23	Yes
Activity 7	Average of 500,000 residents participate in the weekly cleaning campaign	600,000 residents participate in the weekly cleaning campaign in 2022/23	Almost achieved. 599,578 residents participated in 2022/23	Yes
Activity 13	Prepare a new regulation to prevent and control the violation of solid waste regulations and have it approved by the cabinet	By 2022/23	Prepared by city administration to establish organization of law enforcement authority and paramilitary staff administration	Yes
Activity 14	Make 623 model schools related to cleaning by creating awareness in all schools	424 model schools are nominated by 2022/23	Nearly achieved. 380 schools by 2022/23	Yes

* The information source for Goal Activity 4, 5, 6, 7, 13, and 14 is the AACMA annual report on community participation. Some of the information may need to be reviewed. For example, with nearly 40,000 households engaged in composting in 2022/23, the scale of which is too large.

Table 2-39 Review of Ten-Year Development Plan (Goal 2 and Goal 3)

Goal 2		Target	Current Situation (2022/23)	Achievement as Planned
Activity 1	Provide door-to-door collection service as per standards for 4992 blocks	To maintain 4992 blocks from 2020/21 to 2035/36	Most likely achieved since the entire area is covered by door-to-door collection	Yes
Activity 4	Collect compostable and decomposable waste on different days on 4992 blocks	N/A	—	—
Activity 11	Approval of solid waste management policy and strategy by the cabinet and putting it into practice	By 2020/21	Has been submitted to the cabinet. Currently undergoing approval process	No
Activity 12	Construction and start of operation of 80 transfer depots in 11 sub-cities	from 39 to 78 by 2022/23	Achieved. 91 fenced transfer depots and nine permanent transfer depots in 2022/23	Yes
Goal 3		Target	Current Situation (2022/23)	Achievement as Planned
Activity 2	Collect and transport 8,643,202 tons of solid waste as per standards	2,252.1 tons/day collected and transported in 2022/23.	Almost achieved. 2,252 tons/day collected in 2022/23	Yes
Activity 3	Outsource solid waste transportation companies in 11 sub-cities	From two sub-cities, seven sub-cities outsourced by 2022/23	Achieved. In eight sub-cities, transportation work was outsourced in 2022/23	Yes
Activity 7	Examine and implement Solid Waste Management Master Plan	By 2020/21	Will be achieved with some later than scheduled. The Master Plan inception report was prepared in May 2023	Yes

Table 2-40 Review on Ten-Year Development Plan (Goal 4)

Goal 4		Target	Current Situation (2022/23)	Achievement as Planned
Activity 1	Recycle and reuse 946,758 tons of solid waste	206.7 tons/day recycled and reused in 2022/23.	Achieved. 228 tons/ day recycled and reused in 2022/23	Yes
Activity 2	Produce 49,600 tons of compost from solid waste	5.5 tons/day of compost produced in 2022/23.	Achieved. 7.3 tons of compost were produced.	Yes

Activity 3	Construction and start of operation of one composting center	One center operated by 2022/23	Almost achieved. One center in Lemi kura sub-city started operation in early 2023, although this is a private investment. The composting operation is not stable so far.	Yes
Activity 4	Complete construction of Bole Arabsa transfer station	By 2020/21	The construction work has been suspended.	No
Activity 5	Open an integrated solid waste management training center in Bole Arabsa	By 2022/23	The construction work has been suspended.	No
Activity 6	Create 10,000 jobs through street cleaning, collecting garbage door to door, recycling and reusing as well as other activities	In 2022/23, 5,069 total jobs created	Achieved. 7,020 members engaged in waste collection service SMEs in 2022/23.	Yes

Table 2-41 Review of Ten-Year Development Plan (Goal 5)

Goal 5		Target	Current Situation (2022/23)	Achievement as Planned
Activity 1	Utilize 7,402,729 tons of properly handled solid waste for power generation	1,549 tons/day incinerated in 2022/23	Not achieved. 394 tons/day incinerated in 2022/23.	No
Activity 5	Construction and commissioning of two solid waste power generation plants	One plant by 2024/25 and one plant by 2029/30	May not be achieved for the first plant as scheduled. Feasibility study for one plant is conducted in Nov 2021.	No
Activity 7	Construction and commissioning of hazardous solid waste incineration center	By 2024/25	Unlikely to be achieved on schedule	No
Activity 8	Construction of one leachate treatment center	By 2023/24	Unlikely to be achieved on schedule	No
Activity 9	Construction and commissioning of one modern sanitary landfill	By 2024/25	Unlikely to be achieved on schedule	No
Activity 10	Purchase eight cover dump trucks for transportation of ash	Four dump trucks by 2021/22 Four dump trucks by	Two units have been procured, but only one can be	No

		2024/25	used as of 2022/23	

b. Development of Future Waste Management Scenarios for Addis Ababa City

In considering the draft strategic plan of waste management for Addis Ababa City, a simulation of future waste management was conducted. For this, three scenarios for future waste management were developed and examined: 1) a scenario in which no proactive investments are made and waste disposal rates remain unchanged in fiscal year 2022/2023; 2) a scenario in which investments are made to maintain waste disposal rates at the same level as in fiscal year 2022/2023; and 3) a scenario in which proactive investments are made to form a sound material-cycle society. Scenario 3 was developed based on indicators discussed by the AACMA and the JICA expert team.

Table 2-42 Three Scenarios for Future Waste Management in Addis Ababa City

Scenario No.	Content
1	Amounts for collection, transportation, recycling and incineration are the same as in 2022, but the generation amount is increased. This may be considered the scenario without any progress.
2	Rates (collection, transportation, recycling and incineration) are the same as in 2022. This may be considered a scenario close to reality. Municipal solid waste (MSW) can somehow be managed in the same manner as in 2022/23, although there is no progressive target is assigned.
3	Indicators (collection, transportation, recycling and incineration) are targeted as the AACMA planned for 2035/2036. This scenario may be suitable for future planning.

Estimates from simulations of future waste disposal volume in each scenario are shown as follows. In Scenario 1, maintaining the current management capacity alone will lead to a significant increase in illegal dumping within the city, resulting in the worst-case scenario. In Scenario 2, as waste generation increases, waste treatment capacity will also be strengthened, which contributes to maintaining sanitation standards within the city. However, the final disposal amount will increase rapidly, making the issue of the landfill site worse. Therefore, the AACMA and the JICA expert team agreed to create a draft strategic plan based on Scenario 3, which focuses on indicators for actively improving the collection, transportation, recycling, and incineration processes.

(1) Scenario No. 1: No proactive investments are made

<Preconditions>

- There will be no particular budget increase for the AACMA.
- The final disposal amount remains high, and the current disposal site will be full within two to three years.
- Approximately one quarter (1/4) of the MSW generation amount is illegally dumped.

Table 2-43 Scenario No. 1: Waste Disposal Volume Trends

Scenario 1	2022/23		2025/26		2030/31		2035/36	
	Tons /day	%	Tons /day	%	Tons /day	%	Tons /day	%
MSW generation	2,647	100%	2,821	100%	3,106	100%	3,396	100%
Collection	2,252	85%	2,252	80%	2,252	73%	2,252	66%
Recycling	412	16%	412	15%	412	13%	412	12%
Incineration	394	15%	394	14%	394	13%	394	12%
Disposal (including ash)	1,783	67%	1,783	63%	1,783	57%	1,783	53%
Illegal dumping	125	5%	287	10%	553	18%	824	24%

(2) Scenario No. 2: Waste treatment capacity will be strengthened as waste generation increases

<Preconditions>

- The AACMA must increase its waste treatment capacity as the amount of waste generated increases.
- Illegal dumping accounts for 5% of the amount generated, but the amount increases every year.
- The final disposal amount will rapidly increase.

Table 2-44 Scenario No. 2: Waste Disposal Volume Trends

Scenario 2	2022/23		2025/26		2030/31		2035/36	
	Tons /day	%	Tons /day	%	Tons /day	%	Tons /day	%
MSW generation	2,647	100%	2,821	100%	3,106	100%	3,396	100%
Collection	2,252	85%	2,400	85%	2,643	85%	2,889	85%
Recycling	412	16%	438	16%	482	16%	527	16%
Incineration	394	15%	423	15%	466	15%	509	15%
Disposal (including ash)	1,783	67%	1.900	67%	2,093	67%	2,288	67%
Illegal dumping	125	5%	133	5%	146	5%	160	5%

(3) Scenario No. 3: Setting progressive indicators for proactive investments

<Preconditions>

- Eliminate illegal dumping.
- Aim to achieve a total recycling rate (material recycling and composting) of 30%.
- Aim to achieve a final disposal rate of less than 30%.

Table 2-45 Scenario No. 3: Waste Disposal Volume Trends

Scenario 3	2022/23		2025/26		2030/31		2035/36	
	Tons /day	%	Tons /day	%	Tons /day	%	Tons /day	%
MSW generation	2,647	100%	2,821	100%	3,106	100%	3,396	100%
Unmanaged	125	5%	113	4%	62	2%	0	0%
Stored in sacks (*)	178	7%	138	5%	130	4%	199	4%
Waste collection	2,252	85%	2,429	86%	2,786	90%	3,073	90%
Recycling	252	10%	338	12%	684	22%	1,018	30%
Material recycling	228	9%	282	10%	373	12%	509	15%
Composting	24	1%	56	2%	311	10%	509	15%
Transportation from transfer depots	1,727	65%	1,837	65%	1,795	58%	1,784	53%
Waste incoming to the disposal complex	2,092	79%	2,232	79%	2,230	72%	2,259	67%
Incineration	394	15%	670	24%	1,115	36%	1,694	50%
Final disposal (landfill amount)	1,782	67%	1,709	61%	1,360	44%	938	28%

* According to a telephone interview with a person who conducted a MSW generation rate and characterization study in 2020, it is said that the recyclables and other materials are stored in sacks for sale to collectors, but the actual situation is unknown.

NOTE: The percentages in the table above are of MSW generated. Some indicators may differ between future targets and the above, e.g. the targeted incineration rate is 75% with respect to the amount of waste incoming to the final disposal site in 2035/36, but is 50% with respect to total generation.

Table 2-46 Indicators for Waste Collection and Transportation

	2022/23	2025/26	2030/31	2035/36	Note
1. Unmanaged	5%	4%	2%	0%	Illegal dumping needs to be eliminated in the future
2. Collection rate of MSW generated	85%	86%	90%	90%	Collection amount excludes recycling and composting from the source
3. Number of unprotected transfer depots	63	47	0	0	Minimize the number of unprotected transfer depots
4. Number of protected transfer depots (fenced)	85	87	89	20	Increase the number of protected transfer depots instead of minimizing unprotected ones
5. Number of protected transfer depots (buildings)	15	25	50	100	Further upgrade those that are fenced and bring up to appropriate environmental specifications
6. Number of waste collection unions (SMEs)	97	103	110	119	Make proportional to door-to-door collection amount
7. Proportion of transportation amount by sub-city government	57%	50%	40%	20%	Reduce the transportation responsibility of sub-city government

Table 2-47 Indicators for Intermediate Treatment: Waste Minimization through the 3Rs

	2022/23	2025/26	2030/31	2035/36	Note
Recycling					
1. Recycling (tons/day)	9.5%	13%	22%	30%	Rate with respect to MSW generation
	252	338	684	1,018	Total recycling amount
2. Material recycling (tons/day)	8.6%	10%	12%	15%	Rate with respect to MSW generation
	228	282	373	509	Material recycling amount
3. Composting (tons/day)	0.9%	3%	10%	15%	Rate with respect to MSW generation
	24	56	311	509	Composting amount (100%)
On-site composting (households)	Unknown	2%	5%	10%	Rate of composting amount
Off-site composting	100%	98%	95%	90%	Rate of composting amount
4. Number of recycling SMEs	232	287	380	518	For material recycling

5. Composting SMEs	41	94	505	783	For composting
6. Number of recycling companies	31	-	-	-	Plastic: 20; paper: 6; glass: 2; metal: 3
7. Number of recycling centers	1	2	4	8	Bole Arabsa Recycling Center will be completed by 2025/26

Table 2-48 Intermediate Treatment: Incineration

	2022/23	2025/26	2030/31	2035/36	Note
Incineration					
1. Incineration rate	19%	30%	50%	75%	Rate with respect to incoming waste. Increase the incineration rate in order to reduce the final disposal amount.
2. New incineration plant	Feasibility study conducted		Operation needs to start in 2031/32		Calculation based on future estimates

Note: AACMA has already conducted a feasibility study (F/S) in 2023 with the intention of introducing new incineration plant following the Reppie WtE facility. Therefore, the draft strategic plan assumes that the new incineration plant will start operation in 2031/32, when the planned incineration capacity exceeds the 1,190 ton/day (85% of the 1,400 ton/day) of the Reppie WtE facility.

Regarding the introduction of a new incinerator, it should be noted that the Reppie WtE facility will incinerate only 22% of the incoming waste in 2022/23, as mentioned above, and similar events may occur with a new incinerator unless otherwise the fuel characteristics of the incoming waste are improved. Furthermore, in situations where the fuel characteristics of the incoming waste are poor, it is concerned that low-temperature combustion causes the generation of dioxins. Therefore, it is necessary to conduct regular monitoring of exhaust gases.

In addition, considering that the amount of incineration residue (bottom ash and fly ash) from the Reppie WtE facility constitutes more than 20% of the amount of incoming waste, it is necessary to consider to improve this figure as the incineration performance of incinerator is reduced at 10 % due to advancement of technology. Therefore, when new incinerator is introduced, it is desirable to reduce the residue rate, taking into account the extension of the lifespan of final disposal sites.

On the other hand, there are two types of ash generated from waste incineration: bottom ash generated from the bottom of the furnace and fly ash generated from the treatment facilities of exhaust gas. Especially for fly ash, which contains hazardous substances such as heavy metals, special measures needs to be taken to treat and dispose of it appropriately by separating from general waste.

Table 2-49 Final Disposal

	2022/23	2025/26	2030/31	2035/36	Note
1. Final disposal amount (tons/day)	1,782	1,709	1,360	938	The amount is reduced in proportion to the increase in the incineration rate
2. Final disposal rate (%)	67%	61%	44%	28%	Rate with respect to MSW generation
3. Securing landfill site(s) • Improvement of Koshe landfill site to prolong its remaining life • New landfill site development					• Improvement work needs to be completed as soon as possible. • The new landfill site needs to start operation in 2027/28
4. Strengthening of landfill equipment • Procurement of equipment • Strengthening of machinery maintenance					More than half of the equipment is poorly maintained
5. Waste minimization at landfill site • Composting, etc.					
6. Landfill operation using the Fukuoka method					The Fukuoka method for landfill operation, which was introduced in 2019 for slope failure recovery, must be restarted and continued

Table 2-50 Community Participation

	2022/23	2025/26	2030/31	2035/36	Note
1. Increase the number of communities involved in the mass mobilization /cleaning campaigns every week	599,578	682,500	950,000	1,200,000	Creating community awareness through door-to-door visits, different kinds of trainings, panel discussions, talk shows, various exhibitions, and

					media such as broadcast, print, and social media
2. Increase the number of schools and institutions that regularly participate in the cleaning movement or cleaning campaigns every week	2,655	2,655	2,655	2,655	Creating awareness through environmental protection clubs and mini-media in schools and mass media, formal letters in institutions, etc.
3. Increase the amount of revenue obtained in kind or money from community participation (in birr)	34,765,822	50,000,000	80,000,000	105,000,000	Creating community awareness through door-to-door visits and different kinds of media
4. Create model living blocks	688	826	1,171	1,516	Total number of blocks is 4992
5. Create model schools	380	468	623	780	Creating awareness through such things as environmental protection clubs and mini-media in schools

In Addis Ababa City, there is currently a lack of legislation specifically aimed at establishing a sound material-cycle society in the future, although legislation which aims to improve matters on public health, pollution issues, and the living environment has been already established. In this regard, the establishment of a legal system to form a sound material-cycle society in the future is crucial. The waste management in the city should aim at establishing a legal system for the formation of a sound material-cycle society in the future. Waste management towards a sound material-cycle society aims to minimize environmental impact through waste reduction, recycling, and proper disposal; thus, the legislation to be developed should encompass measures to encourage waste reduction, recycling, reutilization, and proper disposal, as well as the implementation of appropriate disposal systems in response to the diverse types and characteristics of waste. While the establishment of such legislation requires national-level initiatives, it is desirable for Addis Ababa City, which has been leading progressive waste management in the country, to collaborate with the central government to develop the necessary legislative framework. It should be noted that the development of such legislation would necessitate the amendment of existing waste management laws and regulations.

Table 2-51 Laws and Regulations

	2022/23	2025/26	2030/31	2035/36	Note
1. Establishment of legal system for the formation of a recycling-oriented society					National-level issues
2. Establishment of laws related to recycling • Packaging waste and home appliances/electronic equipment • End of life vehicles, etc.					National-level issues
3. Regulations related to industrial waste management					National-level issues

Figure 2-13 Expected Trend for Waste Disposal Volume in Scenario 3

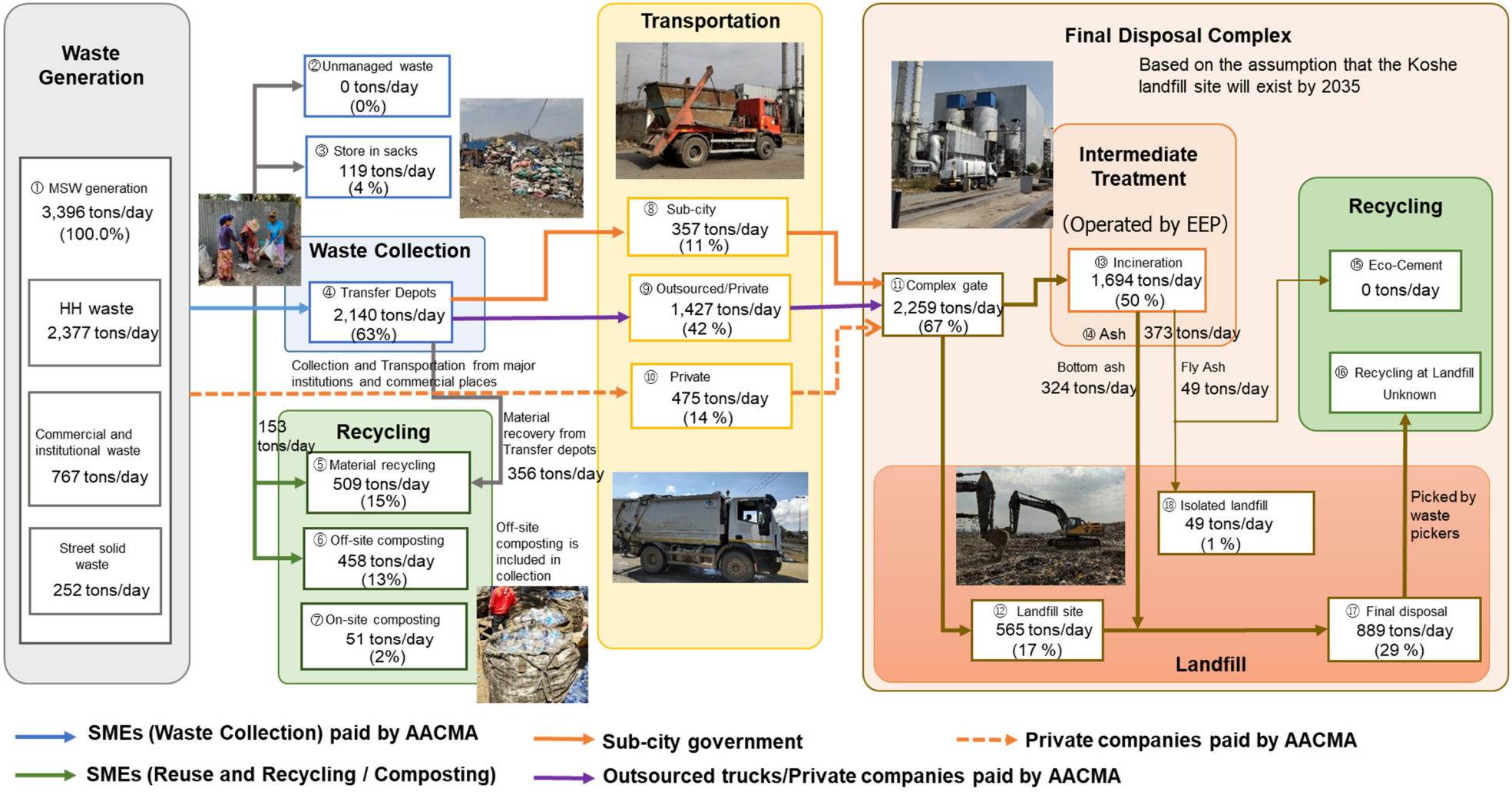


Figure 2-14 Waste Flow Diagram 2035 Based on Progressive (Scenario 3)

Table 2-52 Waste Flow Diagram Calculation Methodology for Progressive Scenario

	Item	tons/day	Calculation Method
①	MSW generation	3,396	ⓐ HH waste + ⓑ Non-HH waste
	ⓐ Household (HH) waste	2,377	HH waste generation rate*1 /person/day x Population*2
	ⓑ Non-HH waste	1,019	Assumed 30% of MSW generation*6
	ⓒ Commercial & institutional waste	767	ⓑ Non-HH waste - ⓓ Street cleaning waste
	ⓓ Street cleaning waste	252	Street cleaning waste generation rate*1 (kg/km/day) x Length of street (km)*3
②	Unmanaged waste	0	According to the progressive target rate
③	Stored in sacks	119	According to the progressive target rate
④	Transfer depot	2,140	①-②-③+ⓕ-⑤-⑥-⑦-⑩
	ⓔ Waste amount transported from transfer depots to final disposal complex	1,784	④-ⓕ
	ⓕ Recyclable collected from HHs	356	Assumed that 70% of the total recycled amount is from households
⑤	Material recycling	509	According to the progressive target rate
⑥	Off-site composting	458	According to the progressive target rate
⑦	On-site composting (home composting)	51	According to the progressive target rate
⑧	Transported by sub-city government	357	According to the progressive target rate
⑨	Transported by outsource or private	1,427	e-⑧
⑩	Collection and Transportation by private	475	Fixed rate (14%) with respect to MSW generation same as 2022/23
⑪	Final disposal complex gate	2,259	⑧Sub-city +⑨ Outsourced/Private + ⑩Private
⑫	Landfill	565	⑪-⑬
⑬	Incineration	1,694	According to the progressive target rate
⑭	Incineration ash*7	373	Fixed rate (22%) to ⑬ incineration same as 2022/23
	Bottom ash	324	
	Fly ash	49	
⑮	Eco-cement	0	Fixed rate (0.1%) to ⑭ Bottom ash + fly ash same as 2022/23
⑯	Recycling at landfill site	0	Not considered.
⑰	Final disposal	889	⑫Landfill + ⑭Bottom ash
⑱	Isolated landfill	49	landfill exclusive for fly ash with liner sheet

*1 Municipal Solid Waste Generation Rate and Characterization Study Report, 2020, AACMA.

*2 Population Projections for Ethiopia 2007-2037, Central Statistical Agency.

*3 Total road length obtained from sub-cities.

*4 AACMA recycling summary report 2022 based on the information from sub-cities.
*5 Truck scale original record of from July 2022 to March 2023 assured by the AACMA.
*6 "Waste Wise Cities Tool", UNHABITAT.
*7 The ratio of incineration residue (bottom ash + fly ash) to the incineration amount (22%) was calculated based on the amount of incoming waste to the incinerator and the amount of incineration residue recorded at truck scale at Reppie in the fiscal year 2022/23. However, considering recent improvements in the waste reduction rate of incinerated waste to around 90%, it is desirable to aim waste reduction rate at around 10% in the future.

Table 2-53 Waste Disposal Amount Based on Scenario 3 (Detailed)

	Item	Unit	2022/23	2025/26	2030/31	2035/36
1	MSW generation	tons/day	2,647	2,821	3,106	3,396
a	Household (HH) waste	tons/day	1,853	1,975	2,174	2,377
b	Non-HH waste	tons/day	794	846	932	1,019
c	Commercial & Institutional waste	tons/day	639	661	714	767
d	Street cleaning waste	tons/day	155	185	218	252
2	Unmanaged waste	tons/day	125	113	62	0
3	Stored in sacks	tons/day	178	138	130	119
4	Transfer depots	tons/day	1,887	2,034	2,056	2,140
e	Waste amount transported from transfer depots to final disposal complex	tons/day	1,727	1,837	1,795	1,784
f	Recyclable collected from HHs	tons/day	160	197	261	356
5	Material recycling	tons/day	228	282	373	509
6	Off-site composting	tons/day	24	55	295	458
7	On-site composting (home composting)	tons/day	0	1	16	51
8	Sub-city	tons/day	993	919	718	357
9	Outsourcing/private	tons/day	734	918	1,077	1,427
10	Private	tons/day	365	395	435	475
11	Final disposal complex	tons/day	2,092	2,232	2,230	2,259
12	Landfill	tons/day	1,698	1,562	1,115	565
13	Incineration	tons/day	394	670	1,115	1,694
14	Bottom ash + fly ash	tons/day	85	147	245	373
	Bottom ash	tons/day	74	128	213	324
	Fly ash	tons/day	11	19	32	49
15	Eco-cement	tons/day	0	0	0	0
16	Recycling at landfill site tons/day	tons/day	0	0	0	0
17	Final disposal	tons/day	1,783	1,709	1,328	889
18	Isolated landfill	tons/day	-	-	32	49

c. Future Waste Management Expected to Be Realized through Progressive Activities Based on Scenario 3

The AACMA needs to invest appropriately to strengthen the capacity for collection and transportation, recycling, and incineration in order to achieve Scenario 3. As a result of such investment, the final disposal amount in 2035 will be reduced to about half of the 2023 amount, and a sustainable municipal waste management system will be established. Furthermore, this improvement is expected to create more jobs, promote the formalization of informal activities, and improve public safety. Consequently, Addis Ababa City is expected to become a clean and livable city that is free from illegal dumping and is one of Africa's leading cities.

Table 2-54 Future Waste Management Achieved through Progressive Activities Based on Scenario 3

	22022/23		2025/26		2030/31		2035/36	
	tons/day	%	tons/day	%	tons/day	%	tons/day	%
MSW generation	2,647	100%	2,821	100%	3,106	100%	3,396	100%
Collection	2,252	85%	2,429	86%	2,786	90%	3,073	90%
Recycling	252	10%	338	12%	684	22%	1,018	30%
Incineration	394	15%	670	24%	1,115	36%	1,694	50%
Disposal	1,783	67%	1,709	61%	1,360	44%	938	28%
Unmanaged waste	125	5%	113	4%	62	2%	0	0%

Table 2-55 Matrix Showing Prioritized Activities toward Target Year (2035/36)

	Short Term by 2025/26	Middle Term by 2030/31	Long Term by 2035/36
Waste collection service	・ Develop a detailed action plan and implement the plan for the target year	・ 0 unprotected transfer depots ・ 89 fenced transfer depots ・ 50 modern transfer depots ・ 110 unions ・ 40% of transportation* is conducted by sub-city governments ・ Pilot scale transfer depot ・ Improvement of transfer depot is examined ・	・ 0 unprotected transfer depots ・ 20 fenced transfer depots ・ 100 modern transfer depots ・ 119 unions ・ 20% of transportation* is done by sub-city governments ・ Examined method is disseminated to target areas
Recycling	・ Develop a detailed action plan and implement the plan for the target year	・ 12,694 households conduct on-site composting ・ Pilot scale separate collection conducted ・ Encourage recycling and composting of	・ 40,461 households conduct on-site composting ・ Separate collection is disseminated to target areas ・ 518 recycling SMEs

		SMEs	and 783 composting SMEs
Incineration (WtE)	・ Survey, research and the development of a detailed plan for the existing plant and a new plant	・ Utilize the existing plant at almost full capacity ・ Start operation of new plant	・ Maintain good operation of both incineration plants (new and existing)
Final disposal	・ Conduct urgent improvement work of Koshe landfill site ・ Plan, design and construct new landfill site ・ Procure necessary equipment and tools	・ New landfill site needs to start the operation since 2027/28 in addition to the continued operation of existing landfill site ・ Train landfill operators so that they learn how to use landfill machinery appropriately for proper final disposal. ・ Procure necessary equipment and tools. ・ Finalize landfill operation ・ manual and plan	・ Implement proper and sanitary final disposal in accordance with landfill operation manual and plan
Community participation	・ Improve community awareness through door-to-door activities, different kinds of trainings, panel discussions, talk shows, holding of different kinds of exhibitions, and media such as broadcasting, printing, and social media.	・ Improve community awareness using different methods.	・ Improving community awareness using different methods.
Plan, laws and regulation	・ Formulate the Addis Ababa Waste Management Master Plan.	・ Revise the Ten-Year Development Plan, which will be effective until 2030/31.	

* “Transportation” means the transportation work from transfer depots to destination facilities.

d. Examination of the Costs Required to Implement the Draft Strategic Plan and Financial Estimation

Under the conditions listed below, the JICA expert team estimated the budget required to implement the draft strategic plan — including costs for incremental improvements based on the draft strategic plan for normal collection and transportation, waste reduction, final disposal, and public participation

— and the construction costs for new landfill sites and new WtE facilities.

- Prices from fiscal year 2022/23 are applied for costs. Price fluctuations are not taken into account in this estimate.
- From 2024 through 2035, the final year of the draft strategic Plan, the budgets for each year and the cumulative amount for this period are calculated.
- The development costs for transfer depots are calculated using quantity of each work items estimated by the JICA expert team and unit prices based on the construction plan of the Sendafa disposal site, incorporating some standard unit prices from Japan.
- Investment costs and operation costs use the unit prices calculated by the JICA experts based on the construction costs (CAPEX) and operating expenses (OPEX) compiled in a waste management technology database[12] and a report on biodegradable waste issued by the EC.[13]
- Key investment projects:

1. Improvement of waste management in ordinary business operations

    - ✓ Integration and improvement of transfer depots: 163 transfer depots will be consolidated into 120 by 2035, of which 100 are upgraded to transfer depots with buildings.
    - ✓ Waste reduction through the 3Rs (Reduce, Reuse, and Recycle): 26 materials recovery facilities (MRFs) and 21 composting facilities will be constructed by 2035.
    - ✓ Construction work at the Koshe disposal site to extend its life and improve capacity: Construction work will be conducted to maximize landfill capacity from 2024 to 2025.

2. Establishment of new final disposal site and intermediate treatment facilities

    - ✓ Establishment of a new final disposal site
    - ✓ WtE facilities

It should be noted that the procurement of waste collection and transportation equipment and heavy machinery for landfill operations are not included in this estimate.

[12] Database of Waste Management Technologies. www.epem.gr/waste-c-control/database/html/MRF-00.htm.

[13] European Commission. “Assessment of the Options to Improve the Management of Biodegradable Waste in the European Union, Annex E: Approach to Estimating Costs” (2009). http://ec.europa.eu/environment/waste/compost/developments.htm.

d.1 Estimation of the Costs Required to Improve the Waste Management in Normal Business Operation in Order to Achieve the Draft Strategic Plan

The following table shows cost estimates for implementing the draft strategic plan.

Table 2-56 Estimated Budget Required to Implement the Draft Strategic Plan

	2023/24	2024/25	2025/26	2030/31	2035/36	2024-2035 Total
	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	(m ETB)
1. Improvement of Collection and Transportation System		**1,942**	**1,887**	**1,803**	**1,705**	**21,950 (58.5%)**
Transfer Depot improvement cost		85	85	85	170	**1,471 (3.9%)**
Costs for waste collection and transportation		1,857	1,802	1,718	1,535	**20,479 (54.6%)**
Waste collection by SMEs		760	780	800	840	9,629 (25.7%)
Transportation by sub-city		859	761	615	319	7,191 (19.2%)
Transportation by outsourcing / Private		114	134	162	224	1,998 (5.3%)
Waste transported (private)		124	127	140	153	1,661 (4.4%)
2. Waste Minimization		**193**	**507**	**997**	**1,476**	**10,965 (29.2%)**
3R Activities		**193**	**219**	**651**	**978**	**7,025 (18.7%)**
Material recycling by SMEs		121	129	171	233	2,058 (5.5%)
Composting by SMEs		72	89	480	744	4,967 (13.2%)
Intermediate Treatment			**288**	**346**	**498**	**3,940 (10.5%)**
A. Material recycling facility 26 Plants by 2035			**161**	**181**	**299**	**2,203 (5.9%)**
MRF CAPEX (10 tons/day class MRF is 31.0 million ETB)			124	62	62	807 (2.2%)
MRF OPEX (2,500 ETB/ton)			37	119	237	1,396 (3.7%)
B. Compost Plants (CP) 21 Plants by 2035			**128**	**165**	**199**	**1,737 (4.6%)**
CP CAPEX (20 tons/day class CP is 60.1 million ETB)			120	120	120	1,261 (3.4%)
CP OPEX (513 ETB/ton)			7	45	79	476 (1.3%)
3. Final Disposal		**493**	**447**	**304**	**210**	**3,862 (10.3%)**
Improvement work to extend the life of the Koshe disposal site		97	64			161 (0.4%)
Landfill operations		396	383	304	210	3,701 (9.9%)
4. Community Participation		**44**	**46**	**63**	**80**	**736 (2.0%)**
Promotion of cleansing campaign / creating model living blocks / creating model schools		44	46	63	80	736
Grand Total Budget from 2024/25 to 2035/36	**2,191**	**2,671**	**2,887**	**3,167**	**3,471**	**37,512 (100.0%)**

The total budget for the period from 2024/25 to 2035/36 is estimated to be 37.512 billion birr, with an average annual growth rate calculated at 2.6%. A breakdown of the total budget shows that collection and transportation accounts for the largest portion at approximately 59%, followed by 30% for waste reduction and 10% for final disposal.

The total budget for the AACMA is 2.19 billion birr for fiscal year 2023/24, which reflects a 73% increase over the previous year. Within the budget, the capital budget stands at 1.98 billion birr, an increase of 78%, while the recurrent budget is 0.21 billion birr, showing a 41% increase.

It is worthwhile to note that 250 million birr is allocated to the capital budget for the improvement of transfer depots, reflecting the AACMA's commitment to realizing the Addis Ababa City Waste Management Ten-Year Development Plan for (2020/21-2030/31). Indeed, the AACMA has already initiated improvement work at 11 transfer depots, and it is expected that operations will commence at 20 transfer depots with buildings within fiscal year 2022/2023. This budget amount represents 84% of the targeted amount for fiscal year 2024/25, demonstrating significant progress towards achieving the goals set.

According to the African Development Bank's "Ethiopia Economic Outlook",[14] actual GDP growth decreased from 5.6% in 2021 to 5.3% in 2022. However, this still surpasses the average for East Africa (4.7% in 2021 and 4.4% in 2022). Driven by industry, personal consumption, and investment, GDP

[14] Website of the African Development Bank. https://www.afdb.org/en/countries/east-africa/ethiopia/ethiopia-economic-outlook.

growth is forecasted to grow 5.8% in 2023 and 6.2% in 2024. The inflation rate is expected to decrease to 28.1% in 2023 and 20.1% in 2024. In contrast, a World Bank report estimates GDP growth at 5.3% in 2022.[15]. Furthermore, the World Bank also reports that the Ethiopian government initiated Ten Year Development Plan based on its economic reform agenda of 2019, covering 2020/21 to 2029/30, which aims to sustain the high economic growth achieved over the past decade under the Growth and Transformation Plans, while promoting the transition to an economy led by the private sector.

Based on this information, it seems likely that GDP growth in Ethiopia will remain in the range of 5% to 6% for the time being. It can therefore be surmised that the budget for Addis Ababa City will also be maintained at its current level. Furthermore, as mentioned earlier, the AACA budget for fiscal year 2023/24 has increased by 73% compared to the previous year. It seems feasible that a budget of approximately 2.83 billion birr will be secured for fiscal year 2024/25, the initial year of the proposed draft strategic plan, which is an increase of about 30% from the 2023/24 budget. Therefore, since the average annual growth rate of the planned budget (2.6%) is approximately half of the GDP growth rate, it is likely that the AACMA budget can be secured throughout the period of the draft strategic plan.

d.2 Estimation of the Costs Required for the Construction of New Final Disposal Site and New Waste-to-Energy Facilities.

The calculations of estimated costs for the construction of a new disposal site and new WtE facilities are shown below in (1) and (2), at 11.618 billion birr and 20.636 billion birr, respectively. The total budget sizes are equivalent to 3.7 and 6.7 times, respectively, of the average planned annual budget for 2024/25-2035/36 (approximately 3.1 billion birr); these amounts significantly exceed what Addis Ababa City can cover with its own funds. Therefore, for the AACMA to realize the proposed draft strategic plan with the aim of establishing a sustainable waste management system, it is necessary to consider coordinating with other domestic administrative agencies such as the Environmental Protection Agency (EPA) and the Ministry of Urban Development and Construction (MoUDC), as well as consider introducing funding from other countries and donors.

(1) New landfill site

In the proposed draft strategic plan, landfilling is set to commence at the new disposal site in 2027/28. Accordingly, the scale of the new disposal site is based on the following assumed specifications, enabling final disposal for a period of 20 years, from 2027/28 to 2046/47.

Specifications for new final disposal site

- Planned landfill capacity: Approximately 8,000,000 m^3 (the landfill amount from 2035 to 2046 is estimated based on the assumption that the landfill amount will continue to be the same as 2035 every year until the final year.)
- Planned land area: Approximately 48 ha (area of landfill section: approximately 40 ha)
- Planned landfill capacity: Approximately 200,000 tons/year
- Planned lifespan: About 20 years
- Construction period: from 2025 to 2027 (3 years)

[15] Website of the World Bank. https://www.worldbank.org/en/country/ethiopia/overview.

Table 2-57 Construction Costs of New Landfill Site

New Landfill Construction	2024/25	2025/26	2026/27	2027/28	2030/31	2035/36	2024-2035
	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Cost (m ETB)	Total Cost (m ETB)
CAPEX		4,647	4,647	2,324			11,618
		(40%)	(40%)	(20%)			(100%)

*m ETB means million Ethiopian birr

(2) New waste-to-energy facilities

According to the draft strategic plan, new WtE facilities are supposed to commence operations in 2031/32, when the daily incineration amount as planned will exceed the treatment capacity of the existing Reppie WtE facility (1,400 tons/day x 85% = 1,190). Therefore, construction of new WtE facilities is to be completed by 2030/31. In addition, the treatment capacity of the new WtE facilities was set to be 1,400 tons/day (700 tons/day x 2), which is the same treatment capacity as the existing plant.

Table 2-58 Construction Costs of New WtE Facilities

	unit	2022/23	2024/25	2025/26	2030/31	2035/36	2024-2035 Total
Incineration amount	tons/day	394	534	670	1,115	1,694	
Incineration at Reppie plant	tons/day	394	534	670	1,115	1,190	
Incineration at new plant	tons/day					504	
CAPEX: 1,400 ton/day-class incinerator	m ETB				20,636		20,636
OPEX: 2 incineration plants after 2031	m ETB	(276)	374	469	780	1,185	9,242
Total costs	m ETB	(276)	374	469	21,416	1,185	29,878

*m ETB means million Ethiopian birr

Appendix

1. Participant List for the 1st Seminar for Japan Experience Sharing Workshop (June in 2023)
2. Participant List for the 1st Workshop to Formulate a Draft Strategic Plan (September in 2023)
3. Participant List for the 2nd Workshop to Formulate a Draft Strategic Plan (October in 2023)
4. Participant List for the 3rd Workshop to Formulate a Draft Strategic Plan (March in 2024)
5. Participant List for the 4th Workshop to Formulate a Draft Strategic Plan (March in 2024)
6. Participant List for the 5th Workshop to Formulate a Draft Strategic Plan (March in 2024)

1. 1st Seminar for Japan Experience Sharing Workshop

Attendance List Date:
June 15, 2023

S. No.	Name	Sub_City/Organization	S. No.	Name	Sub_City/Organization
1	Masersha Tekele	Kirkos	43	Nurdin Ameen	AMN
2	Tadelech Kefle	Addis Ketema	44	XXXX Bereket	AMN
3	Asfaw Tsehaye	Union	45	Jire? Amanuel	AMN
4	Adis Ashagre	Guelele	46	Belay Alemayehu	AMN
5	Alelign Fantaye	Yeka	47	Yelekal Azmeraw	Arada
6	Henok Zewdu	Lideta	48	Tigist Adis	Lideta
7	Aschalew Biwo	Private comp.	49	Adugnaw	Lideta
8	Degu Menber	Union?	50	Endalkachew Yemane	City Manager Office
9	Wondwossen Mulualem	Arada	51	Mahder Negusie	Akaki Kaliti
10	Azum Daniel	Lafto Nifas Silk	52	Girma Hailu	Kirkos
11	Abdis Solomon	Private cleansing company	53	Mulat Tegegn	Kirkos
12	Anwar Akmel	Addis Ketema	54	Habto Abrham	Agency
13	Mulushewa Abebe	AACMA	55	Petros Wawoya	Agency
14	Ashenafi Tesma	Kolfe Keranio	56	Mesfin Demessie	Agency
15	BihonegnTelahun	Kolfe Keranio	57	Getaye Girma	Agency
16	Asefa Dese	Addis Ketema	58	Esu Balew Mekonen	Agency
17	Selamawit Kebed	Guelele	59	Sayeta Gebre	Agency
18	Berhanu Jebecha	Union?	60	Zewdu Abebaw	Addis Ketema
19	Worku Tekle	Union?	61	Asegedom	Addis Ketema
20	Dessie Birhanu	AMN	62	Yenegeta Andalem	Agency
21	Kumulachew Chanie	AMN	63	Belisti Bezuayehu	Agency
22	Wogen Takele	AMN	64	Yohanes Adamu	Bole
23	Gudeta Eyoma	AMN	65	Esaye Aklilu	Landfill Administration
24	Luelseged Kibret	AMN	66	Hundal Yadesa	Nifas Silk afto
25	Nasir Der	AMN	67	Tereza	Nifas Silk afto
26	Yonas	Arada	68	Geberekidan G/Egzabhair	City Manager Office
27	Lemi Abebe	Lideta	69	?	Yeka S/city
28	Solomon Yohans	Lideta	70	Binyam Dereba	Lemi Kura S/city
29	Endal Tsegaye	City Manager Office	71	Mesfinet Zewdie	Yeka S/city
30	Wondemagegn Bekel	Akaki Kaliti	72	Shemels Kebed	Yeka S/city
31	Banchayehu Alelgn	Kirkos	73	Abeb Asefa	Union
32	Fanosie Worku	Kirkos	74	Heven	Bole S/city
33	Wosen Tilahun	Agency	75	Alemtshaye	Bole S/city
34	H/Mariam Mekonen	Agency	76	Abaynesh Tege	Guelele S/city
35	Gemechis Mekonen	Agency	77	Genet Getu	Guelele S/city
36	Enku Legese	Agency	78	Chie Shimodaira	JICA Office Ethiopia
37	Hagos Kahsay	Agency	79	OYA Shunji	JICA Office Ethiopia
38	Dawit Tekle	Agency	80	Oda Shinnosuke	JICA Advisory Group
39	Delelegn Abera	Addis Ketema	81	ANAI Junji	JICA Advisory Group
40	Fekadu Demessie	Addis Ketema	82	Gebeyehu Berhane	JICA Advisory Group
41	Gebere	Agency	83	Iman Ahmed	JICA Advisory Group
42	Idris Hussien	Agency			

2. 1st Workshop to Formulate a Draft Strategic Plan
Attendance List
Date: September 29, 2023

S.N.	Name	Directorate	Position	Organization
1	Agernesh Desalegn	Research & Project Implementation	Team Leader	AACMA
2	Berehegnaw Sultan	Research & Project Implementation	Project Officer	AACMA
3	Rahel Assrat	Research & Project Implementation	Team Leader	AACMA
4	Yetemworke Tekele	Solid Waste Resource Management & Service Provider	Expert	AACMA
5	Amsal Asirade	Awareness Creation & Public Participation	Expert	AACMA
6	Mengistu Tsegaye	solid Waste Resource Management & Service Provider	Team Leader	AACMA
7	Kassa Tesfa	Research & Project Implementation	Expert	AACMA
8	Girma Hailu	Solid Waste Resource Management & Service Provider	Director	AACMA
9	Takele Desisa	Research & Project Implementation	Director	AACMA
10	Sadiya Mohammed	Solid Waste Resource Management & Service Provider	Expert	AACMA
11	Nitsuh Belay	Solid Waste Resource Management & Service Provider	Expert	AACMA
12	Mahder Nigussie	Communication Affiars	Director	AACMA
13	Firewayni Mezgeb	Research & Project Implementation	Technology Expert	AACMA
14	Shimelis Benti	Solid Waste Resource Management & Service Provider	Expert	AACMA
15	Nebyou Tesfaye	Landfill	Director	AACMA
16	Ayhawat Alemshet	Research & Project Implementation	Expert	AACMA
17	Gemechis Mekonnen	Solid Waste Resource Management & Service Provider	Expert	AACMA
18	Eyassu Guta	JICA	PO	JICA
19	Gebeyehu Berhanu	JICA Advisory Team	Expert	KKC
20	Ito Saki	JICA	PFA	JICA
21	Shinnosuke Oda	JICA Advisory Team	Expert	KKC
22	Junji Anai	JICA Advisory Team	Expert	KKC
23	Dr. Eshetu Lemma	Director General Office	Director General	AACMA
24	Iman Ahmed	JICA Advisory Team	Project Assistant	KKC

3. 2nd Workshop to Formulate a Draft Strategic Plan
Attendance List
Date: October 13, 2024

S.N.	Name	Directorate	Position	Organization
1	Ibrahim Mohammed	Research & Development	Civil Engineer	City Manager Office
2	Muluneh Mulugeta	Research & Development	Director	City Manager Office
3	Moges Tama	Research & Development	Researcher	City Manager Office
4	Sisay Birhanu	Project & Development	Sanitary Engineer	City Manager Office
5	Eyassu Guta	JICA	Senior Project Officer	JICA
6	Saki ITO	JICA	Project Formulation Adisor	JICA
7	Gebeyehu Berhanu	JICA Advisory Team	Expert	KKC
8	Takele Desisa	Research & Project Implementation	Director	AACMA
9	Rahel Assrat	Research & Project Implementation	Team Leader	AACMA
10	Bayush Tadesse	Reuse & Recycling	Director	AACMA
11	Junji Anai	JICA Advisory Team	Expert	KKC
12	Iman Ahmed	JICA Advisory Team	Project Assistant	KKC
13	Tefera Mola	City Manager Office	Deputy City Manager	City Manager Office

4. 3rd Workshop to Formulate a Draft Strategic Plan

Attendance List

Date: March 05, 2024

S.N.	Name	Directorate	Position	Organization
1	Agernesh Desalegn	Research & Project Implementation	Team Leader	AACMA
2	Mengistu Tsegaye	Solid Waste Resource Management & Service Provider	Team Leader	AACMA
3	Berehegnaw Sultan	Research & Project Implementation	Project Officer	AACMA
4	Nibret Dessie	Research & Project Implementation	Project Officer	AACMA
5	Nitsuh Belay	Research & Project Implementation	Expert	AACMA
6	Miteku Hirba	Awareness Creation & Public Participation	Director	AACMA
7	Rahel Assrat	Research & Project Implementation	Team Leader	AACMA
8	Tigist Kifle	Awareness Creation & Public Participation	Team Leader	AACMA
9	Junji Anai	JICA Advisory Team	Expert	KKC
10	Iman Ahmed	JICA Advisory Team	Project Assistant	KKC
11	Shinnosuke Oda	JICA Advisory Team	Expert	KKC
12	Gebeyehu Berhanu	JICA Advisory Team	Expert	KKC
13	Eyassu Guta	JICA	Senior Project Officer	JICA
14	Saki ITO	JICA	PFA	JICA
15	Girma Hailu	Awareness Creation & Public Participation	Director	AACMA
16	Takele Desisa	Research & Project Implementation	Director	AACMA
17	Bayush Tasesse	Reuse & Recycling	Director	AACMA
18	Kassa Tesfa	Research & Project Implementation	Technology Expert	AACMA

5. 4th Workshop to Formulate a Draft Strategic Plan

Attendance List

Date: March 07, 2024

S.N.	Name	Directorate	Position	Organization
1	Girma Hailu	Solid Waste Resource Management & Service Provider	Director	AACMA
2	Frewayni Mezgeb	Research & Project Implementation	Expert	AACMA
3	Bayush Tasesse	Reuse & Recycling	Director	AACMA
4	Berehegnaw Sultan	Research & Project Implementation	Expert	AACMA
5	Miteku Hirba	Awareness Creation & Public Participation	Director	AACMA
6	Sadik Shikur	Finance & Admin	Deputy Director	AACMA
7	Gebeyehu Berhanu	JICA Advisory Team	Expert	JICA Advisory Team
8	Zebenay Gizachew	Awareness Creation & Public Participation	Team Leader	AACMA
9	Tigist Kifle	Awareness Creation & Public Participation	Team Leader	AACMA
10	Mengistu Tsegaye	Solid Waste Resource Management & Service Provider	Team Leader	AACMA
11	Nibret Dessie	Research & Project Implementation	Project Monitoring & Implementation	AACMA
12	Kassa Tesfa	Research & Project Implementation	Expert	AACMA
13	Agernesh Desalegn	Research & Project Implementation	Team Leader	AACMA
14	Eyassu Guta	JICA	Senior Project Officer	JICA
15	Saki ITO	JICA	PFA	JICA
16	Shinnosuke Oda	JICA Advisory Team	Expert	KKC
17	Junji Anai	JICA Advisory Team	Expert	KKC
18	Takele Desisa	Research & Project Implementation	Director	AACMA
19	Gebeyehu Berhanu	JICA Advisory Team	Expert	KKC
20	Iman Ahmed	JICA Advisory Team	Project Assistant	KKC
21	Chie Shimodaira	JICA	Deputy Chief	JICA
22	Dr. Eshetu Lemma	Director General Office	Director General	AACMA
23	Mulat Mitiku	Service Delivery Sector	Deputy Director General	AACMA

6. 5th Workshop to Formulate a Draft Strategic Plan

3rd Discussion on Coopearative Framework of JICA next project in Eililly

Attendence List

Date: March 20, 2024

S.N.	Name	Directorate	Position	Signature
1	Dr. Eshetu Lemma	Director General Offfice	Director General	
2	Mulat Mitiku	Service Delivery Sector	Deputy Director General	
3	Sadik Shikur	Finance & Administration Sector	Deputy Director General	
1	Samuel Genzeb	Communication Affairs		
2	Bayush Tadess	Reuse & Recycling	Director	
3	Belay Alemayehu	Reuse & Recycling	Team Leader	
	Takele Desisa	Research & Project Implementation	Director	
4	Rahel Assrat	Research & Project Implementation	Team Leader	
5	Agernesh Desalegn	Research & Project Implementation	Team Leader	
	Berehegnaw Sultan	Research & Project Implementation	Project Officer	
6	Nibret Dessie	Research & Project Implementation	Monitoring & Evaluation Senior Expert	
7	Kassa Tesfa	Research & Project Implementation	Technology Expert	
8	Firewayni Mezgeb	Research & Project Implementation	Technology Expert	
9	Nitsuh Belay	Research & Project Implementation	Research Expert	
10	Miteku Hirba	Awareness Creation & Public Participation	Director	
11	Tigist Kifle	Awareness Creation & Public Participation	Team Leader	
12	Weyneshet Haile	Awareness Creation & Public Participation	Team Leader	
13	Nebyou Tesfaye	Landfill Administration	Director	
14	Essey Aklilu	Landfill Administration	Team Leader	
15	Awel Fenta	Landfill Administration	Team Leader	
16	Girma Hailu	Solid Waste Resource Management & Service Provider	Director	
17	Mengistu Tsegaye	Solid Waste Resource Management & Service Provider	Team Leader	
18	Chie Shimodaira	JICA Ethiopia	Deputy Chief	

Workshop 5

3rd Discussion on Coopearative Framework of JICA next project in . Elilly Hotel

Attendence List

Date: March 20, 2024

S.N.	Name	Directorate	Position	Signature
19	Saki ITO	JICA Ethiopia	PFA	
20	Eyassu Guta	JICA Ethiopia	Senior Project Officer	
21	Shinnosuke Oda	JICA Advisory Team	Expert	
22	Junji Anai	JICA Advisory Team	Expert	
23	Gebeyehu Berhanu	JICA Advisory Team	Expert	
24	Iman Ahmed	JICA Advisory Team	Project Assistant	
25	Kiflay A[illegible]	plan & monitoring	director	
26	Mulaneh [illegible]	Research & [illegible]	Director	
	Sela [illegible]	project	Expert	
27	Birod [illegible]		director	
	GETAHUN		[illegible]	