



Solid Waste Management Master Plan in Juba City 2021-2030

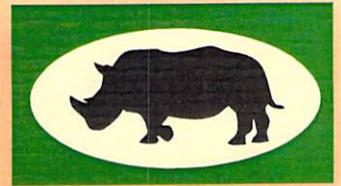


Ministry of Environment and Forestry
Ministry of Health, Central Equatoria State
Juba City Council
Juba County - Rejaf Payam
Japan International Cooperation Agency





REPUBLIC OF SOUTH SUDAN
CENTRAL EQUATORIA STATE
JUBA CITY COUNCIL



Office of the Mayor

Report on Revised Solid Waste Management Master Plan in Juba

MESSAGE FROM HIS WORSHIP OF THE MAYOR OF JUBA CITY COUNCIL
CENTRAL EQUATORIA STATE



Waste management is a concern for all city dwellers as it assures the safety of the health and the living environment. Every Citizen has the right to know and be aware of the overall situation on waste management in the city. Similarly, the City Council should also keep informing and disclosing information to the general Citizen and related stakeholders about their activities to improve solid waste management with people's support. This can only be implemented by a Revised Solid Waste Management Master Plan of Juba by the Department of Environment and Sanitation in Juba City Council.

The Department of Environment and Sanitation is managing around 423.9 tons/day in 2020, and it could reach 547 tons/day in 2025 and 705 tons/day in 2030. It controls the waste collection, transport, and disposal; despite the fact, that environmental regulation is a leeway to protect public health for the better life span of each person. However, with the rapid urbanization and economic growth due to the improvement of the security situation in the country, this becomes challenging to keep waste management under control, moreover, Juba City Council is making efforts to continue providing services with the advanced modern and dynamic approach at all levels.

Soon after, I have taken Office, and with responsibility coupled with the meager resources; we have taken the initiative to improve the current waste management system in the entire Juba City. Engagement of 56 Quarter Councils during waste collection, transport, and disposal; time frame and hour a day for the smooth execution of waste management, and adapt Fixed Time and Fixed Place for waste collection to formalize blocks and Department of Environment and Sanitation to collect waste from each residential area, Juba City Authority is now trying to locate collection points in every residential area, roads, and Hotels to improve the collection system to reduce waste through Segregation facility. Furthermore, Juba City Council has decided to make the City beautification look clean and green City.

Juba City Council is regularly striving to provide the best service and is moving forward from traditional management to modern with digitalization and better technology with the support of local experts and foreign donors like JICA. We are committed to the citizen of Juba City for providing sustainable, clean, and livable Juba City, and I hope we can achieve our goal with everyone's collective effort and international partners.

H. W. Michael Lado Thomas Allah-Jabu
Mayor,
Juba City Council

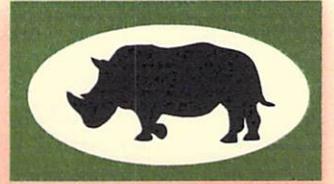


27/10/2022





REPUBLIC OF SOUTH SUDAN
CENTRAL EQUATORIA STATE
JUBA CITY COUNCIL



Office of the Chief Executive Officer

Acknowledgement

Waste management is an important and priority activity of Juba City Council. For the last Ten (10) Years since Independence, the Department of Environment and Sanitation was fully integrated into the structures of the Council to address the challenging issues of solid Waste Management and Environmental Management.

Juba City Council is among some of the fastest growing Cities in the Region currently burdened by swelling population, urbanization and waste generation among others.

Rising cost of living imposed by consequences of economic turbulences and waste management poses another serious challenge that demands scientific and committed approaches to be developed in the nearest possible future.

The review and finalization of the Juba Waste Management Master Plan championed by the Japanese International Cooperation Agency (JICA) is an added advantage, a resource that will contribute to the general improvement of the waste management project in Juba City Council.

To realize the City Council's vision and mission for a clean and green City, our collective efforts with commitment and that of our partners and other stakeholders is paramount.



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Chief Executive Officer
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PREFACE

In recent years, urban areas in the Republic of the South Sudan have been rapidly developing due to economic growth and the flow of refugees, and accordingly the urban population is increasing. It is important for the country now to manage and solve the problems associated with urbanization and population increase. Solid Waste Management (SWM) service is provided to improve the sanitary environment and create working opportunities for poor people. Good SWM service is the first step towards realizing a healthy population for the whole country.

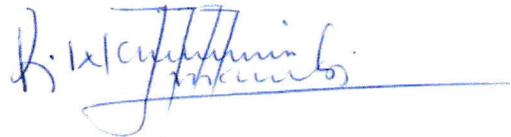
As the result of the demographic growth in Juba, the capital city, environmental pollution is now a serious issue in the city, which makes the citizens' lives less sanitary and sometimes unsafe. The national Environmental Bill has not yet been regulated under the Ministry of Environment and Forestry. Waste is scattered everywhere in the city and makes its environment worse.

Under these circumstances, the Republic of the South Sudan requested JICA to provide support in the field of SWM. JICA implemented a technical cooperation project on solid waste management starting from 2011 and SWM plan was established in 2014. The grant aid project was planned to start from 2016 but the project was postponed due to the conflict. In 2018, JICA started the Data Collection Survey on SWM in Juba to revise and modify the original SWM Plan prepared in 2014 by JICA Expert Team. In 2020, according to the start of the Preparatory Survey for the Project for Improving Solid Waste Management in Juba, the above SWM Plan has been further updated and revised based on the latest survey.

We hope that this "Revised SWM Master Plan" will be effectively utilized to improve SWM in South Sudan.



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TABLE OF CONTENTS

MAP	ix
Drawings.....	x
PICTURES	xi
ABBREVIATIONS	xv
GLOSSARY	xvi
CHAPTER 1 INTRODUCTION	1
1.1 Objectives and Background of the Plan.....	1
1.1.1 Background.....	1
1.1.2 Purpose	1
1.2 Target of the Plan.....	2
1.2.1 Target Area.....	2
1.2.2 Target Waste.....	2
1.2.3 Target Year	2
1.2.4 Target Indicators	2
1.3 Projects Related to Solid Waste Management	3
1.3.1 Projects by JICA	3
1.3.2 Projects by UNEP	4
1.3.3 Projects by UNICEF	4
1.3.4 Projects by UNMISS	4
CHAPTER 2 CURRENT SITUATION OF SOLID WASTE MANAGEMENT IN JUBA	5
2.1 General Information of Juba.....	5
2.1.1 Population.....	5
2.1.2 Natural Condition	5
2.1.3 Organization and Administrative Distinction of Juba.....	6
2.2 Legal and Institutional System	7
2.2.1 Relevant Laws and Regulations.....	7
2.2.2 Solid Waste Management Organization (Stakeholders and Duties).....	9
2.2.3 Duties and Responsibilities on Solid Waste Management	12
2.3 Finance.....	13
2.3.1 Financial Status of Juba	13
2.3.2 Financial Management System of Juba	13
2.3.3 Financial Management System of the Department of Environment and Sanitation of Juba City Council	
14	
2.3.4 Financial Status of Rejaf Payam.....	16

2.3.5	Financial Status of JCDS	18
2.4	Waste Generation.....	19
2.4.1	Unit Generation Amount and Waste Composition.....	19
2.4.2	Waste Generation Amount and Waste Management Flow	21
2.5	Collection and Transportation.....	23
2.5.1	Status of Waste Collection by the Department of Environment and Sanitation of Juba City Council.....	23
2.5.2	Status of Waste Collection by Private Collectors	25
2.6	Workshop.....	27
2.7	Intermediate Treatment and Recycling	27
2.8	Final Disposal	28
2.8.1	General Information of JCDS	28
2.8.2	Current Condition of JCDS.....	29
2.8.3	Amount of Waste Dumped at JCDS	30
2.8.4	Remaining Volume of JCDS	31
2.8.5	Illegal Dumping	31
2.9	Public Relations, Public Awareness and Environmental Education	32
2.9.1	Public Relations	32
2.9.2	Public Awareness	32
2.9.3	Environmental Education	33
2.10	Current Issues	33
CHAPTER 3 MASTER PLAN FOR SOLID WASTE MANAGEMENT IN JUBA		35
3.1	Vision of the Plan.....	35
3.2	Mid-Term Plan.....	36
3.3	Long-Term Plan	36
3.4	Principles and Measures	37
3.5	Planning Basis	39
3.5.1	Population Projection.....	39
3.5.2	Solid Waste Generation.....	39
3.6	Organization and Human Resources Management.....	42
3.6.1	Basic Concept of Organization and Human Resources Management.....	42
3.6.2	Establishment of Implementation System Led by Juba Rejaf Solid Waste Management Group [Priority Measure 1-1].....	43
3.6.3	Clarification of Role and Demarcation of Municipalities related to SWM [Priority Measure 1-2]... ..	43
3.6.4	Strengthening Human Resource Development (Measure 2-1)	47
3.6.5	Establishment of Juba Solid Waste Management Information Exchange Meeting (Measure 4-1-1). ..	47
3.7	Legal System	48
3.7.1	Basic Concept of Legal Development on Solid Waste Management.....	48
3.7.2	Revision and Enactment of SWM Ordinance and Regulations [Priority Measure 1-3]	49

3.7.3	Solid Waste Management Law [Measure 1-4 and 4-1-2]	50
3.7.4	Establishment of Occupational Safety and Health Management [Measure 1-5]	51
3.8	Collection and Transportation.....	51
3.8.1	Basic Concept of Collection and Transportation	51
3.8.2	Collection and Transportation System [Priority Measure 2-2, Measure 2-3 and Measure 2-4]	52
3.8.3	Appointment of SWM Managers and Public Awareness Promoters [Measure 2-5-1]	56
3.8.4	Establishment of Waste Collection System in Cooperation with Private Sector [Measure 3-1].....	56
3.8.5	Procurement Plan for Waste Collection Vehicles [Measure 3-4-1].....	57
3.8.6	Development of Data Management System [Measure 1-5].....	58
3.8.7	Human Resouces Planning	59
3.8.8	Budget Planning.....	59
3.9	Workshop.....	60
3.9.1	Basic Concept of Workshop.....	60
3.9.2	Establishment of Maintenance System Based on Preventive Maintenance [Priority Measure 3-3] ..	61
3.9.3	Development of Workshop [Priority Measure 3-4-2]	62
3.9.4	Appropriate Operation and Management of Equipment [Measure 3-5]	63
3.9.5	Development of Data Management System [Measure 1-6] [Reshown]	64
3.9.6	Human Resources Planning	64
3.9.7	Budget Planning.....	65
3.10	Intermediate Treatment and Recycling	65
3.10.1	Basic Concept of Intermediate Treatment and Recycling.....	65
3.10.2	Promotion of Intermediate Treatment and Recycling in Collaboration with Private Sector [Measure 4-2-1]	66
3.10.3	Human Resouces Planning	69
3.10.4	Budget Planning.....	70
3.11	Final Disposal	70
3.11.1	Basic Concept of Final Disposal.....	70
3.11.2	Rehabilitation of JCDS [Priority 3-2].....	70
3.11.3	Procurement Plan for Heavy Equipment [Priority Measure 3-4-3]	72
3.11.4	Closure of Illegal Dumping Sites [Measure 3-6].....	72
3.11.5	Development of Data Management System [Measure 1-6] [Reshown]	73
3.11.6	Human Resouces Planning	74
3.11.7	Budget Planning.....	74
3.12	Public Relations, Public Awareness and Environmental Education	75
3.12.1	Basic Concept of Public Relations, Public Awareness and Environmental Education	75
3.12.2	Implementation of “Fixed-Time and Fixed-Place Waste Colelction” in Collaboration with Residents [Priority measure 2-2] [Reshown]	76
3.12.3	Appointment of SWM Manager and Public Awareness Promoters [Priority Measure 2-5-1] [Reshown]	

	76	76
3.12.4	Holding Regular Community Meetings with Residents [Measure 2-5-2]	76
3.12.5	Public Awareness Promotion for Self-Treatment of Waste at Source and Waste Reduction [Measure 2-6]	77
3.12.6	Promotion of Environmental Education for Waste Reduction [Measure 4-2-2]	77
3.12.7	Human Resources Planning	77
3.12.8	Budget Planning.....	78
3.13	Finance.....	78
3.13.1	Basic Concept of Finance on Solid Waste Management.....	78
3.13.2	Revision of Fee Collection System [Measure 1-7]	79
3.13.3	Start of Fee Collection for Household Waste Collection [Priority Measure 1-8]	80
3.13.4	Strengthening Fee Collection for Market and Commercial Waste Collection [Measure 1-9]	81
3.13.5	Transparent and Planned Budget Management Using Independent Accounting [Measure 1-10]	81
3.13.6	Introduction of Budget Assessment [Measure 1-11].....	82
3.13.7	Compilation of Annual Report and Annual Plan [Measure 1-12].....	83
CHAPTER 4	FINANCIAL REQUIREMENTS	86
4.1	Precondition.....	86
4.2	Expenditure.....	87
4.2.1	Total Expenditure.....	87
4.2.2	The Department of Environment and Sanitation of Juba City Council	87
4.2.3	Blocks	88
4.2.4	Rejaf Payam.....	89
4.3	Revenue	90
4.3.1	Total Revenue	90
4.3.2	The Department of Environment and Sanitation of Juba City Council	91
4.3.3	Blocks	92
4.3.4	Rejaf Payam.....	93
CHAPTER 5	CONCLISIONS AND RECOMMENDATIONS.....	95
5.1	Conclusions	95
5.2	Recommendations for the Future of Solid Waste Management in Juba	95
5.2.1	Sustainability of Solid Waste Management	95
APPENDIX		

LIST OF TABLES

Table 1-1	Target Waste	2
Table 1-2	Target Indicators	2
Table 1-3	Projects Related to SWM by JICA	3
Table 1-4	The Projects Related to SWM by UNEP	4
Table 2-1	General Information of Juba	5
Table 2-2	List of QCs	7
Table 2-3	Relevant Laws and Regulations on SWM in South Sudan	7
Table 2-4	Target Area of Each Zone	10
Table 2-5	Number of Personnel of the Department of Environment and Sanitation of JCC	11
Table 2-6	Proposed Personnel for the Department of Environment and Sanitation of Rejaf Payam	11
Table 2-7	Duties and Responsibilities on SWM	12
Table 2-8	JCC's Settled Amount of Revenue (2018/19 - 2019/20)	13
Table 2-9	Revenue of the Department of Environment and Sanitation of JCC (2016/17)	14
Table 2-10	Waste Collection Fee and Registration Fee of Private Collectors	15
Table 2-11	Expenditure of Department of Sanitation and Environment by Items (FY 2018/19)	15
Table 2-12	Participants to the Financial Committee from the Department of Environment and Sanitation ..	16
Table 2-13	Revenue of Rejaf Payam (2018/19)	17
Table 2-14	Expenditure of Rejaf Payam (2018/19)	17
Table 2-15	Unit Gate Fee by Type of Vehicles at JCDS	18
Table 2-16	Revenue of Gate Fee at JCDS (January 2019 – July 2020)	18
Table 2-17	Revenue of Gate Fee at Mogoro Illegal Dumping Site (January 2019 – July 2020)	19
Table 2-18	Unit Generation Amount by Type of Waste	19
Table 2-19	Comparison of Waste Composition from JICA's survey result and World Bank's survey result by Income Class	21
Table 2-20	Amount of Waste Generated from Households (Estimation)	21
Table 2-21	Amount of Waste Generated from Markets and Institutions (Estimation)	21
Table 2-22	Waste Collection Vehicles of the Department of Environment and Sanitation of JCC	23
Table 2-23	Recyclables Sold to Recyclers by Waste Pickers	27
Table 2-24	General Information of JCDS	28
Table 2-25	Record of Improvement Activities at JCDS	30
Table 2-26	Remaining Volume of JCDS (Estimation)	31
Table 2-27	Current Issues on SWM in Juba	33
Table 3-1	Target for Mid-Term Plan (2025)	36
Table 3-2	Target Figures for Long-Term Plan (2030)	37
Table 3-3	The Principles and Measures of the Plan	37

Table 3-4	Estimation and Target Values of the Amount of Waste Generated and Collected in Juba	40
Table 3-5	Estimation of Volume of Waste Landfilled at JCDS	40
Table 3-6	Estimation of Remaining Years of JCDS	40
Table 3-7	Schedule for Organization and Human Resources Management.	43
Table 3-8	Roles and Responsibilities on SWM	43
Table 3-9	Roles and Responsibilities of JRSWGMG	45
Table 3-10	Proposed Contents of Occupational Health and Safety Training Session	47
Table 3-11	Expected Members of the Meeting	48
Table 3-12	Schedule for Legal Development	49
Table 3-13	Contents of SWM Regulations in Juba	50
Table 3-14	Schedule for Collection and Transportation	52
Table 3-15	Demarcation of Waste and Recyclables Collection	57
Table 3-16	Number of Waste Collection Vehicles (2023)	57
Table 3-17	Number of Waste Collection Vehicles to be Procured (2023 - 2024)	57
Table 3-18	Number of Waste Collection Vehicles to be Procured (2026- 2027)	58
Table 3-19	Number of Waste Collection Vehicles to be Procured (2030 - 2031)	58
Table 3-20	Human Resource Planning for Waste Collection.	59
Table 3-21	Budget Planning for Procurement of Waste Collection Vehicle	60
Table 3-22	Schedule for Maintenance and Workshop	61
Table 3-23	Proposed Outline of New Workshop	62
Table 3-24	Schedule of Construction of New Workshop.	63
Table 3-25	Human Resources Planning at Workshop	65
Table 3-26	Schedule for Intermediate Treatment and Recycling	65
Table 3-27	Schedule for Construction and Operation of Recycling Facilities.	69
Table 3-28	Schedule for Final Disposal.	70
Table 3-29	Schedule for Planning for Development of JCDS	71
Table 3-30	Summary of Heavy Equipment to be Procured by JICA.	72
Table 3-31	Human Resources Planning of Rejaf Payam for Final Disposal.	74
Table 3-32	Budget Planning for Rehabilitation of JCDS.	74
Table 3-33	Schedule for Public Relations, Public Awareness and Environmental Education	76
Table 3-34	Human Resources Planning for Public Relations, Public Awareness and Environmental Education of the Department of Environment and Sanitation of Juba City Council	77
Table 3-35	Human Resources Planning for Public Relations, Public Awareness and Environmental Education of the Blocks.	78
Table 3-36	Schedule for Finance	79
Table 3-37	Proposed Contents for Annual Report	84
Table 3-38	Proposed Contents for Annual Plan.	84
Table 4-1	Breakdown of Expenditure and Revenue	86

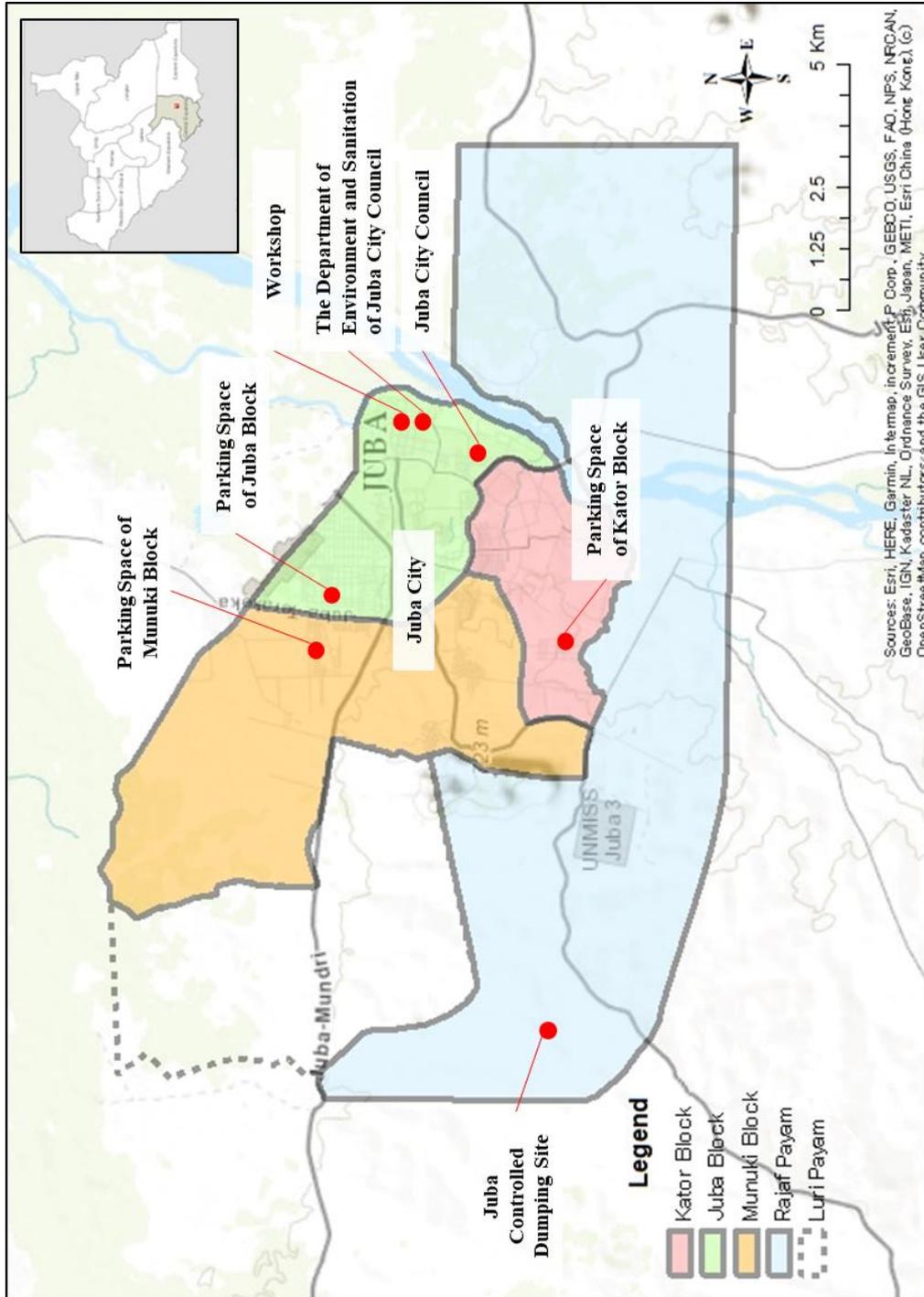
Table 4-2	Total Expenditure for Solid Waste Management (2020-2030)	87
Table 4-3	Total Revenue for Solid Waste Management (2020-2030)	91

LIST OF FIGURES

Figure 2-1	Organization Structure of JCC	6
Figure 2-2	Organization Structure of Stakeholders on SWM in South Sudan and Juba	9
Figure 2-3	Organization Structure of the Department of Environment and Sanitation of JCC	10
Figure 2-4	Proposed Organization Structure of Rejaf Payam	11
Figure 2-5	Revenue of Department of Environment and Sanitation by Source (FY 2016/17)	15
Figure 2-6	Waste Composition in Juba	20
Figure 2-7	Waste Management Flow (2020)	22
Figure 2-8	The Number of Trips and Amount of Waste Collected by the Department of Environment and Sanitation of JCC at JCDS	24
Figure 2-9	Waste Collection Route and Points in Juba	25
Figure 2-10	The Number of Trips and Amount of Waste Collected by Private Collectors at JCDS	26
Figure 2-11	The Number of Trips and Amount of Waste Collected by Private Collectors at Mogoro Illegal Dumping Site	26
Figure 2-12	Schematic Drawing of Juba County Controlled Dumping Site	29
Figure 2-13	Amount of Waste Disposed by Waste Collectors at Juba Controlled Dumping Site	31
Figure 2-14	Location of JCDS and Mogoro Illegal Dumping Site	32
Figure 3-1	Principles of SWM	35
Figure 3-2	Transition of Population, Amount of Waste Generated and Collected in Juba	39
Figure 3-3	Waste Management Flow (2025)	41
Figure 3-4	Waste Management Flow (2030)	42
Figure 3-5	Proposed Organization Structure of the Department of Environment and Sanitation of Juba city Council	46
Figure 3-6	Proposed Organization Structure of Block	46
Figure 3-7	Legal Structure on SWM	49
Figure 3-8	Waste Collection Flow (2025)	53
Figure 3-9	Waste Collection Flow (2030)	54
Figure 3-10	Development View of Fixed-Time and Fixed-Place Waste Collection	55
Figure 3-11	Data Management Process on Waste Collection	59
Figure 3-12	Waste Intermediate Treatment and Recycling Flow (2025)	66
Figure 3-13	Waste Intermediate Treatment and Recycling Flow (2030)	67
Figure 3-14	Flow of Recyclable Plastic Collection at Schools	68
Figure 3-15	Fee Collection System for SWM in Juba	80
Figure 3-16	Management Flow of Budget Assessment	82

Figure 3-17	Management Flow of Budget Compilation	83
Figure 4-1	Expenditure of Solid Waste Management by Category	87
Figure 4-2	Expenditure of Solid Waste Management in JCC-DES	88
Figure 4-3	Expenditure of Solid Waste Management in Blocks	89
Figure 4-4	Expenditure of Solid Waste Management in Rejaf Payam.	90
Figure 4-5	Details of Revenue Sources by Organization.	91
Figure 4-6	Revenue of Solid Waste Management in JCC-DES.	92
Figure 4-7	Revenue of Solid Waste Management in Blocks	93
Figure 4-8	Revenue of Solid Waste Management of Rejaf Payam	94

MAP



Source: Project Team (Juba City), OCHA (South Sudan)

Drawings

Percepective Drawings of Future Workshop



Front Side



East Side



Cross Section

PICTURES

	
<p>Residential Area</p>	<p>Market</p>
	
<p>Clean-up Campaign (2016)</p>	<p>Hotel</p>
	
<p>A Shop of a Market</p>	<p>Illegally Dumped Waste Spreading Behind a Market</p>
	
<p>Removal of Market Waste (1) (A Block rented a heavy equipment and removed waste dumped near the market.)</p>	<p>Removal of Market Waste (2) (Workers couldn't manage to load all of the waste, hence they rented a heavy equipment later.)</p>



Waste Collection by Juba City Councilin Hai Soujon



Waste Collection in Market



Waste Collection along Main Road (1)



Waste Collection along Main Road (2)



Secondhand Compactor of JCC
(Only two compactors has worked as of June 2020)



Compactor Procured by UNICEF
(Only one compactor has worked as of June 2020)



White and Blue Truck (Nissan Diesel)



Dump Truck (Hino)



Main Office at Workshop



Broken Vehicles at Workshop



Compactors Parked at Workshop



Illegal Dumping Site around Juba (1)



Illegal Dumping Site around Juba (2)



Broken Fence at JCDS



Office Building at JCDS



Entrance of JCDS
(Main Gate was removed due to several conflicts)

	
<p>JCDS</p>	<p>Broken Bulldozer</p>
	
<p>Access Road of JCDS (1) (A lot of waste is being dumped on / along the access road connecting the nearest main road with JCDS)</p>	<p>Access Road of JCDS (2) (Juba and Rejaf collaborate to remove the waste dumped on / along the access road regularly)</p>
	
<p>Access Road of JCDS (3) (After the removal of waste)</p>	<p>Waste unloading at JCDS</p>
	
<p>Meeting with the Director of Environment and Sanitation of JCC</p>	<p>Interview with a recycler</p>

ABBREVIATIONS

CEO	Chief Executive Officer
IDPs	Internally Displaced Persons
IEE	Initial Environmental Examination
ILO	International Labour Organization
JCC	Juba City Council
JCDS	JCDS
JICA	Japan International Cooperation Agency
JRSWMG	Juba Rejaf Solid Waste Management Group
MoEF	Ministry of Environment and Forestry
MoHE	Ministry of Health and Environment, Central Equatoria State
MP	Master Plan
NGO	Non-Government Organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PFI	Private Finance Initiative
PP	Pilot Project
PPP	Public Private Partnership
QC	Quarter Council
SDGs	Sustainable Development Goals
SSP	South Sudanese Pound
SWM	Solid Waste Management
UNEP	United Nations Environment Programme
UNHABITAT	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UNMISS	United Nations Mission in the Republic of South Sudan

GLOSSARY

Sustainable Development Goals (SDGs): The amount of waste generated has been increasing in the world due to the rapid population growth and the economic growth. If waste is not properly treated, it will affect the environment badly and prevent the establishment of sustainable sound material-cycle society. “The 2030 Agenda for Sustainable Development” was adopted as a guideline for long-term development (2015 - 2030) in the United Nations Conference in 2015. Appropriate waste management, reduction of waste and recycling are set as a target of SDGs in “Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable” and “Goal 12. Ensure sustainable consumption and production patterns” in the Agenda.

Sound Material-Cycle Society: A society in which the consumption of natural resources will be conserved and the environmental load will be reduced by preventing or reducing the generation of wastes and by promoting appropriate waste management.

Waste Discharger Responsibility: A principle that mentions waste dischargers should use and dispose the waste in a proper cyclical manner on their own responsibility.

Polluter-Pays Principle (Burden of processing cost): An idea that waste dischargers are responsible for paying the cost for the prevention of environmental pollution caused by waste. In South Sudan, the "National Environment Bill 2015 (14, Article 32)" requires residents to bear the cost of waste treatment. The government need to develop tax system and raise the public awareness.

Self-Treatment of Waste: The reduction of the amount of waste collected by the city through waste disposal at home. The methods of waste treatment at home include composting of food waste, conversion of food waste into feed, and recycling through community resource collection. Illegal dumping into rivers and open burning are not included in self-treatment. Open burning is prohibited, in principle, except when it is unavoidable due to public interest or social custom, because it causes environmental pollution such as odour and especially open burning of plastics produces harmful substances to human health.

CHAPTER 1 INTRODUCTION

1.1 Objectives and Background of the Plan

1.1.1 Background

Republic of South Sudan (South Sudan) was independent in 2011, but the country has various problems in basic public services such as education, public health, water supply, infrastructure development, electricity and communications. South Sudan has been facing to some challenges on solid waste management (SWM). Waste collection vehicles and heavy equipment are not enough for appropriate SWM. Moreover, there is not any laws and regulations specialized on SWM and the duties and responsibilities are not clarified. The amount of waste generated is expected to increase by the economic growth and population growth in the future, hence a lot of problems such as deterioration of the sanitary environment by illegal dumping will be occurred.

The Department of Environment and Sanitation of Juba City Council (JCC) is the organization for SWM in Juba, the capital of South Sudan, and the Department collects waste in Juba. The waste collected is transported to JCDS in Rejaf Payam. JCC has the by-laws related to SWM, but it need to be updated. Their waste collection vehicles are too old to maintain, hence most of them are not in operation. Due to the lack of funds, they cannot afford new waste collection vehicles, therefore they cannot provide regular SWM services. JCDS which JICA supported to construct in 2013 is not maintained well now. The fence and gate were destroyed due to the conflict, the bulldozer has not been repaired for a long time and the access road was closed by the waste dumped illegally. This has led to the formation of large illegal dumping sites along some main roads and near JCDS.

In Juba, the Solid Waste Management Plan was formulated through JICA “The Project for Capacity Development on Solid Waste Management in Juba (October 2011 – October 2014)”. JCC requested the government of Japan to support by Grant Aid project in March 2016, but it was postponed due to the conflict. Under the circumstances, it was much difficult to collect information related to SWM in Juba such as population, amount of waste, waste collection vehicles, organization and financial data. Since the environment surrounding Juba has changed significantly compared with the time when the Solid Waste Management Plan was formulated, JICA decided to update the waste Plan.

1.1.2 Purpose

The concept of “Public Services” has not become established sufficiently in Juba. Hence, the Master Plan achieves the establishment of sustainable solid waste management system through the implementation of democratic local government system in collaboration with governmental organizations, residents, private sector etc, and the procurement of waste collection vehicles and heavy equipment. The Master Plan also achieves the improvement of hygienic environment in Juba through sustainable waste management service.

1.2 Target of the Plan

1.2.1 Target Area

The target area of the Plan is Juba City including Juba Block, Munuki Block and Kator Block, and Rejaf Payam in South Sudan.

1.2.2 Target Waste

The target waste for collection and transportation is household, market and commercial wastes which the Department of Environment and Sanitation of JCC and Blocks collect. The target waste for final disposal is the waste disposed at JCDS in Rejaf Payam. The waste generated in other areas is transported to the dumping site. Medical waste, agricultural waste, demolition and construction waste are not included in the Plan because Juba City Council is not responsible for it (APPENDIX-1).

Table 1-1 Target Waste

Category	Jurisdiction	Type of waste	Description
Collection and Transportation	JCC and Blocks	Household Waste	Solid waste discharged from households
		Market Waste	Solid waste discharged from markets
		Commercial Waste	Solid waste discharged from large-scale dischargers such as hotels and hospitals
Final Disposal	Rejaf Payam	-	Solid waste disposed at JCDS

1.2.3 Target Year

(1) Mid-Term Plan

The base year is 2020 and the target year of the mid-term plan is 2025. The mid-term plan is positioned as a preparatory period for the long-term plan.

(2) Long-Term Plan

The base year is 2020 and the target year of the long-term plan is 2030.

1.2.4 Target Indicators

The indicators in the Plan is shown in Table 1-2.

Table 1-2 Target Indicators

Indicator	Target			
	Base Year (2020)	Mid-Term Year (2025)	Long-Term Year (2030)	
Waste Collection Rate (%)	7	50	80	
Fee Collection Rate	Residents	0	27	45

Indicator		Target		
		Base Year (2020)	Mid-Term Year (2025)	Long-Term Year (2030)
(%)	Markets	20	75	90
	Large-scale dischargers	16	50	74
Method of Final Disposal		Open Dumping	Controlled Dumping	Sanitary Landfilling

1.3 Projects Related to Solid Waste Management

1.3.1 Projects by JICA

The projects related to SWM by Japan International Cooperation Agency (JICA) are shown in Table 1-3.

Table 1-3 Projects Related to SWM by JICA

Name of Project		The Project for Capacity Development on Solid Waste Management in Juba	Data Collection Survey on Solid Waste Management in Juba, Republic of South Sudan	
Period		October 2011 – October 2014	February 2017 – August 2018	
Purpose		Development of waste collection at markets Improvement of waste collection at residential areas Development of operation and maintenance at final disposal site Preparation of Mater Plan (Draft)	Collection of basic information for waste management planning Third Country Training Program in neighboring countries Identifying the priorities and needs	
Outcomes	Master Plan	Juba Waste Management Plan (2015-2023)	Outline of Waste Management Plan for 15 years Waste amount survey Waste management flow	
	Collection and Transportation	Market (Market Waste)	Implementing organization: Blocks (Pilot Project of waste collection at two markets)	-
		Residential Area (Household Waste)	Implementing organization: Blocks and Union for waste collection (A pilot project of fixed-time and fixed-place waste collection with plastic bins at four residential areas)	Implementation of a pilot project by primary waste collection Analysis and Reflection of the results to Master Plan
		Institutions (Commercial Waste)	Start of waste collection by JCC and private collectors	-
	Public Awareness / 3Rs	Implementation of fixed-time and fixed-place waste collection as a pilot project	Implementation of primary waste collection as a pilot project	
	Maintenance	-	-	
	Final Disposal	Construction of final disposal site and procurement of heavy equipment Establishment of organization for management of the final disposal site	Incoming waste amount survey at the final disposal site and large illegal dumping site	
	Legal System	-	Preparation of draft waste management regulations	
	Organization	Establishment of Juba Rejaf Solid Waste Management Group (JRSWMG) Update of demarcation on SWM	Reorganization of Juba Rejaf Solid Waste Management Group (JRSWMG) Update of demarcation, roles and responsibilities	
	Finance	Implementation of fee collection	Confirmation of financial flow	
Remarks	JCC purchased 10 compactors (secondhand) in August 2012 (Financial source came from the blocks)	Implementation of the third country training in Sudan (three times)		

1.3.2 Projects by UNEP

The projects related to SWM by United Nations Environment Programme (UNEP) are shown in Table 1-4.

Table 1-4 The Projects Related to SWM by UNEP

Name of Project	Municipal Solid Waste Composition Analysis Study Juba, South Sudan	Municipal Solid Waste Open Dumping Site Juba, South Sudan	Health and Safety Guidelines for Waste Pickers in South Sudan
Issue Date of Report	1 st Survey: April 2013 2 nd Survey: September 2013	April 2013	October 2013
Purpose	Collection of information to improve waste management systems (Waste generation amount, characteristics, etc.)	Assessment of the impact of waste disposal on the surrounding environment	Improvement of the health and safety for waste pickers at a disposal site
Outcomes	Analysis of Waste Characteristics at Lagoon Dumping Site Calculation of unit waste Unit generation amount of waste in Juba Analysis of the density of uncompacted waste disposed	Analysis of the impact on waste pickers and small-scale farmers (Groundwater pollution from leachate, odors, noise, etc.)	Understanding of stakeholders to waste pickers Comprehension of waste pickers about risks for waste picking

1.3.3 Projects by UNICEF

United Nations Children's Fund (UNICEF) constructed a small incinerator for medical waste at an Ebola test facility of Juba Teaching Hospital in Juba in 2015. Juba Teaching Hospital still operates the incinerator and incinerates infectious waste such as sharps and syringes.

In 2016, UNICEF procured three compactors to JCC for the prevention of infectious diseases such as cholera and improvement of environment in Juba.

As of June 2020, one out of three compactors are still in operation and play a role on the waste management in Juba.

1.3.4 Projects by UNMISS

The United Nations Mission in the Republic of South Sudan (UNMISS) was established to support peacekeeping, infrastructure building, and environmental development in South Sudan. A total of 69 countries, including Japan, have dispatched personnel and engaged in a wide range of activities such as the construction of infrastructure and support for refugees, in not only Juba but all over South Sudan. UNMISS has not implemented any official projects related to SWM in Juba, but they prepared a hole of 1 hectare for waste disposal at the beginning of their activities and the hole finally became the part of JCDS.

CHAPTER 2 CURRENT SITUATION OF SOLID WASTE MANAGEMENT IN JUBA

2.1 General Information of Juba

The general information of Juba is shown in Table 2-1.

Table 2-1 General Information of Juba

Item	Description
Population (Estimation)	403,000 (2020) ¹
Area	52 squar kilo meters
Density of Population (Estimation)	7,750 persons / km ²
Block	Three Blocks (Juba, Munuki and Kator)
Quarter Council	50 QCs
Road Pavement Rate ²	2.0 % (2012)

2.1.1 Population

The population of South Sudan and Juba have not been officially surveyed, including a census, since the pre-independence survey in 2008. According to Statistical Yearbook for Southern Sudan 2010 issued by Southern Sudan Centre for Census, Statistics and Evaluation, 5th Sudan Population and Housing Census, 2008 is the latest population census in South Sudan. The census shows that Juba has 230,195 population totally, and Juba Block has 82,346, Kator Block has 64,130 and Munuki Block has 83,719 population. This Figures were applied in “Project for Irrigation Development Master Plan” by JICA (2013). “Data Collection Survey on Solid Waste Management in Southern Sudan (2010)” applied 1.12 million population as the total population of Juba which was mentioned in “Approach Paper to UNEP (2009)”. However, United Nations estimated the total population in Juba may be around 403,000 population in 2020. This project applys this population, but it should be noted that this population was estimated based on the results of the census in 2008 and more than 10 years have passed since the census was conducted.

2.1.2 Natural Condition

(1) Weather

Most of the land of South Sudan belongs to tropical climate in the Köppen climate classification. South Sudan has rainy season (April to October) and dry season (November to March). The weather in Juba has an annual rainfall of 1,052.9 mm. A maximum temperature is 37.2 ° C, a minimum temperature of 19.9 ° C, and an annual average wind speed of 6 km/h.

¹ Source: United Nations-World Population Prospects (2019)

² Source: African Development Bank (AfDB) Group “South Sudan: An Infrastructure Action Plan 2013”

(2) Geographical Features

Juba is a capital city of South Sudan extending approximately 12 km from North to South and approximately 10 km from East to West, and its urban elevation ranges from 450 m to 600 m. On the west side of Juba, there is a mountain with 744 meters above sea level, and on the east side, the White Nile River flows from South to North. A large wetland called the Sud stretches from the North of Juba to the border (APPENDIX-2).

(3) Geology

According to “Preparatory survey report on the project for the improvement of water supply system of Juba in southern Sudan, JICA (2008)”, Juba and its surrounding area lie on a large alluvial plain, gently sloping from south-southwest to north-northwest. The three rocky mountains (Mt. Jebel Kujur, Mt. Rajaf West, Mt. Rajaf East) near Juba are composed of granite-based monoliths, and the surface is exposed to hard and dense crystalline granite. The geology of the urban area of Juba is intrusive rocks such as diorite, and silica-type gravel is deposited on the bed of a small river flowing through Juba. The vegetation has been lost due to the conflicts, and the surface soil has been eroded, and the underlying granite is exposed everywhere.

2.1.3 Organization and Administrative Distinction of Juba

Juba is the capital city of South Sudan and it has three Blocks named Juba Block, Munuki Block and Kator Block. Quarter Councils (QCs) which is the community group to support the activities of JCC and the Blocks voluntarily are under each Block. The organization structure of JCC is shown in Figure 2-1, the list of QCs in Juba is shown in Table 2-2.

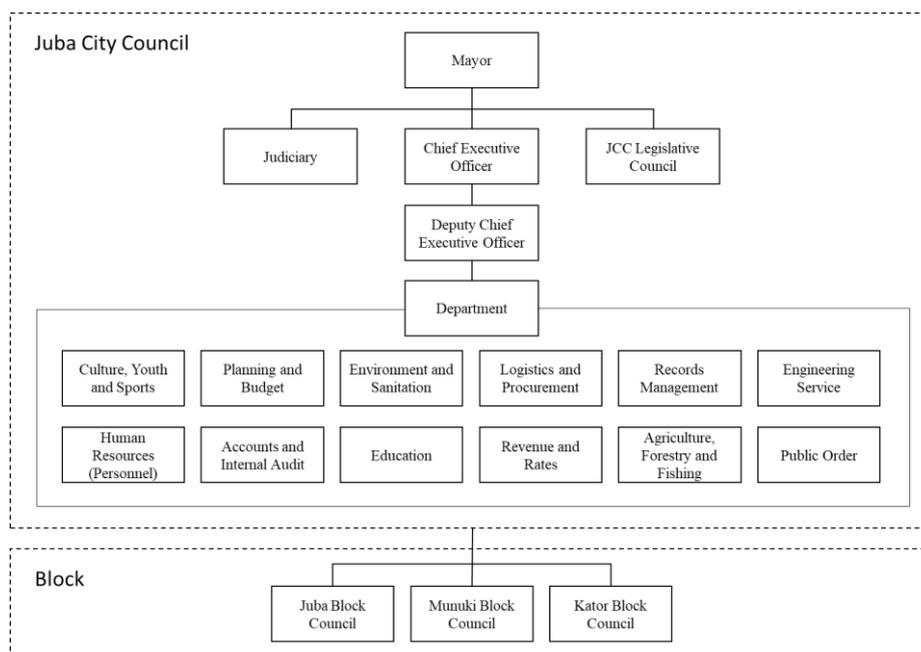


Figure 2-1 Organization Structure of JCC

Source: Project Team

Table 2-2 List of QCs

Block	Zone	QC	Block	Zone	QC
Juba	Northern Zone	Hai Juba Nabari East	Munuki	Nyokuron	Nyokuron East
		Hai Juba Nabari West			Nyokuron South
	Southern Zone	Hai Mayo			Nyokuron West
		Hai Buluk			Nyokuron West 1st Class
		Hai Thoura			Mauna & Jebel
		Hai Commercial and Game	Jebel		
		Hai Zindiya	Dar Salam		
		Hai Fadia Mafi	Mauna 1		
		Hai Nehlei	Mauna 2		
		Hai Nimra Talata	Mauna 3		
	Hai Neem	Munuki	Munuki BK A		
	Eastern Zone		Hai Malakal	Munuki BK B	
			Hai Jalaba and Gabat	Munuki BK C	
			Hai Cinema	Munuki Island	
			Hai Jerusalem	Kuwait Estate	
	Kator	Malakia	Malakia	Gudelle	Gudelle BK 9
Hai Kosti			Gudelle BK 8		
Zuhur Fati			Gudelle BK 7		
Kelibalak			Gudelle BK 6		
Kator		Kator	Kator Centre		Gudelle
			Katoor West		
			Kator South		
			Lologo Centre		
Atlabara		Atlabara	Atlabara "A"		
			Atlabara "B"		
			Atlabara "C"		
Jebel		Jebel	Joborona		
			Gworongoki		
			Wuliang		
			Mijiki		

Source: Project Team

2.2 Legal and Institutional System

2.2.1 Relevant Laws and Regulations

Waste management laws and regulations related to SWM exist in South Sudan and Juba as shown in Table 2-3, but no specific legal system for waste management has been established.

Table 2-3 Relevant Laws and Regulations on SWM in South Sudan

Category	Name	Description
Law	The National Environment Bill (2015)	The Bill describes about environmental conservation and SWM partially. The Bill is being prepared by Ministry of Environment and Forestry, and has not been enacted yet.
	Local Government Act (2009)	The Act describes the general public works by the local government and SWM is one of the important public works as samw as water supply, public health, infrastructure etc.

Category	Name	Description
Policy	South Sudan Annual Environmental Report (2017)	It is emphasized the necessity of appropriate solid waste treatment and disposal as a part of environmental policy.
	National Environment Policy 2015-2025 (2015)	The Policy describes environmental conservation including SWM. The draft of the policy was prepared by the Ministry of Environment and Forestry and passed through the parliament, but it has not enacted as an official policy yet.
	National Medical Waste Management Policy (2011)	The Ministry of Health prepared the draft of the Policy and enacted it in 2011. This Policy describes that the Ministry of Health has the responsibility of medical waste management and need to plan the licensing system for medical waste management.
Ordinance	JCC By-Law	JCC has their own by-laws on SWM. It has been revised to reflect new environmental standards and economic conditions, but has not been enacted.
	Rejaf By-Law	Rejaf Payam has their own by-laws on SWM.
Plan	Juba City Sanitation Reform and Investment Plan	The purpose of this Plan is to improve public health in Juba. It describes the importance of investment to SWM.

Source: JICA Project Team

(1) Laws and Regulations on SWM in South Sudan

There are not any official legal systems specialized for waste management in JCC and South Sudan. Related laws are “Environmental Protection and Management Bill, 2015” and “Local Government Act, 2009”. “Environmental Protection and Management Bill 2015-2025 (2015)”

a. The National Environment Bill

“Environmental Protection and Management Bill, 2015” describes about natural resources, climate change, natural heritage and environmental conservation and has a section for waste management which describes capacity development, fee collection, environmental education and public awareness for appropriate waste management. The Bill is being prepared by Ministry of Environment and Forestry, and has not been enacted yet.

b. Local Government Act

“Local Government Act, 2009” has already been announced officially. It describes the general public works by the local governments. It shows that waste management is one of the public works by the local governments as same as water and sanitation, energy, transportation and communication works.

c. National Environment Policy 2015-2025

“National Environment Policy 2015-2025” refers to a comprehensive approach to environmental conservation including SWM. The Policy also describes the issues and challenges on SWM in South Sudan. The draft of the policy has been prepared by the Ministry of Environment and Forestry and passed through the parliament, but it has not enacted as an official law yet.

(2) JCC By-Law

JCC has developed its own By-laws to govern the operation of waste in the entire city. Currently, it has been revised to correspond to the current situation in Juba. The updated By-laws have not been completed and announced officially. “Juba City Sanitation Reform and Investment Plan” was prepared for future improvement of public health, including solid waste management.

(3) Rejaf By-Law

Rejaf Payam has already enacted their own By-Law in 2017.

2.2.2 Solid Waste Management Organization (Stakeholders and Duties)

(1) The Relationship among Stakeholders on SWM in Juba

The organization structure of stakeholders on SWM in Juba is shown in Figure 2-3. The Ministry of Environment and Forestry is responsible for SWM in South Sudan in principle. However, the Ministry of Health has a responsibility for medical waste. The other wastes such as agricultural, demolition and construction wastes are not managed by any Ministries currently (APPENDIX-2). JCC is responsible for SWM in Juba, but Rejaf Payam operates and maintains a final disposal site.

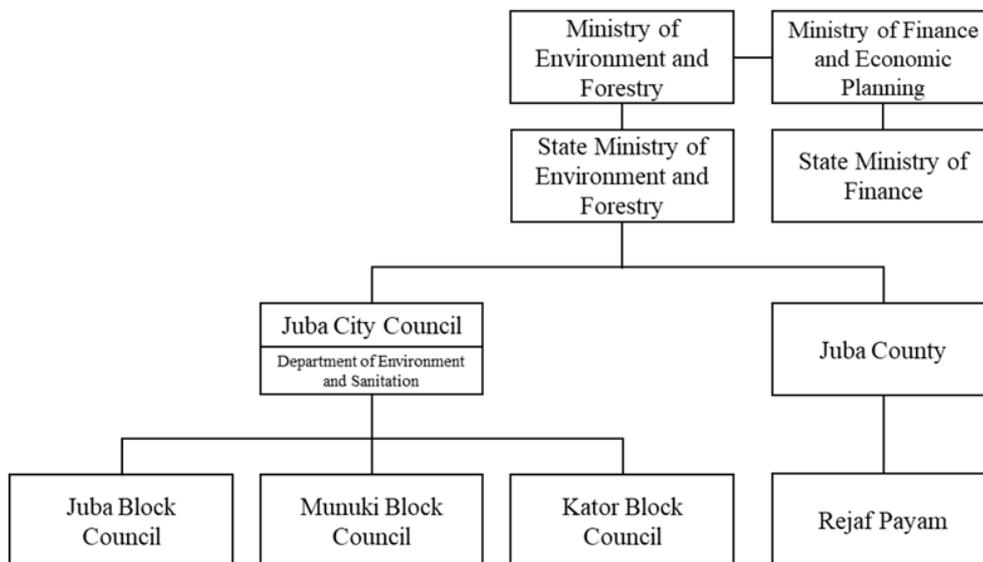


Figure 2-2 Organization Structure of Stakeholders on SWM in South Sudan and Juba
Source: JCC

(2) The Department of Juba City Council

The organization structure of the Department of Environment and Sanitation of JCC is shown in Figure 2-3, the target area of each zone is shown in Table 2-4, and the number of personnel of the Department of Environment and Sanitation of JCC is shown in Table 2-5. The Department of Environment and Sanitation of JCC divides Juba into

five zones and collects waste from the zones. Zone A and D belong to Kator Block, Zone B belongs to Juba Block and Zone C belongs to Munuki Block. Zone E is not the specific area, but the alrge-volume dischargers such as hotels, restaurants, NGOs, and other instituitons. The Department of Environment and Sanitation of JCC has more than 400 employees. According to the survey, especially “Workers” as waste collectors work every other week. The reasons why it happens are the shortage of waste collection vehicles and the inadequate human resource management system.

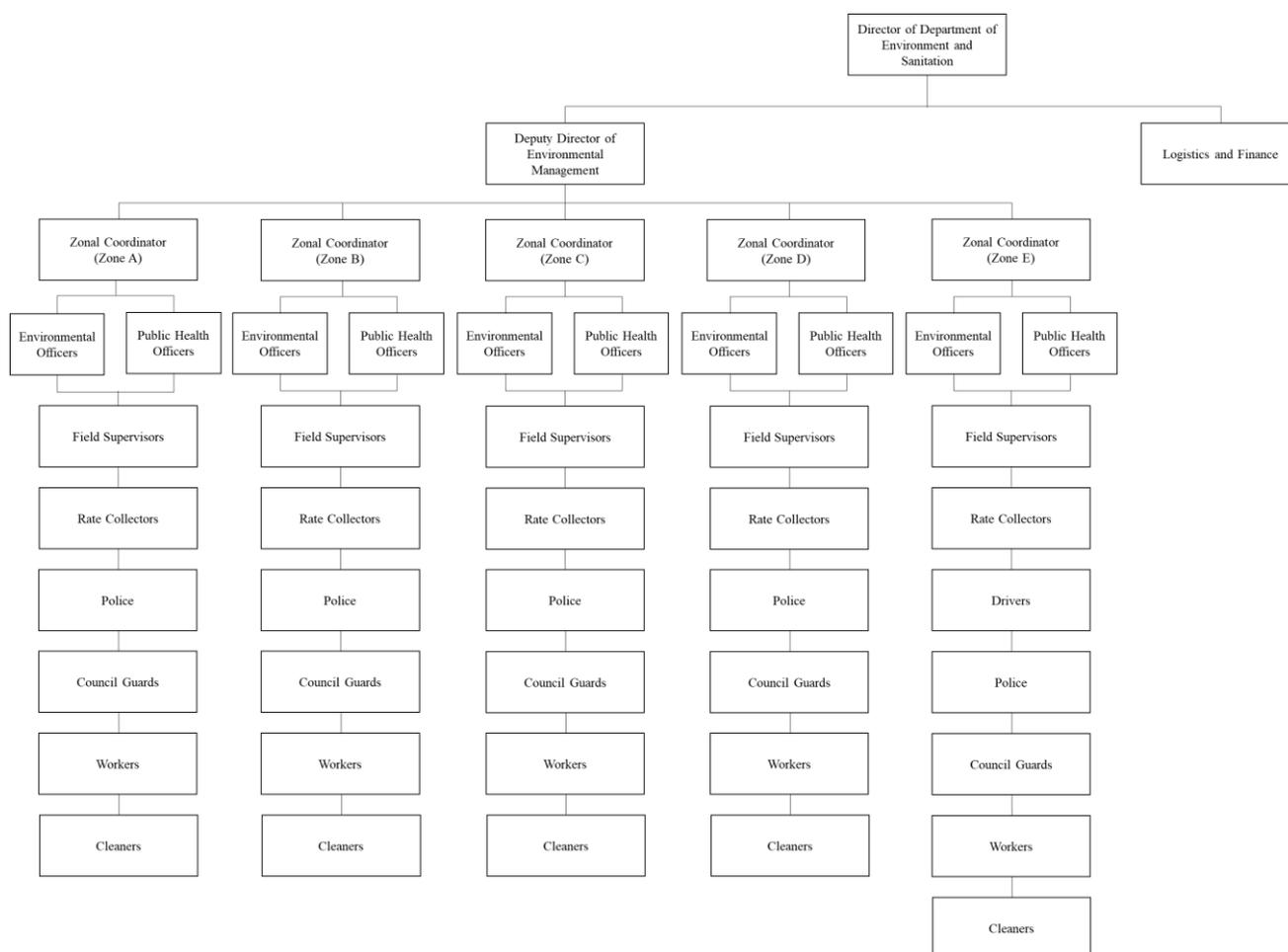


Figure 2-3 Organization Structure of the Department of Environment and Sanitaion of JCC
Source: JCC

Table 2-4 Target Area of Each Zone

Zone	Target Area
Zone A	Kator Block - Konyokonyo Market, Atalabara, Malakia, Lologo Suk Sita
Zone B	Juba Block - Hai Malakal, Juba Market, Hai Shaura, Hai Mayo, Nimr Talata, Hai Commercial, Juba Na Bari, Hai Gabat, Hai Cenima
Zone C	Munuki Block - Munuki Block “A”, “B”, “C”, Kuwait, Munuku Extension, Gudelle 1 & 2, Rockcoty, & Custom, Darsalam,
Zone D	Kator Block - Jebel Market, Nyakuron West, East, & South,
Zone E	Department of Environment and Sanitation - Hotels, Restaurants, NGOs, Government Institutions, Private Companies, General Markets

Source: JCC

Table 2-5 Number of Personnel of the Department of Environment and Sanitation of JCC

Zone	Public Health Officer	Environmental Officer	Field Supervisor	Rate Collector	Driver	Police	Council Guard	Worker	Cleaner	Total
Zone A	8	5	6	10	0	6	9	43	2	132
Zone B	2	5	4	9	0	2	0	33	2	84
Zone C	2	4	8	7	0	7	2	36	2	68
Zone D	1	3	7	8	0	2	6	38	2	68
Zone E	0	3	8	19	10	6	5	68	2	83
Total	13	20	33	53	10	23	22	218	10	435

Source: JCC

(3) Rejaf Payam

The organization structure of Rejaf Payam is shown in Figure 2-4 and proposed personnel of the Department of Environment and Sanitation of Rejaf Payam is shown in Table 2-6. The department of Environment and Sanitation has been proposed but it has not been approved by the authority. Currently seven officers are involved in SWM in practice.

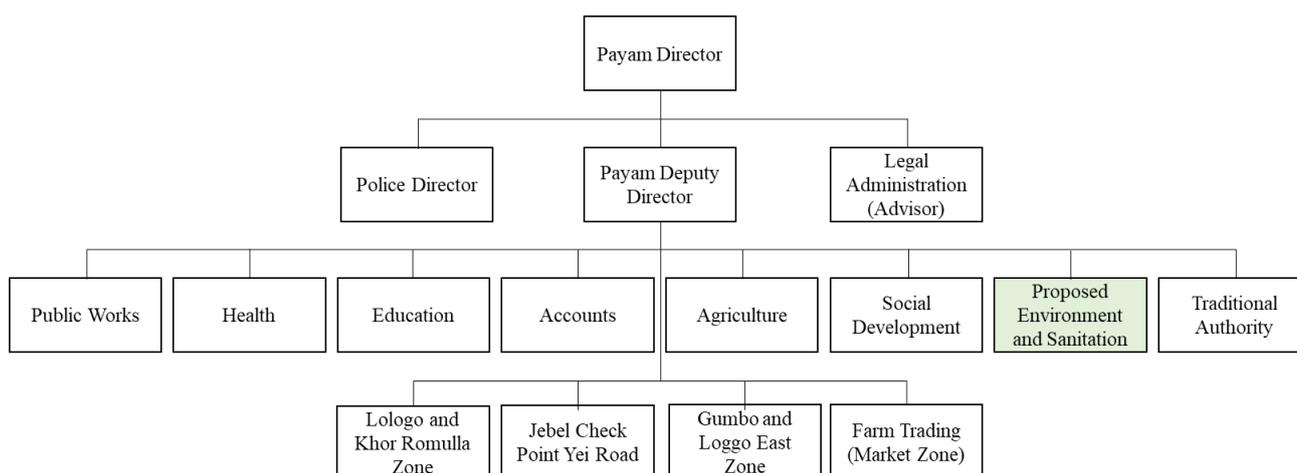


Figure 2-4 Proposed Organization Structure of Rejaf Payam

Source: Project Team

Table 2-6 Proposed Personnel for the Department of Environment and Sanitation of Rejaf Payam

Position	Current No. of Staff (Scheduled New Employment)
Director of Environment & Sanitation	1 (1)
D/Director of Solid Waste Management	0 (1)
Assistant Manager of Solid Waste Management	0 (1)
Environment Officer	0 (1)
Dumping Site Supervisor	1 (1)
Bulldozer operator	0 (1)
Dumping Site Worker	5 (5)
Watchman	0 (a few)
Accountant	0 (1)
Revenue Officer	0 (a few)

Source: Project Team

(4) Juba Rejaf Solid Waste Management Group

Juba Rejaf Solid Waste Management Group (JRSWMG) is the leading organization that consists of the representatives from the Ministry of Environment and Forestry, the State Ministry of Environment and Forestry, the Department of Environment and Sanitation of JCC, Juba Block, Munuki Block, Kator Block and Rejaf Payam. Juba Solid Waste Management Group (JSWMG) was formed by JICA Project in 2011 and Rejaf Payam joined the group later. In this project, regular meetings of JRSWMG were held and a pilot project of fixed-time and fixed-place waste collection and a survey of public awareness were conducted with their leadership. In the future, JRSWMG will achieve to be the authorized group officially by Mayor of Juba.

2.2.3 Duties and Responsibilities on Solid Waste Management

Duties and responsibilities on SWM is shown in Table 2-7.

Table 2-7 Duties and Responsibilities on SWM

Item	National	Juba		Rejaf Payam
	Ministry of Environment and Forestry	Department of Environment and Sanitation of JCC	Blocks (Juba, Munuki and Kator)	
Legal System				
Development of laws or ordinances related to environment conservation	✓	✓		
Collection and Transportation				
Formulation of collection and transportation plan		✓		
Fee collection for collection and transportation		✓		
Implementation of collection and transportation, and budget		✓	✓	
Licensing of private sector		✓		
Procurement of waste collection vehicles		✓		
Operation and maintenance of waste collection vehicles		✓		
Public awareness and environmental education		✓	✓	
Final Disposal				
Formulation of final disposal plan				✓
Operation of final disposal site and implementation of budget				✓
Payment of gate fee		✓		
Fee collection for final disposal				✓
Procurement of heavy equipment				✓
Operation and maintenance of heavy equipment				✓

Source: Project Team

(1) Legal System

The Ministry of Environment and Forestry is responsible for the development of laws and regulations related to

SWM in Souht Sudan. In Juba, JCC has a responsibility for developing its own by-laws on SWM.

(2) Collection and Transportation

The Department of Environment and Sanitation of JCC is responsible for waste collection and transportation in Juba, and the duties of the Department are planning of waste collection, fee collection from markets and institutions. Even though the Blocks are not responsible for waste collection, they sometime clean the areas where waste dumped illegally for the improvement of environment in Juba.

(3) Final Disposal

Regarding final disposal, Rejaf Payam has a responsibility for operation and management of JCDS and the heavy equipment, and gate fee collection. The Department of Environment and Sanitation of JCC and private collectors pay the gate fee to Rejaf Payam when they come and dump waste at JCDS.

2.3 Finance

2.3.1 Financial Status of Juba

Juba Block, Kator Block, Munuki Block, and the Department of Environment and Sanitation of JCC have own special accounts which is independent from the general account of JCC. JCC's settled amount of revenue (2018/19 – 2019/20) is shown in Table 2-8. The total revenue amount of JCC in 2018/19 is 546,125,273.00 SSP and the total revenue amount of JCC in 2019/20 is 803,167,035.00 SSP. The cost for SWM is disbursed from the special account of the Department of Environment and Sanitation of JCC. The ratio of the total revenue of the Department of Environment and Sanitation of JCC to JCC's total settled revenue amount is around 17% for 2018/19 and 16% for 2019/20.

Table 2-8 JCC's Settled Amount of Revenue (2018/19 - 2019/20)

Organization	2018/19	2019/20
Juba City Council Headquarters	131,250,000.00	250,000,000.00
Juba Block Council	156,225,161.00	208,300,217.00
Kator Block Council	93,350,899.00	124,467,865.00
Munuki Block Council	70,380,355.00	93,840,475.00
Department of Environment and Sanitation	94,918,858.00	126,558,478.00
Grand Total of Revenue	546,125,273.00	803,167,035.00

Source: JCC

2.3.2 Financial Management System of Juba

Juba city's financial management consists of fee collection and expenditure according to the financial plan made in the beginning of fiscal year. Financial plan is a cash flow calculation sheet of single year and its result is submitted in central government's format once a year to get approval on next FY's plan.

Cash inflow and outflow are managed weekly and items and amount of expenditure are decided in weekly meeting of financial committee in advance to proposing to central government's accounting section. After approval by central government's accounting section, cash of approved amount is provided. The gap between approved amount and collected amount of fee from the week before is compensated from or deposited to the bank account. However, bad condition of finance from recent years makes withdrawal difficult and support by cash provision between departments, blocks and JCC can be seen instead of compensation or deposit.

Person in charge of audit checks the cost-effectiveness and, when the result is poor, financial document is looked over. External audit is not deployed for the purpose of ensuring transparency.

2.3.3 Financial Management System of the Department of Environment and Sanitation of Juba City Council

(1) Revenue

The revenue of the Department of Environment and Sanitation of JCC is shown in Table 2-9 and Figure 2-5. The main sources of the revenue on Juba's SMW activities are 1) waste collection charge, 2) issuing fee of permission on SWM vehicles, and 3) fines and penalty charge. Most part consists of waste collection charge and 62% comes from the charge from the markets. However, the Department of Environment and Sanitation of JCC don't collect fee from households now because they have not collected waste from the households regularly. In addition, the Department does not have the latest financial information about revenue officially, hence Table 2-9 and Figure 2-5 are brought from "Data Collection Survey on Solid Waste Management in Juba, Republic of South Sudan (2017-2018, JICA)". Table 2-10 shows the unit amount of waste collection fee and registration fee of private collectors.

Table 2-9 Revenue of the Department of Environment and Sanitation of JCC (2016/17)

(Unit: SSP)

Type	Source	Projected	Outturn
Solid Waste	Waste Collection Fee (Market)	27,150,650.00	11,159,276.00
	Waste Collection Fee (Hotel)	2,404,500.00	2,070,000.00
	Waste Collection Fee (Institution)	527,000.00	492,000.00
	Issuing Permission to Waste Collection Vehicle	660,000.00	576,000.00
	Fine and Penalties	454,500.00	500,000.00
	<i>Sub-total</i>	<i>31,196,650.00</i>	<i>14,797,276.00</i>
Liquid Waste	Issuing Permission to Sewerage Tanker	1,535,000.00	3,298,000.00
	<i>Sub-total</i>	<i>1,535,000.00</i>	<i>3,298,000.00</i>
	Total	32,731,650.00	18,095,276.00

Source: FY 2016/17 Financial Report of JCC

Table 2-10 Waste Collection Fee and Registration Fee of Private Collectors

Item	Amount	
Waste Collection Fee (Market)	1,300	SSP/shop/month
Waste Collection Fee (Hotel)	20,000 – 54,000	SSP/hotel/month
Waste Collection Fee (Institution)	20,000 – 42,800	SSP/institution/month
Issuing Permission to Waste Collection Vehicle	25,050	SSP/company/month

Source: JCC

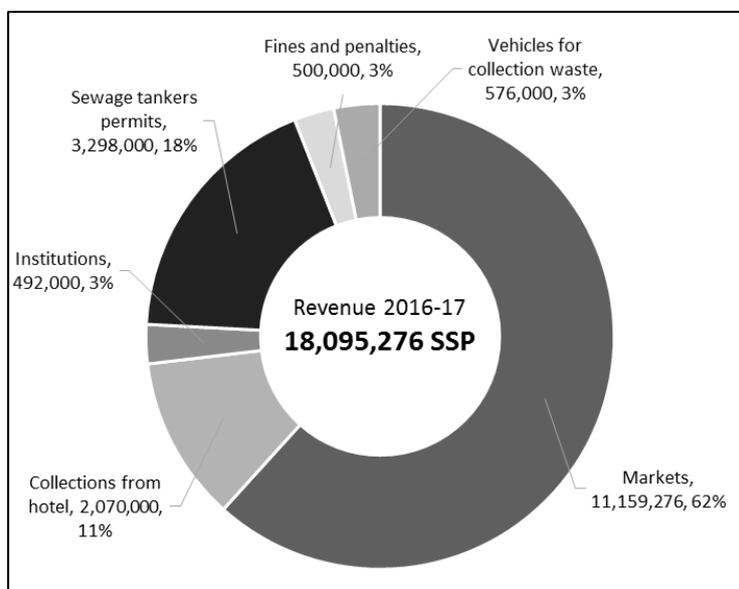


Figure 2-5 Revenue of Department of Environment and Sanitation by Source (FY 2016/17)

Source: FY 2016/17 Financial Report of JCC

(2) Expenditure

Net amount of expenditure of Department of Sanitation and Environment from FY 2018/19 is 71,189,142.80 SSP. Items and respective amount are shown in Table 2-11.

Table 2-11 Expenditure of Department of Sanitation and Environment by Items (FY 2018/19)

(Unit: SSP)

Item	Amount
Wages & Salaries	21,356,742.90
Wages & Salaries	2,135,673.50
Incentives and over time	15,376,855.60
Social benefits	3,844,213.80
Use of goods and services	21,356,742.90
Travel	213,567.40
Staff training	427,134.90
Contracted Services	8,542,697.10
Repairs and Maintenance	10,678,371.60
Utilities and Communications	427,134.90
Supplies, Tools and Materials	640,702.10
Other operating expenses	427,134.90
Capital Expenditure	28,475,657.00

Item	Amount
Infrastructure and lands	3,412,081.90
Vehicles	19,937,956.70
Specialized Equipment	5,125,648.40
Total	71,189,142.80

Source: FY 2018/19 Financial Report of JCC

(3) Independent Account

The Department of Environment and Sanitation has independent account for the budget management for cleaning services. Executive Director of JCC manage the account and financial committee approves withdrawal at weekly meetings when the Department of Environment and Sanitation needs. However, bad condition of finance from recent years makes withdrawal difficult and collected fee is used instead of being deposited.

While the Department of Environment and Sanitation is said to have independent account system and its financial activities are separated from Juba city's general account, part of salary is compensated from central, state, and municipal (Juba City) government and the department compensates weekly budget of other departments, blocks and JCC. Independence and transparency of its finance are not assured.

(4) Finance Committee

Participants to the financial committee from the Department of Environment and Sanitation are shown in Table 2-12.

Table 2-12 Participants to the Financial Committee from the Department of Environment and Sanitation

position	Number
Director of Environment & Sanitation	1
Deputy Director of Environment	1
Deputy Director for Operation	1
Deputy Director for Revenue	1
Finance Manager	1
Logistic Manager	1

Source: Project Team

2.3.4 Financial Status of Rejaf Payam

(1) Revenue

The total revenue of Rejaf Payam is 32,176,673.00 SSP for 2018/19. The breakdown of revenue is shown in Table 2-13. The total revenue includes other income. The income from the gate fees collected at JCDS and the Mogoro Illegal Dumping Site are included in "Sales of Goods and Services".

Table 2-13 Revenue of Rejaf Payam (2018/19)

(Unit: SSP)

Item	Amount
Taxes	7,840,410.00
Taxes Income and Profits	144,790.00
Taxes on Property	5,680,433.00
Taxes on Goods and Services	806,694.00
Other Taxes-Unclassified	1,208,493.00
Grants	7,908,418.00
Transfers Current from other Govt. Units	7,908,418.00
Other Revenue	16,427,845.00
Property Income	9,517,730.00
Sales of Goods and Services	5,437,443.00
Fines and Penalties	200,640.00
Sales of Fixed Assets	549,630.00
Other Revenue	722,402.00
Total	32,176,673.00

Source: FY 2018/19 Financial Report of Rejaf Payam

(2) Expenditure

Net amount of expenditure of Department of Sanitation and Environment from FY 2018/19 is 44,229,971.00 SSP. Items and respective amount are shown in Table 2-14.

Table 2-14 Expenditure of Rejaf Payam (2018/19)

(Unit: SSP)

Item	Amount
Wages & Salaries	13,951,327.00
Wages & Salaries	4,620,439.00
Incentives and over time	8,270,768.00
Social benefits	1,060,120.00
Use of goods and services	17,864,224.00
Travel	251,100.00
Staff training	37,000.00
Contracted Services	836,668.00
Repairs and Maintenance	1,857,100.00
Utilities and Communications	765,500.00
Supplies, Tools and Materials	9,681,430.00
Other operating expenses	4,435,426.00
Other Expenditure	1,449,900.00
Donations and Benefits	1,449,900.00
Capital Expenditure	10,964,520.00
Infrastructure and lands	10,964,520.00
Total	44,229,971.00

Source: FY 2018/19 Financial Report of Rejaf Payam

2.3.5 Financial Status of JCDS

Rejaf Payam opened specialized bank account for JCDS; based on the operation and maintenance in 2013, the main objective of the account is to save all the disposal fee collected from the dumping site. For deposit and withdraw from this account needs approval from Rejaf Payam Director. The staff that can use the account should be limited only one person, and appointed as cashier. For deposit and withdraw from the account, approvals from Payam Director is required. The unit gate fee at JCDS is shown in Table 2-15. The collectors which transport waste to JCDS are divided into two types: the Department of Environment and Sanitation of JCC and private collectors, and the unit price of gate fee differs depending on the type of the vehicles. The revenue of gate Fee at JCDS from January 2019 to July 2020 is shown in Table 2-16. In 2019, JCDS didn't charge the gate fee properly due to illegal dumping along the access road and the deterioration in the security situation. In 2020, the situation became better gradually and the gate fee collection system has been improved, hence the total amount of revenue of gate fee has increased. As a result, the amount is equivalent the amount of revenue at Mogoro Illegal Dumping Site.

On the other hand, there is a large illegal dumping site near Mogoro Village, Rejaf Payam, which is easily accessible from Juba, and it is called Mogoro Illegal Dumping Site. As mentioned above, Rejaf Payam charges the gate fee at Mogoro Illegal Dumping Site because many private collectors visit the site instead of visiting JCDS. The revenue of gate Fee at Mogoro Illegal Dumping Site from January 2019 to July 2020 is shown in Table 2-17.

Table 2-15 Unit Gate Fee by Type of Vehicles at JCDS

Collector	Type of Vehicle	Unit Gate Fee (SSP/trip)
JCC	Compactor	3,000
	Open Truck	2,000
	Dump Truck	2,000
	Tractor	1,000
Private	Compactor	5,000
	Open Truck	3,000
	Dump Truck	3,000
	Tractor	1,000

Source: Rejaf Payam

Table 2-16 Revenue of Gate Fee at JCDS (January 2019 – July 2020)

(Unit: SSP)

Month / Year	2019	2020 ³
January	0	229,200
February	6,000	349,000
March	0	479,000
April	0	524,300
May	0	400,500
June	0	163,000
July	8,150	380,700
August	0	-
September	0	-
October	0	-
November	0	-
December	0	-

³ The survey regarding gate fee collection in Rejaf Payam in August 2020.

Month / Year	2019	2020 ³
Total	14,150	2,525,700

Source: Rejaf Payam

Table 2-17 Revenue of Gate Fee at Mogoro Illegal Dumping Site (January 2019 – July 2020)

(Unit: SSP)

Month / Year	2019 年	2020 ⁴
January	403,900	768,500
February	340,400	334,500
March	347,250	99,500
April	282,500	180,000
May	450,550	422,000
June	380,450	59,000
July	394,450	275,200
August	362,600	-
September	167,770	-
October	526,500	-
November	637,550	-
December	808,500	-
Total	5,102,420	2,138,700

Source: Rejaf Payam

2.4 Waste Generation

2.4.1 Unit Generation Amount and Waste Composition

(1) Unit Generation Amount

In 2020, a waste quantity survey could not be conducted due to COVID-19 pandemic. According to the waste amount survey conducted in Septemeber 2017 during JICA Data Collection Survey on SWM, the unit generation amount for household waste is 0.65kg / capita/ day on average. Africa Solid Waste Management Data Book 2019 (JICA, 2019) indicates that the the unit generation amount for household is around 0.60kg / capita/ day as the result of survey with 23 African countries, hence the unit generation amount calculated by JICA Data Collection Survey on SWM is reasonable. The unit generation amounts for mrknet and commercial waste were calculated by the survey on site in 2020. The unit generation amount of the type of waste is shown in Table 2-18.

Table 2-18 Unit Generation Amount by Type of Waste

Type	Unit Generation Amount	
Household Waste	0.65	kg / capita/ day
Market Waste	2,700	kg / market / day
Commercial Waste	1,000	kg/ institution /day
Total	-	

Source: Project Team

⁴ The survey regarding gate fee collection in Rejaf Payam in August 2020.

(2) Waste Composition

In 2020, a waste quality survey could not be conducted due to COVID-19 pandemic as well as the quantity survey. The comparison of waste composition from two surveys: the result of waste quantity and quality survey by JICA in 2012 and the result of social awareness survey by JICA in 2020 are shown in Figure 2-6. The waste quantity and quality survey (2012) showed that organic, plastic and PET bottle accounted for a large proportion of the total weight and volume of waste. On the other hand, the social awareness survey (2020) described that organic, plastic and PET bottle occupied a large proportion similarly. The social awareness survey was conducted to confirm whether the result of waste quantity and quality survey conducted in 2012 is applicable or not. As a result, a similar trend was observed in the composition of waste.

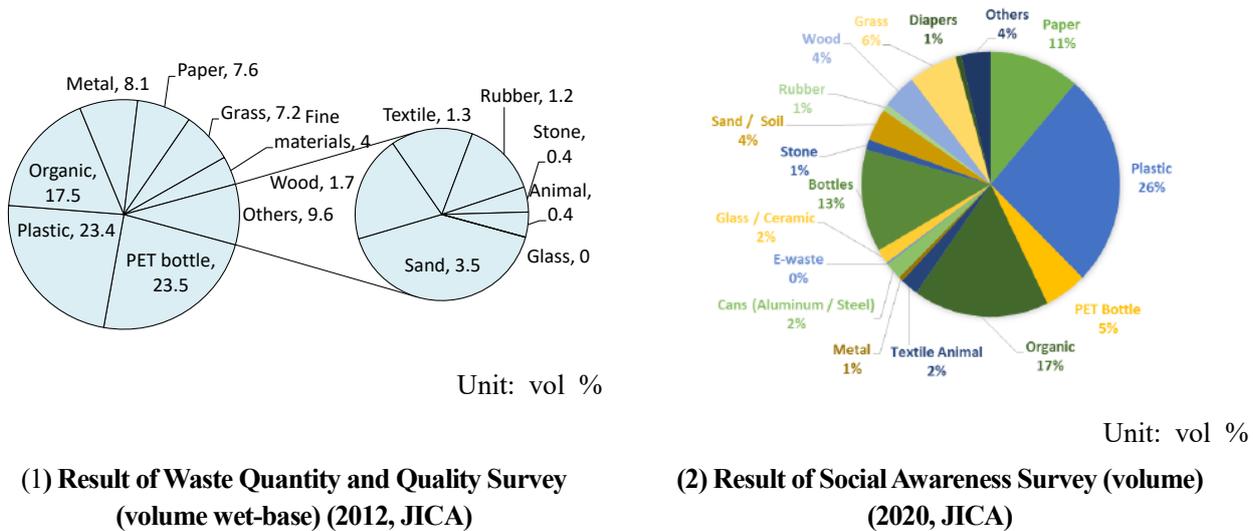


Figure 2-6 Waste Composition in Juba

Source: (1) Juba Waste Management Plan (2014), (2) Social Awareness Survey by Project Team (2020)

Table 2-19 shows the comparison of waste quality results between the reports of World Bank and the Project. Regarding the ratio of organic waste, our result lay between the results of Upper Middle and High Income levels in the report of World Bank. However, the ratio of plastic waste is bigger than the result of High Income level. Our site survey confirmed that the amount of food wastes, such as left overs, were extremely large. For these characteristics, we can assume two main reasons. One reason is the common attitude of how to use supplied materials. In other developing countries, it is common that people use food and other supplied materials thoroughly and continue to reuse and/or recycle with traditional methods. On the other hand, it seems that these traditional reuse and recycling activities are not implemented so often in Juba. Another reason is hygiene. Plastic containers and bottles are indispensable for water supply; especially most of drinking water is handy PET bottled water. Most of other daily necessities from donors and private suppliers are also in plastic containers and bags for good hygiene. It could be the reasons that the daily necessities are mostly imported from neighboring countries, plastic containers are disposable (single-use), and people usually do not reuse and/or recycle them.

Table 2-19 Comparison of Waste Composition from JICA's survey result and World Bank's survey result by Income Class

(Unit: %)

Category		Organic	Paper	Plastic	Glass	Metal	Others
Waste Amount and Composition Survey by JICA Project (2012)		50.0	5.0	19.0	3.0	5.0	19.0
What a Waste 2.0 (World Bank, 2018)	Low Income	56.6	7.0	6.4	1.0	2.0	27.0
	Lower Middle Income	54.0	12.5	11.0	3.0	2.0	17.5
	Upper Middle Income	55.0	12.0	11.0	4.0	2.0	16.0
	High Income	36.0	25.0	13.0	5.0	6.0	15.0

Source: Prepared by Project Team based on Waste Amount and Composition Survey (2012) and What a Waste 2.0 (World Bank, 2018)

2.4.2 Waste Generation Amount and Waste Management Flow

(1) Waste Generation Amount

The amount of waste generated from households in Juba is shown in Table 2-20. Juba does not have a regular population census, hence does not have an accurate population. In the Plan, the population of Juba is 403,000 quoted from the World Population Prospects (UN, 2019). The population distribution of each block was made following the distribution proportion found in the data collection survey on SWM. The unit generation amount was set at 0.65 kg / capita / day, and the total amount of waste generated was estimated (APPENDIX-3).

Table 2-20 Amount of Waste Generated from Households (Estimation)

Block	Population ¹	Unit Generation Amount (kg/capita/day)	Total Amount of Waste Generated (ton/day) ²
Juba Block	120,900	0.65	79
Munuki Block	181,350		118
Kator Block	100,750		65
Total	403,000	-	262

Resource: ¹ Prepared by Project Team based on World Population Prospects (United Nations, 2019)

² Project Team

The amount of waste generated from markets and insitutions in Juba is shown inTable 2-21. The dischargers are markets and large-scale dischargers such as hotels, hospitals, prison and the other institutions in Juba (APPENDIX-4 and APPENDIX-5). JCC knows the number of markets, but the total number of institutions is not known by JCC because private collectors also collect waste from some of institutions. Therefore, the number of large-scale dischargers mentioned in the Plan is the one of the contracted dischargers with JCC only, and the total amount of waste generated will be supposed to be more than the estimation in the Plan.

Table 2-21 Amount of Waste Generated from Markets and Institutions (Estimation)

Category	Number of Place	Unit Generation Amount (kg/place/day)	Amount of Waste Generated (ton/day)
Markets	20	2,700	54
Institutions (Hotels, Hospitals, Prison etc)	84	1,000	84
Total	-	-	138

Source: JCC

2.5 Collection and Transportation

2.5.1 Status of Waste Collection by the Department of Environment and Sanitation of Juba City Council

(1) Status of Target Waste Collection

a. Household Waste

The collection and transportation of household waste have not been done by the Department of Environment and Sanitation of JCC officially. The residents normally dispose the waste by burning in open space, burying it near their houses, or littering the waste along the main roads.

b. Market Waste

There are 20 markets in Juba; 6 markets in Juba Block, 9 markets in Munuki Block and 5 markets in Kator Block. The Department of Environment and Sanitation of JCC has the responsibility of waste collection at markets but the waste collection is not done regularly.

c. Commercial Waste

The large-scale dischargers which JCC collects waste from can be divided into hotels and other institutions such as hospitals, prison and the other institutions in Juba. In order to receive the waste collection service, it is necessary to make a contract with the JCC individually. As of May 2020, 84 large-scale dischargers have the contract with JCC and they are provided waste collection service by JCC. However, some of hotels and other institutions transport or dispose their waste by themselves without the contract with JCC, hence those dischargers are not included the number of large-scale dischargers which JCC knows.

(2) Waste Collection Vehicles

The waste collection vehicles of the Department of Environment and Sanitation of JCC is shown in Table 2-22. The number of waste collection vehicles in operation is not always the same, and those trucks are sometimes broken and sometimes repaired (APPENDIX-6). It was found that the Department of Environment and Sanitation of JCC has not updated the list of the waste collection vehicles recently, hence the Department does not have the appropriate management system for waste collection vehicles.

Table 2-22 Waste Collection Vehicles of the Department of Environment and Sanitation of JCC

Type of Vehicle	Total No. of Vehicle	No. of Operating Vehicles	No. of Stand-by Vehicles	No. of Non-Operating Vehicles	Capacity (m ³ /vehicle)
Compactor (Secondhand)	8	2	1	5	25
Compactor (UNICEF)	3	1	0	2	25

Dump Truck	3	2	1	0	15
Open Truck	1	1	0	0	10
Tractor	5	2	0	3	8
Total	20	8	2	10	-

Source: JCC

(3) Frequency and Amount of Waste Collection

The number of trips and amount of waste collected by the Department of Environment and Sanitation of JCC confirmed through the incoming waste collection vehicle survey from April 1st, 2010 to June 13th, 2020 is shown in Figure 2-8. It was found that the average number of trips is 6.1 trip / day and the average amount of waste collected is 30.2 ton / day through the survey. The number of trips varies depending on the condition of waste collection vehicles.

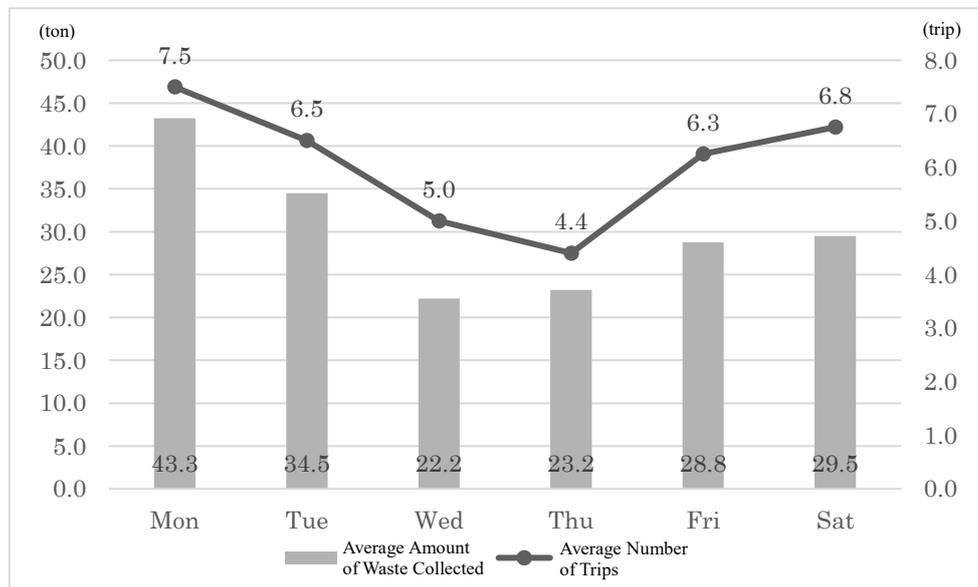


Figure 2-8 The Number of Trips and Amount of Waste Collected by the Department of Environment and Sanitation of JCC at JCDS

Source: Project Team

(4) Waste Collection Route and Method

The waste collection route of the Department of Environment and Sanitation of JCC is shown in Figure 2-9. There are 22 waste collection points in Juba and most of them is at markets. There are 4 routes which covers all the waste collection points. Waste is dumped along main roads normally, and workers load the waste onto the vehicles by hand. In many cases, the waste is not put in plastic bags, hence the workers put it on a large cloth and throw it onto collection vehicles.

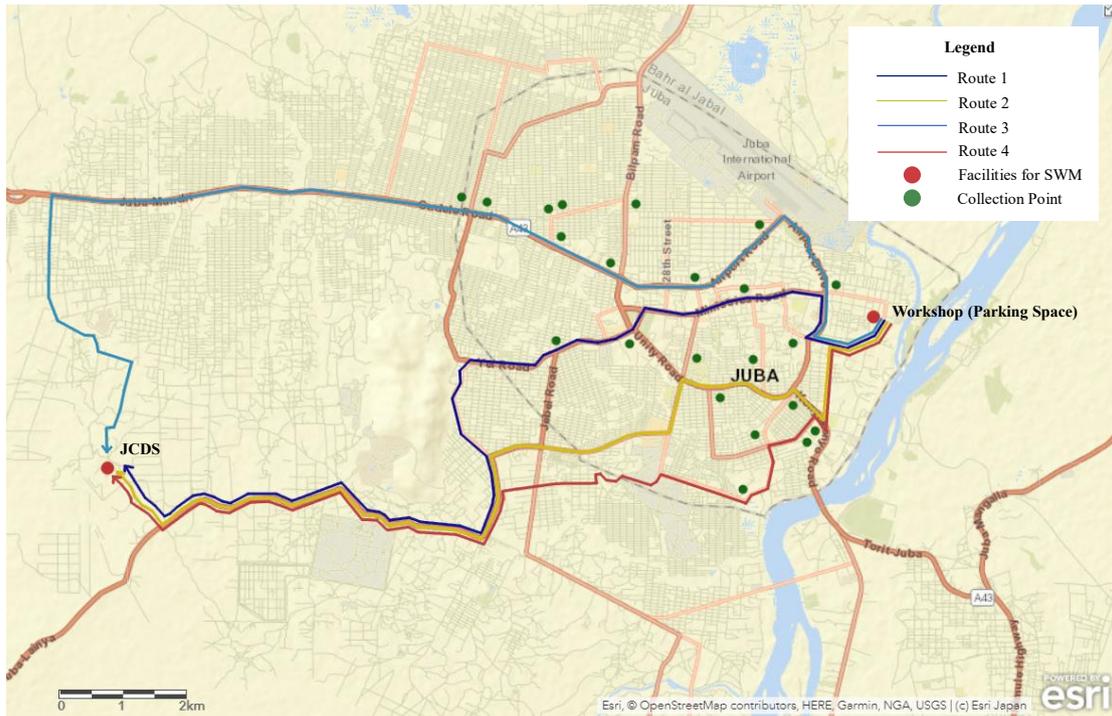


Figure 2-9 Waste Collection Route and Points in Juba

Source: Project Team

2.5.2 Status of Waste Collection by Private Collectors

(1) Registration of Private Collectors

The Department of Environment and Sanitation of JCC has the registration system of private waste collectors, and the Department charges 20,050 SSP for each collectors. They need to register their name, vehicle number, collection service area and contact, and they are not permitted to collect waste from the unregistered areas. As of March 2020, there are 10 registered private waste collectors but a lot of unregistered private collectors were observed during the incoming waste collection vehicle survey. The management system of private collectors need to be developed (APPENDIX-7).

(2) Waste Collection Status

Private collectors mainly have individual contracts with businesses in Juba to provide collection services. All collected waste must be transported to the JCDS, but some of the waste is illegally dumped around Juba. The Department of Environment and Sanitation of JCC does not provide proper collection and transportation guidance to private collectors and does not know the detail of their waste collection status.

(3) Waste Collection Vehicles

Many private collectors in Juba use dump trucks and open trucks for waste collection. There are only a few companies that use compactors for the collection.

(4) Frequency and Amount of Waste Collection

Private collectors transport and dispose the waste to JCDS and illegal dumping sites. The number of trips and amount of waste collected by the private collectors confirmed through the incoming waste collection vehicle survey is shown in Figure 2-10. It was found that the average number of trips is 7.2 trip / day and the average amount of waste collected is 26.2 ton / day through the survey.

The number of trips and amount of waste collected by the private collectors confirmed through the incoming waste collection vehicle survey is shown in Figure 2-12. It was found that the average number of trips is 1.3 trip / day and the average amount of waste collected is 0.9 ton / day through the survey.

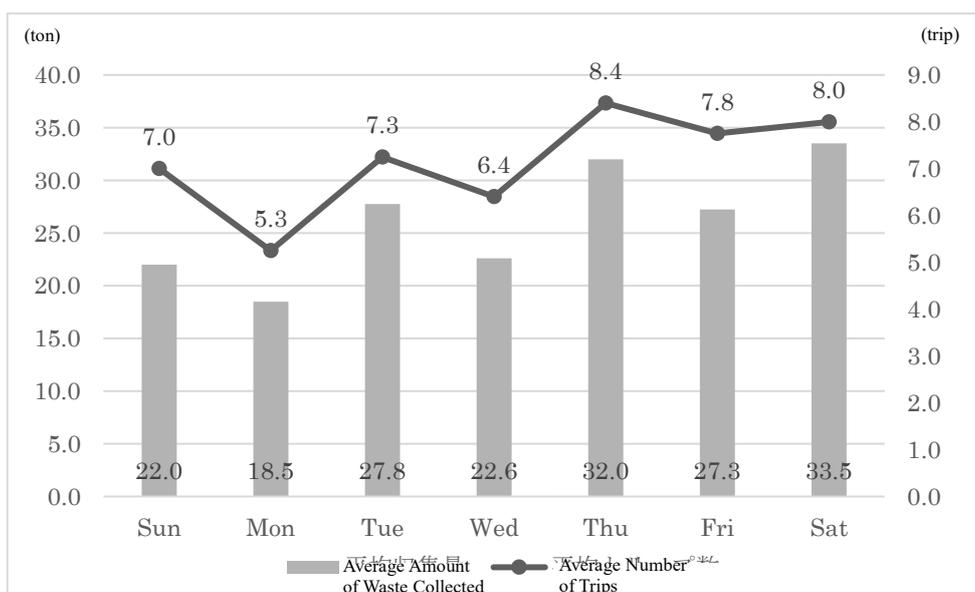


Figure 2-10 No of Trips and Waste Amount Collected by Private Collectors at JCDS

Source: Project Team

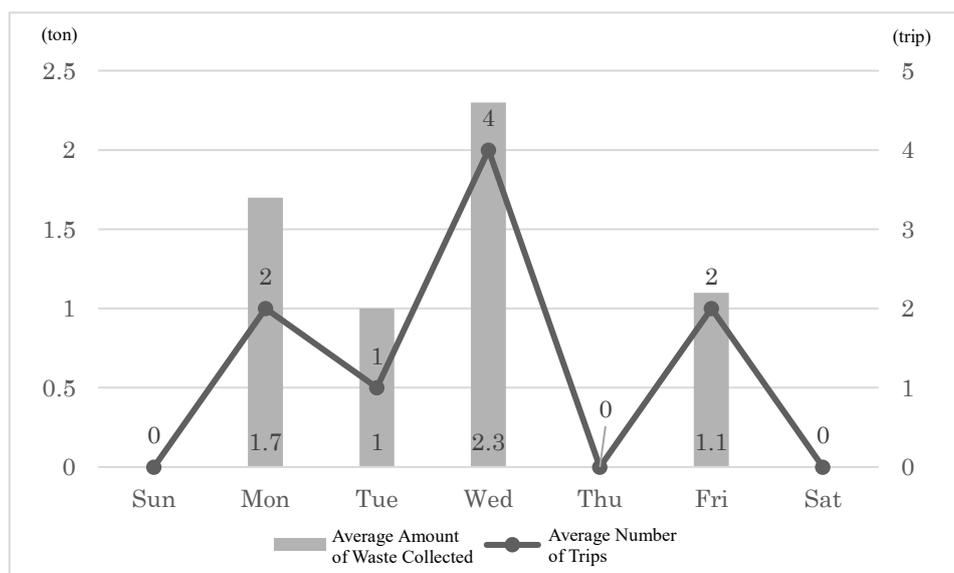


Figure 2-11 No of Trips and Waste Amount Collected by Private Collectors at Mogoro Illegal Dumping Site

Source: Project Team

2.6 Workshop

The workshop of JCC is functioning as a garage mainly. The workshop has a simple facility for repairing and two mechanics and one assistant mechanic. They implement regular maintenance and repairing of waste collection vehicles. They procure spare parts from the markets in Juba, and they conduct regular maintenance once a month and repairing once per 3 month before. However, a lot of waste collection vehicles have been broken down frequently and repairing is highly needed currently. The workshop does not have electrical systems and welding, hence they sometimes request the dispatch of engineers from the private vehicle maintenance workshop depending on the situation. Under the circumstances, the workshop cannot repair and maintenance their waste collection vehicles appropriately, and some broken vehicles have been left without proper repair and maintenance.

Rejaf Payam has a responsibility for maintenance of heavy equipment such as bulldozer. Rejaf Payam needs to make a request for repairing and maintenance to private workshop or authorized dealers because Rejaf Payam doesn't have their own workshop. The bulldozer provided by JICA technical cooperation project (2011 - 2014) to Rejaf Payam has been broken down for a long time, but regular maintenance was done one a month when the bulldozer was in operation. For repairing of minor failure, Rejaf Payam procured genuine spare parts from Caterpillar's authorized dealer and the haeavy equipment operator of Rejaf Payam usually repaired by themselves. Rejaf Payam is planning to repair the broken bulldozer but they have not decided when to repair.

2.7 Intermediate Treatment and Recycling

There is no intermediate treatment in Juba, and only small amount is recycled by wastepicking at final disposal sites. One of the reasons is that the number of waste collection vehicles is insufficient for the amount of waste to be collected, and it is too difficult to carry out waste segregation and collection by the municipality. Chinese compnaies started recycling PET bottles from 2012, but the business was failed and ended after about a year. At the same time, Environmental Rehabilitation Project, which was a French NGO, collected and purchased PET bottles from household and final disposal sites at 0.25 SSP/kg, and exported it to Uganda in their recycling project. However, this project was funded by grants from South Sudan Breweries Ltd., hence the profitability of this project was not considered and finally failed.

Approximately 400 waste pickers collect recyclables such as metal (iron), aluminum cans, PET bottles and hard plastics at JCDS and illegal dumping sites and sell them to the three recyclers of Uganda. The selling price, amount collected and export destination of recyclables are shown in Table 2-23.

Table 2-23 Recyclables Sold to Recyclers by Waste Pickers

Type	Selling Price (SSP/kg)	Amount Collected (kg/day)	Export Destination
Metal (Iron)	25	50~300	Steel Manufacturers (Uganda)
Aluminum Can	20	100~200	(Uganda)
PET Bottle	25	150~200	(Uganda)
Hard Plastics	20	50~200	Plastic Buyers(Uganda)

Source: Project Team

2.8 Final Disposal

2.8.1 General Information of JCDS

JCDS is the only official final disposal site where is around 10 kilometers away from the center of Juba. UNMISS dug a hole of 1 hectare to dump waste in 2008 and the hole became the part of the current JCDS by JICAProject in 2012. However, the controlled dumping site was destroyed by the conflict which started from 2013. The operation of the final disposal site is managed by Rejaf Payam, and the Department of Environment and Sanitation pays gate fee to Rejaf Payam. The general information of JCDS is shown in Table 2-24 and Figure 2-12.

Table 2-24 General Information of JCDS

Item	Description									
Name of the Site	JCDS (JCDS)									
Origin of Wastes	Juba City (Juba, Munuki and Kator Block), Luri Payam									
Area of the Site	25ha									
Area of Phase	Phase 1: 3ha (completion) Phase 2: 4ha (under operation) Phase 3: 4ha (undeveloped) Phase 4: 5ha (undeveloped)									
Disposal Period and Capacity	<table border="1"> <thead> <tr> <th>Phase</th> <th>Period</th> <th>Capacity (m³)</th> </tr> </thead> <tbody> <tr> <td>Phase 1</td> <td>2008 – November 2013</td> <td>250,000</td> </tr> <tr> <td>Phase2</td> <td>December 2013 – Before the conflict</td> <td>280,000 (100,000)¹</td> </tr> </tbody> </table>	Phase	Period	Capacity (m ³)	Phase 1	2008 – November 2013	250,000	Phase2	December 2013 – Before the conflict	280,000 (100,000) ¹
	Phase	Period	Capacity (m ³)							
	Phase 1	2008 – November 2013	250,000							
Phase2	December 2013 – Before the conflict	280,000 (100,000) ¹								
Method of Final Disposal	Controlled Dumping									
Facilities and Equipment	Embankment, Gas Ventilation Pipes, Access Road, Operation Road, Office, Fence, Gate, Dumping Platform, Bulldozer									

¹: Volume of waste disposed by 2013

Source: Project Team

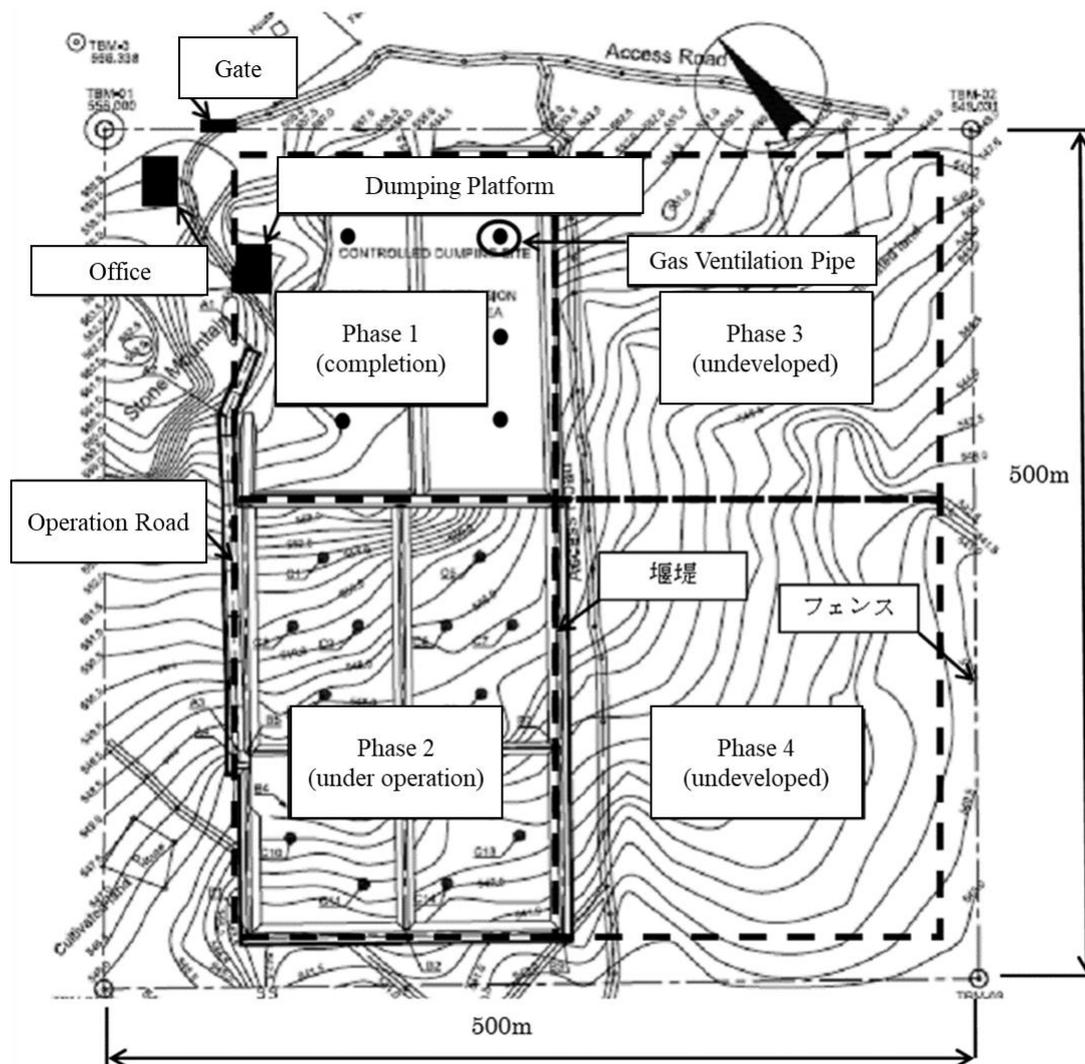


Figure 2-12 Schematic Drawing of Juba County Controlled Dumping Site

Source: Juba Waste Management Plan (2014)

2.8.2 Current Condition of JCDS

Record of Improvement Activities at JCDS is shown in Table 2-25. From 2008 to 2012, the waste collected had been dumped in the small hole which was prepared by UNMISS. In 2012, JICA supported Rejaf Payam to secure the land of 25 hectare for a final disposal site, and developed the facilities and equipment such as embankment, fence, and gas ventilation pipes. The method of final disposal was developed from open dumping to controlled dumping. However, the conflict occurred in 2013, hence the JICA project had to be postponed. The fence and gate were destroyed during the conflict. JICA Data Collection Survey on SWM in 2017 revealed that waste was not disposed properly, the access road was closed due to illegal dumping, and the bulldozer was broken down. As of May 2020, the impact of the conflict remains significant and the operation and management of the JCDS is under the serious situation. Rejaf Payam and the Department of Environment and Sanitation of JCC rent a bulldozer regularly and remove the waste disposed illegally along the access road of Juba Controlled Dumping Site even though the fence and gate have not been repaired yet. Most of waste collectors don't follow the instruction by the workers of Rejaf

Payam. The bulldozer has not been in operation but Rejaf Payama is planning to repair soon.

Table 2-25 Record of Improvement Activities at JCDS

Year	Activity	Method	Area
2008	<ul style="list-style-type: none"> UNMISS constructed a hole (approximately 1ha) and Juba County started to dispose wastes into this hole with the open dumping method. 	Open Dumping	Phase 1 & 2
2012	<ul style="list-style-type: none"> In April, JICA Project started. In May, Juba County secured 25ha of the area including the hole, which was constructed by UNMISS, as the final disposal site following the suggestion by the Project. In August, Initial Environmental Examination (IEE) was completed with the support of the Project in order to improve the existing dumping site. In September, the Project started improving the existing dumping site (Phase 1 area), and instructing how to improve the management of the final disposal site. The waste disposal method was also improved from the open dumping method into the controlled dumping method. South Sudan side implemented IEE for the rest of the site. 	Controlled Dumping	
2013	<ul style="list-style-type: none"> In October, the Project expanded the final disposal site (Phase 2 area) using the rest of the site. In December, Juba County started disposing wastes into the expanded area (Phase 2 area). JICA decided that the filed activity of the Project was suspended. The dispatch of Project Team was postponed due to a conflict. The gate and fence were broken due to the conflict. 	Controlled Dumping	
2017	<ul style="list-style-type: none"> JICA implemented “Data Collection Survey on Solid Waste Management in Juba, Republic of South Sudan“ Many challenges caused by the conflict were observed as follows: inadequate sanitation management of the dumping site, illegal dumping along the access road, suspension of soil cover due to the failure of bulldozer, and deterioration of the surrounding environment. 	Open Dumping	-
2019	<ul style="list-style-type: none"> Rejaf repaired the bulldozer but it was broken down again. Rejaf Payam and the Department of Environment and Sanitation worked together to remove illegally dumped waste along the access roads, but the access road became impassable due to illegal dumping again. Rejaf Payam and the Department of Environment and Sanitation signed the Memorandum on operation and management of JCDS. 		
2020	<ul style="list-style-type: none"> In March, the JICA Project started. Rejaf Payam started to consider repairing their bulldozer procured by the previous JICA Project. 		

Source: Project Team

2.8.3 Amount of Waste Dumped at JCDS

The amount of waste disposed by the type of waste collectors at Juba Controlled Dumping Site is shown in Figure 2-13 according to the incoming waste vehicle survey. The number of trips of waste collection vehicles of the Department of Environment and Sanitation of JCC and private collectors per day was 12.4 trips/day⁵ on average. The amount of waste disposed was 52.1 ton/day on average during the survey. As for the loading capacity of waste collection vehicles, the loading capacity of compactors was estimated to be 12.5 tons/vehicle, that of dump trucks and open trucks 5.3 tons/ vehicle, and that of tractors 2.4 tons/ vehicle based on the inventory of the Department. The waste collected in Luri Payam was also disposed at JCDS, but the amount is very small.

⁵ A cycle from waste collection to disposal of waste at a dumping site.

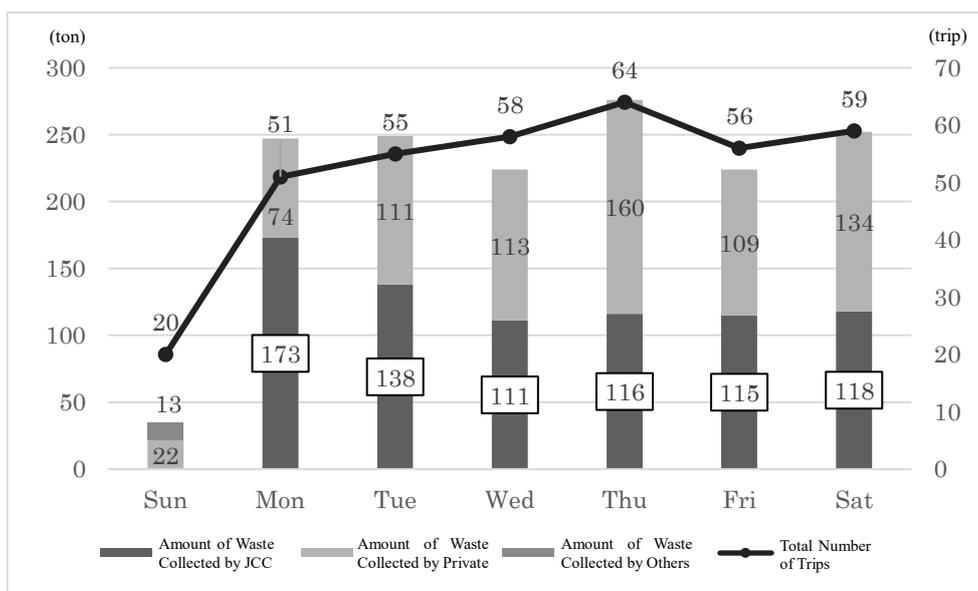


Figure 2-13 Amount of Waste Disposed by Waste Collectors at Juba Controlled Dumping Site

Source: Project Team

2.8.4 Remaining Volume of JCDS

Rejaf Payam started to dispose waste in the Phase 1 of the JCDS in 2008 and completed in November 2013. They started to dump waste in the Phase 2 in December 2013, but the conflict prevented them to dispose waste properly. Under the circumstances, the operation and maintenance system didn't work well and all the waste dumped at the dumping site was burned illegally. Due to this situation, although it is difficult to calculate the exact capacity remained, it was calculated by comparing the current situation of landfill with the design drawing. The results are shown in Table 2-26.

Table 2-26 Remaining Volume of JCDS (Estimation)

Phase-2	Phase-3	Phase-4	Total
180,000m ³	370,000m ³	450,000m ³	1,000,000m ³

Source: Project Team

2.8.5 Illegal Dumping

In Juba, some of the collected waste is illegally dumped, causing environmental pollution and public health problems. The total amount of illegal dumping is not known accurately, and some illegal dumping sites are existing around the city. For example, there is Mogoro Illegal Dumping Site along Juba-Nimule Highway 6 – 7 kilometers away from the center of Juba. The dumping site is located near some of large markets and the road is paved, hence the amount of waste disposed at the dumping site has been increasing. There is White Nile River near the illegal dumping site, hence it is concerned if the waste littered may go to the river. The number of incoming waste collection vehicles is around 1 to 2 vehicles/day on average, but the amount of waste disposed at the dumping site will increase during rainy season because the access road of JCDS becomes worse due to heavy rain. In addition, waste collection

vehicles cannot enter into JCDS due to the deterioration in the security situation and lack of heavy equipment maintenance and they dispose waste along the access road illegally. The Department of Environment and Sanitation of JCC and Rejaf Payam clean and remove waste away from the access road but not regularly. The location of JCDS and Mogoro Illegal Dumping Site is shown in Figure 2-14.

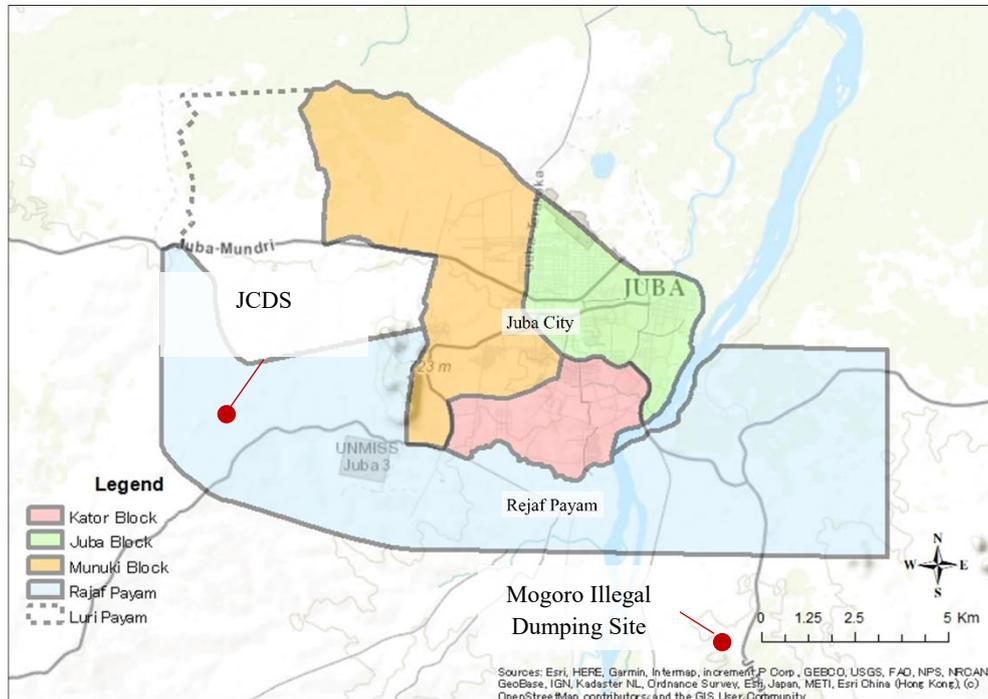


Figure 2-14 Location of JCDS and Mogoro Illegal Dumping Site

Source: Project Team

2.9 Public Relations, Public Awareness and Environmental Education

2.9.1 Public Relations

Event though JCC does not have any officers of public relations, JCC uses the media such as TV and radio to conduct public relations activities as needed. The public relations activities related to SWM is not conducted regularly.

2.9.2 Public Awareness

Through the JICA Technical Cooperation Project from 2011, Juba Solid Waste Management Group (JSWGM) held 61 times meeting during the project and JSWGM planned and implemented some activities regarding public awareness and environmental education. They held 21 times community meetings including waste segregation at source, 3 times clean-up campaigns, 6 times bus tours, setting-up notice boards at 7 areas including the Ministry of Environment and Forestry and JCC, signboards indicating waste collection points at 10 places, and holding open seminars and clean Juba poster contests, and issuing newsletters 3 times.

In addition, a pilot project was implemented in July 2020. In the project, community meetings were held several times, leaflets were distributed to the residents and public awareness activities were conducted. Through this pilot

project, the following activities were carried out: promotion of understanding of the principle that waste dischargers shall bear the responsibility for waste disposal and polluter-pays principle, prohibition of illegal dumping, and encouragement of proper discharge and treatment by fixed-time and fixed-place waste collection (APPENDIX-8 and APPENDIX-9).

2.9.3 Environmental Education

There is no official environmental education curriculum or program in place. As described in Table 2-27, bus tours to inspect the pilot projects for waste collection and disposal during the implementation of JICA Technical Cooperation project and poster contests for elementary school students were implemented in the past. In addition, JICA's South Sudan Office and JCC conducted clean-up campaigns in November 2018 and February 2019.

2.10 Current Issues

The current issues on SWM in Juba is shown in Table 2-27. These issues can be summarized into the following three points.

- (1) Lack of the concept of “public services” and legal framework to support organizations and systems and low ability of the municipalities
- (2) Lack of management resources such as human resources, goods, money and information for SWM
- (3) Low waste collection rate and poor sanitation due to illegal dumping

Table 2-27 Current Issues on SWM in Juba

Item	Issues
Organization and Human Resources Management	<ul style="list-style-type: none"> • The important information regarding population, waste amount, waste collection vehicles, organization and finance are not managed well • Staff training is not provided to employees and workers
Legal System	<ul style="list-style-type: none"> • There is no laws or regulations specialized on SWM • The management system of legal development is not established
Finance	<ul style="list-style-type: none"> • Fee collection from households is not implemented • Special account is not used effectively • Financial information such as revenue and expenditure is not managed well
Collection and Transportation	<ul style="list-style-type: none"> • Lack of waste collection vehicles • Waste collection from households is not implemented • Waste collection from markets and institutions is not implemented regularly • Non-registered private waste collectors is existing
Workshop	<ul style="list-style-type: none"> • Maintenance of waste collection vehicles is not sufficient • Heavy equipment such as bulldozer is not repaired and maintained well • Lack of high-skilled mechanics
Intermediate Treatment and Recycling	<ul style="list-style-type: none"> • Intermediate treatment is not implemented • Recycling is not implemented by the municipality
Final Disposal	<p>[JCDS]</p> <ul style="list-style-type: none"> • Illegal dumping along the access road of Juba Controlled Dumping Site prevent the waste collection vehicles into the site • There is no security around JCDS • The bulldozer is not working due to a failure • The fence and gate have been broken due to the lack of appropriate repair and maintenance

	<p>[Illegal Dumping]</p> <ul style="list-style-type: none"> • There are some illegal dumping sites within and near Juba • The amount of waste disposed at illegal dumping sites increases especially during rainy season due to the bad condition of the access road of JCDS • The waste dumped into rivers affects to the surrounding environment
<p>Public Relations, Public Awareness and Environmental Education</p>	<ul style="list-style-type: none"> • Environmental education and public relations activities are not implemented • Lack of human resources for public relations on SWM

CHAPTER 3 MASTER PLAN FOR SOLID WASTE MANAGEMENT IN JUBA

3.1 Vision of the Plan

The principles of SWM in the Master Plan is shown in Figure 3-1. Considering the current situation, Juba aims to strengthen their capacity as the executive and implementing organization which provides public services and to build a legal system to support the services through “Principle 1: Strengthening governance of municipalities toward sustainable SWM”. "Principle 2: Fostering ownership by implementing participatory SWM" will be carried out with the aim democratic local autonomy through the cooperation of organizations, residents, private sector and the social acceptance of SWM as public service. Juba also achieves to improve the sanitary environment caused by the poor SWM and secure the management resources such as human resources, goods, money and information through “Principle 3: Implementing SWM based on the past experiences”. In addition, 2030 will be the final year of the Sustainable Development Goals (SDGs) and the "Principle 4: Vision for the development of SWM in preparation for rapid urbanization" will be considered in response to requests from the international community.

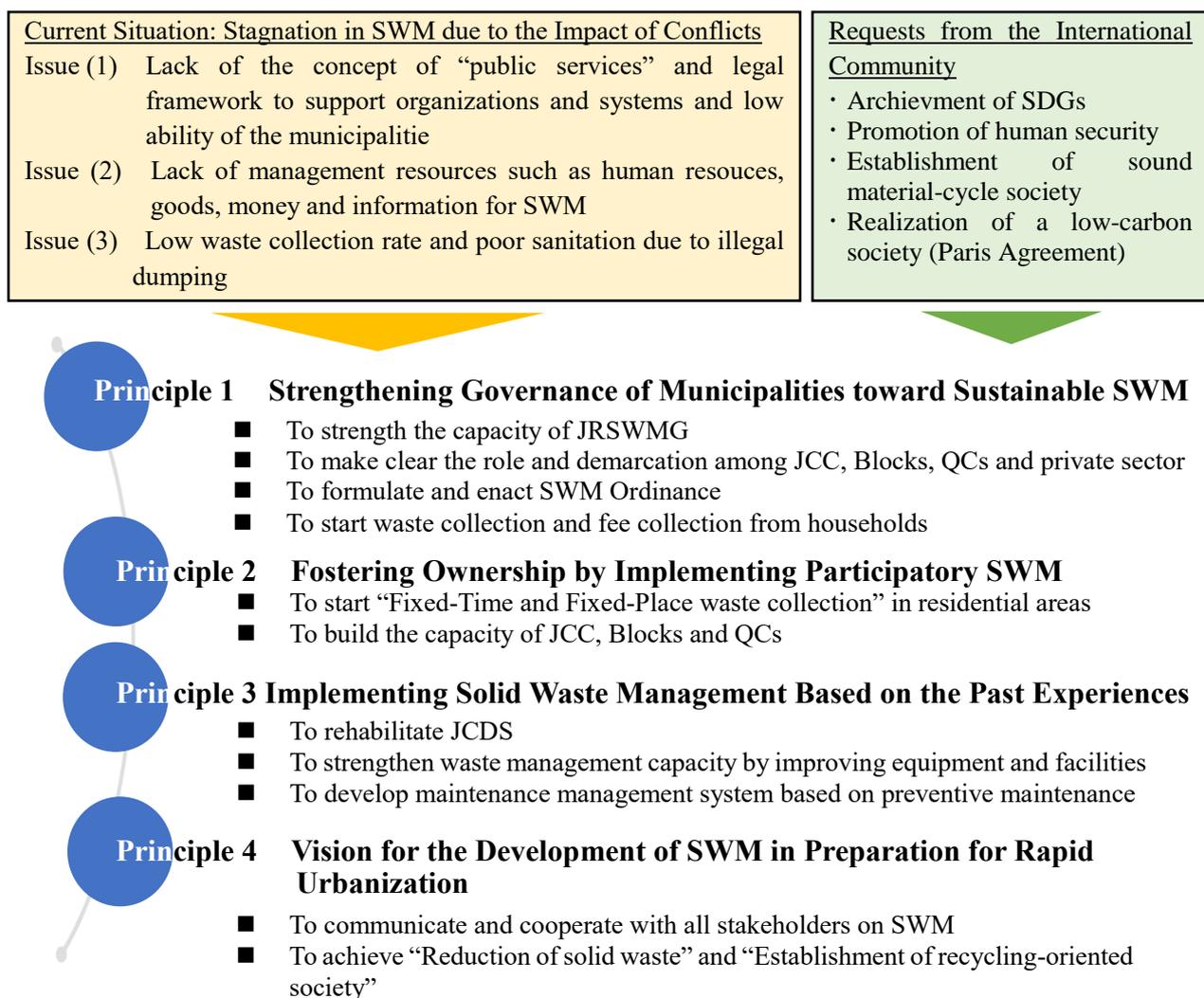


Figure 3-1 Principles of SWM

3.2 Mid-Term Plan

In the mid-term plan by 2025, Juba aims to build the municipalities' capacities for SWM. Prior to the procurement of vehicles and heavy equipment by JICA Grant Aid Project, the necessary SWM implementation system and legal system will be established, the strong relationship among the stakeholders will be built, and the feasible and sustainable SWM system will be started in the first half of the mid-term target year (2020 - 2022). It is planned to archive to develop appropriate SWM system through the capacity building including soft component for vehicles and heavy equipment provided by JICA in the second half of the mid-term target year (2023 - 2025).

In order to achieve the goals above, it is necessary to raise the status of Juba Rejaf Solid Waste Management Group (JRSWGM) to a decision-making official organization in Juba for sustainable SWM. JRSWGM can be divided into two bodies: (1) executive body led by the Mayor of Juba as the leader and (2) implementing body led by the Department of Environment and Sanitation of Juba City Council. They are in collaboration to formulate SWM project plans, and approve and execute budget for SWM. The prior challenges of JRSWGM are "Establishment of effective waste collection system", "Start of fee collection for household waste collection" and "Revision of SWM ordinance and establishment of various regulations". Household waste collection shall be implemented by Juba, Munuki and Kator Blocks, and the fixed-time and fixed-place waste collection which every household need to bring their waste to specific place by specific time will be introduced. At the same time, it is aimed to reduce the amount of waste generated and environmental impact by raising awareness of residents and self-treatment of waste at home. The SWM managers and public awareness promoters are planned to be appointed and they will hold community meetings for explanation of residents and consensus building. As the collection of household waste is planned to be gradually carried out in the city of Juba, the area subject to the fee collection will be expanded. It is required to secure and improve Juba Controlled Dumping Site before the procurement of vehicles and heavy equipment. Thus a lot of activities and projects including waste collection, fee collection and development of legal framework are planned, hence the implementing body of JRSWGM is required to lead Juba.

Table 3-1 shows the target indicators for mid-term plan. The target waste collection rate is 50% and the target rates of fee collection from residents, markets and large-scale dischargers are 27%, 75% and 50% respectively. The method of final disposal will be transferred from open dumping to the controlled dumping.

Table 3-1 Target for Mid-Term Plan (2025)

Item		Target (%)
Waste Collection Rate (%)		50
Fee Collection Rate (%)	Residents	27
	Markets	75
	Large-scale dischargers	50

3.3 Long-Term Plan

In the long-term plan by 2030, Juba aims to implement the independent SWM and intrinsic development and consider the establishment of a sound material-cycle society and preventive measures against problems and challenges in the future. It is also planned to improve the SWM system established in the mid-term period and strengthen the governance for sustainable SWM.

In order to achieve the goals above, it is necessary to implement “Establishment of financial system through transparent and systematic budget management”, “strengthening human resources” and “promotion of recycling”. It is required to improve the transparency and planning of budget management in order to operate SWM sustainably. Juba aims to improve the financial management system through using the existing bank accounts with account book, introduction of budget assessment and compilation of annual report and plan of SWM. Not only the financial resources but also human resources is important for SWM, hence Juba plans to strengthen their officers and workers on SWM. They will hold regular staff trainings considering their each experience, skills, type of job, positions and year of enrollment. In order to contribute the establishment of sound material-cycle society, it is achieved to introduce recyclables collection at schools and self-treatment at home during the mid-term period, and to construct and operate a plastics recycling facility and feed conversion plan. It is necessary to promote recycling business in Juba by inviting domestic and overseas recycling companies through the scheme of “Public Private Partnership (PPP)”.

Table 3-2 shows the target indicators for long-term plan. The target waste collection rate is 80%, the target rate of fee collection from residents, markets and large-scale dischargers are 45%, 90% and 74% respectively. The method of final disposal will be transferred from controlled dumping to sanitary landfilling.

Table 3-2 Target Figures for Long-Term Plan (2030)

Item		Target (%)
Waste Collection Rate (%)		80
Fee Collection Rate (%)	Residents	45
	Markets	90
	Large-scale dischargers	74

3.4 Principles and Measures

The principles and measures of the Plan are shown in Table 3-3.

Table 3-3 The Principles and Measures of the Plan

Note: ● Priority Measure, ○ Measure

Measures	Organization / Human Resources management	Legal Development	Collection and Transportation	Workshop / Maintenance	Intermediate Treatment and Recycling	Final Disposal	PR, Public Awareness and Environment Education	Finance
Principle 1: Strengthening Governance of Municipalities toward Sustainable SWM								
1-1. Establishment of Implementation System Led by JRSWGM [Priority]	●							
1-2. Clarification of Role and Demarcation of Municipalities related to SWM [Priority]	●							
1-3. Revision and Enactment of SWM Ordinance and Regulations [Priority]		●						
1-4. Clarification of Roles and Responsibilities by SWM Law		○						
1-5. Establishment of Occupational Safety and Health Management		○						
1-6. Development of Data Management System			○	○		○		

Measures	Organization / Human Resources management	Legal Development	Collection and Transportation	Workshop / Maintenance	Intermediate Treatment and Recycling	Final Disposal	PR, Public Awareness and Environment Education	Finance
1-7. Revision of Fee Collection System								○
1-8. Start of Fee Collection for Household Waste Collection [Priority]								●
1-9. Strengthening Fee Collection for Market and Commercial Waste Collection								○
1-10. Transparent and Planned Budget Management Using Independent Accounting								○
1-11. Introduction of Budget Assessment								○
1-12. Compilation of Annual Report and Annual Plan								○
Principle 2: Fostering Ownership by Implementing Participatory SWM								
2-1. Strengthening Human Resource Development	○							
2-2. Implementation of "Fixed-Time and Fixed-Place Waste Collection" in Collaboration with Residents [Priority]			●				●	
2-3. Strengthening Collection of Market Waste in Cooperation with Management Unions			○					
2-4. Thorough Commercial Waste Collection Generated by Large-scale Dischargers			○					
2-5. Improvement of Capacity of SWM on site [Priority]								
2-5-1. Appointment of SWM Manager and Public Awareness Promoters [Priority]			●				●	
2-5-2. Holding Regular Community Meetings with Residents [Priority]							●	
2-6. Public Awareness Promotion for Self-Treatment of Waste at Source and Waste Reduction							○	
Principle 3: Implementing Solid Waste Management Based on the Past Experiences								
3-1. Establishment of Waste Collection System in Cooperation with Private Sector			○					
3-2. Rehabilitation of JCDS [Priority]						●		
3-3. Establishment of Maintenance System Based on Preventive Maintenance [Priority]				●				
3-4. Strengthening SWM Capacity by Development of Equipment [Priority]								
3-4-1. Procurement Plan for Waste Collection Vehicles [Priority]			●					
3-4-2. Development of Workshop [Priority]				●				
3-4-3. Procurement Plan for Heavy Equipment [Priority]						●		
3-5. Appropriate Operation and Management of Equipment				○				
3-6. Closure of illegal Dumping Sites						○		
Principle 4: Vision for the Development of SWM in Preparation for Rapid Urbanization								
4-1. Establishment of Framework for collaboration through Multi-Stakeholder Process								
4-1-1. Establishment of Juba Solid Waste Management Information Exchange Meeting	○							
4-1-2. Initiatives to Develop Laws and Plans in Cooperation with the Ministry of Environment and Forestry		○						
4-2. Transition from "Public Health Improvement" and "Reduction of Environmental Impact" to "Reduction of Waste" and "Formation of Sound Material-Cycle Society and Economy"								
4-2-1. Promotion of Intermediate Treatment and Recycling in Collaboration with Private Sector					○			
4-2-2. Promotion of Environmental Education for Waste Reduction							○	

3.5 Planning Basis

3.5.1 Population Projection

The population of South Sudan and Juba was officially surveyed before the independence, but the population census has not been conducted since then. According to World Population Prospects (UN, 2019), the population was projected based on the previous census. In the Plan, the population in 2020 as the base year will be 403,000, the population in 2025 as the mid-term year will be 500,000, and the population in 2030 as the long-term year will be 617,000.

3.5.2 Solid Waste Generation

(1) Amount of Waste Generated and Collected

In this Plan, household waste, market waste and commercial waste are targeted, but the reliable data on SWM is limited in Juba, therefore future household waste generation is projected using population and unit waste generation. In consideration of the current situation, household waste is calculated based on 0.65 kg/person/day calculated from “Data Collection Survey on Solid Waste Management in Juba, Republic of South Sudan”. Market and commercial waste generation are estimated as changes in proportion to population growth rate. The transition of population, amount of waste generated and collected is shown in Figure 3-2. The Table 3-4 shows the estimation and target values of the amount of waste generated and collected in Juba. The target amount of waste collected by private collectors shall increase in proportion to the collection rate as of 2020.

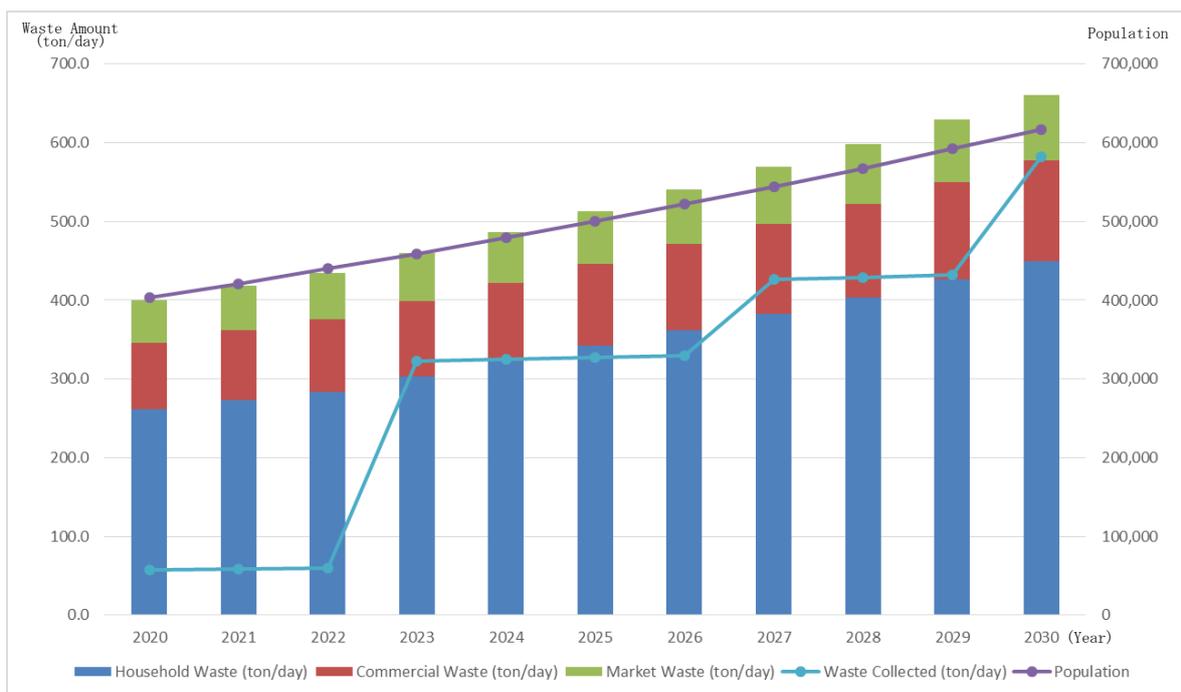


Figure 3-2 Transition of Population, Amount of Waste Generated and Collected in Juba

Table 3-4 Estimation and Target Values of the Amount of Waste Generated and Collected in Juba

Year	Population	Total amount of waste generated (ton/day)	JCC		Private sector		Target waste collection rate (%) (JCC+Private)
			Target amount of waste collected (ton/day)	Target waste collection rate (%)	Target amount of waste collected (ton/day)	Target waste collection rate (%)	
2020	403,000	427	30	-	27	-	-
2025	500,000	547	286	52	41	6	58
2030	617,000	705	529	80	53	8	88

(2) Volume of Waste Landfilled

In the future, there is the possibility that waste transported from Rejaf Payam and Luri Payam to JCDS, but the site shall accept waste transported from Juba mainly. The estimation of volume of waste transported and landfilled at JCDS is shown in Table 3-5.

Table 3-5 Estimation of Volume of Waste Landfilled at JCDS

Year	Incoming	Landfilled				
	Total amount of waste (ton / day)	Daily amount of waste landfilled*1 (m ³ / day)	Daily amount of cover soil*2 (m ³ / day)	Total amount landfilled (m ³ / day)	Annual amount landfilled*3 (m ³ / year)	Total amount landfilled for 10 years (m ³)
2020	57	72	7	79	23,000	-
2025	291	364	36	400	120,000	-
2030	468	585	59	644	193,000	1,095,000

*1 Ratio of waste amount: 0.8 t/m³ *2 10% of waste amount *3 Annual working day: 300 days

(3) Remaining Years of JCDS

The remaining years of JCDS is estimated based on the remaining volume of each phase and capacity. The result is shown in Table 3-6.

Table 3-6 Estimation of Remaining Years of JCDS

Item	Phase 2	Phase 3	Phase 4
Capacity	180,000 m ³	370,000 m ³	450,000 m ³
Remaining years	January 2021 – December 2024 (4 years left)	January 2025 – April 2028 (3 years and 4 months left)	May 2028 – April 2031 (3 years left)

(4) Waste Management Flow

The waste management flows for mid-term is shown in Figure 3-3 and the one for long-term is shown in Figure 3-4.

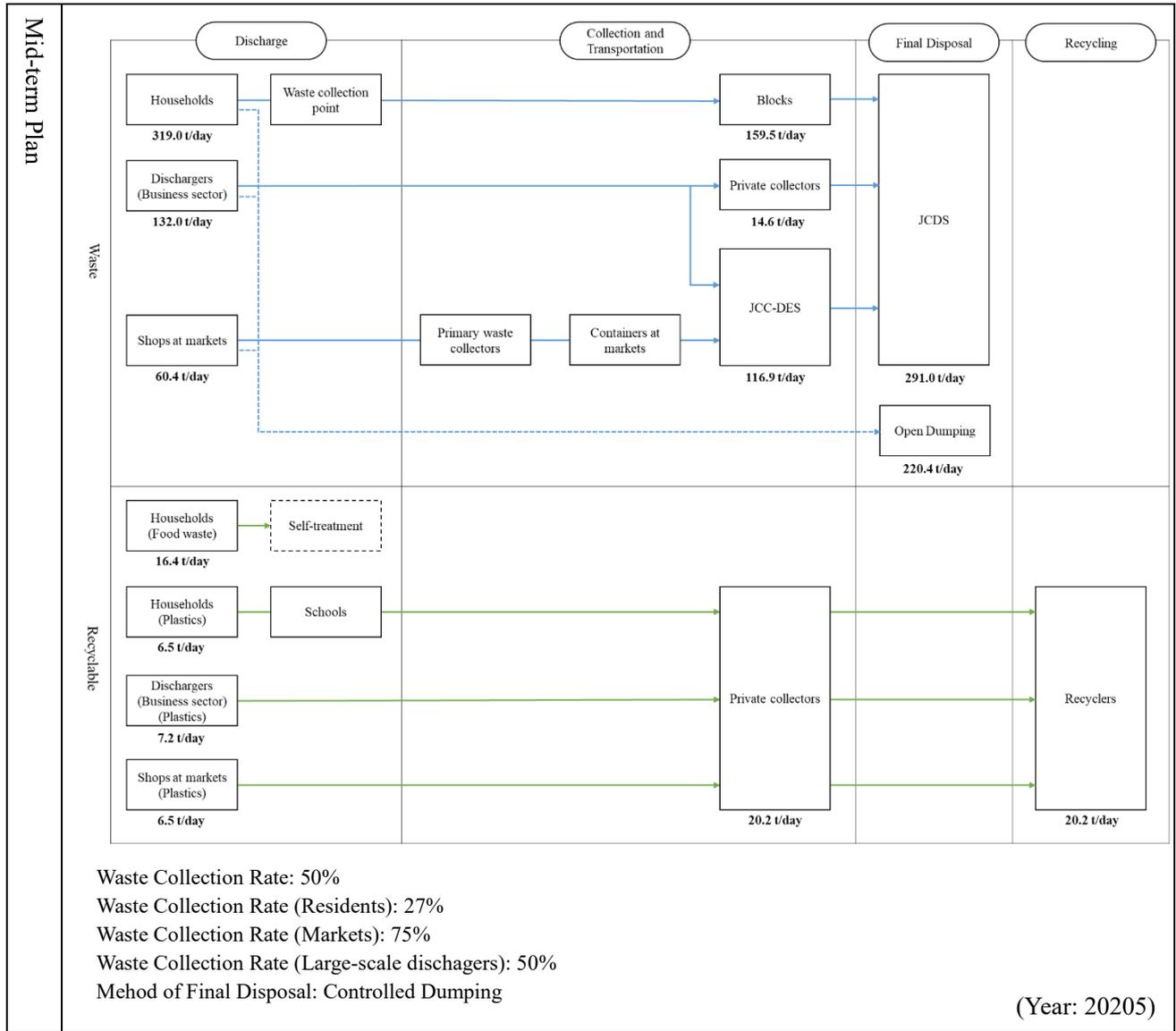


Figure 3-3 Waste Management Flow (2025)

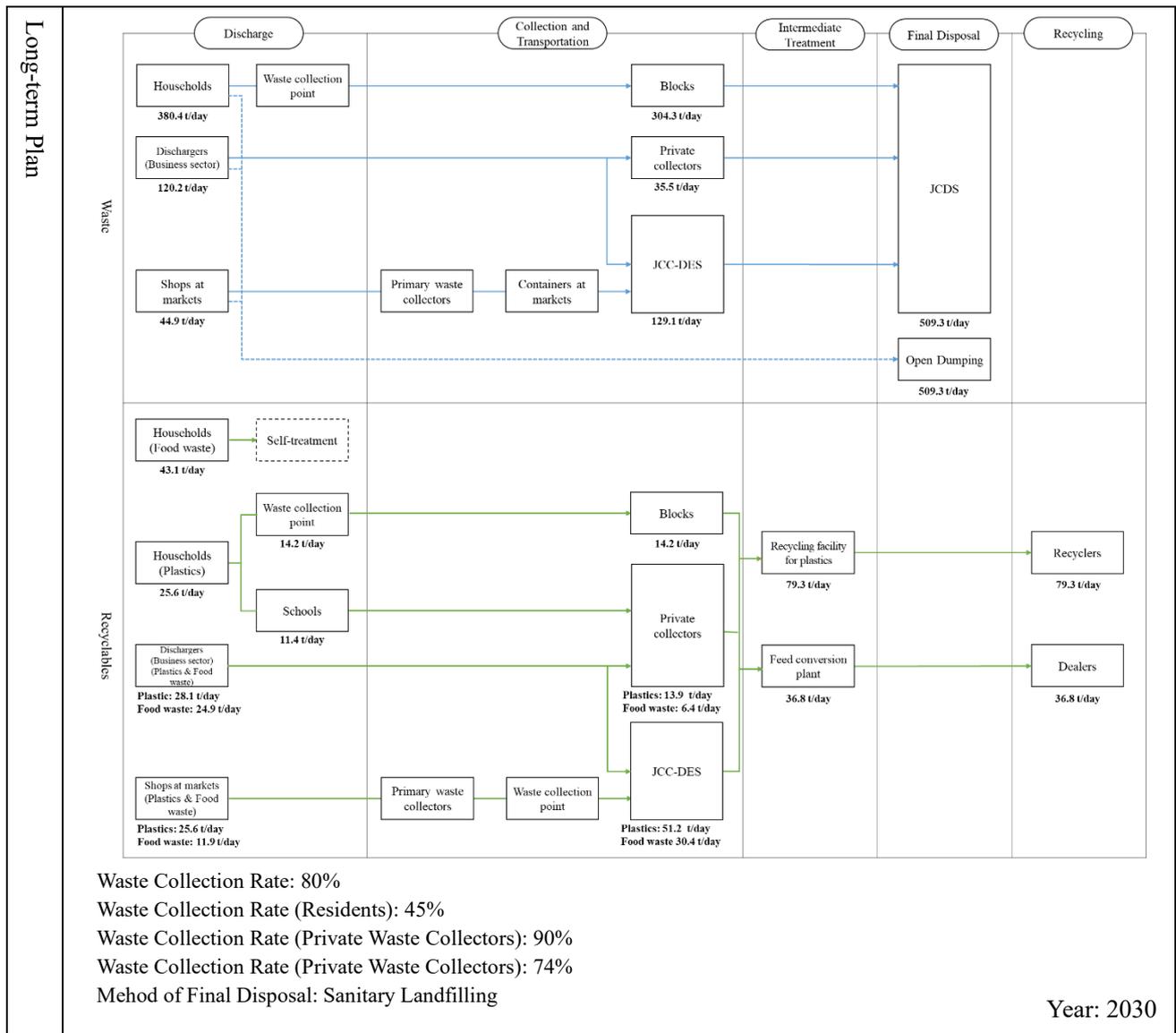


Figure 3-4 Waste Management Flow (2030)

3.6 Organization and Human Resources Management

3.6.1 Basic Concept of Organization and Human Resources Management

The schedule for organization and human resources management is shown in Table 3-7. In order to facilitate appropriate SWM in Juba, the implementation system will be established by Juba Rejaf Waste Management Group (JRSWGM) mainly in the mid-term plan. The implementing body of JRSWGM consists of the forcal persons from the important organizations in Juba, such as the Department of Environment and Sanitation of JCC. The roles and responsibilities related to SWM needs to be clarified.

By 2030 as the target year of long-term plan, Juba Solid Waste Management Information Exchange Meeting is supposed to be held with stakeholders including the national government, Ministries, international agencies, doners, NGOs in order to communicate each other. Juba will undertake the development of human resources and technical platform for sustainable SWM in Juba.

Table 3-7 Schedule for Organization and Human Resources Management

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term	Establishment of Implementation System Led by JRSWGM [Priority Measure 1-1]											
	Clarification of Role and Demarcation of Municipalities related to SWM [Priority Measure 1-2]											
Long-term	Strengthening Human Resource Development [Measure 2-1]											
	Establishment of Juba Solid Waste Management Information Exchange Meeting [Measure 4-1-1]											

3.6.2 Establishment of Implementation System Led by Juba Rejaf Solid Waste Management Group [Priority Measure 1-1]

It is necessary to raise the status of Juba Rejaf Solid Waste Management Group (JRSWGM) to a decision-making official organization in Juba for sustainable SWM. JRSWGM is divided into two bodies: (1) Executive Body headed by the Mayor, and (2) Implementing Body led by the Department of Environment and Sanitation of Juba City Council. JRSWGM is able to formulate SWM plans and approve the plans and budget for the entire city. The implementing body of JRSWGM is responsible for all activities related to SWM in Juba such as waste collection, fee collection, development and division of ordinance and regulations, improvement of final disposal sites, establishment of maintenance system, raising public awareness and securing the budget for SWM. On the other hand, the executive body of JRSWGM is responsible for evaluation of necessity and feasibility of budget and project plans which the implementing organizations request. The projects approved by the executive body of JRSWGM will be implemented by the Department of Environment and Sanitation of Juba City Council in collaboration with the other stakeholders. The review of organization structures of the Department of Environment and Sanitation of Juba City Council and blocks is recommended. Basically it will be considered in accordance with the activities planned such as waste collection and public awareness especially. The activities of JRSWGM shall be done based on Terms of Juba Rejaf Solid Waste Management Group (1st Draft) (APPENDIX-10).

3.6.3 Clarification of Role and Demarcation of Municipalities related to SWM [Priority Measure 1-2]

(1) Roles and Responsibilities

The roles and responsibilities on SWM is shown in Table 3-8.

Table 3-8 Roles and Responsibilities on SWM

Item	Nation	State	JRSWGM	Juba			Rejaf Payam
	MoEF	MoHE		Department of Environment and Sanitation	Blocks (Juba/Kator/Munuki)	QC	
Legal System							
Development of SWM law	○						

Item	Nation	State	JRSWGMG	Juba			Rejaf Payam
	MoEF	MoHE		Department of Environment and Sanitation	Blocks (Juba/Kator/Munuki)	QC	
Development of SWM Ordinance			○	○			○
Establishment of SWM system	○		○				
Planning							
Formulation of SWM annual plan			○				
Approval of SWM annual plan			○				
Collectio and Trasportation							
Formulation of operation plan of waste collection			○	○	○		
Fee collection				○		○	○
Implementation of waste collection and budget		○		○	○		
Licensing to private collectors				○			
Procurement of waste collection vehicle				○			
Maintenance and repair of waste collection vehicles				○			
Public awareness and environmental education				○	○		
Household waste collection					○		
Market waste collection				○			
Commercial waste collection				○			
Monitoring waste collection					○	○	
Public Relations					○	○	
Final Disposal							
Formulation of operation plan of dumping site							○
Implementation of dumping site operation and budget				○			○
Payment of tipping fee				○			
Tipping fee collection							○
Procurement of heavy equipment							○
Maintenance and repair of heavy equipment							○

(2) Demarcation

a. Juba Rejaf Solid Waste Management Group

JRSWGMG is divided into an executive body chaired by the mayor of Juba and an implementing body led by the Department of Environment and Sanitation of Juba City Council. JRSWGMG will formulate a waste management project plan, approve the plan and improve the effectiveness of budget execution. The roles and responsibilities of JRSWGMG are shown in Table 3-9.

Table 3-9 Roles and Responsibilities of JRSWVG

Role	Member	Demarcation
EXECUTIVE BODY	<ul style="list-style-type: none"> • Mayor (Leader) • Commissioner • Deputy Mayor • CEO of JCC • Representative from the National Government • Representative from state Government 	<ul style="list-style-type: none"> • Supervising the implementing body based on their report • Approval for annual SWM report and plan • Passing laws and regulations SWM with JCC legislative council • Report to the Governor the activities of the SWM • Approval of budget on SMW
IMPLEMENTING BODY	<ul style="list-style-type: none"> • Director of Department of Environment and Sanitation of JCC • Directors of Juba, Munuki and Kator Block • Director of Rejaf Payam 	<ul style="list-style-type: none"> • Responsible to manage all the activities of the SWM • Solicit for funds from the Executive body and other institutions • Coordination with other institutions and stakeholders • Formulating and implementing the action plan • Evaluating, revising and implementing the master plan • Recording and managing the SWM data • Collecting, organizing and analyzing the SWM data • Monitoring and Supervision of the SWM activities • Reporting to the executive body regarding any activity of the SWM

b. The Department of Environment and Sanitation of Juba City Council

The Department of Environment and Sanitation of Juba City Council is responsible for the overall SWM in Juba as well as JRSWVG. The Department not only carry out SWM projects as a leading organization, but also supervise blocks and QCs.

The Department is in charge of collecting and transporting market waste from the markets as well as commercial waste from hotels, hospitals excluding medical waste and other businesses, and the fee collection. The target market and large-scale dischargers are required to sign a contract for collection and transportation with the Department. The Department monitors the dischargers on a regular basis and manages the dischargers by renewing the contract. A waste collection plan will be developed in cooperation with JRSWVG in order to provide stable collection and transportation services to the dischargers. Private waste collectors also collect waste from the other waste dischargers in cooperation with the Department. In order to organize both parties' information on waste collection in Juba and promote SWM projects efficiently, the Department will introduce a licensing system for private collectors and manage them. The Department is also responsible for the procurement and maintenance of vehicle and equipment necessary for waste collection and for the development of workshop. The workshop of Juba City Council will regularly inspect and repair their waste collection vehicles to ascertain vehicle conditions, and will maintain the vehicles and procure new vehicles depending on the situation. Juba does not have a final disposal site within the city and all waste collected will be transported to JCDS managed by Rejaf Payam. Therefore, Juba will not be the operator of the final disposal site, but will contribute to appropriate final disposal through financial assistance, including payment of gate fee and the cost of removing waste along the access road of JCDS. The Department also has a responsibility for public relations, public awareness and environmental education related to SWM in collaboration with the SMW manager and public awareness promoters. The proposed organization structure of the Department of

Environment and Sanitation of Juba City Council is shown in Figure 3-5.

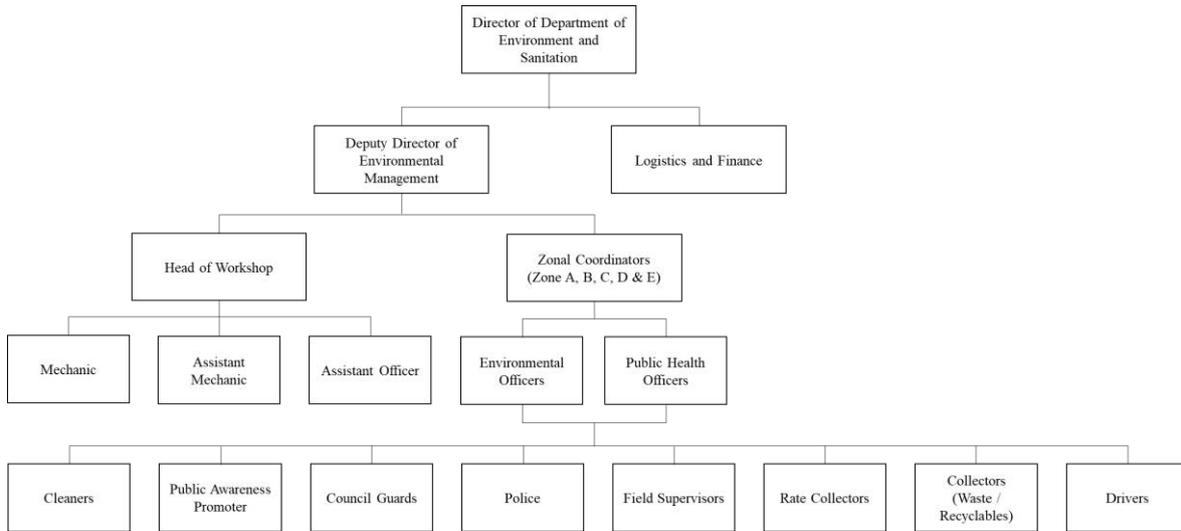


Figure 3-5 Proposed Organization Structure of the Department of Environment and Sanitation of Juba city Council

c. Blocks

Juba City has three blocks: Juba Block, Munuki Block, and Kator Block. The blocks are responsible for carrying out and supervising the collection and transportation of household waste and the fee collection from the residents. The Blocks are responsible for public relations, awareness awareness and environmental education activities for the residents with QCs and contribute to the establishment of a community-based SWM. It also plays a role as a supervisor for QC. The blocks will select the SMW manager and public awareness promoters in collaboration with JRSWGM and QC. The blocks plan and implement household waste collection, monitor waste collection regulary and collect the fee from the households. In order to collect fee from the residents properly, the well-understanding of them is necessary therefore public relations, public awasreness and environmental education activities by the blocks and QC are very important. The proposed organization chart of blocks is shown in Figure 3-6. As of 2020, the blocks don't have the official organization chart, hence the draft organization chart is proposed based on the hearing survey. The blocks will setup the section specialized on SWM and there will be officers and workers such as drivers, rate collectors related to SMW in the section.

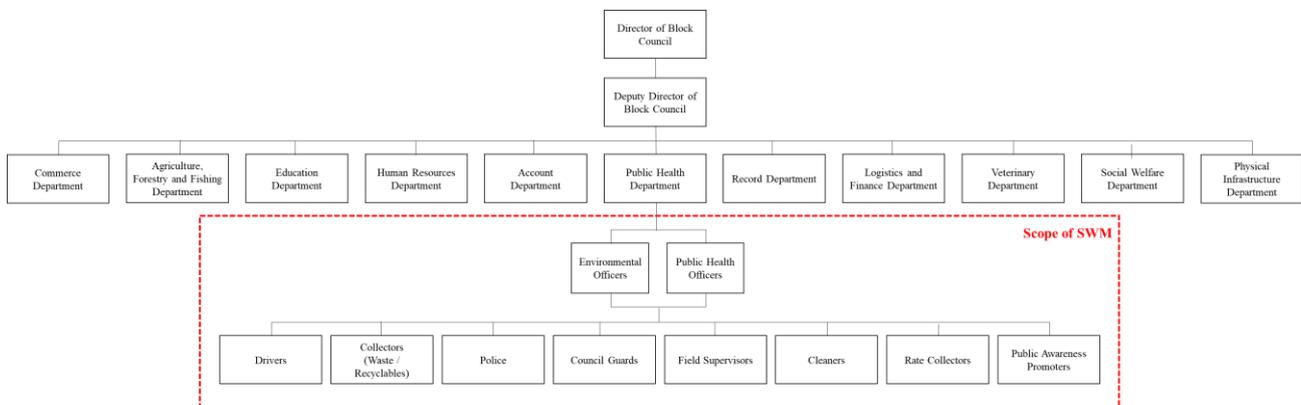


Figure 3-6 Proposed Organization Structure of Block

d. Quarter Councils

QC plays a role in supporting the block's operations related to the collection and transportation of household waste and fee collection from the residents. Since QC is the smallest unit community group in Juba, it is considered that QC is suitable for collecting information and on-site survey on SWM. QCs will implement the activities in cooperation with the SWM manager and public awareness promoters of the blocks.

3.6.4 Strengthening Human Resource Development (Measure 2-1)

(1) Planning of Capacity Development

In order to implement sustainable SWM, human resources with a certain level of ability, knowledge and experience related to SWM are required. Juba aims to strengthen the capabilities of individuals and organizations through staff training for acquiring the knowledge and skills required for each position. The implementing body of JRSWGM and huma resource section of each organization supposed to plan the various trainings.

(2) Implementation of Occupational Safety and Health Training

Juba will implement the occupational safety and health training for officers and workers such as drivers, waste collectors, in order to ensure safety and health in their workplace and promote the formation of a comfortable workplace environment. Lack of awareness of safety and health management is likely to lead to occupational accidents. The knowledge, awareness and behaviour in occupational safety and health management can keep workers away from various risks. The Department of Environment and Sanitation of Juba City Council, Block and QC establish health and safety committees and jointly hold occupational health and safety training sessions once or twice a year. The contents of an occupational health and safety training session is shown in Table 3-10.

Table 3-10 Proposed Contents of Occupational Health and Safety Training Session

Category	Contents
Work Management	Implementation of safety work etc
	Proper wearing of work and protective clothes etc
Work Environment	Inspection of equipment, facilities, and facilities etc
	Maintenance of hygiene environment by 5S: Sorting, Setting-in-Order, Shining, Standardizing, Sustaining the Discipline etc
Health Management	Promotion of health maintenance etc
Others	Sharing of cases (occupational accident prevention measures etc)

3.6.5 Establishment of Juba Solid Waste Management Information Exchange Meeting (Measure 4-1-1)

Juba and establish a Juba Solid Waste Management Information Exchange Meeting to exchange the opinionn experiences among the stakeholders. The purposes of this Meeting are to exchange and share the information on SMW, the current situation and issues of waste management in Juba, case studies on SWM in other countries, information sharing and proposals on new technologies related to SWM, and human resource development and

exchange in the field of waste management. The expected members of the Meeting is shown in Table 3-11. The meeting will be held twice a week

Table 3-11 Expected Members of the Meeting

Category	Organization
Governmental Organization and Ministries	Ministry of Environment and Forestry
	Ministry of Health and Environment, Central Equatoria State
	Embassy of Japan in South Sudan
International Organization and Donors	Internally Displaced Persons (IDP)
	International Labour Organization (ILO)
	United Nations Human Settlements Programme (UNHABITAT)
	United Nations Mission in the Republic of South Sudan (UNMISS)
	The United Nations Children's Fund (UNICEF)
	The United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
	(World Health Organization, WHO)
Non-Governmental Organization (NGO)	NGOs

3.7 Legal System

3.7.1 Basic Concept of Legal Development on Solid Waste Management

Figure 3-7 shows the legal structure on SWM and Table 3-12 shows the schedule for legal development. In the mid-term plan by 2025, Juba SWM ordinance needs to be revised as a priority since the ordinance is an important regulation for the demarcation and fee collection. The ordinance shall be reviewed every two years, and revised if necessary. The Department of Environment and Sanitation of Juba City Council and the implementing body of JRSWGM are responsible for the revision and development of ordinances and regulations, and the executive body of JRSWGM has a responsibility for the approval of the ordinance and regulations.

In the long-term plan by 2030, Juba aims to establish a system for the maintenance and improvement of the safety management of employees and the working environment, which are important for the implementation of SWM in Juba. In addition, based on the knowledge to be obtained after the establishment of ordinance and regulations in Juba, the Department of Environment and Sanitation of Juba City Council and JRSWGM will play a role in providing support for the formulation of laws related to SWM by the Ministry of the Environment and Forestry and the State Government, as well as making recommendations on the contents, with the aim of clarifying the responsibility of SWM.

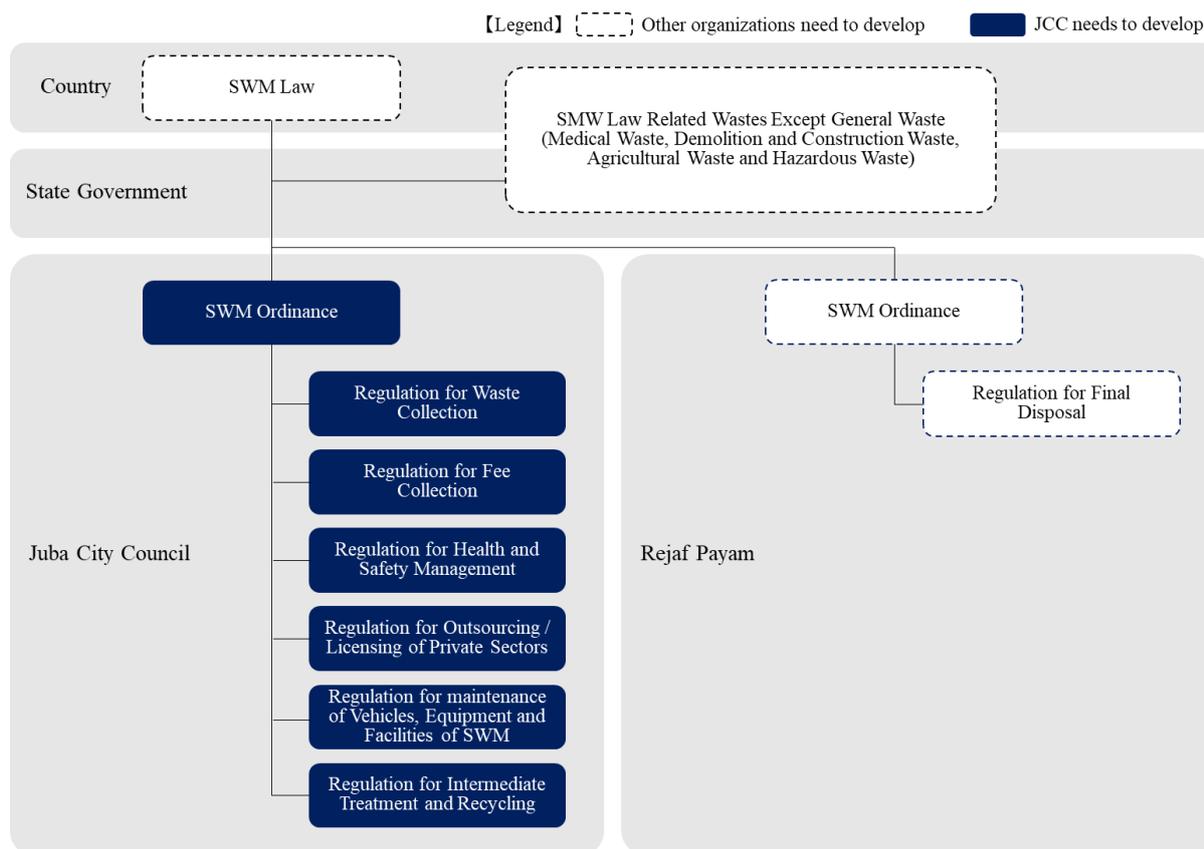


Figure 3-7 Legal Structure on SWM

Table 3-12 Schedule for Legal Development

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Mid-term	Revision and Enactment of SWM Ordinance and Ragulations [Priority Measure 1-3]	—————▶											
Long-term	Clarification of Roles and Responsibilities by SWM Law [Measure 1-4]							—————▶					
	Establishment of Occupational Safety and Health Management [Measure 1-5]							—————▶					
	Initiatives to Develop Laws and Plans in Cooperation with the Ministry of Environment and Forestry [Measure 4-1-2]							—————▶					

3.7.2 Revision and Enactment of SWM Ordinance and Ragulations [Priority Measure 1-3]

(1) Solid Waste Management Ordinance

The SWM Ordinance aims to preserve the living environment and improve public health through proper SWM and mentions the roles and responsibilities of the administration that implementing SMW organizations and the residents. The SWM Ordinance will be planned by the implementing body of JRSWVG and considered by the executive body. The SWM Ordinance will be enacted after the approval by the Mayor (APPENDIX-11).

(2) Solid Waste Management Regulations

In Juba, the SWM Regulations consist of “Regulations for Waste Collection”, “Regulations for Fee Collection”, “Regulations for Health and Safety Management”, “Regulations for Outsourcing and Licensing for Private Sector”, “Regulations for Vehicles, Equipment and Facilities of SWM” and “Regulations for Intermediate Treatment and Recycling”. The main contents of each regulation are shown in Table 3-13.

Table 3-13 Contents of SWM Regulations in Juba

Category	Contents
Regulations for Waste Collection	<ul style="list-style-type: none"> • Demarcation of waste collection by type of waste • Waste collection service details (frequency, time, place etc)
Regulations for Fee Collection	<ul style="list-style-type: none"> • Outline of fee collection system • Charge amount for waste collection by the type of waste
Regulations for Health and Safety Management	<ul style="list-style-type: none"> • Preventative measures for accidents at workplace • Outline of staff training
Regulation for Outsourcing / Licensing of Private Sectors	<ul style="list-style-type: none"> • Scope of outsourcing and licensing • Process of outsourcing and licensing
Regulations for Maintenance of Vehicles, Equipment and Facilities of SWM	<ul style="list-style-type: none"> • Demarcation regarding vehicles, equipment and facilities of SWM • Outline of maintenance of regarding the vehicles, equipment and facilities
Regulations for Intermediate Treatment and Recycling	<ul style="list-style-type: none"> • Scope of intermediate treatment and recycling • Process of development and implementation for intermediate treatment and recycling facilities

3.7.3 Solid Waste Management Law [Measure 1-4 and 4-1-2]

(1) Clarification of Roles and Responsibilities by SWM Law [Measure 1-4]

It is desirable that "Responsibilities of the residents", "Responsibilities of private dischargers" and "Responsibilities of the national, state and local governments" are stipulated by the SWM Law. The responsibilities of the residents are to cooperate with the municipalities through contributing reduction, recycling, segregation and disposal of waste by themselves.

By clearly stating that residents, businesses, and administrative organizations have the responsibility for waste disposal, the government will build a foundation that enables each of them to contribute to the sustainable SWM and the establishment of a sound material-cycle society.

(2) Initiatives to Develop Laws and Plans in Cooperation with the Ministry of Environment and Forestry [Measure 4-1-2]

Although the SWM Law is enforced by the Ministry of Environment, Juba City Council and JRSWGM has decided to implement its own SWM ordinance and related regulations in the mid-term plan, and it is believed that they are supposed to obtain useful experience and knowledge on SWM by 2030. Therefore, Juba City Council and JRSWGM will be able to provide the support and advice to the Ministry of Environment for the formulation of SWM Law. By

2030, Juba Solid Waste Management Information Exchange Meeting will be formulated, hence not only Juba City Council and the Ministry of Environment, but also the other stakeholders will join the meeting to discuss SMW in South Sudan.

3.7.4 Establishment of Occupational Safety and Health Management [Measure 1-5]

An occupational safety and health management system shall be established for the purpose of ensuring safety and health in the workplace and improving workplace environment more comfortably for field workers such as drivers, waste collectors, disposal site workers engaged in SWM services. The Department of Environment and Sanitation of Juba City Council and the blocks shall establish the committee for occupational safety and health. Each committee cooperate with each other and prepare and enact the regulation on SWM. The regulation mentions the mid-term and long-term plans including important activities to reduce the risks and accidents, and the preventative measures against the accidents on occupational safety and health. The committee consists the representatives from each organization on occupational safety and health, and holds regular meetings. The committee is supposed to have the staff training on occupational safety and health once or twice a year in order to improve the work environment for the officers and workers on SWM.

3.8 Collection and Transportation

3.8.1 Basic Concept of Collection and Transportation

Table 3-14 shows the schedule for collection and transportation. In the mid-term plan by 2025, Juba aims to establish waste collection and transportation system to make the most effective use of waste collection vehicles provided by JICA Grant Aid Project, and to build the relationship with the other stakeholders. Household waste shall be collected by the blocks, market waste shall be collected by the Department of Environment and Sanitation of Juba City Council, and commercial waste shall be collected by the Department and private sector. The waste collection vehicles to be procured by JICA shall be used by the Department and the blocks. Juba is planning to implement “Fixed-Time and Fixed-Place Waste Collection” which is the method that the residents take their waste from their home to a specified place at specified time as household waste collection. It is important to hold community meetings regularly to promote the understanding and participation of residents who have not been received waste collection service for a long time. In order to implement activities related to public awareness in Juba, the Department of Environment and Sanitation of Juba City Council and blocks need to appoint and deploy “Public Awareness Promoters” to support increasing the number of households which can receive waste collection services by the municipalities. In accordance with the plan, the municipalities need to procure some waste collection vehicles by themselves in the future. The waste collection rate including the Department and blocks is set 50% in 2025.

In the long-term plan by 2030, Juba achieves to expand the collection area and establish an appropriate SWM system. While improving collection efficiency through appropriate management of waste collection vehicles, and guidance and trainings for drivers and workers, the municipalities including the Department of Environment and Sanitation of Juba City Council will strengthen sustainable SWM system by regularly monitoring the waste discharge

status of households, markets, and other private dischargers, and providing administrative guidance as necessary. In addition, the construction and operation of plastic recycling facility and feed conversion plant are planned. Private collectors will continue to collect recyclables from schools, while blocks will be in charge of collecting resources discharged from households. The recyclables discharged from markets will be collected by the Department of Environment and Sanitation of Juba City Council and the recyclables discharged from private companies and the other institutions will be collected by the Department and private collectors. It is necessary to consider the implementation of preventive measures against the new challenges facing Juba through reviewing the current waste collection system, analyzing data observed by monitoring and procuring new waste collection vehicles by themselves. The waste collection rate including the Department and blocks is set 80% in 2030.

Table 3-14 Schedule for Collection and Transportation

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term & Long-term	Implementation of "Fixed-Time and Fixed-Place Waste Collection" in Collaboration with Residents [Priority Measure 2-2]											
	(1) Holding Regular Community Meetings with Residents											
	(2) Expansion of Target Collection Area											
Mid-term	Appointment of SWM Manager and Public Awareness Promoters [Priority Measure 2-5-1]											
	Procurement Plan for Waste Collection Vehicles [Priority Measure 3-4-1]											
Long-term	Strengthening Collection of Market Waste in Cooperation with Management Unions [Measure 2-3]											
	Thorough Commercial Waste Collection Generated by Large-scale Dischargers [Measure 2-4]											
	Establishment of Waste Collection System in Cooperation with Private Sector [Measure 3-1]											
	Development of Data Management System [Measure 1-6]											

3.8.2 Collection and Transportation System [Priority Measure 2-2, Measure 2-3 and Measure 2-4]

As mentioned above, household waste shall be collected by the blocks, market waste shall be collected by the Department of Environment and Sanitation of Juba City Council, and commercial waste shall be collected by the Department and private sector. In order to collect those wastes effectively, it is necessary to establish sustainable and systematic waste collection system in collaboration with the Department, blocks and private sector. In addition, it is important to implement various activities such as planning overall waste collection, vehicle allocation and routing, maintenance, data management in accordance with the characteristics of target waste, area and dischargers. Household waste will be collected through "Fixed-Time and Fixed-Place Waste Collection". Each block is responsible to plan and implement household waste collection. Basically, each QC is considered as each collection area in accordance with their characteristics, location and road condition, and some waste collection points will be in each collection area with the approval of residents. The blocks will decide collection route by each waste collection vehicle by comprehensive review of capacity of waste collection vehicles, their departure time from parking lots, collection frequency, number and location of collection points, and time of delivery to final disposal sites. The type of waste collection vehicles to be used for household waste collection is compactors and dump trucks. Market waste

shall be collected by the Department of Environment and Sanitation of Juba City Council. The Department shall install containers at some of markets for sanitary waste collection. Depending on the scale, it is necessary to secure primary waste collectors who bring waste from each shop to the containers at each large market which has a lot of shops within. Basic waste collection plan is the collection with containers, but the Department will collect waste with compactors and dump trucks instead of installing containers at small markets generated less than 500 kg of waste per day. Commercial waste shall be collected by the Department and private sector. Commercial waste refers to waste generated as a result of business activities in Juba. Large-scale dischargers refer to relatively large businesses such as hotels, hospitals (excluding medical waste), public institutions and international organizations in Juba. The target of the Department of Environment and Sanitation of Juba City Council is large-scale dischargers, and the Department shall make contracts including target waste, collection time, frequency, fee and period, with the large-scale dischargers before the Department starts to provide waste collection services. The Department is required to monitor those large-scale dischargers and collect useful data for renewal of contracts. The type of waste collection vehicles for market waste collection is compactors and dump trucks. The Department is responsible for overall SWM in Juba, hence they need to manage private sector properly. Therefore, the Department will introduce licensing system for private collectors. There is an existing registration system for private collectors but it does not work well, therefore this system will be reviewed and improved to a licensing system. Private collectors are required to apply to the Department and to get the approved license before they start their business. They need to update their license regularly, and the Department need to observe the private collectors' activities.

Collection of recyclables will be done the Department, blocks and private collectors. In the mid-term plan, the collection of plastics from households is planned to be carried out by private resource collectors at schools as collection points. In the long-term plan, plastics and /or food waste generated by households, markets and private dischargers will be implemented. Plastics generated by households will be collected by the blocks, recyclables including plastics and food waste will be collected by the Department and commercial waste generated by private dischargers will be collected by the Department and private collectors. The waste collection flow for mid-term is shown in Figure 3-8 and the one for long-term plan is shown in Figure 3-9.

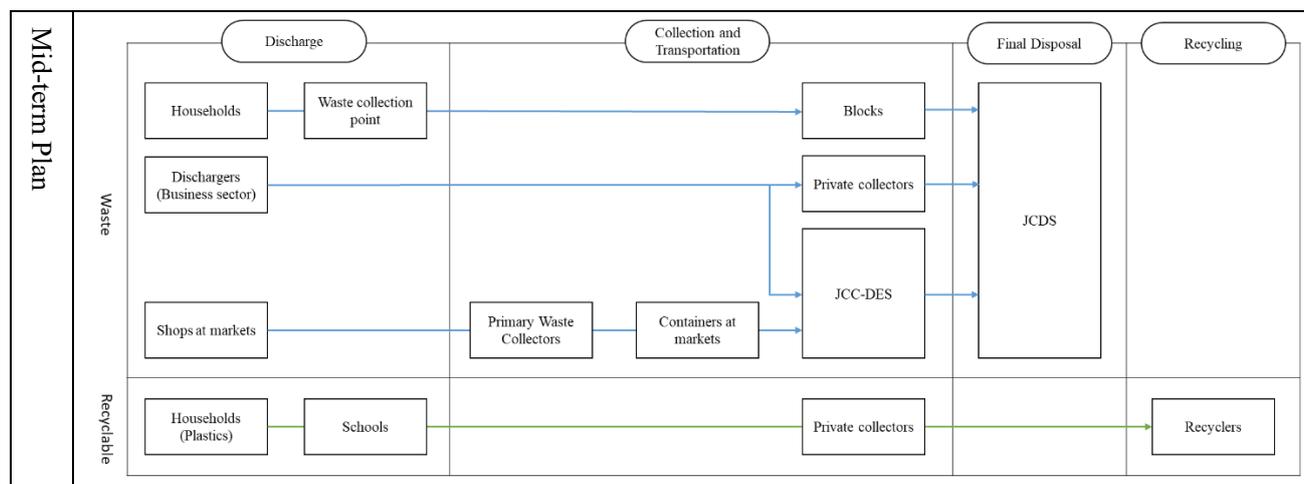


Figure 3-8 Waste Collection Flow (2025)

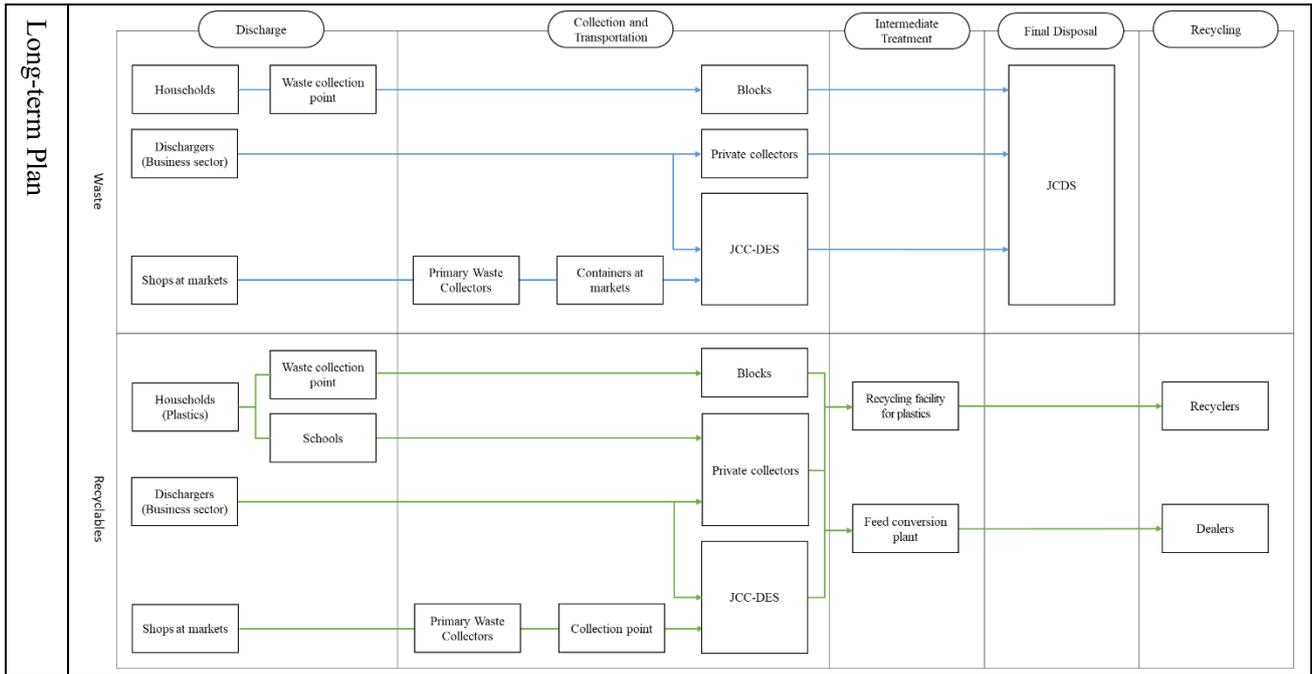


Figure 3-9 Waste Collection Flow (2030)

(1) Implementation of “Fixed-Time and Fixed-Place Waste Collection” in Collaboration with Residents [Priority Measure 2-2]

“Fixed-Time and Fixed-Place Waste Collection” is implemented for household waste collection. The fixed-time and fixed-place waste collection is the collection method that the residents take their waste from their home to a specified place at specified time. This method is more efficient to collect waste than to visit every household for waste collection. However, it is necessary to raise public awareness and involve the residents in to succeed the fixed-time and fixed-place waste collection. In the case of house-to-hosue collection, the residents just put their waste in front of their houses, but in the case of fixed-time and fixed-place waste collection, they have to bring their waste to a specified collection points at specified time, hence some of them may refuse to cooperate in the collection. Therefore, it is important to promote their understanding that waste disposal is the responsibility of residents and to change their behavior in order to spread the fixed-time and fixed-place waste collection. The public awareness promoters of blocks will plan and hold community meetings to encourage the residents participating the waste collection. The community meetings will be held based on QCs or some households within the same QCs, the concepts of “Waste Discharger Responsibility Principle” and “Polluter-Pays Principle”, and the detailed information of the fixed-time and fixed-place waste collection will be explained to the residents in the community meetings again and again. Especially fee collection for household waste collection shall start at the same time, hence it is also necessary to explain and confirm the agreement of the fee collection. In the community meetings, blocks shall provide schedule for waste collection to the residents and set up signboards showing the information of fixed-time and fixed-place waste collection around waste collection points.

The service area of fixed-time and fixed-place waste collection will be extended as shown in Figure 3-10. The first stage will be until 2023, when waste collection vehicles will be provided through JICA Grant Aid Project. During the period, household waste will be collected using the existing collection vehicles. Since this is the first time for many

residents to collect waste through fixed-time and fixed-place waste collection, blocks will start in four QCs selected by the blocks including Gudele 7 and Mauna 2 in Munuki Block which a pilot project of fixed-time and fixed-place waste collection in 2020. In addition, a QC needs to be selected from Juba Block and Kator Block as well. In the second stage after the collection vehicles is provided (2024 - 2026), fixed-time and fixed-place waste collection will be carried out at neighbouring QCs to the 4 QCs which fixed-time and fixed-place waste collection is previously implemented. The blocks and QCs need to select some QCs in accordance with their characteristic and situation. In addition, fixed-time and fixed-place waste collection is extended to all QCs in Juba in Stage 3 (2027 - 2030). At all stages, the blocks and QCs conduct regular collection monitoring with residents, they need to build appropriate waste collection and transportation system by identifying issues and implementing improvement measures.

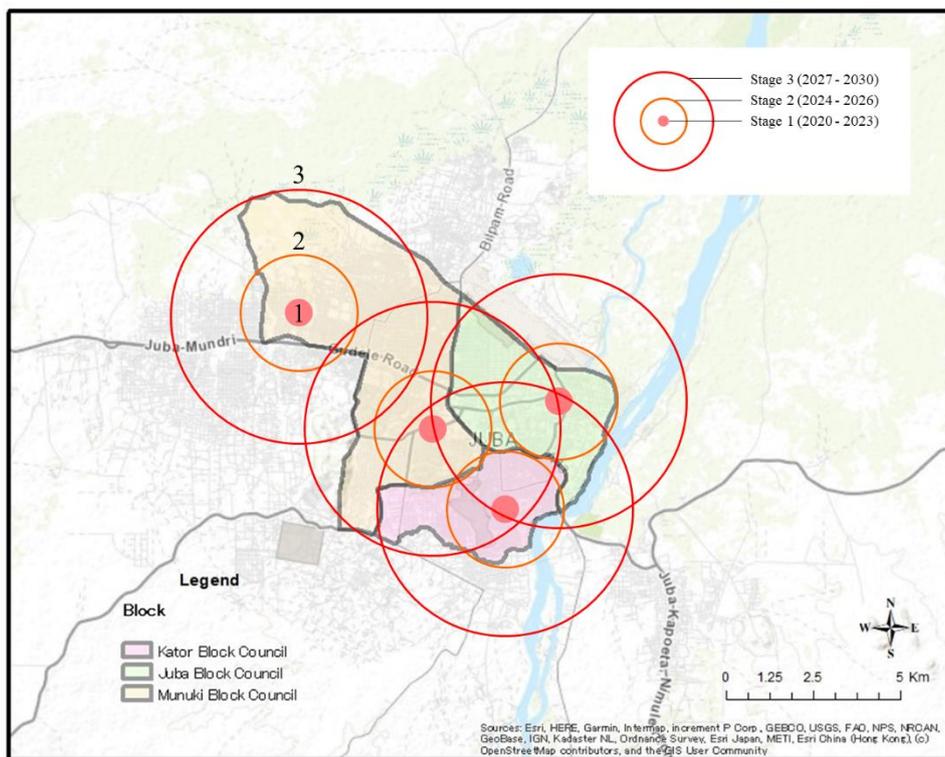


Figure 3-10 Development View of Fixed-Time and Fixed-Place Waste Collection⁶

(2) Strengthening Collection of Market Waste in Cooperation with Management Unions [Measure 2-3]

There are a management union named “Chamber of Commerce” in each market. The union manage generally each market including operation fee collection from the shops and provision of security services. The Department of Environment and Sanitation of Juba City Council is responsible for waste collection at markets, but the unions knows their markets rather than the Department, therefore it is important to cooperate each other for the efficient waste collection. For the waste collection at large markets, they need to plan waste collection with primary waste collectors and containers in accordance with the characteristics of each market. A lot of waste has been dumped illegally around markets, therefore they need to remove the waste away in cooperation with the Department and the unions.

⁶ This image is for illustration purpose.

(3) Thorough Commercial Waste Collection Generated by Large-scale Dischargers [Measure 2-4]

As mentioned above, the Department of Environment and Sanitation of Juba City Council is responsible for collecting commercial waste generated by especially large-scale dischargers. Some of dischargers such as hotels and hospitals have a contract with the Department and the waste has been collected. However, it is assumed that there are more large-scale dischargers in Juba and it is not even possible to determine the number of items to be collected because the definition of large-scale discharger is ambiguous. Therefore, it is necessary to distinguish large-scale discharger and the others in Juba, and conduct data collection survey for the management. A large-scale discharger is assumed to be a large private companies, institutions and international organization and judged whether they are large-scale dischargers by comprehensively evaluating based on waste discharge etc. In order to provide the most appropriate collection and transportation service to the dischargers, the Department examines the most appropriate collection route and frequency based on the needs of them and the result of the survey conducted by the Department.

3.8.3 Appointment of SWM Managers and Public Awareness Promoters [Measure 2-5-1]

In order to develop SWM in Juba, the Department of Environment and Sanitation of Juba City Council and Blocks need to establish a system for the implementation of participatory SWM in cooperation with QCs. The SWM managers and public awareness promoters will be appointed and they will provide the information on SWM to the residents and private dischargers. In particular, it is assumed that they will play an important role in the introduction of fixed-time and fixed-place waste collection. They will plan to have community meetings, clean-up campaigns and provide useful information including discharge methods and collection schedules for the fixed-time and fixed-place waste collection, and response to the residents' complaints.

3.8.4 Establishment of Waste Collection System in Cooperation with Private Sector [Measure 3-1]

It is important to make strong relationship between the municipalities and residents in Juba in order to provide the city-wide waste collection services. Basically, private waste collectors will provide the waste collection service to the private dischargers except the large-scale dischargers and they will supervised by the Department of Environment and Sanitation of Juba City Council through licensing system. Based on the registered information, the Department will conduct regular monitoring and on-site inspections, and provide guidance for improvements if deficiencies are found in their service. The rules for this licensing system are going to be noted in “Regulation for Outsourcing / Licensing of Private Sectors”. The collection of recyclable plastics at schools will be started by 2025 as the mid-term target year, and a construction and operation of recycling facility for plastic and feed conversion plant will be implemented by 2030 as the long-term target year. The private collectors is responsible for collection of recyclables as well. In that case, the Department of Environment and Sanitation of Juba City Council needs to manage the private collectors through the licensing system. The demarcation of waste and recyclables collection is shown in Table 3-15.

Table 3-15 Demarcation of Waste and Recyclables Collection

Type	Department of Environment and Sanitation of JCC	Blocks	Private Collectors
Houshehold waste		•	
Market waste	•		
Commercial waste	•		•
Recyclables from household		•	
Recyclables from private dischargers	•		•

3.8.5 Procurement Plan for Waste Collection Vehicles [Measure 3-4-1]

In order to implement stable waste collection and transportation, it is necessary to procure waste collection vehicles systematically. In the mid-term plan, some waste collection vehicles will be procured by the JICA Project in 2030. The Department of Environment and Sanitation of Juba City Council has 20 waste collection vehicles in 2020, but the most of them were manufactured before 1990s, therefore they are not going to work in 2023. On the other hand, the 3 compactors provided by UNICEF were manufactured in 2011, hence the vehicles are supposed to work in 2023. As mentioned above, not only the Department but also the blocks will implement waste collection in Juba, therefore the waste collection vehicles to be procured by JICA will be provided to the Department and the blocks. Table 3-16 show the number of waste collection vehicles in 2023.

Table 3-16 Number of Waste Collection Vehicles (2023)

Type	Capacity (m ³)	Waste Collection Vehicle					Total Number of Vehicles	Year of Manufacture
		Department of Environment and Sanitation of JCC	Juba Block	Munuki Block	Kator Block			
Compactor	25	3	0	0	0	3	2011	
Compactor	12	4	5	7	4	20	2023	
Dump Truck	10	1	1	1	1	4	2023	
Container Carriers	8	10	0	0	0	10	2023	
Container	8	29	0	0	0	29	2023	

Source: Project Team

In the long-term plan with 2030 as the target year, the waste volume to be collected will be increased by considering new procurement of waste collection vehicles. Therefore, the Department of Environment and Sanitation of Juba City Council is supposed to procure them in 2026 - 2027 and 2030 – 2031 by themselves. The operation frequency of each compactor and dump truck is set to 2 trip / vehicle / day and the one of container carrier is set to 3 trip / vehicle / day.

Table 3-17 Number of Waste Collection Vehicles to be Procured (2023 - 2024)

Type	Capacity (m ³)	Waste Collection vehicle			Total
		Existing	Procured by JICA	Procured by JCC	
Compactor	25	3	0	0	3
Compactor	12	0	20	0	20

Dump Truck	10	0	4	0	4
Container Carriers	8	0	10	0	10
Container	8	0	29	0	29

Source: Project Team

Table 3-18 Number of Waste Collection Vehicles to be Procured (2026- 2027)

Type	Capacity (m ³)	Waste Collection vehicle			Total
		Existing	Procured by JICA	Procured by JCC	
Compactor	25	3	0	0	3
Compactor	12	20	0	8	28
Dump Truck	10	4	0	4	8
Container Carriers	8	10	0	0	10
Container	8	29	0	0	29

Source: Project Team

Table 3-19 Number of Waste Collection Vehicles to be Procured (2030 - 2031)

Type	Capacity (m ³)	Waste Collection vehicle			Total
		Existing	Procured by JICA	Procured by JCC	
Compactor	25	3	0	0	3
Compactor	12	28	0	14	42
Dump Truck	10	8	0	4	12
Container Carriers	8	10	0	0	10
Container	8	29	0	0	29

Source: Project Team

3.8.6 Development of Data Management System [Measure 1-5]

It is required to collect and accumulate useful information and data in order to improve SWM. The necessary data related to waste collection and transportation can be roughly divided into data related to the resources and data related to the target. The information on the vehicle number, manufacturer, year of manufacture, capacity, specifications, drivers, waste collectors, private collectors managed by the Department of Environment and Sanitation of Juba City Council can be considered as the data related to the resources of the Department. The information on households, markets, and private dischargers that receives waste collection service including type and amount of waste collected, collection frequency, and the payment status of waste collection fee shall be considered as the data related to the target on waste collection. JRSWGMG and the other municipalities such as the Department of Environment and Sanitation of Juba City Council shall prepare a common data management format and distribute it to the implementing organizations. The blocks need to submit a report to the Department of Environment and Sanitation of Juba City Council by using the format. All organizations are supposed to use the same format to report, therefore it shall be easy to summarize collected data. The data summarized by the Department shall be sent to JRSWGMG and they shall identify issues and consider solutions and countermeasures. Data management process on waste collection is shown in Figure 3-11.

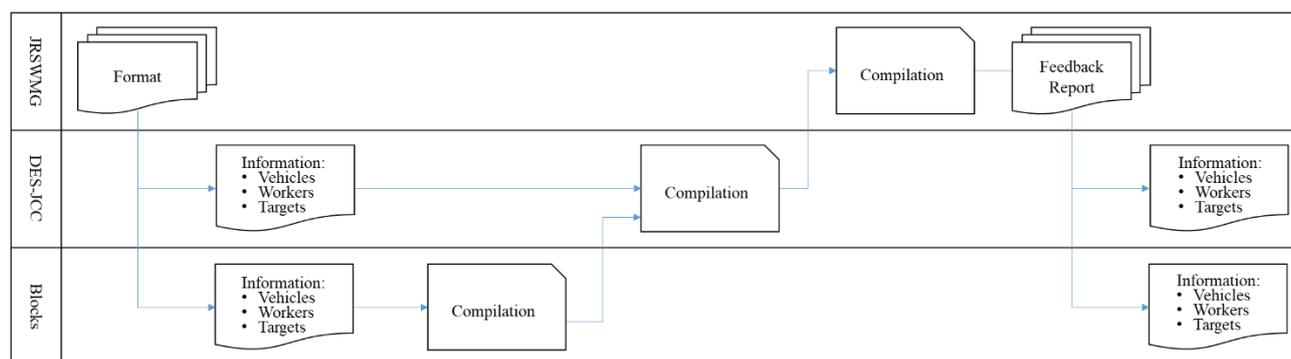


Figure 3-11 Data Management Process on Waste Collection

3.8.7 Human Resources Planning

Table 3-20 shows the number of personnel required for waste collection and transportation by year. For the operation and management of waste collection, especially drivers, waste collectors and field supervisors are required. It is necessary to secure the workers when the operation of feed conversion plant and plastic recycling facility is started in 2026. When some waste collection vehicles is procured, drivers and the other workers need to be increased in accordance with the number of waste collection vehicles. In the Plan, 1 driver and 2 waste collectors will be necessary for each compactor and container carrier, 1 driver and 6 waste collectors will be needed for each dump truck and open truck, and 1 driver and 1 waste collector is required for a tractor.

Table 3-20 Human Resource Planning for Waste Collection

Position		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
JCC	Driver (Waste)	10	10	10	18	18	18	19	21	21	21	23
	Collector (Waste)	32	32	32	40	40	40	42	50	50	50	58
	Driver (Recyclable)	0	0	0	0	0	0	0	2	2	2	3
	Collector (Recyclable)	0	0	0	0	0	0	0	12	12	12	18
	Field Supervisor	8	8	8	8	8	8	8	8	8	8	8
	Rate Collectors (Market Waste)	20	20	20	20	20	20	20	20	20	20	20
	Rate Collectors (Commercial Waste)	2	2	2	2	2	2	2	2	2	2	2
Block	Driver (Waste)	0	1	1	19	19	19	23	30	30	30	38
	Collector (Waste)	0	1	1	38	38	38	46	60	60	60	76
	Driver (Recyclable)	0	0	0	0	0	0	0	6	6	6	9
	Collector (Recyclable)	0	0	0	0	0	0	0	6	6	6	9
	Field Supervisor	8	8	8	8	8	8	8	8	8	8	8
	Rate Collectors (Household Waste)	0	0	4	20	20	20	50	50	50	50	50

3.8.8 Budget Planning

The budget planning regarding the procurement of waste collection vehicle is shown in Table 3-21. The purchase unit price is referred from the application for JICA's Grand Aid Project. Based on the price, the total cost for the procurement in 2026 - 2027 and 2030 - 2031 was calculated. The overall budget planning regarding waste collection of the Department of Environment and Sanitation of Juba City Council is described in Figure 4-2 in Chapter 4 and the overall budget planning regarding waste collection of the Blocks is described in Figure 4-3 in Chapter 4.

Table 3-21 Budget Planning for Procurement of Waste Collection Vehicle

[Unit: Thousand SSP]

Type	2023 ¹			2026 - 2027			2030 - 2031		
	No. of Vehicle	Unit Price (SSP/vehicle)	Total Price (SSP)	No. of Vehicle	Unit Price (SSP/vehicle)	Total Price (SSP)	No. of Vehicle	Unit Price (SSP/vehicle)	Total Price (SSP)
Compactor (12 m ³)	20	-	-	8	21,875	175,000	14	21,875	306,250
Dump Truck (10 m ³)	4	-	-	4	17,500	70,000	4	17,500	70,000
Container Carrier (8 m ³)	10	-	-	0	0	0	0	0	0
Container (8 m ³)	29	-	-	0	0	0	0	0	0

¹ No amount due to procurement through JICA grant aid.

Source: Project Team

3.9 Workshop

3.9.1 Basic Concept of Workshop

Table 3-22 shows the schedule for maintenance of waste collection vehicles and equipment, and workshop of Juba City Council. The number of waste collection vehicles of the Department of Environment and Sanitation of Juba City Council will increase due to the procurement by JICA and the service area will be extended, therefore the maintenance of the vehicles is very important. A maintenance system based on "preventive maintenance", which is a regular maintenance of vehicles and equipment in accordance with maintenance plan, will be established by 2025, the mid-term target year. Preventative maintenance will avoid the failures and problems that may cause stagnation of SWM in Juba. The workshop of Juba City Council has the responsibility for maintenance of waste collection vehicles and facilities. As mentioned above, they will implement not only preventative maintenance but also inventory control, procurement plan for spare parts, instruction of appropriate operation and maintenance for drivers and workers, and training of mechanics. The New Workshop will be constructed by JICA Grant Aid Project and the existing workshop will be used as a garage. Currently the mechanics are not well-trained hence only minor repairs are done at the existing workshop. Until the new workshop is constructed, the maintenance of waste collection vehicles will be implemented at the existing workshop or through outsourcing. Juba City Council will utilize the existing workshop even if the new workshop is constructed. Training for mechanics shall be implemented through soft component at New Workshop to improve the management system regarding maintenance.

By 2025, the long-term target year, it is required to accumulate useful data for maintenance by appropriately managing data related to daily and regular inspections and inventory management of spare parts.

Table 3-22 Schedule for Maintenance and Workshop

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term	Establishment of Maintenance System Based on Preventive Maintenance [Priority Measure 3-3]					→						
	Development of Workshop [Priority Measure 3-4-2]					→						
	Appropriate Operation and Management of Equipment [Measure 3-5]						→					
Long-term	Development of Data Management System [Measure 1-6]											→

3.9.2 Establishment of Maintenance System Based on Preventive Maintenance [Priority Measure 3-3]

(1) Concept of Preventative Maintenance

Preventive maintenance shall be implemented as a basic maintenance policy. Preventive maintenance is the regular maintenance by well-planned inspection, repair, and parts replacement in order to ensure the stable operation of vehicles, equipment and facilities. By implementing preventive maintenance, it is possible to know the condition of equipment and to take appropriate maintenance measures. It not only prevents the occurrence of failures, but also enables efficient and systematic operation safely for a long time. The workshop of Juba City Council is responsible for maintenance of waste collection vehicles, and Rejaf Payam has the responsibility to maintain heavy equipment.

(2) Daily Inspection by Drivers

Drivers are supposed to inspect their vehicles by themselves. They need to make sure if their vehicles has no problem for the operation when they start and finish the work everyday. It prevents the occurrence of failures by preventative maintenance. It is necessary to prepare “Daily Inspection Sheet” summarizing the minimum items to be checked on a daily basis and drivers inspect the vehicle in accordance with it. The workshop of Juba City Council needs to plan training of daily inspection for drivers. The items of the inspection sheet and frequency will be described in “Regulation for Maintenance of Vehicles, Equipment and Facilities of SWM”. If a failure or defect are found by daily inspection, drivers need to report it immediately to the supervisor and take necessary measures at a vehicle maintenance workshop.

(3) Regular Inspection by Mechanics at Workshop

In addition to daily inspections by drivers, regular inspections by mechanics will also be conducted. This periodic inspection is to inspect and confirm whether the safety of waste collection vehicles is ensured, and shall be conducted once a year basically. In order to discover factors that may affect the safety, inspections are conducted mainly to check parts inside the vehicle that cannot be confirmed through daily inspection.

(4) Outsourcing of Repair

If vehicles become inoperable due to a failure discovered through daily inspection by drivers or regular inspection by mechanics, or due to a problem caused by a sudden accident, the vehicles need to be brought to the workshop of Juba City Council first. If the workshop cannot repair the vehicles, they need to consider outsourcing repairs. There are some private workshops in Juba, and they are well-equipped and they have well-trained mechanics comparing to the workshop of Juba City Council. Depending on the level of failure, the workshop of Juba City Council will decide if they can repair by themselves or not, and then repair it as soon as possible.

3.9.3 Development of Workshop [Priority Measure 3-4-2]

In 2023, a new workshop will be constructed in the site next to the existing workshop by JICA Grant Aid Project. Juba City Council needs to maintain the waste collection vehicles by regular maintenance and repair in order to extend the life of the vehicles and reduce the operation and maintenance cost. The New Workshop has 3 bays; (1) for daily work, (2) for inspection and repair of lower part of vehicles and (3) long-term repair. In addition, the workshop has space for car wash outside. The draft outline of New Workshop is shown in Table 3-23 and the schedule of construction of New Workshop is shown in Table 3-24.

Table 3-23 Proposed Outline of New Workshop

Item	Building outline	Facilities	Number	Floor Area (m ³)
New Workshop	<ul style="list-style-type: none"> • Structure: Reinforced Concrete Frame Structure • Roof: Hot-Dip Aluminum-Zinc Alloy-Coated Steel Sheet t=0.8 • Wall: Concrete block masonry , Paint on Mortar • External wall: Concrete block masonry, Paint on Mortar • Floor: Concrete Steel trowel finish (Working Bay, Storage),tiled (Office) • Hygienic equipment: Water supply system, Oil & water separator, Soak Pit, Rain Water Tank • Electrical equipment: Electric capacity required at the facility 10kVA (230/415V), 1 Generator (30kVA) 	Working Bay	1	150.00
		Storage	1	36.43
		Generator	1	15.83
		Office	1	52.27
		Stair (Outside)	1	17.56
		Washing Space (Outside)	1	60.10
		Total Building Floor Area (Without Washing Space)		

records and training for drivers and mechanics.

(2) Instruction for Maintenance of Heavy Equipment

Rejaf Payam has the responsibility for the maintenance of heavy equipment. Since Rejaf Payam doesn't own their workshop, they need to request the repair to private workshops. Daily inspection before and after work by the heavy equipment operator at JCDS is implemented. One bulldozer, backhoe loader and dump truck will be procured by JICA, therefore Rejaf Payam needs to establish operation and maintenance system through soft component.

(3) Instruction for Management of Maintenance Equipment

The Department and Environment and Sanitation is responsible for management of maintenance equipment to be provided by JICA. As same as waste collection vehicles and heavy equipment, the mechanics need to implement daily inspection from viewpoint of preventative maintenance. New maintenance equipment and tools will be provided by JICA, therefore it is important to conduct soft component to establish proper appropriate management system.

3.9.5 Development of Data Management System [Measure 1-6] [Reshown]

Regarding the development of data management system for maintenance, it is considered to manage data of daily and regular maintenance and inventory data on spare parts at workshop. In addition to preparing inspection sheets for daily inspections and regular inspections, it is important to hold trainings for drivers on daily inspection work, and establish a system that enables inspection work to be conducted properly. The inspection sheets should be kept for a certain period to check for signs of failure. For inventory control of spare parts, it is necessary to prepare a checklist so that the required quantities of spare parts can be used where needed, when needed, and by the people who need them. When spare parts are used, they must be recorded on an inventory checklist, and when the number of spare parts is less than the required number, additional spare parts are procured. Records should be made on the checklist when spare parts are replenished as well. It is necessary to implement inventory work regularly and update the data regarding spare parts.

3.9.6 Human Resources Planning

Table 3-25 shows the number of workers required at workshop by year. Some mechanics who repairs waste collection vehicles and a head of mechanic who organizes the workshop are necessary. It is necessary to incread the number of mechanics since the number of waste collection vehicles increase as well by JICA Grant Aid. After that, self procurement of vehicles are being planned, therefore the workshop of Juba City Council needs to consider the increase in number of mechanics as well as utilization of private workshop.

Table 3-25 Human Resources Planning at Workshop

Position	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Head of Mechanics	1	1	1	1	1	1	1	1	1	1	1
Mechanics	2	2	2	6	6	6	6	6	6	6	6
Assistant Mechanics	1	1	1	3	3	3	3	3	3	3	3
Office Assistant	1	1	1	1	1	1	1	1	1	1	1

3.9.7 Budget Planning

The budget planning for workshop is described in Figure 4-2 in Chapter 4.

3.10 Intermediate Treatment and Recycling

3.10.1 Basic Concept of Intermediate Treatment and Recycling

Table 3-26 shows the schedule for intermediate treatment and recycling. In the mid-term plan, recyclable collection at schools shall be implemented. Schools shall be considered as recyclable collection points and the students will bring “waste” from their houses and private collectors will collect the waste as resources. The resources to be collected are assumed to be plastics including PET bottles. In addition to the recyclable collection at schools, it shall be also recommended to promote self-treatment at home by the residents to reduce the waste amount.

In the long-term plan, Juba shall archive the construction and operation of feed conversion plant and plastic recycling facility by PPP scheme. In order to recycle food waste discharged mainly from restaurants, markets, hotels, food factories into feed for livestock, the construction and operation of feed conversion plant and plastic recycling facility will be planned. A certain level of separation ability is required, such as removal of unsuitable materials for recycling and quality maintenance of raw materials. Therefore, the cooperation of residents and private sector is essential. Juba will verify the significance and effectiveness of intermediate treatment and recycling, and request cooperation from the residents and private sector through public relations, public awareness and environmental education activities. It is important to encourage private sector inside and/or outside South Sudan to promote recycling of not only food waste and plastics but also the other resources.

Table 3-26 Schedule for Intermediate Treatment and Recycling

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term & Long-term	Promotion of Intermediate Treatment and Recycling in Collaboration with Private Sector [Measure 4-2-1]											
	(1) Recyclable Plastic Collection at Schools											
	(2) Promotion of Self-Treatment at Home											
Long-term	(3) Construction and Operation of Feed Conversion Plant and Plastic Recycling Facility											

3.10.2 Promotion of Intermediate Treatment and Recycling in Collaboration with Private Sector [Measure 4-2-1]

Cooperation with the private sector is important to promote intermediate treatment and recycling in Juba. As main measures, "collection of recyclable plastics at schools", "promotion of self-treatment of waste at source" and "construction and operation of recycling facilities" are planned. Private collectors shall collect recyclable plastics from schools and private companies shall be invited by PPP scheme, and a feed conversion plant and plastic recycling facility shall be constructed and operated by the private company. The waste management flow regarding intermediate treatment and recycling for mid-term plan is shown in Figure 3-12 and the one for long-term plan is shown in Figure 3-13.

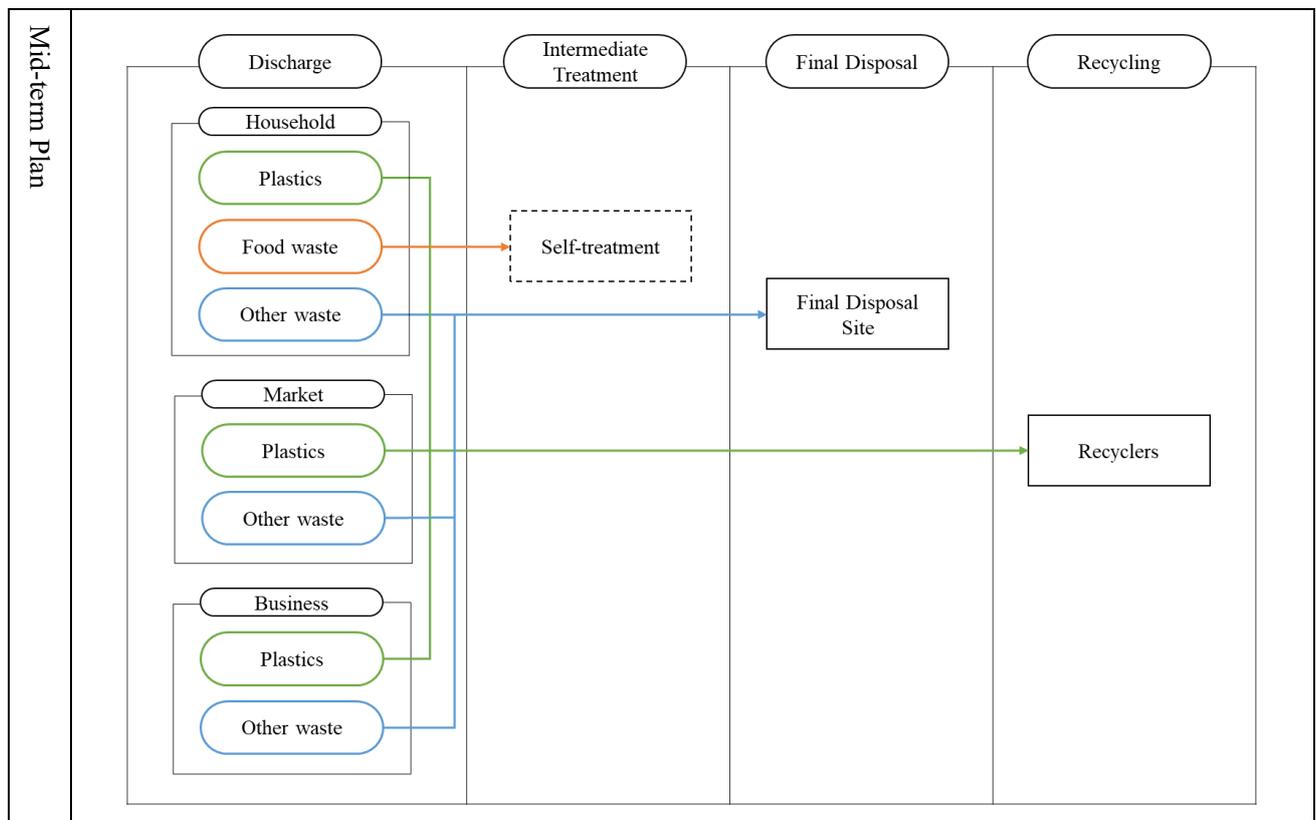


Figure 3-12 Waste Intermediate Treatment and Recycling Flow (2025)

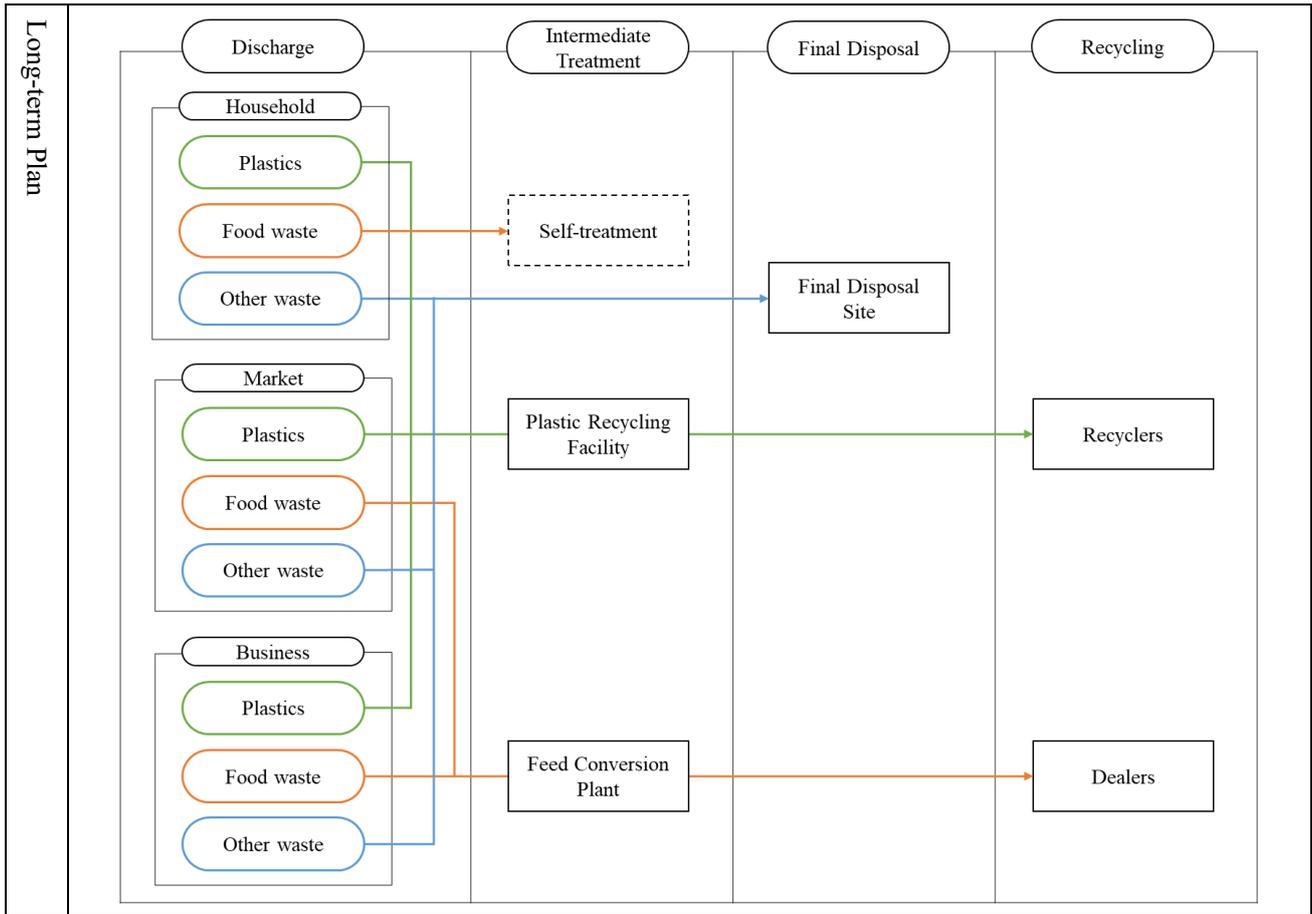


Figure 3-13 Waste Intermediate Treatment and Recycling Flow (2030)

(1) Recyclable Plastic Collection at Schools

The cooperation with private sector is highly necessary to implement recyclable plastic collection at schools. The waste management flow regarding recyclable collection is shown in Figure 3-14. The blocks has the responsibility for the recyclable collection with the support of QCs, but private collectors shall collect recyclables from the schools in practice. The schools and private collectors which are interested in the activity needs to be registered by the blocks in advance. The blocks and QCs shall provide the information of private collectors to the schools. After the approval of the blocks, the schools shall make a contract with a private collector and decide the type of recyclables to be collected, frequency of collection etc. During the implementation, schools are required to report the amount of recyclables collected in a month to the blocks. Based on the report, the blocks will provide waste bins and school equipment as a reward. Awareness of waste segregation and recycling among residents, children, students, and their parents, will be raised, and this will contribute greatly to the establishment of community-based SWM system and the formation of a sound material-cycle society. This activity will provide not only the business opportunity for the private sectors but also the strong relationship between the municipalities and private sectors.

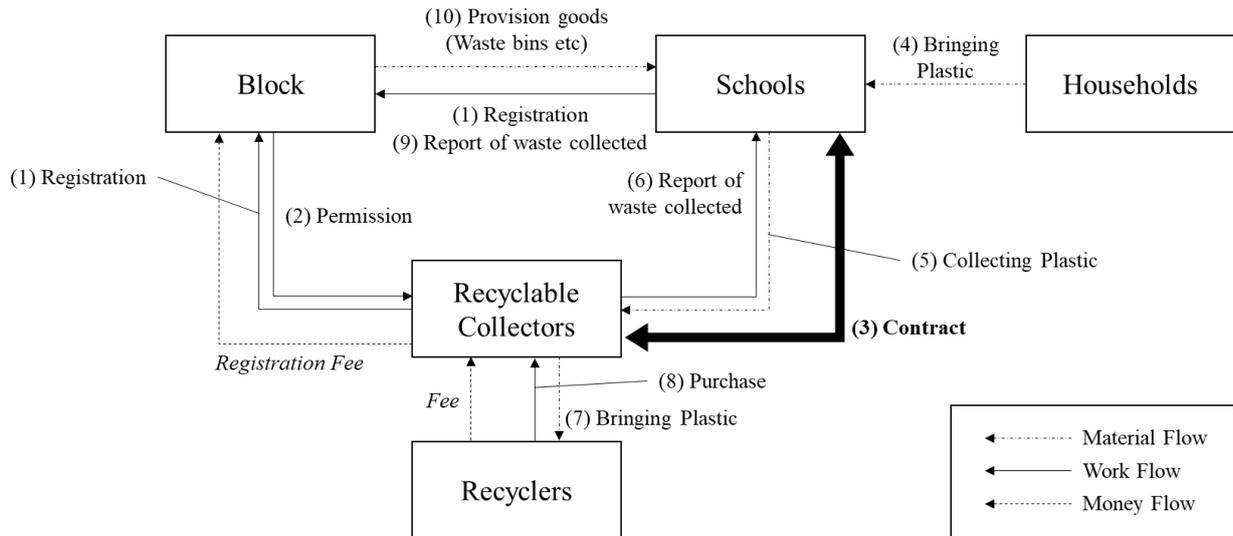


Figure 3-14 Flow of Recyclable Plastic Collection at Schools

(2) Promotion of Self-Treatment at Home

“Self-treatment” means the reduction of waste at home by composting food waste. In order to convert household food waste into compost, it is necessary to separate it into biodegradable waste and undegradable waste. There are some points to be noted for composting, but basically the process of composting is produced only by the power of microorganisms, hence composting can be carried out without much effort. The compost produced can be effectively used in home gardens as a safe organic fertilizer without using chemical fertilizer. In order to encourage the resident’s self-treatment at home, the SWM manager and public awareness promoters are required to conduct community meetings regularly.

(3) Construction and Operation of Feed Conversion Plant and Plastic Recycling Facility

As for the construction and operation of recycling facilities, Juba will basically consider inviting private companies inside and/or outside South Sudan through PPP scheme. PPP means Public Private Partnership, which is a method for improving the quality of public services, utilizing the funds, and operating the services efficiency through various know-how and technologies of private sector in cooperation between municipalities and the private sector. PPP includes “Private Finance Initiative (PFI)” and outsourcing. In addition to planning of PPP projects, it is necessary to establish a system to promote waste degradation through the development of laws, ordinances, and regulations regarding outsourcing of private sector, which are the basis for PPP. The schedule for construction and operation of recycling facilities is shown in Table 3-27.

Table 3-27 Schedule for Construction and Operation of Recycling Facilities

Item		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Legal Framework	Prepare Regulation for intermediate treatment and recycling		→									
Project Selection	Proposal of projects			→								
	Development and announcement of implementation policy			→								
	Evaluation, selection and announcement of project			→								
Private Operators Selection	Recruitment, evaluation, selection and announcement of private operators				→							
	Agreement and contract				→							
Project Implementation	Construction					→						
	Operation								→			
Public Awareness	Holding briefing meeting for residents				→							

1) Feed Conversion Plant

It is considered that a feed conversion plant shall be constructed and operated in order to recycle food waste discharged from businesses. Since the livestock industry is one of the main industries in South Sudan, there are many farmers, and it is considered that it is relatively easy to secure customers for feed. However, it is important to separate food waste according to the rules at the source. In order to produce feed, it is necessary to maintain the quality of food waste as a raw material, and it will become impossible to produce feed if inorganic substances such as glass are mixed. In addition, not only the quality but also the quantity of food waste is needed, therefore it is necessary to request cooperation from businesses such as restaurants, hotels, markets and food factories that regularly discharge large amounts of food waste,.

2) Plastic Recycling Facility

It is considered that a plastic recycling facility shall be constructed and operated in order to recycle plastics including PET bottles discharged from businesses and residents. Since drinking water is mostly supplied by PET bottles and plastic tanks by water tankers, many PET bottles and plastic containers are discharged in Juba. Therefore, the introduction of plastic recycling facility seems to contribute to waste reduction in Juba.

3.10.3 Human Resources Planning

With regard to intermediate treatment and recycling, the construction and operation of feed conversion plant and plastic recycling facility are entirely implemented by private operators, therefore it is considered that there is no need to secure the officers and workers of the municipalities. However, the administrative officers who will supervise the private operators are needed, hence the existing officers such as environmental officers and public health officers are required as a supervisor. The necessary number of drivers and collectors for recycling is mentioned in “3.8.7 Human Resources Planning”, and the ones for public awareness for recycling is indicated in “3.12.7 Human Resources Planning”.

3.10.4 Budget Planning

Since the construction and operation of feed conversion plant and plastic recycling facility are all entrusted to private operators under the PPP scheme. The necessary expenses to be paid by the Department of Environment and Sanitation of Juba City Council and blocks are only those related to collection, transportation and public awareness. The cost for collection and transportation is described in “3.8.8 Budget Planning”, and the one for public awareness is indicated in “3.12.8 Budget Planning”.

3.11 Final Disposal

3.11.1 Basic Concept of Final Disposal

Table 3-28 shows the schedule for final disposal. By 2025 as the target year of mid-term plan, JCDS is necessary to be rehabilitated. The repair of equipment and facilities damaged by the conflict will be implemented and the method of final disposal will be developed from open dumping to controlled dumping. Rejaf Payam aims to ensure the appropriate operation of JCDS by planning for the maintenance and procurement. Rejaf Payam is responsible for the management of the final disposal site, but the Department of Environment and Sanitation of Juba City Council shall support them by paying the disposal fee and removal of waste dumped along the access road of the dumping site.

By 2030 as the target year of long-term plan, it is necessary to strengthen facilities and equipment by heavy equipment provided by JICA Grant Aid Project, and start the establishment of data management system to record the amount of waste disposed, gate fee collected etc. This will accumulate data that will contribute to the remaining years and cost estimates of JCDS, and will enable to develop a plan including securing land for new final disposal site and reviewing the management system in the future. Juba has a difficulty of securing land, therefore Juba will continue to support the operation and management of JCDS and consider the construction of new final disposal site in neighbouring area to Juba in the future. Juba aims to reduce the waste dumped illegally by closing illegal dumping sites in Juba and the method of final disposal will be developed from controlled dumping to sanitary landfill.

Table 3-28 Schedule for Final Disposal

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term	Rehabilitation of Juba Controlled Dumping Site [Priority Measure 3-2]						→					
	Procurement Plan for Heavy Equipment [Priority Measure 3-4-3]						→					
Long-term	Closure of illegal Dumping Sites [Measure 3-6]							→	→	→	→	→
	Development of Data Management System [Measure 1-6]							→	→	→	→	→

3.11.2 Rehabilitation of JCDS [Priority 3-2]

In order to operate appropriate final disposal sites, it is necessary to develop not only technique but also operation and management. The development plan for the JCDS is shown in Table 3-29.

Table 3-29 Schedule for Planning for Development of JCDS

Item	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operation and Management											
Plan for operation, maintenance and management	→	→	→							→	→
Plan for rehabilitation	→	→	→							→	→
Plan for heavy equipment and facility	→	→	→							→	→
Development of data management system				→							
Plan for construction of new final disposal site									→	→	→
Land selection									→		
Land expropriation										→	
Design											→
Closure of JCDS											→
Facilities and Equipment											
Development											
Parking Space for heavy equipment and vehicle			■								
Fence / Gate			■								
Office			■								
Access road				■							
Road within JCDS				■							
Phase				■							
Embarkment				■							
Strengthening (New installation)											
Gas ventilation pipe					■						
Procurement											
Heavy equipment				■							
Dump truck for transporting of cover soil				■							

(1) Improvement of Operation and Management

It is necessary to formulate the mid-term and long-term operation plans in order to rehabilitate JCDS and aim sustainable operation. The operation plans consist of; (1) operation, maintenance and management plan including budget and human resources, (2) rehabilitation plan including renovations of fence, gate and access road and installation of gas ventilation pipes (3) plan for development of facility and equipment including construction of new landfill site and procurement schedule. In addition, it is important to collect data such as amount of waste transported and gate fee collected, accumulate and analyze the data continuously. The amount of waste brought and of gate fee will be recorded by landfill workers near the gate of JCDS. The filed workers will record the amount of waste landfilled in each phase. For the safe disposal of waste and the execution of compaction and soil covering, the filed workers will give the guidance for waste collectors where to dump their waste in accordance with the plan for landfilling. In addition, the existing final disposal site will be full around May 2032, it is necessary to consider of the construction of new dumping site. As already mentioned, since it is too difficult for Juba to secure land for a new final disposal site within the city, Juba City Council needs to consider and discuss the construction of new dumping site with related municipalities.

The selection, securing and design of candidate sites for new final disposal site shall be carried out by 2030 as the long-term target year. In addition, JRSWGM, the Department of Environment and Sanitation of Juba City Council and Rejaf Payam are required to have regular meetings for the evaluation and revision of operation plan depending

the situation. In 2030, the next mid-term and long-term plans shall be formulated by Rejaf Payam.

(2) Improvement of Facilities and Equipment

After the preparation of operation manuals and various plans, the facilities and equipment for JCDS will be developed. In 2023, heavy equipment and vehicle such as a bulldozer, backhoe loader and dump truck will be procured, therefore Rejaf payam needs to construct the parking space for the equipment. The fence, gate and office will be repaired in order to strengthen the security of the final disposal site and improve the environment for the heavy equipment and vehicles procurement by JICA. The management system at the final disposal site will be strengthened by improving the working environment for officers and workers stationed at the site. After the procurement, the other facilities and/or equipment such as phase, embankment, road inside the site and access road will be developed especially. This will not only make it easier to manage equipment and materials, but also to provide guidance to waste collectors. Gas ventilation pipes will be installed to conserve the surrounding environment and prevent the environmental accidents.

3.11.3 Procurement Plan for Heavy Equipment [Priority Measure 3-4-3]

Rejaf Payam has a bulldozer procured by JICA in August 2013, but the bulldozer has been broken for a long time. Therefore a new bulldozer will be provided by JICA Grant Aid additionally. One backhoe loader will be procured to Rejaf Payam in order to cover waste with soil, rehabilitate JCDS and close the illegal dumping sites in Juba. The summary of heavy equipment to be procured by JICA is shown in Table 3-30. There is no plan to purchase any heavy equipment by 2030, which is the target year of the long-term plan, but a procurement plan should be considered for the future.

Table 3-30 Summary of Heavy Equipment to be Procured by JICA

Type	Capacity	Manufacturing Year
Bulldozer	600 m ³ / day	2023
Backhoe Loader	0.3 m ³ / day [loader]	2023
	1.1 m ³ / day [backhoe]	
Dump Truck	10 m ³	2023

3.11.4 Closure of Illegal Dumping Sites [Measure 3-6]

(1) Planning to Close Illegal Dumping Sites

The Plan for closure of illegal dumping sites can be divided into five categories: (1) investigation and information collection survey (2) adjustment of equipment and personnel; (3) restoration and closure of sites; (4) establishment of regulations; and (5) public relations, public awareness and environmental education. Those activities shall be implemented by JRSWMG and the Department of Environment and Sanitation of Juba City Council. Depending on the number and size of illegal dumping sites, the necessary equipment and personnel will be calculated and a comprehensive closure plan will be formulated. In order to prevent illegal dumping and littering in the future, it is

necessary to establish regulations and management systems, and to inform the residents and private waste collectors about the prohibition of illegal dumping, while proceeding with waste removal work in accordance with the closure plan. The prohibition of illegal dumping, and the fines and penalties are described in detail in the SWM Ordinance. In addition, JRSMG and the Department need to supervise those who litter waste, set up signboards prohibiting illegal dumping and conduct regular monitoring. In order to reduce the amount of waste dumped illegally by residents and the other dischargers, the municipality will regularly and repeatedly conduct public relations activities through Television and Social Networking Services to raise public awareness at community meetings, and provide environmental education to children at schools.

(2) Restoration of Illegal Dumping Sites

Restoration of illegal dumping sites shall be planned and carried out. Restoration means to return to the original condition, in this case, to return illegal dumping sites to the place where used to be clean. Basically heavy equipment which Rejaf Payam owns will be used, but it will be considered to rent another heavy equipment depending the current condition. When the amount of waste dumped is very small, the waste will be transported to JCDS and landfilled there. If the amount of waste littered is large, the waste at the illegal dumping site shall be compacted by the heavy equipment and then covered with soil.

3.11.5 Development of Data Management System [Measure 1-6] [Reshown]

The data of incoming waste and heavy equipment etc is necessary to be collected and accumulated, however, it is too difficult to record the amount of waste transported to JCDS accurately because the site doesn't have a weighbridge. It will be the most efficient way to install weighbridges basically but it will not be possible due to the lack of electric power at the site. Even though the quality of data will be lower comparing to using weighbridges, it will be possible to calculate amount of waste landfilled, remaining years and capacity by recording data. Rejaf Payam needs to prepare a format including for recording date and time of delivery, number of vehicles, name of delivery organization, driver's name, type of waste, collection area, amount of waste, amount of fee paid etc. The workers require the waste delivery organization to provide the necessary information in accordance with the format, and they will record all the information. The records of waste amount landfilled are also one of the data necessary for proper operation of the final disposal site. JCDS is designed by dividing the landfill area into four phases. Rejaf Payam needs to prepare the format to record the date of landfilling, phase number, amount of waste landfilled etc and the workers are required to record the data about landfilling waste consistent with the data about incoming waste. Rejaf Payam is requested to summarize the data, report it to JRSMG, identify issues and consider improvement measures and countermeasures. In order to manage the final disposal site properly, Rejaf Payam needs to make a management list which covers data about the heavy equipment and vehicle such as vehicle number, manufacturer, manufacturing year, capacity. Daily and regular inspection will be done by Rejaf Payam.

3.11.6 Human Resources Planning

1) The Department of Environment and Sanitation of Juba City Council and Blocks

The officers and/or workers of the Department of Environment and Sanitation of Juba City Council and Blocks shall not be stationed at final disposal sites.

2) Rejaf Payam

Human resources planning of Rejaf Payam for final disposal is shown in Table 3-31. Currently Rejaf Payam has applied for the establishment of the Department of Environment and Sanitation, but has not received the approval. Based on the breakdown of employees under the application, the necessary number of officers and workers were estimated. Those were divided into the administrative section and operation section for JCDS.

Table 3-31 Human Resources Planning of Rejaf Payam for Final Disposal

Position	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Director of Environment and Sanitation	1	1	1	1	1	1	1	1	1	1	1
D/Director of Environment and Sanitation	1	1	1	1	1	1	1	1	1	1	1
A/Manager of Solid Waste Management	1	1	1	1	1	1	1	1	1	1	1
Environment Officer	1	1	1	1	1	1	1	1	1	1	1
Dumping Site Supervisor	1	1	1	1	1	1	1	1	1	1	1
Heavy Equipment Officer	1	1	1	2	2	2	2	2	2	2	2
Driver	0	0	0	1	1	1	1	1	1	1	1
Dumping Site Worker	2	2	2	6	6	6	6	6	6	6	6
Watchman	2	2	2	2	2	2	2	2	2	2	2
Accountant	1	1	1	1	1	1	1	1	1	1	1
Revenue Officer	2	2	2	2	2	2	2	2	2	2	2

3.11.7 Budget Planning

1) The Department of Environment and Sanitation of Juba City Council and Blocks

The budget planning of the Department of Environment and Sanitation of Juba City Council and blocks for final disposal is indicated in Figure 4-2 and Figure 4-3 in Chapter 4.

2) Rejaf Payam

The budget planning for rehabilitation of JCDS is shown in Table 3-32. The other planned budget of Rejaf Payam for final disposal is described in Figure 4-4 in Chapter 4.

Table 3-32 Budget Planning for Rehabilitation of JCDS

Item	Unit Price (SSP)	Quantity	Total Amount (SSP/year)	Implementing Year	Remarks	
Improve ment	Fence / Gate	12,300	2,500	30,750,000	2022	
	Office	158,700	1	158,700	2022	
	Access Road	23,400	24	5,616,000	Every Year (twice/month)	Cost for waste removal
	Road Inside JCDS	-	-	-	2023	Using the heavy equipment procured by JICA

Item		Unit Price (SSP)	Quantity	Total Amount (SSP/year)	Implementing Year	Remarks
	Phase	-	-	-	2023	Using the heavy equipment procured by JICA
	Embarkment	-	-	-	2023	Using the heavy equipment procured by JICA
New Installation	Parking Space	12,300	60	738,000	Before 2023	
	Gas ventilation Pipes	146,700	12	1,760,400	After 2024	
Procurement	Bulldozer	-	-	-	2023	JICA Grant Aid
	Backhoe Loader	-	-	-	2023	JICA Grant Aid
	Dump Truck	-	-	-	2023	JICA Grant Aid
New Dumping Site	Design	83,333,000	1	83,333,000	2030	Including on-site survey

Source: JICA Study Team

3.12 Public Relations, Public Awareness and Environmental Education

3.12.1 Basic Concept of Public Relations, Public Awareness and Environmental Education

Table 3-33 shows the schedule for public relations, public awareness and environmental education. Juba aims to establish a community-based SWM system that requires the cooperation of residents through starting household waste collection, promoting self-treatment at home, and recycling. For those activities, it is important that the residents have correct knowledge and participate in SWM, hence the municipality in Juba such as JRSWGM and the Department of Environment and Sanitation of Juba City Council need to provide information related SWM such as the concept of “Waste Discharger Responsibility Principle” and “Polluter-Pays Principle” to the residents through public relations, public awareness and environmental education.

By 2025 as the target year of mid-term plan, it is necessary to strengthen the implementing organization to start fixed-time and fixed-place collection of household waste with the residents. Juba is planning to promote waste reduction by self-treatment at home, therefore it is necessary to provide useful information through community meetings and leaflets, signboards etc. Those public awareness activities will be implemented in collaboration with the SMW manager and public awareness promoters of the Department of Environment and Sanitation of Juba City Council, blocks and QCs.

By 2030 as the target year of long-term plan, the municipalities in Juba needs to implement environmental education to the residents, especially the children focusing on waste reduction.

Table 3-33 Schedule for Public Relations, Public Awareness and Environmental Education

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term	Implementation of “Fixed-Time and Fixed-Place Waste Collection” in Collaboration with Residents [Priority Measure 2-2] [Reshown]											
	Appointment of SWM Manager and Public Awareness Promoters [Priority Measure 2-5-1] [Reshown]											
	Holding Regular Community Meetings with Residents [Priority Measure 2-5-2]											
	Public Awareness Promotion for Self-Treatment of Waste at Source and Waste Reduction [Measure 2-6]											
Long-term	Promotion of Environmental Education for Waste Reduction [Measure 4-2-2]											

3.12.2 Implementation of “Fixed-Time and Fixed-Place Waste Collection” in Collaboration with Residents [Priority measure 2-2] [Reshown]

JRSWVG will lead the implementation of fixed-time and fixed-place waste collection in cooperation with the leaders of the target areas and residents. After the selection of target areas, community meetings will be held regularly to explain the purpose of fixed-time and fixed-place waste collection and collection method to the residents. Prior preparation includes the installation of sign boards indicating the date, time and the method of waste collection, and the distribution of leaflets to residents. During the implementation, officers in charge from the Department of Environment and Sanitation of Juba City Council need to inspect the status of discharging waste and provide guidance to residents on waste discharging rules and appropriate management of waste collection points. Before, during and after the implementation, it is required to improve the waste collection by residents' opinions provided in community meetings. Various educational tools necessary for the introduction of fixed-time and fixed-place waste collection were prepared (Appendix-9).

3.12.3 Appointment of SWM Manager and Public Awareness Promoters [Priority Measure 2-5-1] [Reshown]

In order to develop SWM in Juba, the Department of Environment and Sanitation of Juba City Council and Blocks need to establish a system for the implementation of participatory SWM in cooperation with QC. The SWM manager and public awareness promoters provide the information on SWM to the residents and private dischargers. In particular, it is assumed that they will play an important role in the introduction of fixed-time and fixed-place waste collection. They will plan to have community meetings, clean-up campaigns and provide useful information including discharge methods and collection schedules for the fixed-time and fixed-place waste collection, and response to the residents' complaints.

3.12.4 Holding Regular Community Meetings with Residents [Measure 2-5-2]

It is important to foster awareness and ownership for SWM by holding regular community meetings and providing opportunities for residents to participate. The topics may include (1) the current situation of SWM in the community, (2) the level of understanding and satisfaction with fixed-time and fixed-place waste collection, (3) willingness to

pay and acceptable payments, (4) the validity and improvement of waste collection methods, and (5) sharing of knowledge on waste collection. According to the result of social awareness survey conducted in the Project, most of the residents answered that they obtained the knowledge on discharge of household waste from family, community leaders and community meetings therefore holding regular community meetings is important to raise the residents' awareness for SWM.

3.12.5 Public Awareness Promotion for Self-Treatment of Waste at Source and Waste Reduction [Measure 2-6]

Community meetings will be held regularly in the future to explain to the residents how to separate waste and how to cooperate in waste reduction and recycling. Clean-up campaign will also be held in order to remove waste from the residential area and road, prohibit littering and keep the environment clean. A bulletin board at the Ministry of Environment and Forestry and Juba City council will be set up to provide information on SWM, and leaflets will be distributed.

3.12.6 Promotion of Environmental Education for Waste Reduction [Measure 4-2-2]

Since official environmental education curriculums and programs are not in place, JRSWGM will take the lead in holding seminars for the residents on waste segregation and self-treatment methods, and regularly issuing newsletters to promote environmental education for waste reduction.

3.12.7 Human Resouces Planning

1) The Department of Environment and Sanitaiton of Juba City Council

Human resouces planning for public relations, public awareness and environmental education of the Department of Environment and Sanitaiton of Juba City Council is shown in Table 3-34. The Department will have three officers as public awareness promoters in charge of public relations, public awareness and environmental education and supervising the blocks and QCs.

Table 3-34 Human Resouces Planning for Public Relations, Public Awareness and Environmental Education of the Department of Environment and Sanitaiton of Juba City Council

Position	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Public Awasreness Promoter	3	3	3	3	3	3	3	3	3	3	3

2) Blocks

Human resouces planning for public relations, public awareness and environmental education of the blocks is shown in Table 3-35. The blocks will have officers as public awareness promoters in charge of public relations, public awareness and environmental education. The number of officers will increase year by year.

Table 3-35 Human Resources Planning for Public Relations, Public Awareness and Environmental Education of the Blocks

Position	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Public Awareness Promoter	0	0	15	20	26	31	37	42	48	53	59

3.12.8 Budget Planning

Budget Planning of the Department of Environment and Sanitation of Juba City Council, blocks and Rejaf Payam regarding Public Relations, public awareness and environmental education is mentioned in Figure 4-2 and Figure 4-3 in Chapter 4.

3.13 Finance

3.13.1 Basic Concept of Finance on Solid Waste Management

Table 3-36 shows the schedule for finance. Juba aims to establish and strengthen fee collection system for securing financial resources and to establish transparent and systematic budget compilation, execution and reporting process for the purpose of stabilizing and restoring the finance on SWM.

In the mid-term plan by 2025, it is planned to review the current fee collection system, introduce systematic budget management using independent accounts. The fee collection from households by the blocks and QCs will be started, and the Department of Environment and Sanitation of Juba City Council will strengthen the fee collection for market and commercial waste collection. In addition, it is expected to strengthen waste collection system of Juba by the procurement of waste collection vehicles by JICA Grant Aid Project and relation-building with private sector. In accordance with the plans, it is important to secure the finance resources by strengthening fee collection system. The Department of Environment and Sanitation of Juba City Council has an independent account specialized on SWM but they don't make good use of the account. It is recommended to improve the transparency of budget including revenue and expenditure through using the account.

In the long-term plan by 2030, it is planned to introduce "budget assessment" for the transparency and sustainability of budget requested. In order to understand the whole SWM activities in Juba, it is important to compile the annual report and the annual plan for following fiscal year on SWM every year. Those two documents will include all the activities on SWM such as waste collection and public awareness done in a year, and balance of revenue and expenditure, therefore all information on SWM will be available in this document.

Table 3-36 Schedule for Finance

Category	Related Measures	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mid-term & Long-term	Revision of Fee Collection System [Measure 1-7]											
	Start of Fee Collection for Household Waste Collection [Priority Measure 1-8]											
Mid-term	Strengthening Fee Collection for Market and Commercial Waste Collection [Measure 1-9]											
	Transparent and Planned Budget Management Using Independent Accounting [Measure 1-10]											
Long-term	Introduction of Budget Assessment [Measure 1-11]											
	Compilation of Annual Report and Annual Plan [Measure 1-12]											

3.13.2 Revision of Fee Collection System [Measure 1-7]

Figure 3-15 shows the fee collection system for SWM in Juba. The main sources of revenue of the Department of Environment and Sanitation of Juba City Council are market waste collection fee, commercial waste collection fee from large-scale dischargers, licensing fees for private collectors, penalties and fines. As of 2020, Juba City Council has a registration system of private waste collectors, but the number of official registered collectors are very small. Instead of that, a lot of waste collectors, more than the registered collectors, were found during the incoming vehicle survey conducted in 2020, and some of them usually dumps waste illegally within Juba, therefore it is necessary to strengthen collection of fee for licensing of private collectors, penalties and fines. The target for charging penalties and fines is not only waste collectors but also dischargers who dumps waste illegally. In case of private dischargers such as hotels and markets, the Department of Environment and Sanitation of Juba city Council needs to collect the penalties and fines. In case of residents, each block should charge the cost on them. The waste collection vehicles to be procured by JICA Grant Aid Project will be provided to the Department of Environment and Sanitation of Juba City Council and blocks, but the Department have a responsibility of the management of all the vehicles. However, the blocks will bear the expenses for regular maintenance and repair of their waste collection vehicles, hence the Department will charge the cost the blocks every month. The main sources of revenue of the blocks is household waste collection fee. The blocks collect tax for all administrative services but waste collection fee is excluded. Since the procedure for changing the tax system is expected to be unclear and difficult, the blocks will collect waste collection fee separately from the tax. These resources will be used to secure operation and maintenance costs on SWM. However, it is difficult to secure funds for the procurement of new waste collection vehicles with only those revenue, therefore it is necessary to consider the external funds from international aid agencies.

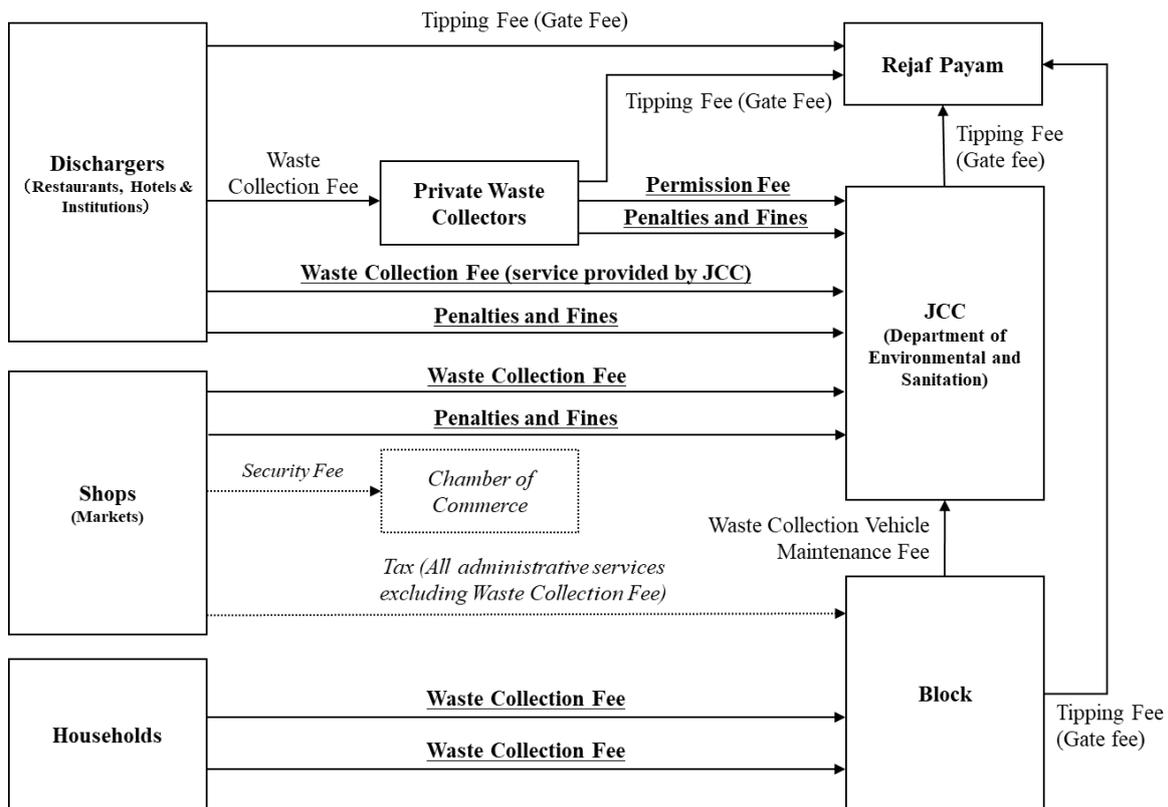


Figure 3-15 Fee Collection System for SWM in Juba

3.13.3 Start of Fee Collection for Household Waste Collection [Priority Measure 1-8]

As of 2020, Juba doesn't collect fee from the residents since they don't provide sufficient household collection services to them. In the mid-term plan, fee collection for household waste will be started in accordance with the implementation of community-participatory waste collection and strengthening officers and workers of municipalities. The collection of household waste shall be carried out by "fixed-time and fixed-place waste collection", and it is assumed that the target area is gradually expanded, and fee collection shall be also implemented according to the waste collection plan. Rate collectors of blocks visit each household and collect the fee for waste collection. The detailed information regarding fee collection such as amount of fee to be collected from each household, target, fee collection date and method etc will be noted in "Regulation for Fee Collection". The rate and amount of fee will be changed before and after JICA Grant Aid Project. Until 2022, the standard amount will be 250 SSP / household / month based on the results of household waste collection collection experimentally conducted by blocks in 2020. After 2023, the standard amount will be 430 SSP / household / month based on the results of social awareness survey in some target areas by JICA in 2020. According to the survey, approximately 80% of the residents answered that they were willing to pay the waste collection fee and the result showed that 430 SSP / household / month would be appropriate. The average monthly income of the residents in the study area was 5,200 SSP, which represents about 8% of their monthly income. According to "What a Waste 2.0 (World Bank, 2018)", the average amount of waste collection fee in Sub-Saharan Africa is 10 – 40 USD / year (108 - 434 SSP monthly equally), therefore 430 SSP / household / month is reasonable.

3.13.4 Strengthening Fee Collection for Market and Commercial Waste Collection [Measure 1-9]

The Department of Environment and Sanitation of Juba City Council aims to establish sustainable SWM through strengthening fee collection for market and commercial waste collection, which is one of the main sources of revenue of the Department.

Regarding market waste collection, rate collectors of the Department will visit the shops of each market and collect the fee directly from them. As preparation, the Department is required to make a list of markets and shops in collaboration with the Chamber of Commerce at each market. This list is important to grasp the number of shops and calculate the amount of fee to be collected, and it must be updated accordingly. When the rate collectors visit markets, they need to bring the list and request the shops which paid the waste collection fee to sign on the list after the fee collection. This list can help to distinguish the shops which already paid the fee and the other shops which don't pay it in every month. If there are some shops which do not accept the payment of fee, rate collectors need to follow up those shops by visiting them again and again. The Department of Environment and Sanitation of Juba City Council and/or JRSWVG are required to request the shops as supervisors if the situation does not change. The amount of fee, target, frequency and method will be described in "Regulation for Fee Collection".

3.13.5 Transparent and Planned Budget Management Using Independent Accounting [Measure 1-10]

The Department of Environment and Sanitation of Juba City Council has a bank account for SWM. Originally, the SWM costs should be managed in this bank account, but now the fee collected is managed without being deposited in the account. The SWM costs of the Department of Environment and Sanitation of Juba City Council are planned to be independent from the general account of the Juba City Council. However, expenditures often exceed revenues and they are financially supported by the central government, the state government and the Juba City Council Headquarters, therefore it is not ensured the financial independence and transparency. Improving fiscal and budgetary transparency and planning is a necessary requirement for the stable operation of appropriate SWM, hence Juba aims to review and strengthen its budget management system by making effective use of existing bank account. The fee for household waste collection shall be collected by rate collectors of blocks and the fee for market and commercial waste collection shall be collected by rate collectors of the Department of Environment and Sanitation of Juba City Council. The fees collected by the rate collectors shall be delivered to the officers in charge of finance of each organization with a list of collection results including payees and amount collected etc. After confirming that the actual amount of money collected and the records match, the officers in charge of finance shall deposit money into the bank account for the management of SWM costs. The officers in charge of finance need to keep an account book according to the flow of money. The amount of revenues and expenditures can be accurately grasped by recording the flow of money in the books. Bank account records and the account books can be used effectively when considering future SWM project plan.

3.13.6 Introduction of Budget Assessment [Measure 1-11]

(1) Concept of Budget Assessment

Budget assessment is to examine the suitability and adequacy of budget requested for SWM plans. In order to implement stable financial management in the future, it is necessary to prepare an appropriate budget plan for each fiscal year and implement projects according to the plan. The municipalities need to introduce budget assessment to expand their services with limited budget.

(2) Implementation of Budget Assessment

The management flow of budget assessment is shown in Figure 3-16. Budget assessment can be divided into three steps; (1) Compilation and submission, (2) Explanation and discussion and (3) Assessment. The budget plan will be prepared and submitted by the blocks and the Department of Environment and Sanitation of Juba City Council as the implementing organization for SWM. Each block need to prepare their own budget plan and explain it to the Department of Environment and Sanitation of Juba City Council and the Department is required to explain overall budget plan to the officers and manager in charge of budget management in the Department. After the assessment, it is necessary to report the result to the senior management such as director and deputy director of the Department for the approval.

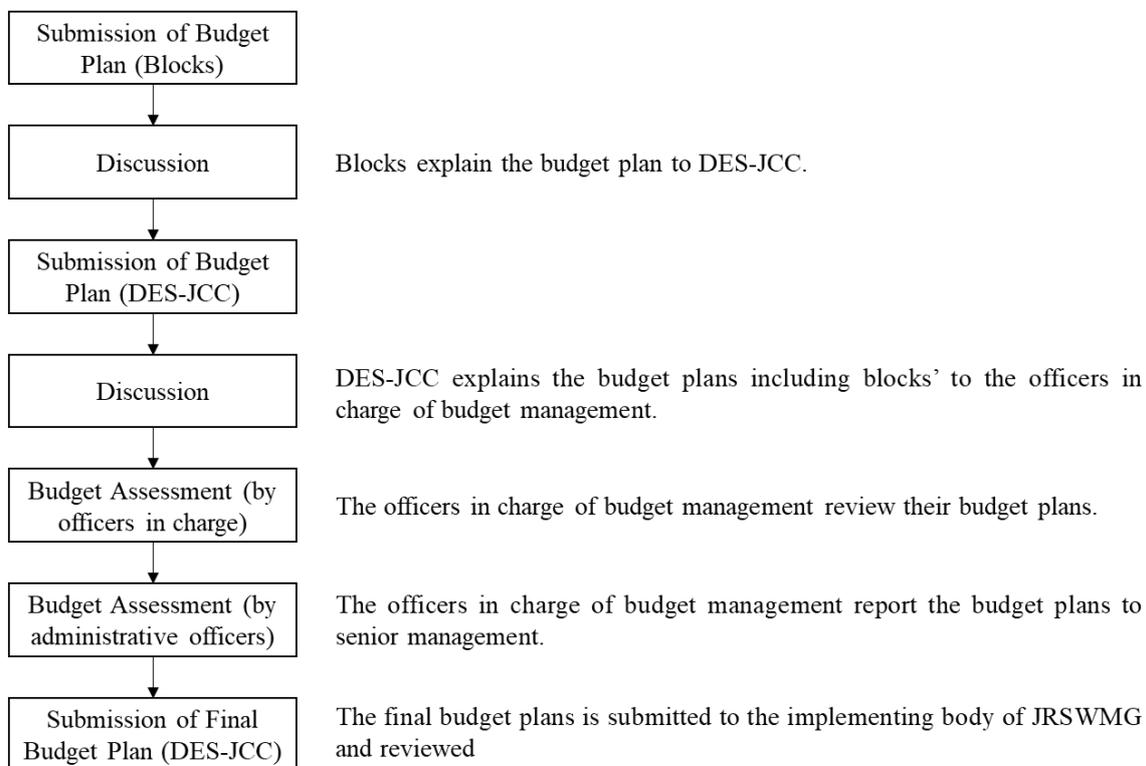


Figure 3-16 Management Flow of Budget Assessment

(3) Budget Compilation

The blocks is supposed to submit their budget plan to the Department of Environment and Sanitation of Juba City Council. Officers in charge of budget planning of each organization needs to set standard unit price referring to the past SWM cost, and determines the budget request content. In the case of continuing projects, the budget plan will be prepared by using the basic unit price set with reference to the operating expenses of the previous fiscal year. In the case of new projects, it is impossible to set standard unit price from their experience, hence the cost shall be calculated based on the implementing plan on SWM. On the other hand, officers in charge of budget assessment shall confirm questions regarding the budget estimation with the officers in charge of budget planning based on the document submitted by them. During the assessment, the officers in charge of budget assessment need to request correction if they find some failures on it. The officers in charge of budget assessment are required to confirm whether the budget requested is suitable with budget compilation policy and SWM plan. The budget plan shall be revised if it is difficult to be approved. Through this process, final budget plan shall be compiled by the Department of Environment and Sanitation of Juba City Council, submitted to the implementing body of JRSWVG, and requested for the approval of the executive body of JRSWVG. After the Mayor, the leader of JRSWVG, approved, the budget shall be allocated to each organization. The management flow of budget compilation is shown in Figure 3-17. Since the entire process is expected to take about five to six months, it is necessary to calculate the budget back from the first month of the new fiscal year.

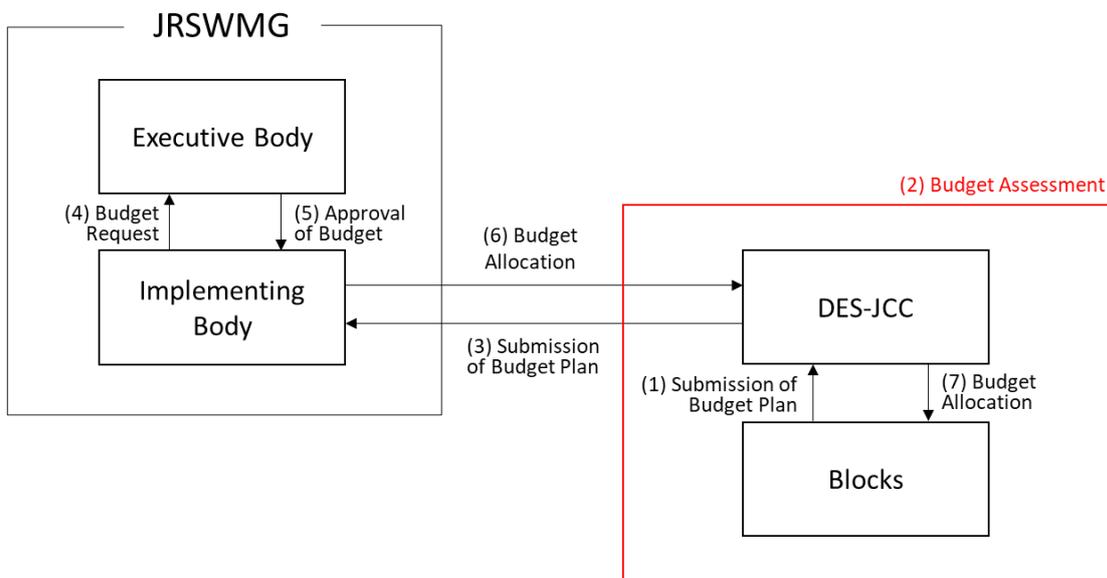


Figure 3-17 Management Flow of Budget Compilation

3.13.7 Compilation of Annual Report and Annual Plan [Measure 1-12]

(1) Annual Report of Solid Waste Management

The implementing body of JRSWVG needs to prepare the annual report of SWM in collaboration with the Department of Environment and Sanitation of Juba City Council and the blocks every year. This report is necessary

to be submitted to the executive body of JRSWGM and approved by the Mayor as the leader of JRSWGM. The proposed contents for the annual report is shown in Table 3-37.

Table 3-37 Proposed Contents for Annual Report

No.	Item	Contents
1	Legal Development	Establishment and revision of laws, ordinances and regulations related to SWM, renewal of Master Plan etc
2	Organization and Human Resources Management	Organization structure, number of officers and workers, officers in charge, demarcation, results of trainings etc
3	Collection and Transportation	Type of waste, actual amount of waste collected, collection area, collection frequency, implementing organizations, situation of waste collection, actual amount of waste transported to a final disposal site, method of waste collection, challenges, specification and number of waste collection vehicles, working days, time and vehicles etc
4	Intermediate Treatment and Recycling	Type of target recyclables, actual amount of recyclables collected, collection area, collection frequency, implementing organizations, situation of waste collection, challenges, specification and number of vehicles, actual amount of waste transported to recyclers, working days, time and vehicles etc
5	Final Disposal	working days and time, number of workers, total area, capacity of each phase, actual amount of waste transported, situation of waste removal from the access road, situation of illegal dumping etc
6	Maintenance / Workshop	Operation results of workshops, procurement of waste collection vehicles and heavy equipment, results of maintenance and repair etc
7	Public Relations, Public Awareness and Environmental Education	Results of community meetings, business briefing sessions and clean-up campaigns etc
8	Finance / Budget	Balance of revenue and expenditure related to all the activities above

(2) Annual Plan of Solid Waste Management

The Annual Plan of Solid Waste Management which shows the activities plan for the following fiscal year, is prepared by the implementing body of JRSWGM, the Department of Environment and Sanitation of Juba City Council, and Blocks. After the annual plan is submitted to the executive body of JRSWGM and approved by the Mayor as the leader of JRSWGM, the annual plan becomes valid. The annual plan will be prepared based on the results from the previous year. The proposed contents for annual plan is shown in Table 3-38.

Table 3-38 Proposed Contents for Annual Plan

No.	Item	Contents
1	Legal Development	Laws, ordinances and regulations related to SWM, master plan etc
2	Organization and Human Resources Management	Organization structure, number of officers and workers, officers in charge, demarcation, training plan etc
3	Collection and Transportation	Type of waste, planned amount of waste collected, collection area, collection frequency, implementing organizations, method of waste collection, planned amount of waste transported to the final disposal site, specification and number of waste collection vehicles, planned working days and time etc
4	Intermediate Treatment and Recycling	Type of recyclables, planned amount of waste collected, collection area, collection frequency, implementing organizations, planned amount of recyclables transported to recycling facilities, specification and number of waste collection vehicles, planned working days and time etc
5	Final Disposal	Planned working days and time, plan for landfilling, number of workers, capacity of each phase, planned amount of waste transported to the final disposal site, plan for

		closing illegal dumping sites, plan for removal of waste along the access road of the final disposal site, design of the final disposal site etc
6	Maintenance / Workshop	Operation plan of workshops, plan for procurement of waste collection vehicles and heavy equipment, plan for maintenance and repair etc
7	Public Relations, Public Awareness and Environmental Education	Plan for community meetings, business briefing sessions and clean-up campaigns etc
8	Finance / Budget	Budget plan including revenue and expenditure related to all the activities above

CHAPTER 4 FINANCIAL REQUIREMENTS

4.1 Precondition

Expenditure and revenue associated with Solid Waste Management over the period of 2020 to 2030 is estimated with the breakdown shown in Table 4-1. Details of precondition and calculation is given in APPENDIX-12.

Table 4-1 Breakdown of Expenditure and Revenue

	Organization	Category	Items
Expenditure	Department of Environment and Sanitation of Juba City Council (JCC-DES)	Waste collection and transportation	Equipment Cost (Waste collection vehicles), Wages and Salaries, Fuel Cost, Tipping fee, Supplies expenses, Overhead expenses
		Workshop	Construction Cost, Wages and Salaries, Maintenance Cost (including outsource cost), Utilities, Overhead expenses
		Public Relations, Public Awareness and Environmental Education	Wages and Salaries, Public relation cost, Overhead expenses
		General administrative expenses	
	Blocks	Waste collection and transportation	Wages and Salaries, Fuel Cost, Maintenance Cost, Tipping fee, Overhead expenses
		Public Relations, Public Awareness and Environmental Education	Wages and Salaries, Public awareness cost, Administrative cost, Overhead expenses
		General administrative expenses	
	Rejaf Payam	Final Disposal	Equipment Cost (Landfill), Construction Cost (Parking of heavy equipment), Construction Cost (improvement of existing dumping site), Designing fee for new landfill site, Wages and Salaries, Fuel Cost, Operation Cost, Maintenance Cost, Overhead expenses
		General administrative expenses	
	Revenue	Department of Environment and Sanitation of Juba City Council (JCC-DES)	External Revenue Sources
Independent revenue sources			Waste collection fee (Market), Waste collection fee (Business), Permission fee of private operators, Waste collection vehicle maintenance fee, Fines
Blocks		External Revenue Sources	Subsidy from State Government, Subsidy from JCC-DES
		Independent revenue sources	Waste collection fee (Household)
Rejaf Payam		External Revenue Sources	Subsidy from State Government, International cooperation
		Independent revenue sources	Tipping fee

4.2 Expenditure

4.2.1 Total Expenditure

Total expenditure of Solid Waste Management in JCC-DES, Blocks, and Rejaf Payam over the period of 2020 to 2030 is estimated as approx. 4,267 million SSP. Table 4-2 shows the details of expenditure by year and organization. Capital expenditure (CAPEX) of Solid Waste Management such as procurement cost for waste collection vehicles and improvement construction cost of dumping site is approx. 1,383 million SSP (approx. 32 % of total expenditure). Operation cost (OPEX) of Solid Waste Management is approx. 2,885 million SSP (approx. 68 %). As shown in Figure 4-1 by category, expenses for “Waste collection and transportation” is higher (approx. 70 %). Expenses for final disposal is then approx. 15 %, expenses for “Workshop” is approx. 7 %, and expense for “Public Relations, Public Awareness, Environmental Education” is approx. 5 % and “Others” is approx. 3 %.

Table 4-2 Total Expenditure for Solid Waste Management (2020-2030)

Items	Standard					Mid-term					Long-term (thousand SSP)		Total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030		
CAPEX	5,616	5,985	36,894	776,616	5,616	5,616	128,116	129,876	33,394	33,394	221,519	1,382,641	
JCC-DES	0	0	0	676,000	0	0	122,500	122,500	0	0	188,125	1,109,125	
Rejaf Payam	5,616	5,985	36,894	100,616	5,616	5,616	7,376	7,376	33,394	33,394	33,394	273,516	
OPEX	87,631	89,314	94,728	263,677	268,200	271,955	288,048	365,005	359,535	363,962	432,590	2,884,645	
JCC-DES	72,462	72,661	72,661	132,772	134,494	135,798	146,303	166,814	161,518	163,349	184,572	1,443,405	
Blocks	1,352	2,836	8,250	92,359	95,082	97,455	102,966	152,668	152,624	155,359	202,687	1,063,637	
Rejaf Payam	13,817	13,817	13,817	38,546	38,624	38,701	38,779	45,522	45,394	45,254	45,331	377,603	
Total	93,247	95,299	131,622	1,040,293	273,816	277,571	416,164	494,881	392,929	397,356	654,109	4,267,286	

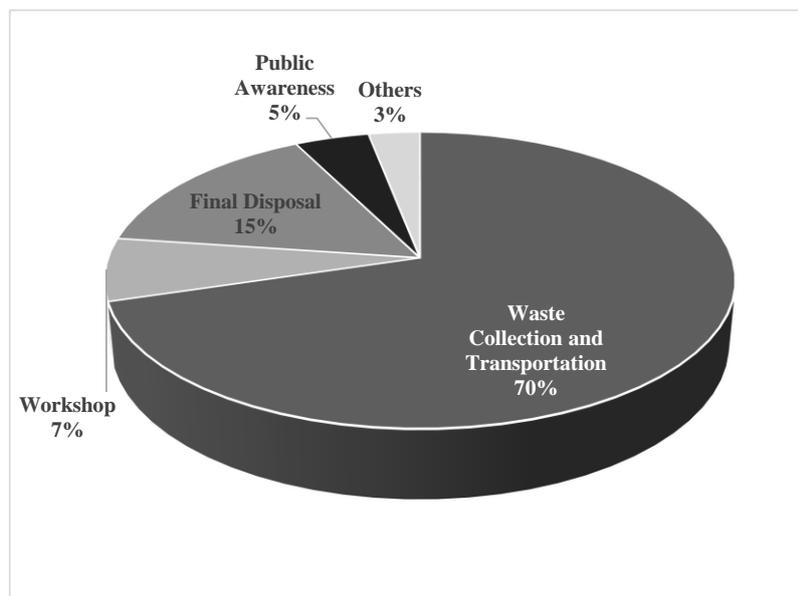


Figure 4-1 Expenditure of Solid Waste Management by Category

4.2.2 The Department of Environment and Sanitation of Juba City Council

Total expenditure of Solid Waste Management in JCC-DES for 10 years is approx. 2,553 million SSP. Figure 4-2 shows the details of expenditure by year and category. Expenditure of 2023 is extreme because of the CAPEX associated

with JICA Grant Aid. Procurement of waste collection vehicles by own budget is also planned in 2026-2027 and 2030-2031. Fund for construction of new landfill site will be accumulated and reserved from 2027. Unit cost for OPEX (cost per 1ton of waste collected) is estimated between approx. 6,848 SSP/ton (Average between 2020 and 2022) and approx. 2,132 SSP/ton (average between 2023 and 2030).

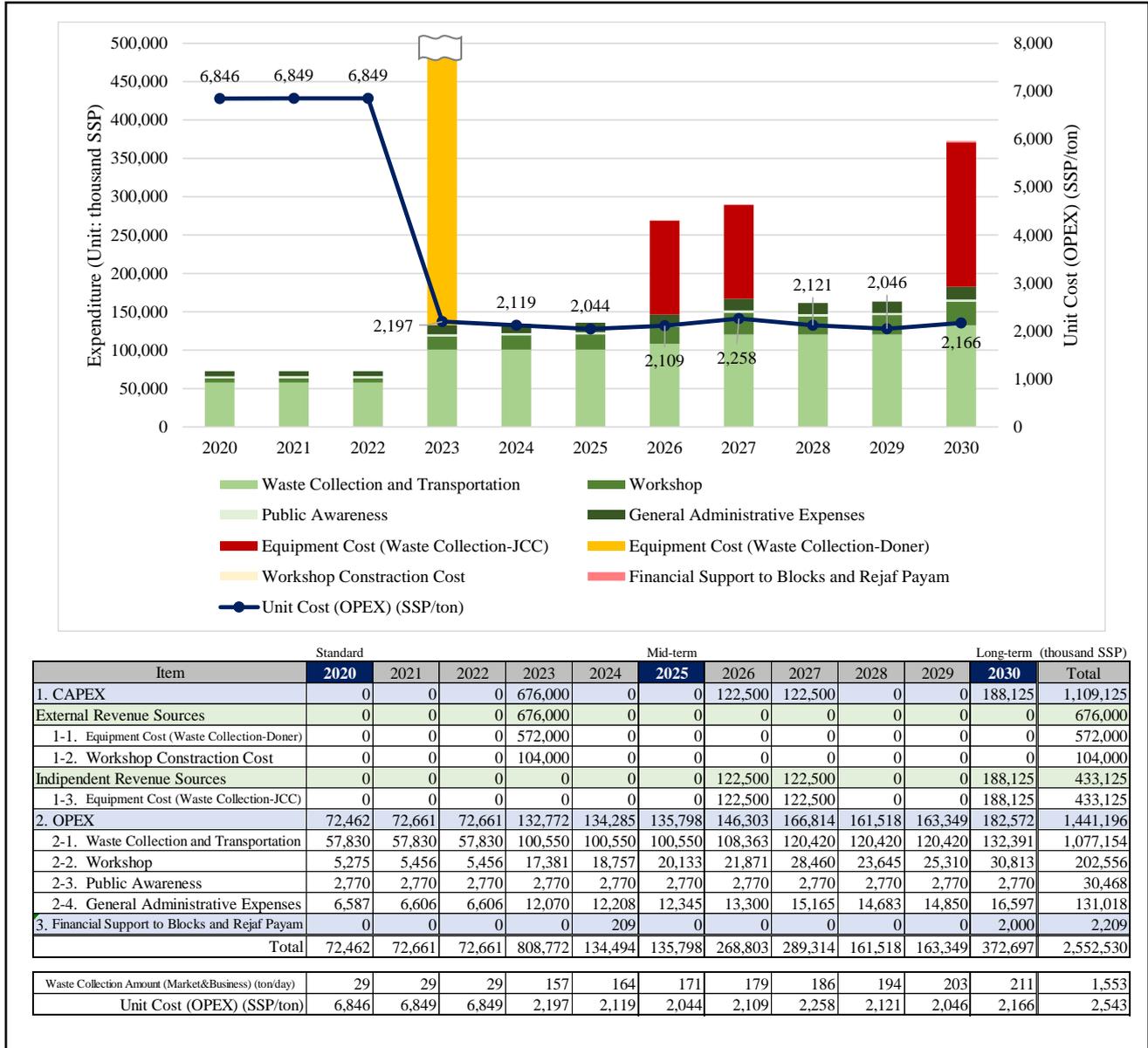


Figure 4-2 Expenditure of Solid Waste Management in JCC-DES

4.2.3 Blocks

Total expenditure of Solid Waste Management in Blocks for 10 years is approx. 1,064 million SSP. Figure 4-3 shows the details of expenditure by year and category. Major portion of expenses is associated with waste collection and transportation (approx. 85 %) and remainings are associated with public awareness and administrative cost for fee collection. Expenses from 2020 to 2022 is extremely low because waste collection service by Blocks will be provided after 2023 (on trial bases from 2021 to 2022).

Unit cost for OPEX (cost per 1ton of waste collected) after 2023 is estimated between 2,632 SSP/ton and 1,746 SSP/ton.

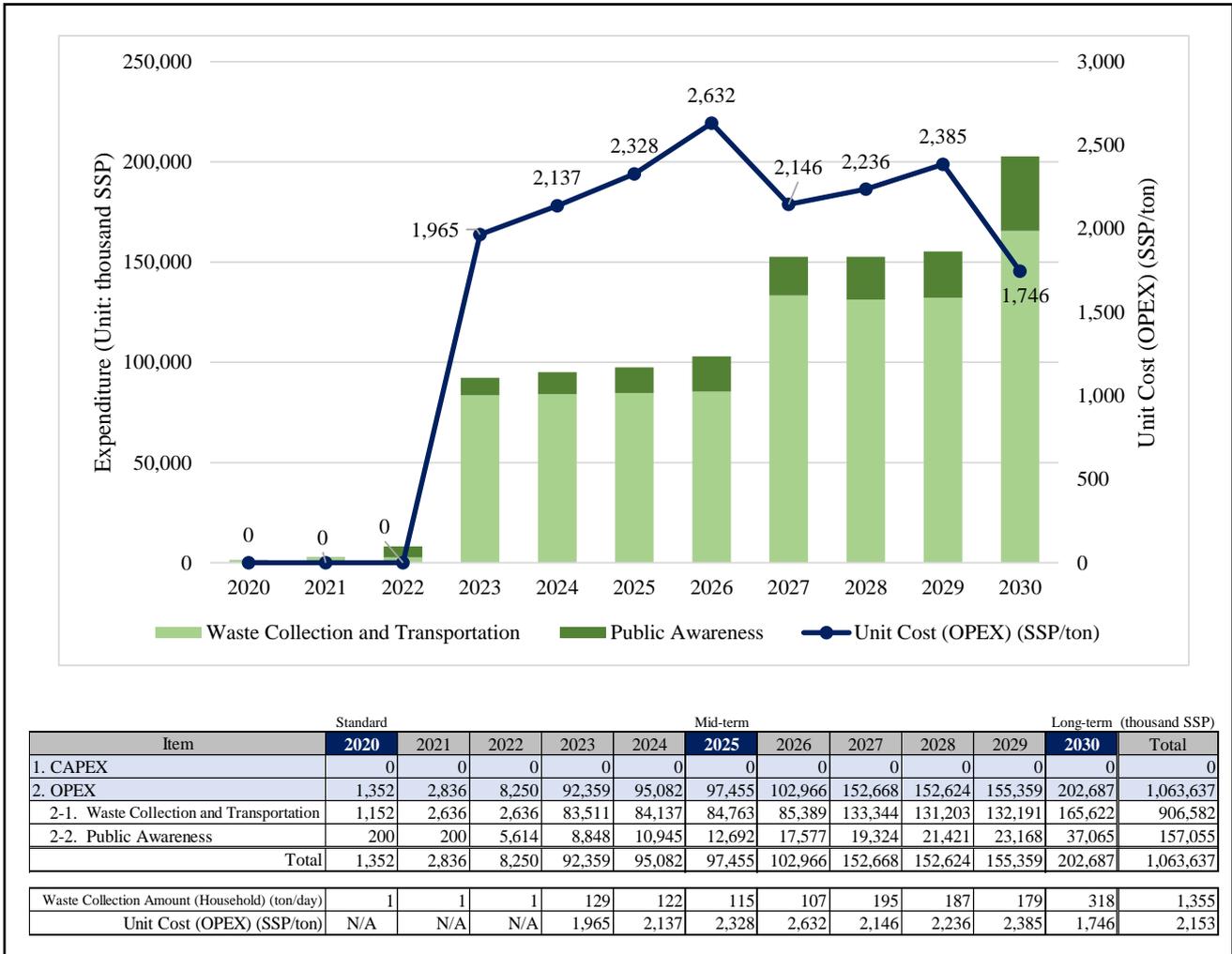


Figure 4-3 Expenditure of Solid Waste Management in Blocks

4.2.4 Rejaf Payam

Total expenditure of Solid Waste Management in Rejaf Payam for 10 years is approx. 651 million SSP. Figure 4-4 shows the details of expenditure by year and category. CAPEX associated with infrastructure of Juba Final Disposal Site is approx. 274 million SSP (approx. 42 %) and remaining approx. 58 % is for OPEX such as salaries and fuel cost for landfill operation. The procurement of heavy equipment and vehicle by JICA Grant Aid Project is planned in 2023, hence the total expenditure in 2023 is higher rather than another years.

Expenditures for improvement work are expected in 2022, as the construction and improvement of existing disposal sites are required prior to the installation of equipment. The cost for the removal of waste dumped along the access road of JCDS is expected to be paid every year. The new dumping site need to be constructed after 2031, hence the expenditure excluding the construction cost is accumulated from 2028.

Unit cost for OPEX (cost per 1ton of waste landfilled) after 2023 is estimated between 757 SSP/ton (2020) and

220 SSP/ton (2030).

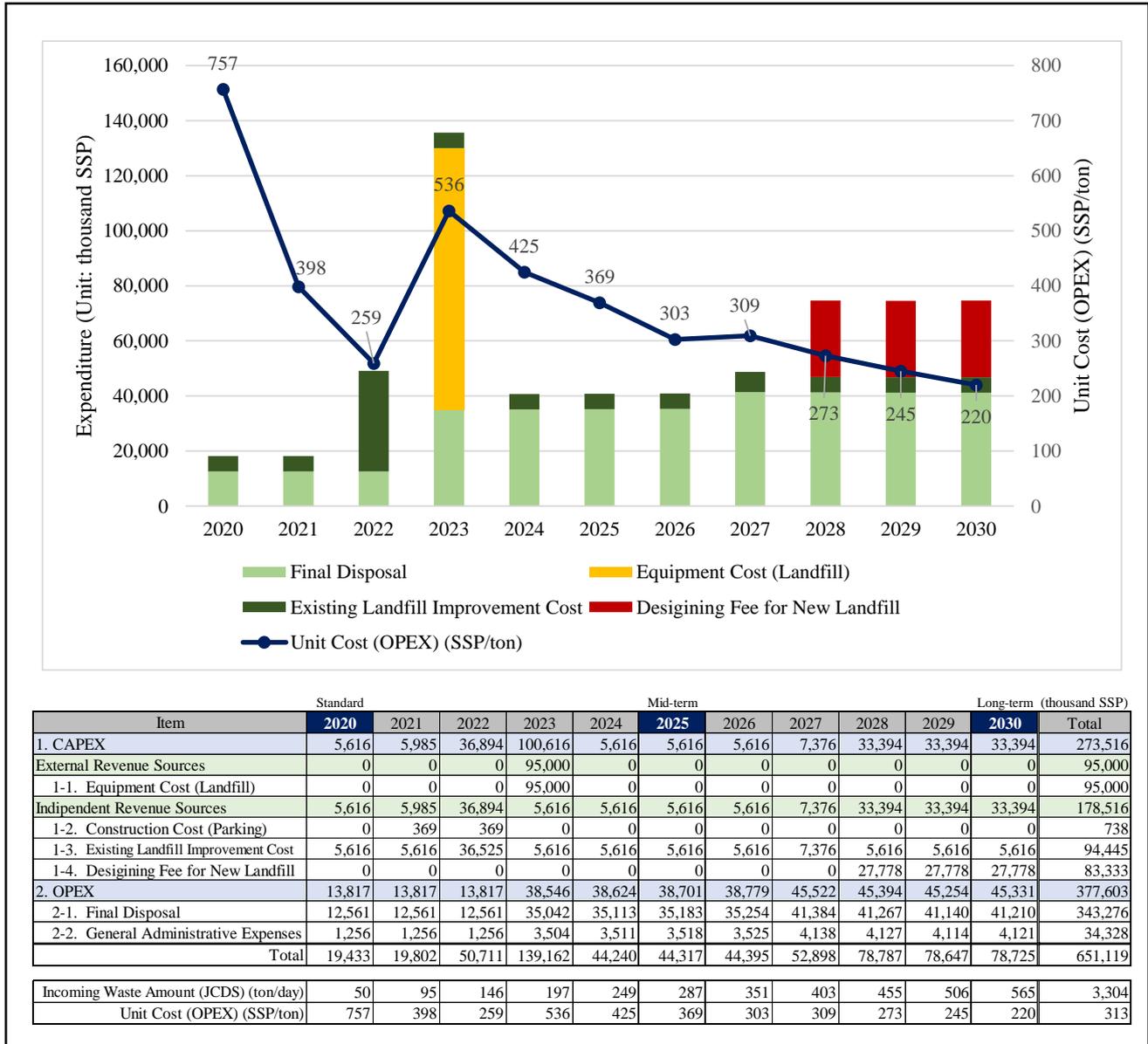


Figure 4-4 Expenditure of Solid Waste Management in Rejaf Payam

4.3 Revenue

4.3.1 Total Revenue

Total revenue of Solid Waste Management in JCC-DES, Blocks and Rejaf Payam over the period of 2020 to 2030 is estimated as approx. 4,719 million SSP. Table 4-3 shows the details of revenue by year and organization, and Figure 4-5 shows the details of revenue of solid waste management by category. Revenue from external revenue sources, covering mainly CAPEX, is approx. 873 million SSP (approx. 19 %) and revenue from independent revenue sources, such as waste collection fee and tipping fee, is approx. 3,846 million SSP (approx. 81 %). Ratio of Independent

revenue sources of JCC-DES would be approx. 72 % because the portion of JICA Grant Aid is high. Waste collection fee for Blocks and tipping fee for Rejaf Payam are supposed to cover the major amount of expenses. Therefore, ratio of independent revenue of Blocks and Rejaf Payam is expected to be higher at approx. 98 % and approx. 90 % respectively.

Table 4-3 Total Revenue for Solid Waste Management (2020-2030)

Items	Standard			Mid-term							Long-term (thousand SSP)	
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
External Revenue Sources	24,335	23,644	29,068	772,356	1,565	1,356	1,368	1,620	1,620	1,620	3,788	873,310
JCC-DES	24,335	23,638	22,989	677,056	1,056	1,056	1,068	1,116	1,116	1,116	1,152	755,698
Blocks	0	6	6	300	509	300	300	504	504	504	2,636	16,539
Rejaf Payam	0	0	6,072	95,000	0	0	0	0	0	0	0	101,072
Independent Revenue Sources	75,217	77,912	79,023	304,716	341,329	380,284	405,488	500,334	516,680	539,432	625,216	3,845,631
JCC-DES	48,127	49,023	49,672	131,716	165,346	201,249	218,462	240,307	256,149	275,579	298,498	1,934,128
Blocks	0	712	744	92,059	94,572	97,155	102,666	152,164	152,120	154,855	200,051	1,047,098
Rejaf Payam	27,090	28,177	28,608	80,941	81,411	81,880	84,360	107,863	108,411	108,998	126,667	864,405
Total	99,552	101,556	108,091	1,077,072	342,894	381,640	406,856	501,954	518,300	541,052	629,004	4,718,941

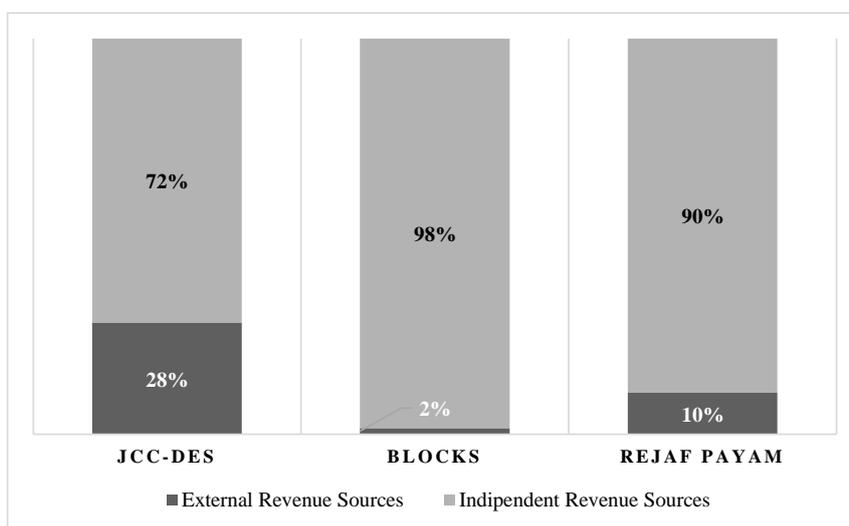


Figure 4-5 Details of Revenue Sources by Organization

4.3.2 The Department of Environment and Sanitation of Juba City Council

Total revenue of Solid Waste Management in JCC-DES for 10 years is approx. 2,690 million SSP. Figure 4-6 shows the details of revenue by year and category. External revenue sources are mainly i) subsidy from state government for wages and salaries (approx. 12 million SSP, 0.4 %), ii) JICA Grant Aid for equipment and facility construction (approx. 676 million SSP⁷, 25 %). Main independent revenue source is waste collection fee from market and business (approx. 1,737 million SSP, 65 %). However, these revenues are not sufficient, especially until 2022 due to lack of waste collection capacity and fee collections, and financial support from general account of JCC (approx. 68 million SSP) would be required.

In the mid-term plan, ratio of independent revenue sources would be approx. 99.5 % by reaching 75% of collection rate of waste collection fee from market and 50 % from business, and in the long-term goal, ratio of independent

⁷ This is estimated costs based on the application submitted by Juba in March 2016 for a grant aid project, and do not indicate costs approved by the Government of Japan.

revenue sources would be approx. 99.6 % by reaching 90% of collection rate of waste collection fee from market and 74 % from business. Independent revenue sources other than waste collection fee are permission fee of private operators, waste collection vehicle maintenance fee from Blocks and Fines, which consists of approx. 7 % of total revenue.

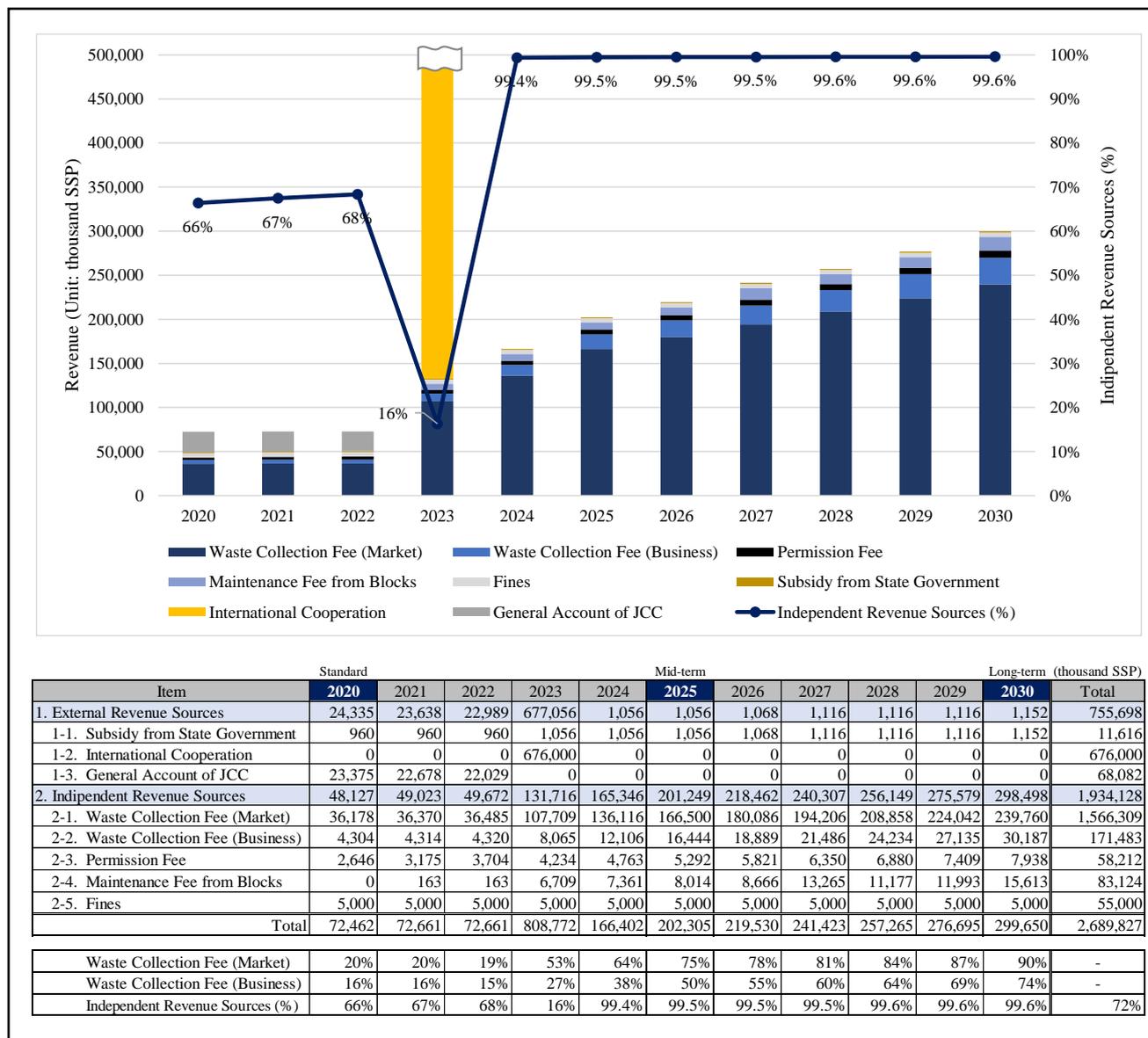


Figure 4-6 Revenue of Solid Waste Management in JCC-DES

4.3.3 Blocks

Total revenue of Solid Waste Management in Blocks over the period of 2020 to 2030 is approx. 1,064 million SSP. Figure 4-7 shows the details of revenue by year and category. External revenue sources are mainly subsidy from state government for wages and salaries (approx. 3 million SSP, 0.3 %). As avobe-mentioned, waste collection fee from household is supposed to cover the major expenses for waste collection. However, these revenues are not sufficient, especially until 2022 due to lack of waste collection capacity and fee collections, and financial support from general

account of Blocks (approx. 11 million SSP) would be required.

In the mid-term plan, ratio of independent revenue sources would be approx. 99.7 % by reaching 27 % of collection rate of waste collection fee from household, and in the long-term goal, ratio of independent revenue sources would be approx. 98.7 % by reaching 45 % of collection rate of waste collection fee from household.

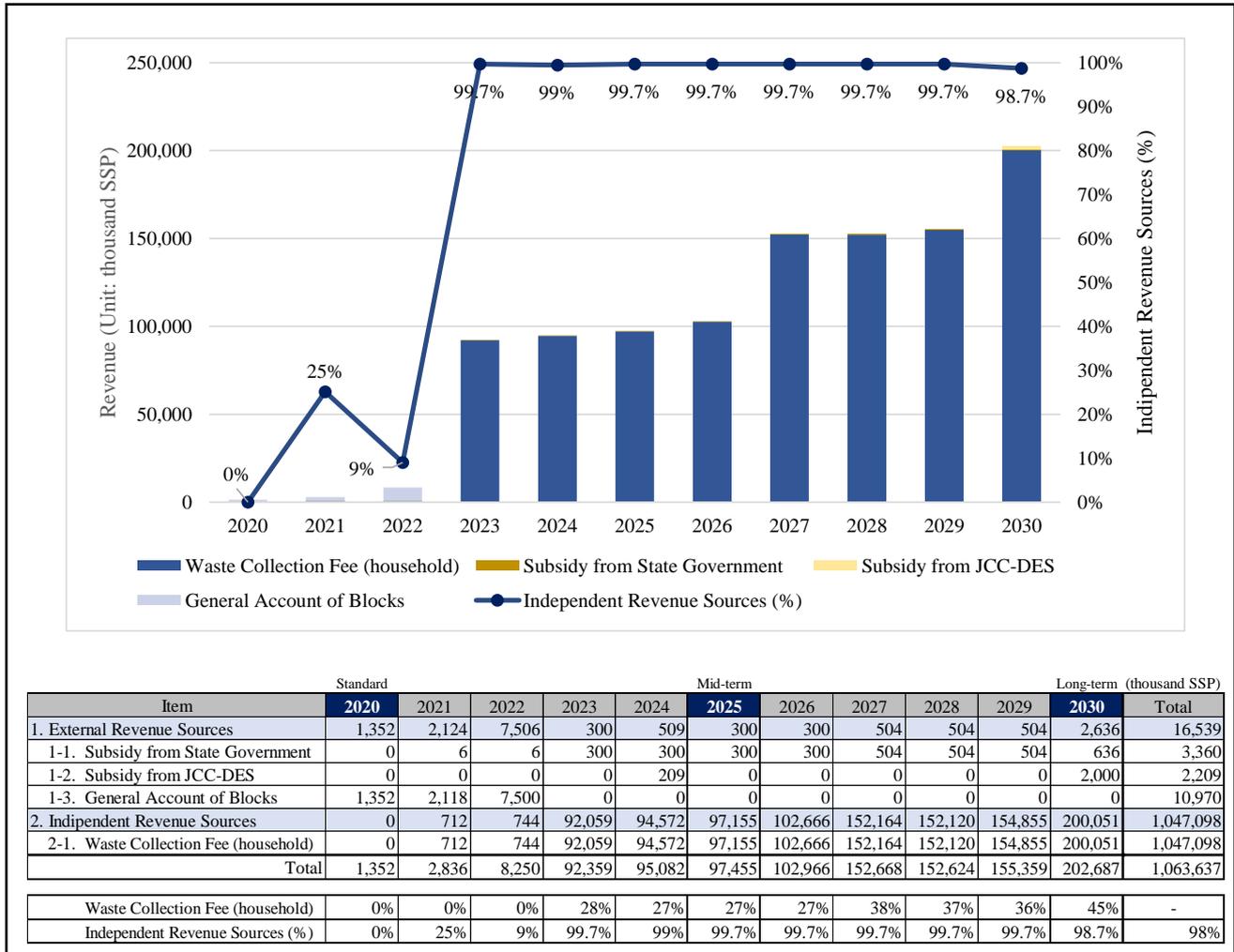
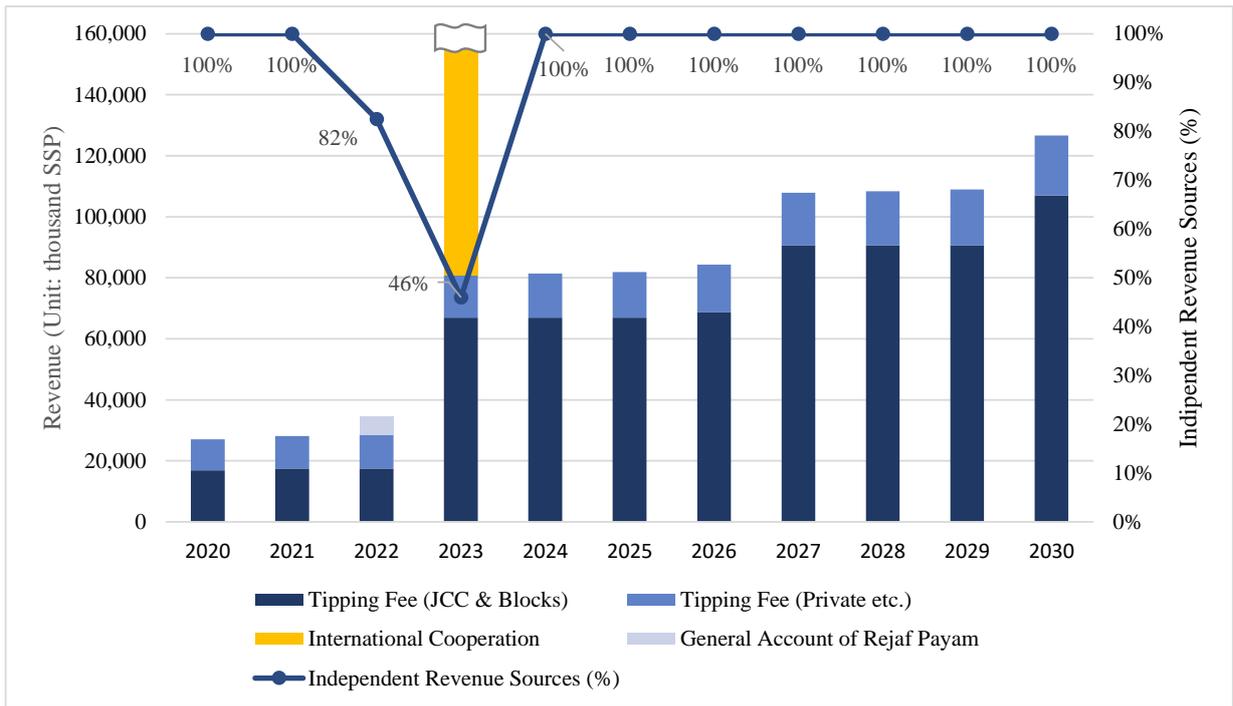


Figure 4-7 Revenue of Solid Waste Management in Blocks

4.3.4 Rejaf Payam

Total revenue of Solid Waste Management in Rejaf Payam over the period of 2020 to 2030 is approx. 965 million SSP. Figure 4-8 shows the details of revenue by year and category. Major independent revenue source is tipping fee collection at the Juba Final Disposal Site (approx. 864 million SSP, 90 %). As above-mentioned, tipping fee at JCDS is supposed to cover the major expenses for landfill. However, these revenues are not sufficient, especially until 2022 due to lack of equipment and fee collections, and financial support from general account of Rejaf Payam (approx. 6 million SSP) would be required. Surplus of the income will be used as a fund for construction of new landfill site after 2031.



Item	Standard			Mid-term						Long-term (thousand SSP)		Total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
1. External Revenue Sources	0	0	6,072	95,000	0	0	0	0	0	0	0	101,072
1-1. International Cooperation	0	0	0	95,000	0	0	0	0	0	0	0	95,000
1-2. General Account of Rejaf Payam	0	0	6,072	0	0	0	0	0	0	0	0	6,072
2. Independent Revenue Sources	27,090	28,177	28,608	80,941	81,411	81,880	84,360	107,863	108,411	108,998	126,667	864,405
2-1. Tipping Fee (JCC & Blocks)	16,894	17,520	17,520	66,951	66,951	66,951	68,829	90,729	90,729	90,729	106,997	700,800
2-2. Tipping Fee (Private etc.)	10,196	10,657	11,088	13,990	14,459	14,929	15,531	17,135	17,682	18,269	19,670	163,605
Total	27,090	28,177	34,680	175,941	81,411	81,880	84,360	107,863	108,411	108,998	126,667	965,477
Independent Revenue Sources (%)	100%	100%	82%	46%	100%	100%	100%	100%	100%	100%	100%	90%

Figure 4-8 Revenue of Solid Waste Management of Rejaf Payam

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Juba has been facing to many challenges regarding the provision of various public services and the development of social infrastructure due to the impact of the conflict. Regarding SWM, there are various problems such as lack of concept of public service, low ability of administrative staff, lack of legal framework to support organizations, shortage of resources, and deterioration of sanitary environment. In addition, it is required to strengthen the capacity and infrastructure for implementing community-based SWM in response to the recent needs from the world, including SDGs and contributions to the establishment of sound material-cycle society. The Plan mentions the various activities to achieve sustainable SWM as follows.

Legal system	Revision and enforcement of SWM ordinance (by-law) Clarification of role and responsibilities of related organizations
Organization and human resource management	Strengthening implementing organization such as JRSWGM
Waste collection and transportation	Implementation of fixed-time and fixed-place waste collection for households waste Strengthening market and commercial waste collection
Intermediate treatment and recycling	Recycling at shools Construction and operation of a feed conversion facility and plastic recycling facility
Final disposal	Rehabilitation of JCDS Closure of illegal dumping sites
Maintenance (Workshop)	Construction of new workshop
Public relations, public awareness and environmental education	Establishment of new section specialized on SWM, especially for public awareness activities with public awareness promoters
Finance	Strengthening fee collection Preparation of annual report and plan for SWM

5.2 Recommendations for the Future of Solid Waste Management in Juba

5.2.1 Sustainability of Solid Waste Management

(1) Promotion of Waste Reduction

The plan describes that it is necessary to promote the reduction of waste at source incollaboration with all stakeholders such as the Department of Environment and Sanitation of JCC, Blocks, residents, private waste dischargers, private waste collectors, and international organizations. In particular, it is important to raise the awareness of residents in order to reduce the amount of household waste and to introduce the self-treatment of food waste at source. The Department of Environment and Sanitation of JCC and blocks need to hold community meeting with the residents, set up notice boards at the Ministry of Environment and Forestry and Juba City Council, and make a leaflet describing the waste segregation, reduction of waste and cooperation for recycling. In addition, cleanup campaigns need to be conducted in order to clean their own community and keep the environment clean. It would take long time to change the residents' behavior on SWM, hence it is important to plan SWM well.

(2) Establishment of Resycilg System

In order to reduce the amount of waste generated in Juba, the Plan recommend that collection of recyclable plastic at schools need to be done by 2025, and it is necessary to construct and start the operation of plastic recycling facility and food conversion facility are necessary by 2030. Partnerships with the private sector are particularly important in implementing. In the Plan, private sector will play a role as main recyclable plastic collectors, and private companies selected by PPP scheme will be in charge of the entire process from construction to operation and maintenance of plastic recycling facility and food conversion facility. The Department of Environement and Sanitation of JCC need to support and instruct the private companies for the establishment of recycling system in Juba.

(3) Introduction of Sanitary Landfill

The waste generated in Juba is transported and disposed at JCDS in Rejaf Payam. The dumping site was improved from open dumping site to controlled dumping site by JICA project in 2012, but it has not been properly managed due to the conflict. The Plan archives to improve the method of final disposal from open dumping to controlled dumping by 2025, and from controlled dumping to sanitary landfilling by 2030 in order to rehabilitate JCDS. Therefore it is necessary to formulate a plan for the operation of JCDS and to strengthen the implementation system in accordance with the plan. It is important to repair the existing facility and equipment such as the fence and gate as well as to install gas ventilation pipes.

(4) Contribution to the Establishment of Sustainable Sound Material-Cycle Society

In recent years, the international momentum for the establishment of sustainable sound material-cycle society has been growing. The importance of appropriate SWM has been recognized through SDGs which was adopted in United Nations Conference in 2015 and ACCP which was established for the purpose of developing SWM in African cities. Especially, South Sudan is the member of ACCP, hence it is necessary to recognize the responsibility to archive SDGs on SWM by 2030.

(5) Modeling SWM and Deploying to Local Cities in South Sudan

Juba is required to take the initiative in the establishment and modeling of appropriate SWM in the country. In South Sudan, the development of various public services and infrastructure, including waste management, has been delayed across the country due to the conflicts. If waste is not properly managed, the impact on not only the environment and also people will be larger. Juba is expected to play a role as the capital of South Sudan and take the initiative for the establishment of SWM applicable to local cities in South Sudan by utilizing knowledge and experience. Therefore, Juba needs to provide advice to the national government on the development of laws specializing in SWM, to build a network between Juba and local cities, to collaborate with the universities etc, and to create opportunities for sharing knowledge with local cities.

Solid Waste Management Master Plan in Juba City 2021-2030

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