Republic of South Sudan
Ministry of Environment
Juba City Council
Juba County

Republic of South Sudan

PROJECT FOR CAPACITY DEVELOPMENT ON

SOLID WASTE MANAGEMENT IN JUBA

Technical Cooperation Products

November, 2014

Japan International Cooperation Agency

(JICA)

Yachiyo Engineering Co., Ltd.

GE
JR
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Republic of South Sudan

PROJECT FOR CAPACITY DEVELOPMENT ON SOLID WASTE MANAGEMENT IN JUBA

Technical Cooperation Products

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1. Seminars and Workshops Report

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Republic of South Sudan

Project for Capacity Development on Solid Waste Management in Juba

Seminars and Workshops Report

November, 2014

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1. Introduction

This report summarizes the contents and results of seminars and workshops implemented during the *Project for Capacity Development on Solid Waste Management in Juba* ("Project"), especially that of the Joint Coordination Committee ("JCC").

2. Joint Coordination Committee

During the Project, the five JCC meetings shown in Table 1 were held. The first three JCC meetings were held in Juba, but the fourth was held in Kampala because of the political instability since December 2013. The last JCC meeting was held through the telephone conference between South Sudan (Juba City) and Japan (Tokyo).

Table 1 JCC meetings implemented during the Project

No.	Date	Place	Main discussion points
1	May 3, 2012	Juba, South Sudan	• Approval of work plan • Approval of PDM • Approval of Juba Solid Waste Management Group members
2	November 12, 2012	Juba, South Sudan	• Report of project progress • IEE of the dumpsite • Roles of Juab City Council and Juba County
3	June 4, 2013	Juba, South Sudan	• Approval of work plan • Modification and approval of PDM indicators • Modification and approval of counterpart organizations • Approval of establishing a committee of public waste collection company
4	April 25, 2014	Kampala, Uganda	• Commencement and conditions of the pilot project for fee collection • Improvement of dumpsite operation and management • Preparation of annual activity report and annual activity plan on solid waste management

5	October 16, 2014	South Sudan (Juba), Japan (Tokyo)	• Presentation and confirmation of project outputs • Approval of solid waste management draft plan, annual activity report and annual activity plan • Confirmation of short/long-term plan of actions

2.1 1st JCC Meeting

(1) Agenda

The agenda of the 1st JCC meeting is shown in the following table.

Table 2 Agenda of the 1st JCC meeting

Time	Contents	Persons in charge/ Presenters
10:00	Opening remarks	Ministry of Environment JICA South Sudan Office
10:20	Confirmation of the role and members of the Joint Coordinating Committee	JICA Expert Team
10:40	Project work plan	JICA Expert Team
11:00	Discussion and agreement on PDM and Work Plan	

(2) Discussion points

The discussion points of the 1st JCC meeting are as follows:

a) Approval of work plan
b) Approval of PDM
c) Approval of Juba Solid Waste Management Group members

Table 3 Juba Solid Waste Management Group members

Implementation Organization	Area	Juba solid waste management group		
		South Sudan Side		JET
		Chief	Members	
Output 1	Collection improvement in residential area	Mr. Kalisto Tombe (Juba Town Payam/ acting Juba City Council)	Collection: Mr. Gamardin Mogga (Kator Town Payam) Mr. James Daudi Dada (Munuki Town Payam)	Mr. Ishii Mr. Osada Ms. Matsubara

Output 2	Collection improvement in market area	Subchief: Mr. Alphones Pitia (Kator Payam)	Community Activity: Mr. Stephen Tako (Munuki Town Payam) Mr. Silvestro Peter (Juba Town Payam)	
Output 3	Landfill site improvement	Mr. Sebit Amosa （Juba County）	Public Health Officer (Rejaf Payam)	Mr. Saito
Output 4	Solid waste management plan in Juba	Ms. Dorina Keji (Ministry of Environment, RSS) Mr. Paul Gore (Ministry of Environment, CES)	Accountant: Mr. Hallary Jada Woderif (Juba City Council)	Mr. Yao Mr. Ishii

2.2 2nd JCC meeting

(1) Agenda

The agenda of 2nd JCC is shown in the following table.

Table 4 Agenda of the 2nd JCC meeting

Time	Contents	Persons in charge/ Presenters
10:00	Welcome by Chair	Ministry of Environment
10:05	Opening remarks	JICA South Sudan Office
10:15	Activity report 1) Market waste collection pilot project 2) Residential waste collection pilot project 3) Landfill site improvement pilot project 4) Waste collection expansion 5) Waste collection pilot project expansion & public company in Palestine started in 2007	Kator Payam JICA Expert Team
11:00	Public waste collection company	
11:20	Discussion (demarcation of waste management)	

(2) Discussion points

The discussion points of the 2nd JCC meeting are s as follows:

a) Report of project progress

b) IEE of the dumpsite

c) Roles of Juba City Council and Juba County

2.3 3rd JCC meeting

(1) Agenda

The agenda of the 3rd JCC meeting is shown in the following table.

Table 5 Agenda of the 3rd JCC meeting

Time	Contents	Persons in charge/ Presenters
10:00	Opening remarks	Juba City Council, Juba County, JICA South Sudan Office
10:20	Presentation: JICA activity	JICA South Sudan Office
10:40	Presentation "2nd year Work Plan of JICA SWM Project"	JICA Expert Team
11:10	Discussion (To establish "Preparatory Committee for the Public Solid Waste Management Company")	

(2) Discussion points

The discussion points of the 3rd JCC meeting are as follows:

a) Approval of work plan

b) Modification and approval of PDM indicators

The PDM indicators were modified and approved as shown in the table below.

Table 6 Modification of PDM indicators

	Indicator	Annual Indicator
Project Purpose: Basic structure of solid waste management in Juba is formulated.	• Result of capacity assessment for C/P staff is improved. • **Periodic cleaning service is continuously implemented.**	• Counterparts are surveyed by questionnaire. • Evaluation is made by the expert team and counterparts. • **Record of cleaning service is evaluated by the expert team and counterparts.**

c) Modification and approval of counterpart organizations

The counterpart organizations were modified and approved as shown in the table below.

Table 7 Modification of counterpart organizations

C/P	Ministry of Environment (RSS: Republic of South Sudan), Juba City Council **and Juba County**
Related Ministries and Agencies	Ministry of Housing and Physical Planning, Ministry of Health, Ministry of Finance and Economic Planning, Juba County, Ministry of Environment (CES: Central Equatorial State)
Beneficiaries: Direct Beneficiaries Indirect Beneficiaries	 Ministry of Environment (RSS), Juba City Council, **Juba County** Juba Citizens (Approximately 240,000 persons)

d) Modification and approval of composition of counterparts, and project implementation structure

The composition of the counterparts, and the project implementation structure were modified and approved as shown in the table below.

Table 8 Modification of composition of counterparts

1. Project Director	Director General, Ministry of Environment
2. Project Manager	Mayor of Juba City
3. Counterparts	**More than one official will be appointed for each of the following 5 groups from the related agencies:** **a) Market garbage collection/ transportation group [Output 1] (Juba City Council)** **b) Residential area garbage collection/ transportation group [Output 2] (Juba City Council)** **c) Landfill group [Output 3] (Juba county government)** **d) Comprehensive solid waste management group [Output 4] (Juba City Council)** e) **Public relations group [Output 1 – 4] (Ministry of Environment)**
4. Secretariat	Juba City Council

e) "Preparatory Committee for the Public Solid Waste Management Company" will be established with the Juba City Council leadership.

2.4 4th JCC meeting

(1) Agenda

The agenda of the 4th JCC is shown in the following table.

Table 9 Agenda of the 4th JCC meeting

Time	Contents	Persons in charge/ Presenters
9:00 – 9:10	Opening remarks	JICA South Sudan, JICA Project Team
9:10 – 9:30	Introduction of Project DVD	JICA Project Team
9:30 – 10:20	Presentation: Summary of Pre-JCC discussion	Juba City Council
10:20 – 11:20	Discussion: Exchange of opinions	
11:20 – 11:30	Closing remarks	Juba City Council

(2) Discussion points

The discussion points of the 4the JCC meeting are as follows:

a) Commencement and conditions of a pilot project for fee collection

A fee collection pilot project will be implemented; JICA will hire one collection truck with the condition that the Juba City Mayor issues a letter and Juba City Council hires cleaners.

b) Improvement of dumpsite operation and management

Waste filling plan and accounting report of the disposal fee will be prepared for the expansion of the dumping areas, and improvement of the dumpsite operation and management.

c) Preparation of annual activity report and annual activity plan on solid waste management

The importance of the annual activity report and activity plan on solid waste management was recognized among the participants, and they are expected to prepare the annual activity report and annual activity plan.

2.5 5th JCC meeting

(1) Agenda

The agenda of the 5the JCC meeting is shown in the following table.

Table 10 Agenda of the 5th JCC meeting

Time (South Sudan)	Time (Japan)	Contents (Persons in charge/ Presenters)
10:00-10:05	16:00-16:05	Opening remarks (Ministry of Environment)
10:05-10:10	16:05-16:10	Significance of Juba solid waste management project (JICA South Sudan Office)
10:10-10:35	16:10-16:35	Report on preparatory meeting for JCC - Solid waste management plan (Ministry of Environment)
10:35-10:55	16:35-16:55	Report on preparatory meeting for JCC – Annual report, Annual activity plan (Juba City Council)
10:55-11:20	16:55-17:20	Q&A/ Discussion Approval of solid waste management plan
11:20-11:30	17:20-17:30	Break
11:30-11:50	17:30-17:50	Outputs of Juba solid waste management project (JICA Experts)
11:50-12:05	17:50-18:05	Outputs of Juba solid waste management project – Collection (Kator Payam)
12:05-12:20	18:05-18:20	Outputs of Juba solid waste management project – Landfill (Rejaf Payam)
12:20-12:30	18:20-18:30	Summary, Way forward JICA Headquarters, Juba City Council
12:30-12:55	18:30-18:55	Q&A
12:55-13:00	18:55-19:00	Closing remarks (Juba City Council)

(2) Discussion points

The discussion points of the 5the JCC meetings are as follows:

a) Presentation and confirmation of project outputs
b) Approval of solid waste management draft plan, annual activity report and annual activity plan
c) Confirmation of short/long-term plan of actions

2. Solid Waste Collection Pilot Project Report

Project for Capacity Development on Solid Waste Management in Juba

Solid Waste Collection Pilot Project Report




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Preface

When the project activity started in April 2012, there were collections conducted according to the explanation of counterparts, however there was no solid waste collection conducted by Juba City Council after the determination of 3 weeks visit. Further survey indicated that there were no vehicles, responsible staffs / established organization or budgets.

Therefore, different approaches for solid waste collection were considered and “Fixed Time Station Collection” System was selected. It was for the counterparts to understand the proper waste collection process by implementing together and gradual handover.

Residents bring the waste to the collection point at fixed time with this method. This involves residents for discharge and collection and promotes understanding of waste management. There is no facility required with this method and city will be kept clean when the rule is properly followed.

Collection started in Jebel Market and Atlabara B&C residential areas (Both in Kator Payam, one of the wards out of three in Juba City) in July 2012. Collection was extended to Hai Thoura in Juba Payam, and Gudele Block 8 in Munuki Payam in November 2012. In July 2013, Juba Market was added for market waste collection.

In August 2012, Juba City Council purchased 10 compactor trucks and started collection in November 2012.

Project was ceased in December 2013 due to violence occurred however, the collection continues without assistance of JICA vehicles.

1. Waste Collection Improvement in Market

1.1 Preparation of the Pilot Project

Before the commencement of the Market Pilot Project, most of the space in front of Jebel Market was filled with waste. Based on the discussion with Kator Payam, Jebel Market Association and JICA Expert team, the Market Pilot Project started on 21st July, 2012. The Pilot Project theme was to implement a program for the collection of waste to be discharged at designated times and places. Two collection points were set in the space in front of Jebel Market. Collection was implemented by Kator Payam and the JICA Expert Team. The collection schedule was planned as shown in the following table. This schedule was for the combined collection of the wastes from the market and the surrounding residential areas because it was difficult to make a schedule separately as well be explained later. According to this plan, the collection was implemented by 2 trucks per day for Jebel Market, from Monday to Saturday, with no collection on Sunday. On the collection days the waste was collected 2 times (9:00 am and 15:00 pm) per day and special cleaning was implemented by a wheel loader on Mondays.


New Waste Collection System

To Shop Owners in Jebel Market

Attention

Juba Solid Waste Management Group (JSWMG) and Japan International Cooperation Agency (JICA) will start new market waste collection as follows

Starting Date: Saturday, 21st July 2012

Collection Method:
Waste will be collected by tipper truck at the collection point. Waste should be put in plastic bins or plastic bags and brought to the collection point at scheduled time.

Collection Schedule:

	Monday	Tuesday	Wednesday	Thursday	Saturday
Morning	9:00a.m.	9:00a.m.	9:00a.m.	9:00a.m.	9:00a.m.
Afternoon	3:00p.m.	3:00p.m.	3:00p.m.	3:00p.m.	3:00p.m.

Your cooperation would be highly appreciated

JSWMG
JICA Expert Team

Contact: Philip, Market Union Leader
Phone: 0926873032

Figure 1 Signboard at Collection Points

Table 1 Original Plan of Collection Schedule

	Collection Vehicle/Heavy Equipment		Working Place
	Type	Number of Truck	
Mon	Wheel Loader by JICA Expert Team	1 unit	Jebel Market
	Open truck by JICA Expert Team	1 unit	Jebel Market
	Open truck by Payam	1 unit	Jebel Market
Tue	Open truck by JICA Expert Team	2 units	Jebel Market
Wed	Open truck by JICA Expert Team	1 unit	Jebel Market
	Open truck by JICA Expert Team	1 unit	Residential area
	Open truck by Payam	1 unit	Jebel Market
Thu	Open truck by JICA Expert Team	2 units	Jebel Market
Fri	Open truck by JICA Expert Team	2 units	Jebel Market
Sat	Open truck by JICA Expert Team	2 units	Jebel Market
	Open truck by Payam	1 unit	Residential area
Sun	Off		

To prepare for the Market Pilot Project and explain the new collection system, leaflets were distributed to almost all the shops covered in the area and 300 plastic bins were provided to those

shops which operate in building structures. Signboards were set up at the collection points. JICA Expert Team hired a crew of collection workers composed of 1 head instructor, 3 instructors, 1 coordinator, and 10 cleaners. Their main jobs were to load wastes onto the trucks, to instruct shops and to prevent any violation of the rules.

1.2 Selection of Target Areas for Pilot Project

Jebel Market was selected as target market area for the pilot project, for the following reasons:

- Jebel Market has 900 stores, which was the largest concentration of shops in Juba City. The amount of waste generation was extremely large.
- Kator Payam, which covers Jebel Market, was the only area where waste was regularly collected in Juba City.
- Unlike other markets, in Jebel Market there was no large-scale demolishment and renovation. Since the demolishment was quite limited, and business was more stable and well-settled, the public relations activities were considered easier to implement.
- The Union of the marketgroup was well-organized under the initiative of the leader of the union.
- Since sufficient open space is available for waste discharge at markets, it would be easier to find the solutions for waste management problems there.
- Jebel Office (Kator Payam) was cooperative with the project.
- One of the Jebel officers (Kator Payam) was a member of Juba Solid Waste Management Group.
- Jebel market was the closest market from the landfill, and it was easier to operate collection trips from this location.

1.3 Progress of Implementation

The progress of the pilot project is shown in the following table.

Table 2 Progress of Pilot Project Implementation

Date	Activities	Notes
6/30	Meeting at Kator Payam	Explanation of the project and pilot projects
6/30	Meeting at Kator Payam and Jebel Office	Confirmation of implementation area
7/2	Meeting at Jebel Market	Preparation for implementation
7/12	Meeting with the association	Preparation for implementation
7/15	Meeting with store representatives	Preparation for implementation

Date	Activities	Notes
7/19	Distribution of bins	300 bins
7/19	Installation of collection signboards	Installed at two existing discharge spots.
7/20	Special cleaning activity	4 trucks; 3 trips per truck All the waste at the discharge spots was cleared.
7/21	Commencement of collection	2 trucks; 3 trips per truck All the waste was transported to the landfill, even though the amount of waste was huge.
7/23	Special cleaning activity	1 truck, in addition to 1 truck and workers of Kator Payam 3 trips/ truck
7/24	Commencement of fixed time collection	Implemented without any difficulty
7/25		1 truck, in addition to 1 truck and workers of Kator Payam

The findings from the pilot project were as follows:

Findings by pre-study	• A lot of waste was put into the plastic bags and dumped. • Primary collection workers were engaged in collecting waste discharged outside the stores. • Each store was relatively well-regulated.
Findings by implementation	• It had been reported that local people discharged waste at night; however, this situation was found to rarely occur. • More people followed the rules and schedule than was expected.

The progress of collection amount was shown in the following table.

Table 3 Progress of Collection Amount

Date	7/20	7/21	7/23	7/24	7/25	7/26	7/27
Collection Amount	10t *6trips	10t *6 trips	10t *6 trips	10t *6 trips	10t*5 trips	10t*5 trips	10t*5 trips
Notes	Special Clean-up	Regular Clean-up	Special Clean-up	Regular Clean-up	Regular Clean-up	Regular Clean-up	Regular Clean-up

1.4 Situation after 2 months

(1) Discharge from Shops

Regarding discharging at the designated points (collection points); almost all wastes were discharged at the collection points although some violations did occur, such as discharging in the backyard and other vacant spaces. Generally, shops in Jebel Market cooperated with the Market Pilot Project. One of the reasons for this compliant behavior may be that people in Jebel Market have customarily discharged waste at the open space in front of the market (which where the designated collection points determined by the Pilot Project). Another reason may be that the effectiveness of the

instructions and monitoring by the health officers in Kator Payam and the collection workers, and also by the police (instructions not to bring waste at night and/or from other places).

Regarding discharging at the designated time, the schedule was changed from the original plan. As of September 2012, the collection time is not twice a day, but from 9:00 am to 15:00 pm. People in Jebel Market discharge waste mainly in the morning, however, some of them discharge waste in the afternoon because they think “Wastes can be discharged until 15:00 pm”.

The collection schedule, other than the time remained the same as the original plan.

(2) Situation around Collection Point

The amount of discharged wastes at collection point No. 1, which was set in the western part of the space in front of the market, was relatively more than the other point (collection point No. 2 set in the eastern part). This may be explained by the large number of restaurants in the western part in Jebel Market. Although surrounding areas of the collection points are not designated in the Market Pilot Project, people from those areas tend to discharge near the signboards. However, wastes are scattered at the night and on Sundays. And some people discharge wastes directly onto the ground because they want to bring the bags or bins immediately back to their shops. The problem of these actions is not only scattering of the wastes, but also increasing the burden and the working time of collection workers.

1.5 Situation after 4 months

As a part of awareness-raising activities, the 1st Clean-up Campaign in Jebel market was held on 6th October, 2012. Eighty two (82) volunteers from inside and outside of Jebel Market attended and picked up the wastes in the market. Most of attendants were from outside of Jebel Market. It was found out to be necessary to promote that people in the market can be involved more.

On 19th and 20th October, 2012, clean-up in Juba City was held with 10 units of new compacters procured by Juba City. It was decided that these compactors would be utilized for waste collection in each Payam. Consequently, the collection capacity of Kator Payam was expanded. Therefore, clean-up with wheel loader in Jebel Market every Monday was stopped. Instead of clean-up, one dump truck

would be allocated every Monday just for collection and transportation. The schedule of vehicle allocation by Kator Payam for Jebel Market is shown in the following table.

Table 4 Schedule of Vehicle Allocation by Kator Payam for Jebel Market

Location	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Jebel Market	JICA Truck*2		JICA Truck	JICA Truck	JICA Truck	JICA Truck	JICA Truck
			Kator Payam Truck	Kator Payam Truck	Kator Payam Truck	Kator Payam Truck	Kator Payam Truck

The market union of Jebel market suggested holding the workshop. With the support of JICA Expert Team, the workshop was held on 3rd November, 2012 not only for JICA Pilot Project, but also other issues related to waste management, such as liquid wastes. Sixty two (62) people attended this workshop. Regarding to JICA Pilot Project, attendants showed their satisfaction to the collection by the Project, and agreed to keep the rule of waste collection. On the basis of the discussion in this workshop, the collection time was changed from 9:00 and 15:00 to 9:00 and 12:00.

And the new collection point (Point 3) was set in the back yard of Jebel Market. Kator Payam decided to collect the wastes at Point 3 basically.

Figure 2 First Clean-up Campaign in Jebel Market (6th October, 2012)

Figure 3 Workshop in Jebel Market (3rd November, 2012)

1.6 Situation after 7 months

The following table shows the achievement of vehicle allocation for Jebel Market by Kator Payam. Kator Payam achieved to allocate vehicles almost every time. However, the wastes at Point 3 was not collected regularly.

Table 5 Achievement of Vehicle Distribution by Payams

	Jebel Market				
Week	Mon	Tue	Wed	Thu	Fri
Nov 12-17	1	1	1	1	1
Nov 19-24	1	1	1	1	1
Nov 26-Dec 1	0	1	1	1	1
Dec 3-8	1	1	1	1	1
Dec 10-15	1	1	1	0	1
Dec 17-22	1	1	1	1	1
Dec 24-29	1	1	0	1	1
Dec 31- Jan 5	1	0	1	1	1
Jan 7-12	1	1	1	1	1
Jan 14-19	1	1	1	1	1
Jan 21-26	1	1	1	1	1
Jan 28-Feb 2	1	1	1	1	1
Feb 4-9	1	1	1	1	1
Feb 11-16	1	1	1	1	1
Total	13	13	13	13	14

Note)

1: Payam sent the vehicle

0: Payam did not send the vehicle

In December 2012, Juba City revised the waste collection fee. The revised fee related to the market is shown in the following table. The prices of the revised fees for all types were 4 times higher than the original fee.

Table 6 Waste Collection Fee for Shops Revised by Juba City

Type of building	Original Fee (from 2011 to 2012) [SSP/month]	Revised Fee (from 2012 to 2013) [SSP/month]
Whole Sale Shop	75	300
Ordinary shop	75	300
Stores	60	240

On 9th March, the 1st review meeting for the Pilot Project in Jebel Market was held with XX attendants. At the end of the meeting, it was decided to held the 2nd Clean-up Campaign would be held. The main comments from attendants are as follows;

- The market had been very dirty before the commencement of JICA Pilot Project. After JICA Pilot Project started, the collection was improved. We appreciated JICA Project and wanted to continue to manage wastes properly.

- JICA Pilot Project was a kind of environmental education. We want JICA Project to continue the environmental education related to waste management.
- The responsibility for waste collection should be shared with the related parties. We should manage wastes as our issue.
- Because the truck allocation by Payam was not regular.
- Support by JICA Project was still necessary because Kator Payam did not allocate the vehicles regularly.
- The newly established 6 committees in Jebel Market told the Mayor of Juba City about the huge increase of waste collection fee. We expected the fee price would be examined.

On 11th March, 2013, the 2nd Clean-up Campaign was held. Attendants picked the scattered wastes only in the back yard. It was different from the 1st campaign that all attendants were from Jebel Market because the 2nd campaign was decided and agreed in the review meeting.

Figure 4 First Review Meeting in Jebel Market (9th March, 2013)

Figure 5 Second Clean-up Campaign in Jebel Market (11th March, 2013)

1.7 Waste Collection Improvement in Markets

Each Payam has learned the technique and methodology for the collection system with the designated time and place through the collection pilot projects in the target market and residential areas since the first year of the Project. Therefore, JICA Expert Team decided to add a new target market for the second year of the Project. For selecting a new target market, JICA Expert Team considered the following points;

- The market is the priority area for collection by Payam.
- The market has a key organization/person, such as market union.
- The market will be a good example for surrounding areas.
- The number of shops in the market is less than 500 shops.
- The road condition around/inside the market is good. (the compactors and trucks can come.)
- Security around/inside the market is secured. (Japanese experts can implement their activities)
- If possible, the market is in Juba Town Payam or Munuki Payam.

At first, the local staff of JICA Expert Team implemented the basic survey to confirm the approximate numbers of markets in each Payam, and selected several candidate markets preliminary in June 2013. According to the hearing with officers of Administration Zones, Juba Town Payam has about 2,900 markets, Kator Payam has about 4,900 markets and Munuki Payam has about 1,300 markets regardless of the size of markets. In July 2013, Japanese Experts implemented the hearing survey with Health Officers and Directors in each Payam, and narrowed down the candidates after confirmation of security situation. After that, JICA Expert Team implemented the site surveys, discussed in JSWMG meetings, obtained the agreement among related agencies/persons, and finally decided the new target market.

The candidate markets were 3 markets; Freedom Square Market (Kator Payam), Suk Libya Market (Munuki Payam) and Juba Town Market (Juba Town Payam). Freedom Square Market had 3 management organizations; a branch office of Juba City Council, a branch office of Kator Payam and an ethnic group. So the management system was complicated. Moreover, the road condition in the market was not good. Suk Libya Market cleared the conditions. But C/Ps and JICA Expert Team evaluated that the capacity of Muniki Payam was not developed well because they did not collect wastes in the target residential area periodically. In Juba Town Market, the market leaders managed shop owners and Juba Town Payam also managed shops by registration system. Therefore, Juba Town

Market was selected as the new target market.

From 15th July to 26th July 2013, C/Ps, Japanese Experts and market leaders decided the collection points, collection schedule and demarcation of vehicle allocation with JICA Expert Team, and prepared the workshop for prior explanation. 3 collection points were set. Point 1 was inside the market, Point 2 was along the main street in front of the market (opposite side of Paradise Hotel), and Point 3 was near the boundary of the residential area (opposite side of the market). And the collection frequency and time were set as 2 times/day (at 9:00 and 12:00) for Point 1 and Point 3, and 1 time/day (at 9:00) for Point 2 because the traffic jam at the main street was heavy in the afternoon. The vehicle allocation was set as 3 days/week by Juba Town Payam (Monday, Wednesday and Friday) and 3 days/week by JICA Expert Team (Tuesday, Thursday and Saturday).

On 27th July 2013, C/Ps and JICA Expert Team held the workshop for starting the pilot project. The number of the attendants was more than 50 persons. The meeting agenda was as follows;

1. Opening remark (Market leader and Chief Japanese Expert)
2. Awareness survey for the present collection service
3. Explanation for the pilot project
4. Open discussion
5. Closing remark (JICA South Sudan Office)
6. Delivery of bins

On 30th July 2013, the collection pilot project was started in Juba Town Market. In the first day, the health officer in charge of Juba Town Market, Deputy Director and Director monitored the collection, and collection at all points was finished by the noon.

Figure 6 Before and After the Collection at "Collection Point 1" at Juba Town Market at the First Day of Pilot Project

Figure 7 Before and After the Collection at "Collection Point 2" at Juba Town Market at the First Day of Pilot Project

Figure 8 Before and After the Collection at "Collection Point 3" at Juba Town Marke at the First Day of Pilot Project

1.8 Progress in Jebel Market and Collection Schedule of Target Markets

The following table shows the 1st collection schedule when the pilot project in Jebel market was started. The policy of the pilot project is that Kator Payam should manage own budget, human resource and equipment, and collect wastes in cooperation with JICA Expert Team. At first, JICA Expert Team did cleaning up with the rental wheel loader because officers and collection workers of Kator Payam, shop owners in the market, and other related people did not get used to the new collection system.

Table7 First Collection Schedule in Jebel Market from July 2012 to October 2012

		Mon		Tue	Wed		Thu	Fri	Sat
JICA	Type	Wheel Loader	Open truck	Open truck	Open truck	Open truck	Open truck	Open truck	Open truck
	Unit	1 unit	1 unit	2 units	1 unit	1 unit	2 units	2 units	2 units
Kator Payam	Type	Open truck			Open truck				Open truck
	Unit	1 unit			1 unit				1 unit

In October 2012, the collection capacity of Kator Payam was improved because 3 compactors bought by Juba City Council were allocated to Kator Payam. So the allocation by JICA Expert Team was reduced. The following table shows the 2nd collection schedule from October 2012 to March 2013. Additionally, 1 collection point was added. Therefore, Jebel Market has 3 collection points.

Table 8 Second Collection Schedule in Jebel Market from October 2012 to March 2013

		Mon	Tue	Wed	Thu	Fri	Sat
JICA	Type	Open truck	Open truck	Open truck	Open truck	Open truck	Open truck
	Unit	2 units	1 unit	1 unit	1 unit	1 unit	1 unit
Kator Payam	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
	Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit

From March 2013, the allocation by JICA Expert Team was reduced again and set as 3 times/week (4 open trucks/week) because the collection by Kator Payam became stable gradually. The following table shows the 3rd collection schedule from March 2013 to 21st July 2013. In May 2013 when the second year of the Project, the collection by Kator Payam became stable more and more. The left over wastes were very small and people could utilize the areas surrounding the collection points as parking areas.

Table 9 3rd Collection Schedule in Jebel Market from March 2013 to 21st July 2013

		Mon	Tue	Wed	Thu	Fri	Sat
JICA	Type	Open truck		Open truck			Open truck
	Unit	2 units		1 unit			1 unit
Kator Payam	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
	Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit

From the Independence Day on 9th July 2013, the collection by Kator Payam became unstable, and the left over wastes were huge as same as the situation before the pilot project. Many discussions to search the reasons and solutions were held among the market union, health officers and Director of Kator Payam, local staff and collection workers of JICA Expert Team, members of JSWMG and related people. Also the activity of raising awareness was strengthened. In this period of time, the workshop for review was held (on 20th July 2013). In this workshop, C/Ps could talk directly with shop owners why the discharging and collection situation became deteriorated. It was found that several shop owners did not know even the collection time and place. After that, announcement by the market union and guidance by Payam were strengthened. At the same time, the vehicle allocation by JICA Expert Team was increased only for 1 week. The following table shows the 4th collection schedule from 21st July 2013 to 28th July 2013.

Table 10 4th Collection Schedule in Jebel Market from 21st July 2013 to 28th July 2013

		Mon	Tue	Wed	Thu	Fri	Sat
JICA	Type	Open truck	Open truck	Open truck	Open truck		Open truck
	Unit	2 units	1 unit	1 unit	1 unit		1 unit
Kator Payam	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
	Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit

As the results of trials and efforts to recover, the collection by Kator Payam was becoming stable, and the allocation by JICA Expert Team was reduced. In this period of time, the collection pilot project was started in Juba Town Market. The following table shows the 5th collection schedule from 29th July 2013.

Table 11 5th Collection Schedules in Jebel Market/ Juba Town Market from 29th July 2013

		Mon	Tue	Wed	Thu	Fri	Sat
JICA for Jebel Market	Type	Open truck					
	Unit	2 units					
Kator Payam	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
	Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit

JICA for Juba Town Market	Type		Open truck		Open truck		Open truck
	Unit		1 unit		1 unit		1 unit
Juba Town Payam	Type	Compactor		Compactor		Compactor	
	Unit	1 unit		1 unit		1 unit	

From August to October 2013, the collection by Kator Payam was not stable and the left over wastes were increased because of the frequent breakdown of the compactors. Sometimes Kator Payam improved the situation by own efforts, such as cleaning up by the rental wheel loarder and renting the open trucks. In case of Juba Town Market, there were some problems during the beginning stage, such as changing the place of Point 3 and inappropriate collection by Juba Town Payam. It cannot be said that the collection by Juba Town Payam is stable.

At present (as of October 2013), the collections by Kator Payam and Juba Town Payam are not stable because of the frequent breakdown of the compactors. Juba City Council has a responsibility to maintain the compactors, but their efforts are very little. Even they do not buy spare parts. Therefore, each Payam suffers the great damages for collection.

		
Collection point when the collection was stable at the beginning of 2nd Year	Collection point when the collection got unstable in July	Collection point when the collection got stable again in August

Figure 9 Before and After the Collection at "Collection Point 3" at Juba Town Market the First Day of Pilot Project

1.9 Achievement of Vehicle Allocation for Market by Each Payam

(1) Achievement of Vehicle Allocation for Market by Each Payam

The following table shows the achievement of vehicle allocation for Jebel Market by Kator Payam. This table shows the ratio of days that Kator Payam actually allocated vehicles to the scheduled days. By July 2013, the allocation ratio was over 80% and Kator Payam mostly allocated vehicles according to the schedule. From August 2013, the allocation ratio was decreased because the compactors were broken down frequently, and the allocation by JICA Expert Team was reduced. However, Kator Payam keeps allocation to some extent. In order to raise the allocation ratio, Kator Payam needs to increase trips and/or number of allocated vehicles in cooperation with JICA Expert Team.

Table 12 Achievement of Vehicle Allocation for Jebel Market by Kator Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
March, 2013	21	24	88%
April, 2013	23	25	92%
May, 2013	26	27	96%
June, 2013	25	26	96%
July, 2013	23	27	85%
August, 2013	19	27	70%
September, 2013	16	25	64%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

(2) Achievement of Vehicle Allocation for Juba Town Market by Juba Town Payam

The following table shows the achievement of vehicle allocation for Juba Town Market by Juba Town Payam. This table shows the ratio of days that Juba Town Payam actually allocated vehicles to the scheduled days. The allocation ratio was raised gradually. And Juba Town Payam is at the stage to learn the new collection system, to practice the provision of periodical service, and etc. In order to achieve the stable vehicle allocation, JICA Expert Team will monitor and guide Juba Town Payam.

Table 13 Achievement of Vehicle Allocation for Juba Town Market by Juba Town Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
August, 2013	7	13	54%
September, 2013	8	13	62%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

2. Waste Collection Improvement in Residential Area

2.1 Target Areas and Collection System

Based on the discussions with related agencies, Atlabara B and Atlabara C in Kator Payam were selected as the target areas of the Pilot Project in residential areas for the following reasons;

- Collection routes could be fixed because Atlabara B and Atlabara C were residential areas by zoning, and roads in these areas were maintained.
- Kator Payam implemented waste collection periodically.
- Pilot Projects could be easily started because the density of housing in each area was not so high.
- Communication with residents was frequently held by the leaders of Quarter Councils in each area.
- Pilot Project could be easily started because the size of area in each area was not so large.

The same collection system applied in the Market Pilot Project; collection at designated times and places, was adopted. Twenty-four (24) collection Points were set in Atlabara B and 14 collection Points were set in Atlabara C. Collection time was fixed on Wednesdays from 3 pm to 4 pm at Atlabara B and from 10 am to 11:00 am Atlabara C. The same collection crew and truck used in the Market Pilot Project were also utilized for the Residential Pilot Project. The original schedule for the Residential Pilot Project is shown in the following table.

Table 14 Original Schedule for Pilot Project in Residential Areas

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Collection by JICA Project	off	off	off	one truck	off	off	off
Collection by Kator Payam	off	off	off	off	off	off	one/several trucks

2.2 Preparation and Commencement

Preparation until the commencement of this Pilot Project was as follows;

Table 15 Original Schedule for Pilot Project in Residential Areas

Atlabara B		Atlabara C	
6/30	Meeting with head office of Kator Payam	6/30	Meeting with head office of Kator Payam
6/30	Meeting with head office and branch office at of Kator Payam	6/30	Meeting with head office and branch office of Kator Payam
7/18	Meeting with Quarter Council	7/2	Meeting with Quarter Council
7/19	Explanation by the leader of Quarter Council to the residents representatives	7/3	Explanation by the leader of Quarter Council to the residents representatives
7/20	1st community meeting	7/4	1st community meeting
7/21	2nd community meeting	7/11	2nd community meeting
7/21	Setting collection points	7/14	Setting collection points
7/21	Delivery of bins	7/16	Delivery of bins
7/25	Start	7/25	Start

Figure 10 Original Collection Route for Pilot Project in Residential Areas

In the first day of collection, the waste amount was larger than the expected amount. Therefore, three days were required to collect all wastes in Atlabara B and Atlabara C as shown in the following table.

Table 16 Original Schedule for Pilot Project in Residential Areas

Date	25 July	26 July	27 July
Amount	4 trips by 10t truck	4 trips by 10t truck	1 trip by 10t truck
Note		Leftover on 25th July	Leftover on 26th July

2.3 2 Months after Pilot Project started

(1) Waste Disposal by Residents

In both Atlabara B and Atlabara C, most of the residents cooperated with the Pilot Project. The station collection with the designated time schedule was mostly accomplished. Especially in Atlabara B, the residents did not have any experiences of such collection system; however, most of them followed the rules. Some issues were encountered; someone removed the sign boards (because of mischief and the dissatisfaction with the locations of the collection points), wastes were scattered in some collection points, and business entities in residential areas disposed of a large amount of wastes, etc.

(2) Situation of Truck Allocation

Kator Payam could not send the truck to residential areas every Saturday as outlined in the schedule. In the schedule, the waste collection in Atlabara C was the first (in the morning) and Atlabara B the second (in the afternoon). Therefore, the scheduled collection especially at Atlabara B could not be completed. As of September 2012, it could be said that the collection in these areas was implemented mostly once a week with the truck prepared by the JICA Expert Team. With only the JICA Expert Team truck it was not possible to collect all the discharged wastes within the day because the amount of waste was too large. However, residents in both Atlabara B and Atlabara C did not make any complaints. This was because the collection was once every three weeks before the Pilot Project started. Residents might have been more satisfied with the collection system introduced by the Pilot Project. However the improper maintenance of the scheduled collection by Kator Payam would be a significant obstacle when considering implementing periodical fee collection and other future plans. Once a new system has been introduced in discussions with the residents and their cooperation has been secured, it is necessary for both sides; the service provider as well as the residents to fulfill their duties under that system.

2.4 Review Meeting

One month after commencement and good implementation of the Pilot Project, Kator Payam and JICA Expert Team decided to hold review meetings at Atlabara B and Atlabara C. The aim of these meetings was to evaluate the Pilot Project and to examine how to improve it.

(1) Atlabara B

The first review meeting was held on the 5th of August, 2012. We found that it was difficult to hold a meeting in order to review the Pilot Project because they had no such custom to hold such meetings in this area. Attendants were only 10 people; 1 person from Kator Payam, 2 people from Quarter Council, 4 residents and 3 people from JICA Expert Team. Through the meeting, we found that the Woman's Group in Atlabara B held occasional meetings. So, it was decided that the next meeting would be held with the Woman's Group. The opinions in the first review meeting were as follows;

- Some people discharged wastes on the ground at collection points because they did not know the scheduled time (Quarter Council opinion)
- Quarter Council provided guidance to the residents on the station collection with scheduled time (Quarter Council opinion)
- There were no complaints concerning the present schedule (collection from 3pm on every Wednesday), but residents claimed that the wastes were not collected on a certain day (Quarter Council opinion)
- It would be more effective todistribute leaflets (Quarter Council opinion)
- A large amount of wastes were discharged at a market (Point No. 3) and a hotel (Point No. 12) (Quarter Council opinion)
- The Pilot Project was generally good, but scattering of wastes after collection was a problem (female resident opinion)

The second review meeting was held on the 1st of September, 2012. More than 50 people were in attendance. The main opinions from residents were as follows;

- They appreciated the Pilot Project by JICA.
- The Pilot Project provided a better service than the service by Payam.
- Before, there was no waste collection like that provided by the Pilot Project.
- It was effective to shoe the residents a drawing on how to discharge and collect wastes. Residents were able to understand the Pilot Project, therefore scattering of wastes on the street was decreased after the Pilot Project was implemented.
- One hotel discharged its wastes without following the Pilot Project rules (especially at night).
- Trucks could not come into some areas because of the road conditions. It was requested to consider countermeasures.

- It would be better to announce the collection time (truck arrival time) by a whistle (a bell collection).
- It was better to collect on Sunday, not on Wednesday because most residents were at home on Sunday.
- An officer from Kator Payam was required to check illegal dumping.
- It was necessary to change the collection point No. 17 from a sanitation point of view because there was a water source near this point.
- An additional 300 bins or bags were required.
- JICA cleaning workers and trucks were required to implement door to door collection and road sweeping.

Figure 11 Second Review Meeting at Atlabara B (1st September, 2012)

After the second review meeting, a lot of wastes were discharged in some collection points such as the point in front of a hotel. One of the reasons might be due to the awareness raising experienced by the people from the review meeting. The issue on how to approach the business entities in residential areas to gain their cooperation needs to be considered.

And the similar review meeting was held in Atlabara C (by the long-term JICA expert).

2.5 Expansion of Target Areas

Hai Thoura QC in Juba Town Payam and Gudele Block 8 QC in Munuki Payam were added as the target areas of Residential Pilot Project from 15th and 16th November, 2012 respectively.

(1) Background

Pilot Project for waste collection in Jebel Market, Atlabara B and Atlabara C started in July 2012. After 4 months, each collection activity was mostly going well. And it was found that the pilot project collection system (station collection with designated time) together with the involvement of the residents was suitable for the social customs in Juba City. From now on, C/Ps and JICA Expert Team plans to expand this collection system in other areas of Juba City.

Furthermore the commencement time of the Pilot Project coincided nicely with the start of operation of 10 compactors procured by Juba City. Kator Payam allocated one of the compactors to Jebel market on a regular basis. Other payams were also considering the best methods to operate the compactors, so JICA Expert Team provided guidance for the operation.

According to the discussion with Deputy Mayor of Juba City and Directors at the meeting at the office of Kator Payam, it was found that officers of payams tried to learn how to collect wastes through the Project.

(2) Pilot Project Expansion Plan

In the Pilot Project, the JICA Expert Team requested Payams to send the collectionvehicles in each target area on a different day from the collection day by JICA Expert Team. JICA Expert Team intended to decrease the distribution of the vehicles when Payams and QCs gradually learned how to do this, and change the target areas to expand the collection system.

At the beginning, this plan seemed to be difficult because Payams did not have enough collection vehicles. However, the situation changed because of the start of operation of 10 compactors procured by Juba City.

From now on, the Pilot Project will be continued in several areas in order that many residents understand the system and officers of each Payam learn how to collect wastes in an efficient way.

(3) Situation of the Starting Time in Hai Thoura QC in Juba Town Payam and Gudele Block 8 in Munuki Payam

JICA Expert Team took an initiative to prepare the Pilot Project in Kator Payam. This time, JICA Expert Team decided that the South Sudan side should take the initiative for preparation.

In Juba Town Payam, Director and Health Officer decided Hai Thoura QC as the target area. And then they went to the office of Hai Thoura QC, and decided the collection points, time and route. After that, the community meeting was held twice, and residents agreed to start the new collection system.

In Munuki Payam, the same procedure was mostly followed.

Table 17 Activity Record to Start Pilot Project in Juba Town Payam and Munuki Payam

Date	Activity	Remark
29th Oct	JICA Expert Team explained the plan how to expand Pilot Project to Deputy Mayor and Mr. Hiraly in Juba City Council, and they agreed to the plan.	JICA Expert Team showed the signboard and the collection bin.
Juba Town Payam		
30th Oct	Director agreed to start the Pilot Project and decided Hai Thoura QC as the target area	
3rd Nov	Health officer of Juba Town Payam explained the plan to the chairperson of Hai Thoura QC.	Health officer of Juba Town Payam showed the pilot project collection situation in Atlabara B and Atlabara C to the chairperson of Hai Thoura QC.
3rd Nov	The chairperson of Gudele Block 8 QC tentatively set collection points.	
7th Nov	QC set signboards were installed at the collection points.	
10th Nov	Community meeting was held and bins, which were procured by the Project, were distributed to residents.	
15th Nov	Pilot Project started.	Only 1 trip was taken although the vehicle stopped at every collection points. This was because residents might not have known much about the Pilot Project.
Munuki Payam		
30th Oct	Deputy Director agreed to start the Pilot Project and decided Gudele Block 8 QC as the target area.	Director was out of office, but the implementation of Pilot Project was decided.
3rd Nov	Health officer of Munuki Payam explained to the chairperson of Gudele Block 8 QC.	
7th Nov	The chairperson of Gudele Block 8 QC tentatively set the collection points.	
9th Nov	Signboards were set at collection points.	
14th Nov	Community meeting was held and bins were distributed to residents.	
16th Nov	Pilot Project started.	With the good coordination of QC, residents brought wastes at the points. It took 3 trips from Point 1 to Point 12 on the first day. Collection from Point 13 to Point 15 was done in the next day.

Figure 12 Original Collection Route of Hai Thoura QC in Juba Town Payam

Figure 13 Original Collection Route of Gudele Block 8 QC in Munuki Payam

2.6 Situation after 7 months

(1) Waste Collection Fee Revised by Juba City

In December 2012, Juba City revised the waste collection fee. The revised fee related to the residential areas is shown in the following table. The prices for the 1st and 2nd classes were double, but the prices for 3rd and 4th classes were same as the original fees.

Table 18 Waste Collection Fee For Residential Area Revised by Juba City

Type of Residential Area	Original Fee (from 2011 to 2012) [SSP/month]	Revised Fee (from 2012 to 2013) [SSP/month]
1st Class	30	60
2nd Class	25	50
3rd Class	20	20
4th Class	20	20

(2) Collection Schedule and Achievement

The schedule of vehicle allocation by each Payam for each target area, and the achievement of allocation are shown in Table 8-18 and Table 8-19 respectively.

Table 19 Schedule of Vehicle Distribution by Payams

	Location	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Kator payam	Atla bara B	Kator payam Truck			JICA Truck			
Kator payam	Atla bara C	Kator Payam Truck				JICA Truck		
Juba Town Payam	Hai Thoura				Juba Payam Truck		JICA Truck	
Munuki Payam	Gudele Block 8						Muniki Payam Truck	JICA Truck

Note) Schedule of Juba Town Payam Truck was changed from Monday to Tuesday. Schedule of Munuki Payam Truck was changed from Tuesday to Thursday (as of March, 2013).

Table 20 Achievement of Vehicle Allocation by Payams

	Residential Area		
Week	Hai Thoura	Gudele 8	Atlabara B,C
Nov 12-17	0	0	0
Nov 19-24	0	0	0
Nov 26-Dec 1	0	0	0

Dec 3-8	0	0	1
Dec 10-15	0	0	0
Dec 17-22	0	0	1
Dec 24-29	0	0	0.5
Dec 31- Jan 5	0	0	1
Jan 7-12	0	1	0.5
Jan 14-19	0	0	0.5
Jan 21-26	0	0	1
Jan 28-Feb 2	0	0	0.5
Feb 4-9	1	1	0.5
Feb 11-16	1	0	1
Total	2	2	7.5

Note)

1: Payam sent the vehicle

0: Payam did not send the vehicle

(3) Review Meeting

On 10th March, 2013, the review meeting was held in Gudele Block 8. The representative of QC and Health Officer of Munuki Payam also attended. Comparing to other target areas, QC of Gudele Block 8 was very active and cooperative. And Health Officer of Payam was also active. Therefore the meeting could be started smoothly. The main comments from attendants are as follows;

- We wanted to expand JICA Pilot Project.
- We could not rely on Payam, so we could collect money and hire a truck to collect wastes regularly.
- Munuki Payam had not allocated the vehicle regularly at first, but recently they allocated it regularly.
- If Payam had problems for regular allocation of vehicle, we could need to collect money for fuel.
- Residents should learn the waste collection system by JICA Project.

On 12th March, 2013, the review meeting was held in Atlabara C (originally the meeting was planned to be held on 8th March, but it was cancelled). The representative of QC also attended. The main comments from attendants are as follows;

- We were satisfied with the waste collection by JICA Project.
- Vehicle allocation by Kator Payam was not regular. We want JICA Project to extend the Pilot Project until they could allocate the vehicle regularly.
- The attitude of collection workers from JICA Project was not good (they did not return the bags,

not load the wastes on to the truck, and not support for children.)

- QC should provide the sufficient information for residents (we did not know the date of this review meeting).

The same review meetings will be held in Atlabara B and Hai Thoura (by the long-tern JICA Expert).

Figure 14 Review Meeting in Gudele Block 8 (10th March, 2013)

2.7 Collection Schedule of Target Residential Areas

In July 2012, the collection pilot project started in 2 target residential areas (QCs) in Kator Payam; Atlabala B and Atlabara C. Then the pilot project started in the additional 2 target residential areas; Hai Thoura in Juba Town Payam and Gudele Block 8 in Munuki Payam. The following table shows the collection schedule of target residential areas. It has not been changed since the pilot project started. Each Payam allocates one compactor for each residential area once a week, and JICA Expert Team allocates one open truck for each residential area once a week.

Table 21 Collection Schedule of Target Residential Areas

Payam	Target Area	Allocation	Mon	Tue	Wed	Thu	Fri	Sat
Kator Payam	Atlaraba B	By Payam						Compactor: 1 unit
		By JICA		Open Truck: 1 unit				
	Atlaraba C	By Payam						Compactor: 1 unit
		By JICA			Open Truck: 1 unit			
Juba Town Payam	Hai Thoura	By Payam		Compactor: 1 unit				
		By JICA				Open Truck: 1 unit		
	Lobulet Bridge	By JICA				Open Truck: 1 unit		
Munuki Payam	Gudele Block 8	By Payam				Compactor: 1 unit		
		By JICA					Open Truck: 1 unit	

2.8 Achievement of Vehicle Allocation for Residential Areas by Kator Payam

(1) Atlabara B

The following table shows the achievement of vehicle allocation for Atlabara B by Kator Payam. This table shows the ratio of days that Kator Payam actually allocated vehicles to the scheduled days. By July 2013, the allocation ratio was raised gradually, and Kator Payam achieved 100 % in July 2013.

From August 2013, the allocation ratio was decreased because of the frequent break down of the compactors. In September 2013, the allocation ratio reached 0%. Juba City Council has a responsibility to maintain the compactors, therefore, C/Ps and JICA Expert Team need to involve Juba City Council more.

Table 22 Achievement of Vehicle Allocation for Atlabara B by Kator Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
March, 2013	0	4	0%
April, 2013	1	4	25%
May, 2013	1	4	25%
June, 2013	3	5	60%
July, 2013	4	4	100%
August, 2013	2	5	40%
September, 2013	0	4	0%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

(2) Atlabara C

The following table shows the achievement of vehicle allocation for Atlabara C by Kator Payam. This table shows the ratio of days that Kator Payam actually allocated vehicles to the scheduled days. As same as the case of Atlabara B, the allocation ratio was greatly decreased because of the frequent break down of the compactors from August. In order to achieve the stable allocation, C/Ps and JICA Expert Team need to involve Juba City Council more.

Table 23 Achievement of Vehicle Allocation for Atlabara C by Kator Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
March, 2013	0	4	0%
April, 2013	3	4	75%
May, 2013	4	4	100%
June, 2013	2	5	40%
July, 2013	3	4	75%
August, 2013	2	5	40%
September, 2013	0	4	0%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

2.9 Achievement of Vehicle Allocation for Hai Thoura by Juba Town Payam

The following table shows the achievement of vehicle allocation for Hai Thoura by Juba Town Payam. This table shows the ratio of days that Juba Town Payam actually allocated vehicles to the scheduled days. By July 2013, Juba Town Payam kept more than 70%. However, from August 2013, the allocation ratio was decreased because of the frequent break down of the compactors as same as the case of Kator Payam. C/Ps and JICA Expert Team need to involve Juba City Council more.

Table 24 Achievement of Vehicle Allocation for Hai Thoura by Juba Town Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
March, 2013	3	4	75%
April, 2013	4	5	80%
May, 2013	4	4	100%
June, 2013	4	4	100%
July, 2013	4	5	80%
August, 2013	2	4	50%
September, 2013	1	4	25%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

2.10 Achievement of Vehicle Allocation for Gudele Block 8 by Munuki Payam

The following table shows the achievement of vehicle allocation for Gudele Block 8 by Munuki Payam. This table shows the ratio of days that Munuki Payam actually allocated vehicles to the scheduled days. The allocation reatio in March was reached 100%, but the allocation ratio was decreased by July 2013. In August and September, Munuki Payam could keep the allocation ratio around 45%. So Munuki Payam did not suffer the damage very much by the the compactors breakdown compared to Kator Payam and Juba Town Payam. However, the allocation ratio was still low and unstable. Therefore, Juba Town Payam needs to make efforts with JICA Expert Team for stable allocation.

Table 25 Achievement of Vehicle Allocation for Gudele Block 8 by Munuki Payam

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
	[days/month]	[days/month]	[%]
March, 2013	4	4	100%
April, 2013	2	4	50%
May, 2013	0	5	0%

	Achievement (Number of Allocated Vehicle)	Schedule	Allocation Ratio
June, 2013	0	4	0%
July, 2013	0	4	0%
August, 2013	2	5	40%
September, 2013	2	4	50%

Note) [Allocation Ratio] = [Days that Payam actually allocated vehicles] / [Scheduled Days] x 100

Conclusions

Pilot project supposed to start in November 2012 based on the original schedule however, it was started in July 2012 in Jebel Market and Atlabara B&C residential areas. This was based on the expectation that the promotion of understanding of counterpart staffs and residents takes time. This expectation seems to be correct.

In Jebel Market, strong leadership of market union promoted the activity despite the fact that there were 900 shops and restaurants. This selection also seems to be collect. Residents in Atlabara B&C were cooperative in collection.

The pilot activity was extended to Hai Thoura in Juba Town Payam and Gudele Block 8 in Munuki Payam (Jebel Market and Atlabara B&C are located in Kator Payam) and all 3 Payams were covered.

In July 2013, Juba Market was added in market collection. The way of extension seems to be correct.

“Fixed Time Station Collection” System doesn’t require cost for collection and also awareness raising for the residents is involved. This became stable because it fitted to the culture of Juba.

Project was ceased in December 2013 due to violence occurred however, the collection continues without assistance of JICA vehicles.

Collection pilot is currently conducted remotely for monitoring and advice. It is desired to continue by the effort and ingenuity of counterpart staffs.

3. Landfill Improvement Pilot Project Report

Project for Capacity Development on Solid Waste Management in Juba

Landfill Improvement Pilot Project Report

Table of Contents

1. Surveys and Examination for Understanding the Present Landfill Management

In order to understand the present situation of landfill management, the following surveys and examinations were implemented;

Table 1-1 Surveys and Examination for Understanding the Present Landfill Management

Item	Purpose	Results
Site survey	To confirm the situation	Wastes were disposed out of the disposal site. Scattering wastes, offensive odor, flies, fires were observed and confirmed. There was no manager. There was no equipment for landfill operation. Activity of waste pickers was confirmed.
Topographic survey	To confirm the capacity of the existing disposal site To perpare the future plan	Survey maps (see the Appendix)
Incoming waste survey	To estimate the amount of incoming waste	177 m^3/day, 40 vehicles/day in average
Recycling survey	To estimate the waste amount for recycling	At the landfill site, Iron: 0.7 ton/day Aluminum cans: 0.5 ton/day Hard plastic: 0.4 ton/day PET bottles: 0.5 ton/day
Examination of landfill capacity and lifespan	To estimate the landfill capacity and lifespan	The remaining lifespan of the landfill site is around 1 year and 3 months based on the results of topographic survey, incoming waste survey and recycling survey.

2. Issues of the Existing Disposal Site

JICA Expert Team identified the following issues based on the results of surveys and examination and implemented 3 pilot projects.

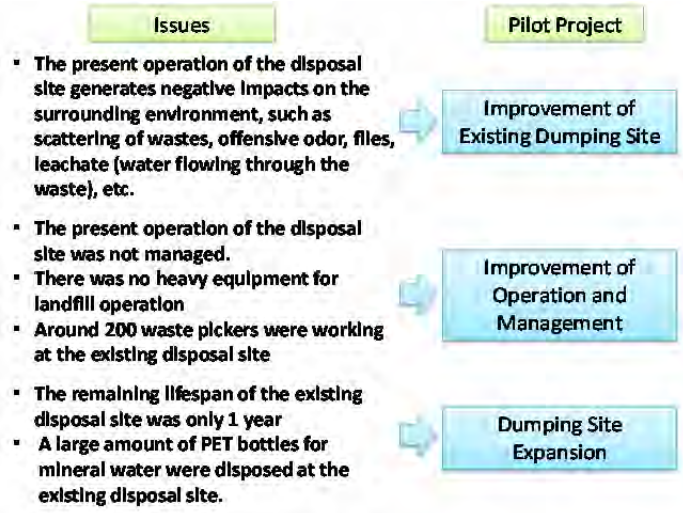


Figure 2-1 Relationship between issues and pilot project

3. Activity of Pilot Project

3.1 Improvement of Existing Disposal Site

1) Purpose of Activity

The existing disposal was not under any control, and waste was randomly dumped, a condition which caused serious impacts on the surrounding areas. Therefore, it was realized that the existing disposal site should be improved immediately. To improve these conditions, it was first necessary to collect the existing randomly dumped waste, transfer the designated place and cover with soil.

Heavy equipment was necessary for dumping operations, such as bulldozers, wheel loaders and dump trucks. Bulldozers are used for spreading and compaction of the randomly dumped waste; Wheel loaders are utilized to collect the randomly dumped waste; Dump trucks are necessary to move waste, which wheel loaders have collected, to a given spot.

2) Improvement Method

The method adopted to improve the existing disposal site is shown in the following figures.

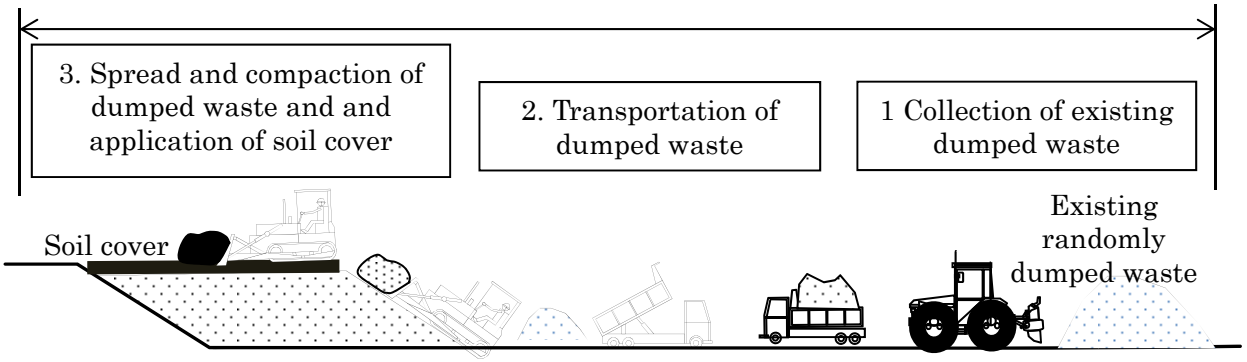


Figure 3-1 Method of Disposal site improvement

3) Input by JICA Side

Inputs from the JICA side for this activity are shown in the following figure. Main input was to rent heavy equipment (wheel loader, dump truck and bulldozer). This bulldozer will also be utilized for operation at the disposal site as mentioned later.

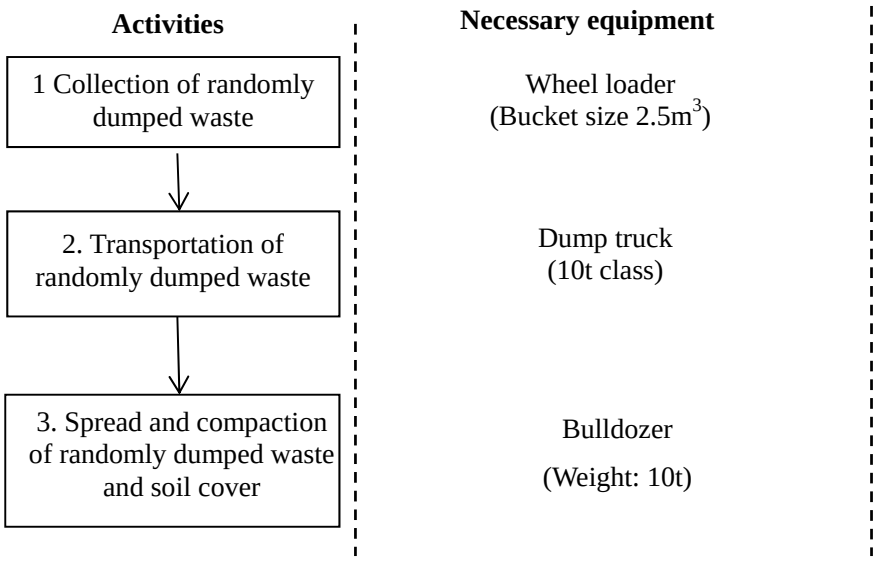


Figure 3-2 Activity Flow and Necessary Equipment for Existing Disposal Site Improvement

4) Input by South Sudan Side

Inputs from the South Sudan Side for this activity were provision of human resources: a Manager (1 person from Juba County) and Landfill Supervisors (respectively 1 person from Juba County and Rejaf Payam).

5) Work of Landfill Staff

The work of the landfill staff are as follows:

- Record of waste vehicles (number plates, time)
- Instruction of waste dumping spots for drivers of dump trucks
- Report on working conditions to local staff

6) Schedule

The schedule to improve the disposal site is shown in the following table.

Table 3-1 Schedule to Improve Disposal Site

	Year 2012				
	July	August	September	October	November
Design	←	→			
Preparation		←	→		
Construction			←	→	

	
Before improvement (inside of the landfill)	After improvement (outside of the landfill)
	
After improvement (inside of the landfill)	After improvement (outside of the landfill)

Figure 3-3 Situation Before and After the Improvement Works

3.2 Improvement of Landfill Management

(1) Construction of Control Facilities

1) Purpose of Activity

The purpose for providing control facilities is to convert the site from an open dumping site to a controlled dumping site. Construction of a Fence and Gates prohibits undesirable people from getting into the site, and clarifies the landfill boundary. Landfill staff members use the Control building for landfill operations. The gas vent pipe system collects methane gas from kitchen garbage, and emits it into the air.

2) Inputs

・ JICA Side

Inputs from the JICA side for this activity are procurement, designing, construction and supervision of the following control facilities. JICA Expert Team determined the required facilities as follows:.

・ South Sudan Side

Inputs from the South Sudan Side for this activity are human resources: a Manager (1 person from Juba County) and two Landfill Supervisors (respectively 1 person from each of Juba County and Rejaf Payam).

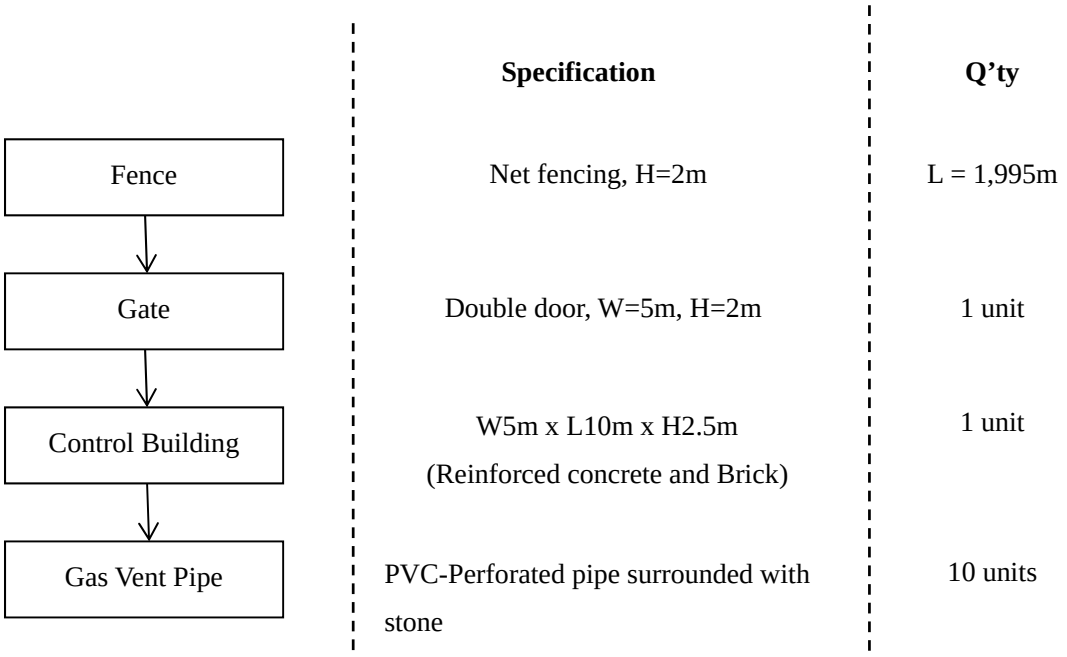


Figure 3-4 Specification and Quantity and Construction Flow of Control Facility Input from the

JICA

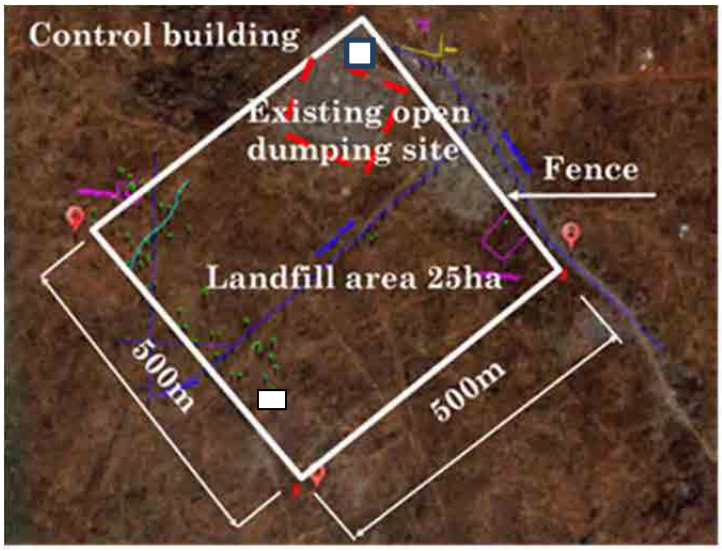


Figure 3-5 Layout Plan of Control Facility Input from the JICA Side

3) Schedule

After the completion of construction work, the opening ceremony was held with invited related agencies at the beginning of February, 2013. The construction schedule of the control facility is shown in the following table.

Table 3-2 Construction Schedule of Control Facility

Item	Year 2012						Year 2013	
	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Design	←	—						
Preparation		←	—	→				
Construction				←	—	—	—	→
Opening ceremony								▼

Control building

Fence

Gas vent pipe

Figure 3-6 Facilities of Landfill

(2) Improvement of Waste Disposal Method

1) Purpose

Improvement of the waste disposal method was necessary in order to improve the uncontrolled site operation that was prevailing at the disposal site. It was necessary to allocate management staff and bulldozers to the landfill site. The management staff guides the waste collection vehicles to specific dumping spots. Bulldozers level the waste disposed, and regularly apply cover soil to prevent the waste from scattering and emitting offensive odor.

2) Improvement Method

The improvement method is shown in the following figure.

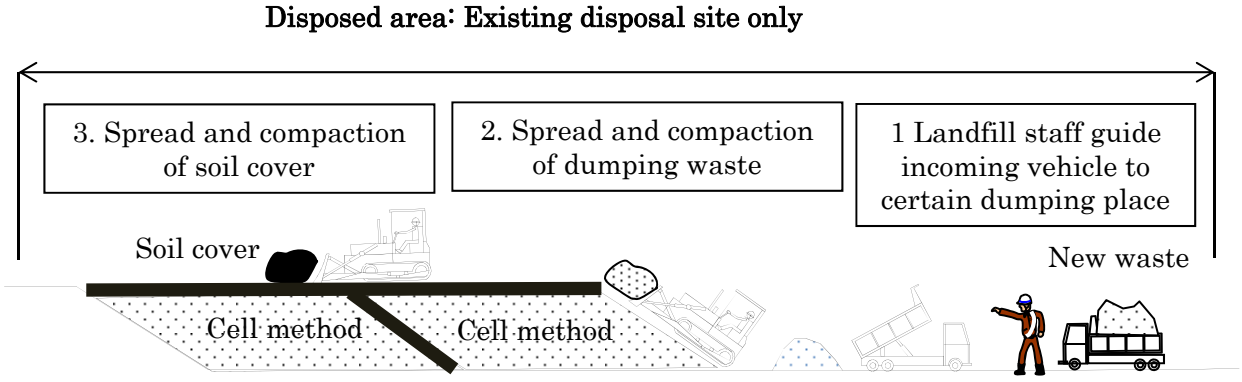


Figure 3-7 Improvement Method for Waste Disposal

(1) Inputs

・ JICA Side

Inputs from JICA side for this activity are shown in the following figure. The main input was to rent heavy equipment (wheel loaders, dump trucks and bulldozers).

・ South Sudan Side

Inputs from South Sudan side for this activity were the provision of human resources: a manager (1 person from Juba County) and two landfill staff (respectively 1 person from Juba County and Rejaf Payam).

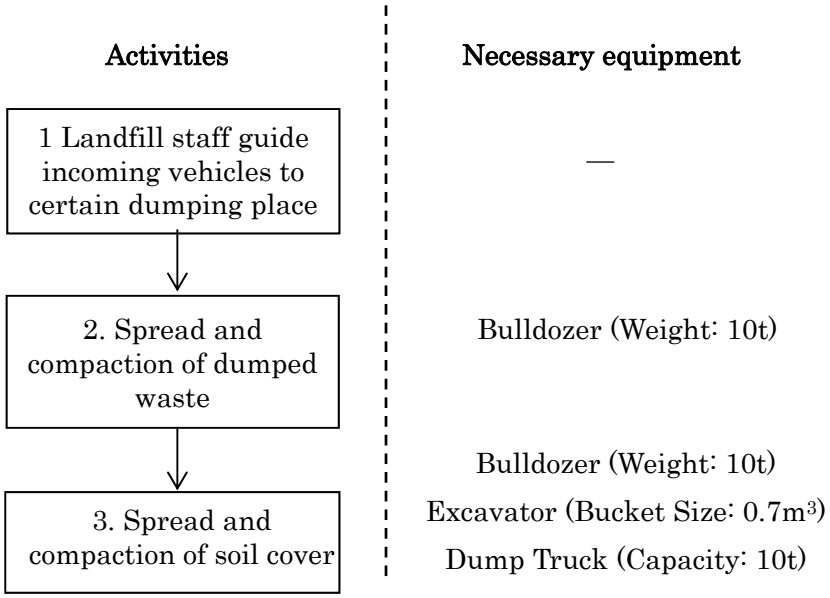


Figure 3-8 Improvement Activity Flow and Necessary Equipment

(2) Work of Landfill Staff

The work of the landfill staff was as follows:

- Preparation of operation record (dumping spots, height, waste dumping conditions, etc.)
- Record of waste vehicles (number plates, time)
- Preparation of working record for heavy equipment
- Instruction of waste dumping spots
- Report on working conditions to local staff (when problems occur)

(3) Schedule

The schedule to improve the landfill site is shown in the following table.

Table 3-3 Schedule to Improve the Landfill Site

	Year 2012				Year 2013
	July	August	September		March
Design	←	—	—		
Preparation		←	—		
Improvement			←	—	→

		
Guidance for waste vehicles	Leveling and rolling computation of waste	Soil covering

Figure 3-9 Situation of Disposal Method Improvement

(3) Establishment of Landfill Management Organization

1) Discussion for Establishment of Landfill Management Organization

JICA Expert Team discussed the organization for the landfill management with the Commissioner of Juba County, the Deputy Director of Public Health and the Director of Rejaf Payam, who are responsible for operation of the landfill site. The discussion results were as follows;

- The commissioner of Juba County has all the responsibility from landfill planning to operation and management.
- The Rejaf Payam is in charge of operation and management of landfill site (including tipping fee collection).
- Juba County is responsible for future plan of landfill site.
- Ordinary operation staff shall be respectively one person from Rejaf Payam and Juba County.
- The operators of bulldozers shall be employed by Rejaf Payam.

2) Changes for landfill management organization

Changes for landfill management organization are as below. As facility or equipment increased, number of staffs is also increased

Month/ Year	Event	Landfill Management Staff
April 2012	The project started	・One staff
September 2012	Improvement of landfill started	・One site manager ・One staff
January 2013	Disposal in extended area started	・One site manager ・Two staffs
August, 2013	Provision of Bulldozer	・One site manager ・Two staffs ・One machine operator

3) Organization for operation and maintenance of landfill site

Figure below shows the organization for operation and maintenance of landfill site in December 2013. Minimum number of the staffs for proper landfill management is assigned.

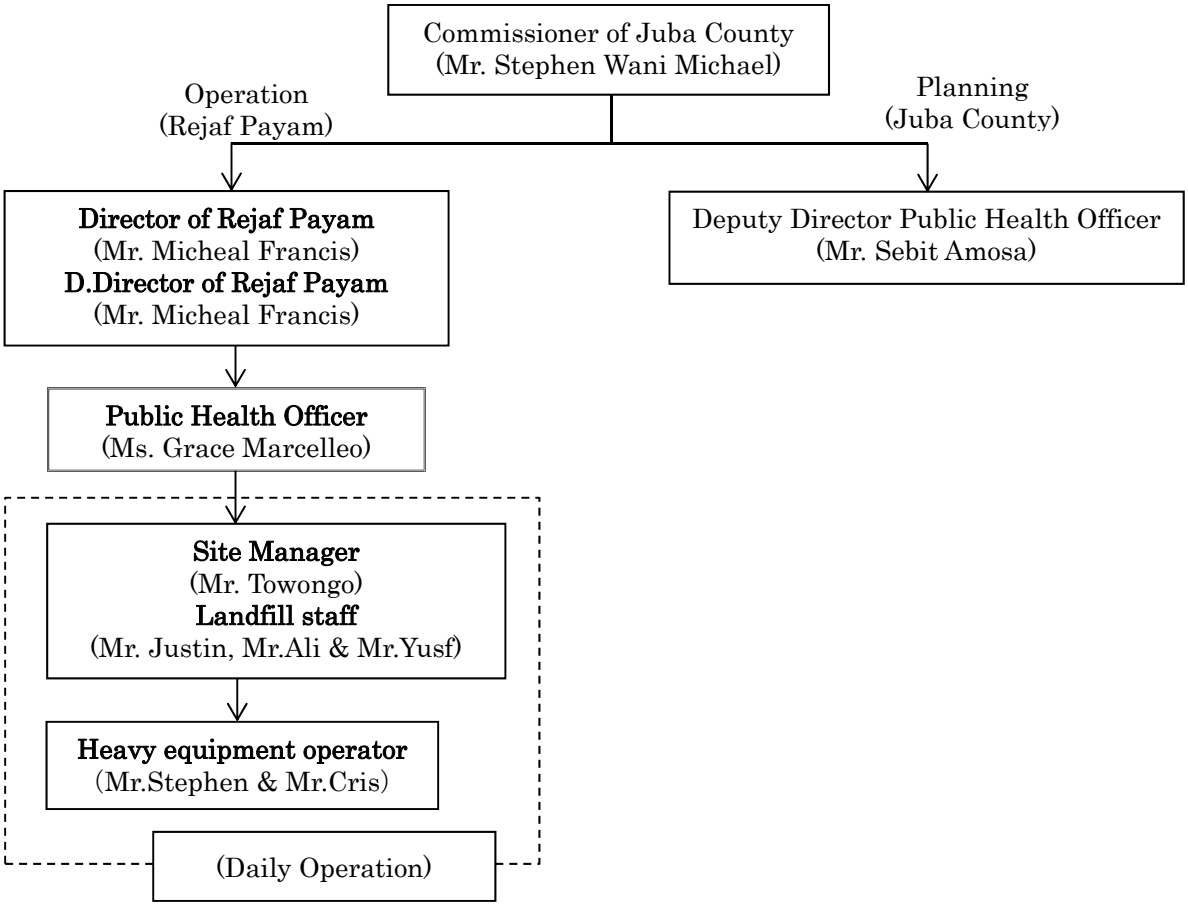


Figure 3-10 Organization for operation and maintenance of Juba County Controlled Dumping Site

(4) Examination on Heavy Equipment Procurement

1) Purpose

Minimum one bulldozer is required for proper waste disposal. Rental and purchase options were considered because of very high rental cost for heavy equipment including bulldozer.

2) Property and purchase plan of heavy equipment by the South Sudan side

- MoPI has a bulldozer; it can be regularly rented but it is impossible to be transferred to Juba County or Rajaf Payam.
- In case the bulldozer is regularly rented, the transportation fee will be high (1,000USD/time).

- The Ministry of Housing and Physical Planning mentioned that there was a plan to purchase a bulldozer for dumping sites, but it is not promising because the acquisition data and financial resources are unclear.

3) Comparison of rental fee and purchase price of bulldozers

- There is an official dealer of CAT in Juba City.
- CAT D6, which is a size bigger than existing heavy equipment that may be rented, is quoted as 300,000 USD.
- The purchase cost of the CAT D6 is equivalent to the rental fee of existing rental heavy equipment (CAT D5) for 1 year

Table 3-4 Comparison of Renting Case and Procurement Case of Bulldozers

	Rental (current)	Purchase
Type	CAT D5	CAT D6
Capacity	100HP	130HP
Cost	26,500 USD/Month	300,000 USD/ Month

4) Operation and maintenance costs for heavy equipment

- Landfill operation cost is about 33,000 SSP/month
- Operation cost only for bulldozer is about 22,600 SSP/month

Table 3-5 Landfill Operation and Maintenance Costs

Item	Cost (SSP/month)	Remarks
Bulldozer Operator	2,100	
Bulldozer fuel	17,000	
Maintenance	5,500	For bulldozer
Rental of Excavator	5,040	For soil cover
Rental of Dump truck	3,360	For soil cover
Total	33,000 (22,600)	( ):only for bulldozer

5) Income for landfill site operation

- Rajaf Payam collected the disposal fee at the check point.
- The fees for the vehicles with less than 10 tires and for those with more than 10 tires are 25 SSP/time and 50 SSP/time respectively.
- Juba County is examining to raise the disposal fee for UN offices, and is negotiating with them to receive 20,000 SSP/month.
- In August 2012, the total disposal fee of Payams is estimated as 31,817 SSP. If the disposal fee for

UN offices is increased to 20,000 SSP, the total will be 57,817 SSP.

- This collected fee can cover the operation and maintenance costs (35,000 SSP/month). However, Rajaf Payam does not receive the fee from Payams. They are now requesting Payams to pay because Payams do not have to pay the disposal fee at the check point although private companies should pay at the check point.

- **Table 3-7 Disposal Fee of Each Payam**

	August, 2012	
	Amount of Fee	Amount of collection
Juba Town Payam	13,900	0
Kator Payam	18,850	10,000
Munuki Payam	2,175	2,175
Private company	7,892	7,892
Total	37,817	20,067

6) Comparison between income and operation & maintenance cost

Income of 37,817 SSP per month (August, 2012) can cover the cost for operation and maintenance (33,000 SSP). Unlike private companies paying fees at the check point, total fees are not collected from Juba and Munuki Payam since they are paying monthly. Fee collection system to collect fees from Payams is needed.

7) Procurement of bulldozer

Provision of bulldozer from JICA was decided with the condition of proper fee collection from the Payams and Rejaf payam cater for the cost of bulldozer operation and maintenance.

(5) Fee Collection for O&M

1) Purpose

General budget of Rejaf Payam cannot cover the cost of O&M, so that tipping fee from incoming vehicle to improved dumping site is used for O&M.

2) Tipping Fee Collection from Users

Rejaf Payam has collected tipping fee for O&M since October, 2012, in order to secure the O&M cost. Large vehicles should pay 50 SSP and small vehicles should pay 25 SSP. The total collected fee from vehicles ordered by public agencies, such as Payams, from July 2012 to May 2013 was 184,775 SSP. Its monthly average was 19,473 SSP/month. The amount of collected fee from vehicles ordered by private agencies was not clear. It is because such vehicles should pay at the check point, and officers at the check point collected not only fee for O&M for Juba County Controlled Dumping Site, but also other fees, such as material transportation. Now Deputy Director prepares solutions for this matter.

3) Method of fee collection

The method of fee collection is that counting the number of incoming vehicles at the checkpoint (Since July 2012). Payams and JCC are paying monthly and private vehicles are paying at the checkpoint. Though, Payams delayed payment so that the method of checkpoint payment was applied for Payams and JCC form December 2013.

4) O&M Cost

In order to operate the bulldozer newly procured by JICA from August 2013, the average O&M cost from August to October, 2013 was calculated as 38,300 SSP/month.

Table 3-8 Landfill Operation Cost Unit: SSP

Item	August	September	October	Average
Fuel for Bulldozer	13,500	18,000	19,200	16,900
Fuel for Bulldozer	3,120	5,120	5,120	4,450
Rental fee of equipment for soil covering	15,120	15,120	15,120	15,120
Maintenance cost of a bulldozer	4,500	0	1,000	1,830
Total	36,240	38,240	40,440	38,300

4) Comparison between Collected Fee and O&M Cost

The average collected fee from vehicles ordered by public agencies, which is 19,473 SSP/month, is smaller than calculated O&M cost as 38,300 SSP. If the collected fee is calculated with the data of average number of incoming vehicles mentioned in 3.2, the income from incoming vehicles will be "44,850 SSP = 46 vehicles/day x 37.5 SSP/vehicle (average of large and small vehicles) x 26 days", and will be bigger than O&M cost. Therefore, O&M cost can be covered by fee collection from incoming vehicles if Rejaf Payam collects fees from all incoming vehicles.

(6) Landfill Operation & Maintenance

1) Purpose

Daily management and maintenance is very important to manage landfill. Instruction was given for CP to learn landfill operation and maintenance.

2) Task for O&M of landfill

Tasks are categorized as below;

① Management, Administration
② Disposal management
③ Maintenance of facilities and equipment
④ Environmental management

Landfill management manual to cover all tasks is drafted through on the job training for CP

3) Training method

Realization of proper O&M for landfill is heavily depending on the motivation of site manager, landfill staff and machine operator to understand the function of landfill and their effort. Training method is as below;

① Principle is to instruct individually by actual work on site. Common items are instructed by lectures
② The method is for trainee to analyze issues and propose realistic solutions (Self-proposal, self-solution). Landfill O&M is improved by trainee in the process to propose, implement, evaluate, improve solution and enhance their understanding and motivation.
③ Instruction is given by expert, however the training of site manager is prioritized in order to continue operation while expert absence.

④ Use visual tool such as DVD videos as much as possible

4) Training Plan

Outline of training for each tasks is shown in Table 3-9.

Table 3-9 Outline of Training

Task		Contents	Method	Audience	Period
Management, administration		・ Necessary facility and environmental conservation ・Security and fire prevention of the site ・Task management of the staff, supervision and sanitation	＊Lecture (Self-solution is considered) ＊Training on site ＊ Draft operation manual and implementation	①Site Manager ②Landfill staff	Once a week
Disposal management	Receiving Waste	・Inappropriate waste ・Monitoring and record of waste quality and quantity ・Processing into statistics (Source, category etc…)	＊ Individual and group ＊On site and lecture ＊Through daily operation ＊Implementation of operation manual	①Site Manager ②Landfill staff	
	Direction of truck, tipping	・Safe driving ・ Cooperation between incoming vehicle and machine operator		① Site Manager ② Landfill staff ③ Machine operator	
	Spreading, compaction, soil cover	・Stabilization mechanism of the waste (early stabilization) ・Function of facilities and points of concern for operation ・Reduction of leachate			
Maintenance of facility and equipment		・Facility and equipment ・Stable operation of facility and equipment ・Checkup and fixing of facility and equipment	＊Draft maintenance manual for facility and equipment ＊Implementation of the manual	①Site Manager ① Landfill staff ② Machine operator	
Environmental management		・ Purpose of environmental management, parameter	On site	①Site Manager ③ Landfill staff	

5) Situation of O&M

Operation Manual was prepared with landfill staff in August 2013. From now on, O&M of Juba County Controlled Dumping Site will be implemented with this manual. The present O&M situation is shown in the following table.

Table 3-10 Situation of landfill O&M

Work Item	Situation
1) Overall management • Operation record	• Site manager makes the operation record every day.
• Weekly meeting	• Weekly meeting is held on every Monday. The chairperson reports issues to Director of Rejaf Payam.
2) Landfill management • Guidance for incoming vehicles to the dumping place	• Guidance is mostly done every day. Sometimes staff guides vehicles into muddy places and vehicles get stuck in the mud.
• Record of incoming vehicles	• Site manager makes the incoming vehicle record every day.
• Landfilling	• Landfilling is mostly done every day. Landfilling at existing area was completed in December, 2013, so the expansion area has started to be used.
• Soil Covering	• Rejaf Payam uses collected fee and covers soil once per 2 weeks. Soil covering is mostly done every time, but compaction is not enough at some areas.
• Management of waste pickers	• There are not any fires and accidents (injury) at present. Waste pickers cleaned the site once per 2 weeks.
3) Facility management • Facility management	• Using the Operation Manual, management of each facility will start from September 2013.
• Management of heavy equipment	• Operation started in August 2013. Management will start with the Operation Manual from September 2013.
• Extension of gas vent pipes	• Gas vent pipes are extended according to the progress of landfilling. Sometimes heavy equipment and vehicles hit and break the pipes, but landfill staff repairs every time.
4) Environmental management • Groundwater	• From August, 2013, Ph, EC, COD, Nitrate nitrogen and Ammonia nitrogen were measured with simple water analysis tools at the monitoring wells which were set by the geological and groundwater survey.
• Gas	• In November, 2013, O_2, CO_2 and Methane and Hydrogen sulfide water were measured with simple gas analysis tools at the gas vent pipes.

6) O&M Record

(7) Environmental Monitoring

a) Purpose

Ground water quality and landfill gas were measured in order to monitor the environmental impact of landfill. It is also for CP to understand the importance of environmental monitoring

b) Observation point

Observation points are shown in the right Figure.

- Groundwater quality

  BH-5 was selected from 5 boreholes used for hydrology survey which locates downstream of the dumping area and easily affected when leachate leak from landfill.

- Landfill gas

  Two gas vent pipes were selected for landfill gas measurement where soil cover was already ended.

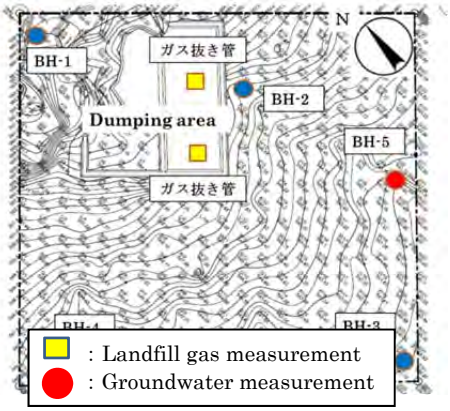


Figure 3-11
Observation Points

c) Results

Measured results are as below;

- Groundwater quality

The value of COD, NH_4^+-N and NO_3-N were small and low possibility of leachate leak is indicated

Table 3-11 Result of groundwater quality measurement

Date	Color	Groundwater level (GL-m)	pH	EC (ms/cm)	COD (mg/l)	NH_4^+-N (mg/l)	NO_3^--N* (mg/l)
Aug 26	No	—	6.8	2.00	5	0.3	20
Oct 5	No	—	—	—	13	0.5	20
Nov 1	No	9.75	6.6	1.22	7	0.0	20

*Lower limit:20mg/l

- Landfill gas

It is expected that anaerobic decomposition is taking place from the result of high temperature and high concentration of CH_4 and CO_2.

Table 3-12 Result of landfill gas measurement

Date	Point	Temp (℃)	CH_4 (%)	CO_2 (%)	O_2 (%)	H_2S (ppm)	CO (ppm)
Nov 9	No.1	41.0	43.8	40.2	2.6	5.0	0

	No.2	45.0	36.9	30.7	5.4	1.0	29

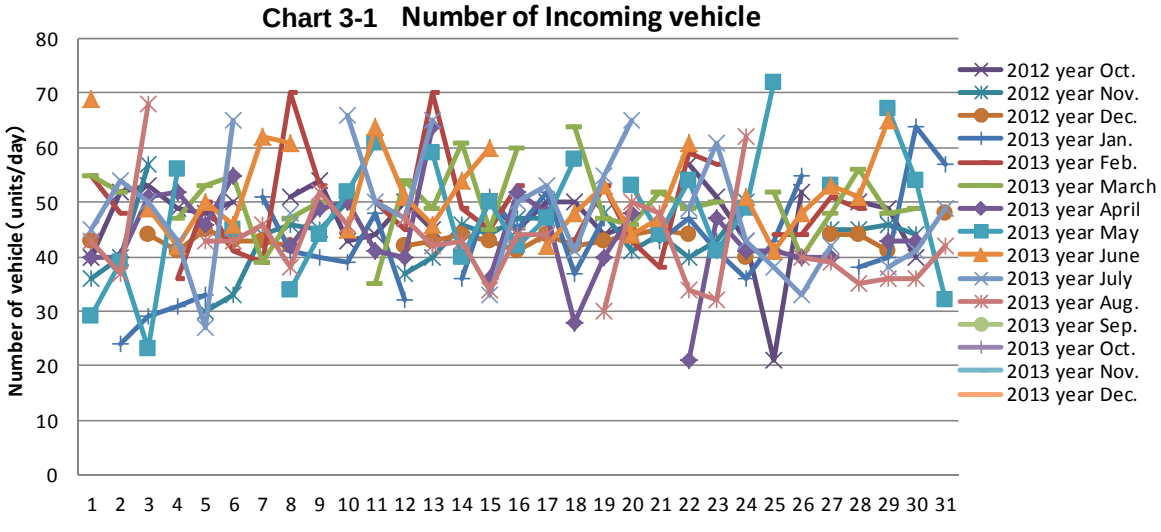
Figure 3-12 Ground water measurement

Figure 3-13 Landfill gas measurement

i) Number of incoming vehicle

Landfill staffs are recording the number of incoming vehicles since October 2012. Lowest number is 20 vehicles/day, Highest is 71 vehicles/day and 46 vehicles/day on average. Number in July to September is approx. 43 vehicles/day and it is lower than average. Breakdown of compactors in the Payams is the expected reason for this.

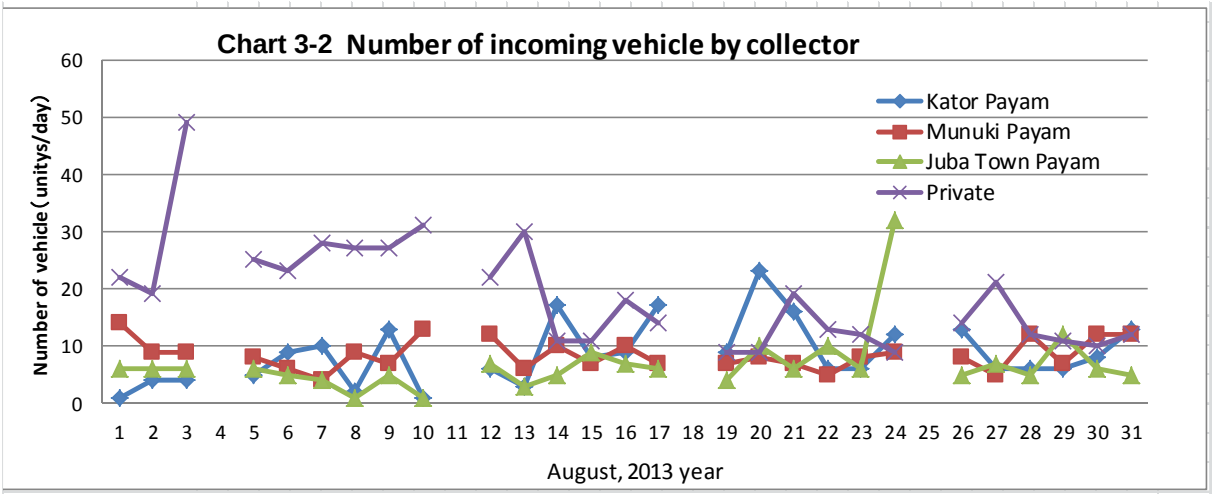
Chart 3-1 Number of Incoming vehicle



	2012 year			2013 year												
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Total No.	1,227	1,088	993	1,100	1,185	1,303	1,138	1,198	1,303	1,251	1,154	882				1,152
Woking day	26	25	23	26	24	26	26	25	25	25	27	21				25
Average No	47	44	43	42	49	50	44	48	52	43	43	42				46

ii) Number of incoming vehicle by waste collectors

Landfill staffs started recording incoming vehicles by waste collectors in August 2013. From the result of August, Percentage for Private is 44, Kator Payam is 20, Munuki Payam is 20 and Juba Payam is 16 (total 56% from public). Ratio for private and public is almost equal throughout the month



August

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Kator Payam	1	4	4	0	5	9	10	2	13	1	0	6	3	17	8	9	17	0	9	23	16	6	6	12	0	13	6	6	6	8	13	233
Munuki Payam	14	9	9	0	8	6	4	9	7	13	0	12	6	10	7	10	7	0	7	8	7	5	8	9	0	8	5	12	7	12	12	231
Juba Town Payam	6	6	6	0	6	5	4	1	5	1	0	7	3	5	9	7	6	0	4	10	6	10	6	32	0	5	7	5	12	6	5	185
Private	22	19	49	0	25	23	28	27	27	31	0	22	30	11	11	18	14	0	9	9	19	13	12	9	0	14	21	12	11	10	12	508
Sub- Total	43	38	68	0	44	43	46	39	52	46	0	47	42	43	35	44	44	0	29	50	48	34	32	62	0	40	39	35	36	36	42	1157

(8) Activity of Waste Pickers

It is preferable to stop the activity of waste pickers because they scatter the wastes to pick up recyclable materials and they might interfere with the operation of the heavy equipment. However, it is impossible to stop their activity without securing alternative jobs for them. Therefore, it was decided to cooperate with them under the following agreement with waste pickers.

a) Waste Pickers

- Not to openly burn the waste
- To clean up the site once every two weeks

b) Landfill Manager and Staff

- Provide some time for waste pickers to pick the recyclable materials from the waste
- Operate the heavy equipment slowly and carefully

3.3 Construction of Landfill Expansion Areas

(1) Purpose

According to the results of the topographic survey, incoming waste survey and recycling survey, it was revealed that the remaining lifespan of the existing disposal site (the hole constructed by UNMISS) is only 1 year even though wastes are piled up to 5m height by bulldozers. Therefore, JICA Expert Team examined the expansion of the existing disposal site.

(2) Issues for Expansion

- Ministry of Environment directed to implement Environmental Impact Assessment.
- Ministry of Environment requested to construct the sanitary landfill site

⇩ Discussion

- Ministry of Environment agreed to implement Initial Environmental Examination (hereinafter referred to as "IEE") and to construct the controlled landfill site.

(3) Examination for Expansion

- Ministry of Environment approved to expand the site within the area where the wastes have been already disposed.
- The area where the wastes have been already disposed was 2.5 ha in June 2012.
- This area was expanded to 4.0 ha in September 2012 when the expansion work started.
- As a result, the area of landfill site is secured at 4.0 ha and the life span becomes 3.0 years

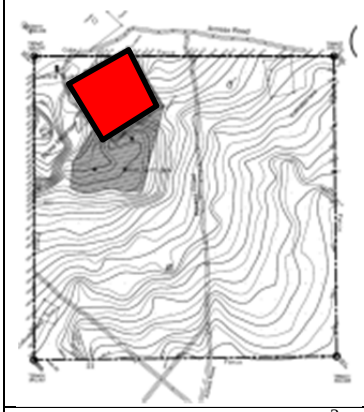
Hole constructed by UNMISS	As of June 2012	As of September 2012
		
Landfill capacity: 7,000m^3 Landfill Area: 1.3ha Lifespan: Around 1 year	Landfill capacity: 10,000m^3 Landfill Area: 2.5 ha Lifespan: Around 1.5 years	Landfill capacity: 20,000m^3 Landfill Area: 4.0 ha Lifespan: Around 3.0 years

Figure 3-14 Range of Landfill Site

Re-expansion of dumping area

① Purpose

1. To secure enough landfill capacity for 4 years, by expanding areas at the southern side of existing landfill, because the existing space has been filled up with waste.
2. To give technical instructions to C/Ps, so that they can construct the expansion areas in the future by themselves.

② Instruction on Construction and Supervision of Expansion Areas

1) Targets

The targets to be instructed were 1. Site manager, 2. Landfill staff.

2) Instruction Contents

① Management of construction procedure (only for Site manager)

② Methods of embankment construction and supervision (for Site manager and Landfill staff)

- Control of embankment height and locations
- How to utilize heavy equipment (bulldozer, backhoe, dump trucks)
- Compaction and construction of embankment

③ Construction Work

The southern side of existing landfill was expanded, and has been utilized as controlled dumping site (4ha). The detail of construction is as follows:

Table 3-14 Construction work

Facility name	Size
Embankment	Crown width: 3.5m Height: 3.5m Extension: 800m
Access roads	Width：7m Expansion：400m
Gas vent pipes	Structure:φ150mm (with holes) + gravel Setting points: 14 points

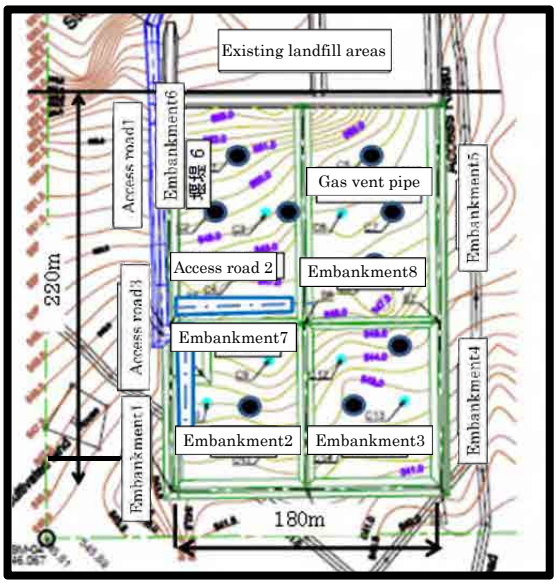


Figure 3-15 Plan of expansion area

④ Collaboration among JICA, Japan Self Defense Force, and Rejaf Payam

The construction was operated directly by JICA, Japanese Self-defense Forces ("JSDF") and Rejaf Payam. The work done by three organizations is shown in the table below. It is notable that a bulldozer from Rejaf Payam joined the work while it was used for landfilling work.

Table 3-15 Collaboration with Japan Self Defense Force

	Material and equipment provided	Construction work
JICA	bulldozer, excavator, dump trucks, gas vent pipes, marking poles, road roller	site clearing, setting of marking poles, embankment, access roads, gas vent pipes work
JSDF	bulldozer	Embankment construction
Rejaf Payam	bulldozer	Site clearing, setting of marking poles, embankment and roads construction

⑤ Construction Period and Process

Construction period is one month from October 16th to November 15th. The construction process is shown in the Table below. Therefore, the pictures of rehabilitation work are shown below.

Table 3-16 Construction Process

Item	Incharge	Heavy equipment	Octorber															Novemenber															
			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Preparation																																		
(1) Site clearance	JICA, Rejaf	Bull × 2units																																
(2) Marking pole	JICA	—																																
2. Phase-1 Construction																																		
(1) Excavation	JICA	Exca. , Dump																																
(2) Embankment	Rejaf																																	
① Line-1	Rejaf	Bulldozer																																
② Line-2	Rejaf	Bulldozer																																
③ Line-3	Rejaf	Bulldozer																																
④ Line-4	Rejaf	Bulldozer																																
⑤ Access road-3	Rejaf	Bulldozer																																
3. Phase-2 Construction																																		
(1) Excavation	JICA	Exca. , Dump																																
(2) Embankment																																		
① Line-5	Rejaf	Bulldozer																																
② Line-6	Rejaf	Bulldozer																																
③ Line-7	JSDF	Bulldozer																																
④ Line-8	JSDF	Bulldozer																																
⑤ Access road-1	Rejaf	Bulldozer																																
⑥ Access road-2	Rejaf	Bulldozer																																
⑦ Removal of waste	Rejaf&JSDF	Bulldozer																																
⑧ Site cleaning	Rejaf&JSDF	Bulldozer																																
4. Gas vent pipe																																		
①Gas vent pipe	JICA	—																																

Pictures of Landfill Improvement Construction

1. Explanation of construction outline and schedule (Oct. 16) **and installation of marking poles** (Oct. 19)

The construction outline and schedule were explained to the landfill staff, before the construction began. The landfill staff set up marking poles for embankment construction on October 19.

2. Site clearance work (Oct. 16-19)

The site clearance of expansion areas was started on October 16, with bulldozers. The bulldozer procured by JICA also started to help site clearance from October 17, while working for waste landfilling.

3. Excavation and soil transportation work (Oct. 21- Nov. 7) (10/21-11/7)

Rented excavator and dump trucks started to work for excavation and soil transportation work on October 21.

4. Embankment construction (Oct. 24-Nov. 15)

A landfill bulldozer began to construct embankment on October 24. Landfill staff also worked on Sundays (October 27 and November 3), because the excavation work had taken more time than expected, which made the construction delayed.

5. Installation of gas vent pipes (Nov.7, 13)

14 gas vent pipes were installed on November 7 and 13.

6. JSDF work (Nov. 11-15) **and media tour** (Nov. 13)

JSDF started to work on November 11, and was in charge of part of embankment and levelling work. While JSDF worked, media tour was organized on November 13. The right picture shows the collaboration work by JSDF and JICA bulldozers.

7. Construction of access road 1

Access road 1 was constructed on November 9, with a backhoe and road roller.

8. Levelling of landfill site and playground for waste pickers

Bulldozers levelled the site so that vehicles can easily enter. After the levelling work, some waste pickers used the site as a playground.

9. View of landfill expansion areas（Nov. 3）

4. Output of Pilot Project

Outputs of pilot project are as follows. It is remarkable that minimum number of staffs, heavy machinery and budget are secured within 2 years. Also landfill staffs gained the knowledge of landfill operation and maintenance.

Figure 4-1 Output of Pilot Project

Activity	Output
1. Improvement of existing landfill	• CP learned the improvement method of open dumping • Impact of existing dumping site to the surroundings is decreased (Bad odor, flies, waste fly in all directions etc…)
2. Landfill O&M (1) Construction of facility (2) Landfill improvement (3) Establishment of landfill management organization (4) Procurement of heavy machinery (5) Fee collection for O&M (6) Landfill O&M (7) Activity of waste pickers	• Minimum required facility was prepared for landfill management • CP learned the method of sanitary landfill • Impact of landfill to the surroundings is decreased (Bad odor, flies, waste fly in all directions etc…) • Working environment of staffs are improved by decreasing bad odor or flies • Minimum number of staffs for landfill O&M is secured. • Heavy machinery is procured by JICA and minimum required machinery for sanitary landfill is secured. • Fee collection system for landfill operation is established • CP mastered proper landfill management, disposal method, maintenance of facility and equipment, and environmental management • Operation manual was produced with CPs • Waste pickers stopped setting fire on waste • Waste pickers participated landfill cleanup
3. Landfill expansion	・ CP learned construction method of controlled dumping site. ・ Life time of landfill is extended up to 2018.

5. Good practices of CP

Good practices of CP through pilot project are as follows;

(1) Change of landfill operation days and time

In the beginning of the project, holiday for landfill staff was on Sunday, however the site was open on Sundays. Since there is no staff on Sunday, vehicle driver dumped the waste anywhere. Working hour of staff was from 9 a.m. to 5 p.m. however, same dumping issue occurred after hours. Through the discussion by the staff, it is notified to the drivers through notice paper that landfill is closed after 5 p.m. on weekdays and Sunday. Illegal dumping was concerned but the rule was followed by the drivers.

(2) Improvement of fee collection

Fee was collected at the check point for private incoming vehicles. Though, for the Payams were only counting and charged at the end of the month. It read to the delay of the payment by the Payams. CP discussed and noticed to the Payams that payment should be done at the checkpoint. Currently, all vehicles are paying at the checkpoint.

(3) Price increase for tipping fee

After the violence in December 2013, vehicles from JICA collection was decreased and fee collection also decreased. CP started increasing the amount of tipping fees from January 2014. Change is as follows;

Figure 5-1 Change for fee collection

	Large	Small	Tractor, tricycle
Before Jan 2014	55 SSP	25 SSP	25 SSP
After Jan 2014	60 SSP	30 SSP	25 SSP

(4) Repair of access road

Access road branches from Yei road become muddy in the rainy season. CP is repairing the access road regularly by using bulldozer.

(5) Support for expansion of landfill

Schedule of the expansion work was delayed due to hard soil or delay of JSDF participation. CP assisted construction work by using bulldozer in the interval of landfill operation and Sundays. Ownership mind for the staffs are grown through this work.

(6) Explanation of the landfill

All landfill staffs understood the history of landfill improvement, outline and the contents of O&M. Landfill staffs now can explain to the visitors about the site.

4. Juba Waste Management Plan (Draft)

Republic of South Sudan

Ministry of Environment

Juba City Council

Juba County

Republic of South Sudan

Project for Capacity Development on Solid Waste Management

in Juba

Juba Waste Management Plan (Draft)

November 2014

Japan International Cooperation Agency

Yachiyo Engineering Co., Ltd.

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Chapter 1 Principles for Juba Waste Management Plan

1.1 Background and Purpose

Juba Waste Management Plan (hereinafter referred to as “the Plan”) was prepared by Juba Solid Waste Management Group (hereinafter referred to as “JSWMG”) and Japan International Cooperation Agency (hereinafter referred to as “JICA”) on the basis of waste management works in Juba (Juba City and Juba County), which is the capital city of the Republic of South Sudan (hereinafter referred to as “South Sudan”), and the JICA Project for Capacity Development on Solid Waste Management in Juba (hereinafter referred to as “JICA Project”) from April 2012 to September 2014 in Japan and South Sudan.

Main activities of JICA Project were the pilot projects for waste collection in Juba City; management of the final disposal site in Juba County; and public relations activities to promote waste management works. The pilot projects had continuously suffered insufficiency of equipment, human resources, and experiences since its beginning; so that there was a difficult period to continue the pilot projects. However, the South Sudan side has started implementing waste management as the public service although they still have insufficient matters. The pilot projects have sustained for more than one year and the South Sudan side has gained a lot of experiences through these pilot projects.

In December 2013, the field activities of JICA Project were suddenly suspended due to political deterioration in South Sudan. At present, the pilot projects are continuously implemented somehow by the South Sudan side itself under the support from the JICA experts.

Here, JICA Project reviewed the present waste management in Juba again, and prepared the Plan in order to implement the sustainable waste management as the public service. The Plan is not just a summary of the activities. It is a material for all officers and workers in South Sudan engaged in waste management to think how they can approach waste management in Juba in the future based on the activities in JICA Project.

The Plan is composed from 2 parts; (1) the Long-Term Plan as the future vision of waste management in Juba, and (2) the Short-Term Plan including the primary actions of the Long-Term Plan and emergently necessary actions. The team of the Project (hereinafter referred to as “JICA Expert Team”) expects that waste management in Juba shall be understood and stated as administrative policy by Juba County, Juba City and Blocks (Wards); and developed as the sustainable activity.

1.2 Target Year

(1) Short-Term Plan

JSWMG sets 2013 as the base year and 2015 as the target year for the Short-Term Plan.

(2) Long-Term Plan

JSWMG sets 2023 as the target year for the Long-Term Plan.

1.3 Target Collection Rate

The definition of the collection rate is a rate of waste collected by public and private agencies among all of the generated wastes in Juba. As a condition, the present ratio for collection activity between public and private agencies would be kept until the target year of the Plan. JSWMG sets the target collection rate in 2023 as 20% larger than the collection rate in 2013.

1.4 Target Areas

(1) Short-Term Plan

For waste collection, the target areas of the Short-Term Plan are the same as the present collection areas. They include 2 types of areas; (1) the pilot project areas of JICA Project (4 residential areas (Atlabara B, Atlabara C, Hai Thoura and Gudele Block 8) and 2 markets (Jebel Market and Juba Town Market)), (2) the areas where Juba City Council (hereinafter referred to as “JCC”) and Payams collect wastes in Juba City by their own (main streets, markets and large-volume dischargers).

For final disposal, the target site is a dumping site in Rejaf Payam of Juba County.

(2) Long-Term Plan

For waste collection, the target areas are expanded according to the target collection rate in each year. The unit target area should be Quarter Council (the minimum administration unit, hereinafter referred to as “QC”). The details are shown in Chapter 5 of this Plan.

For final disposal, the target site is a site in which all collected wastes are disposed of in a sanitary manner. The details are shown in Chapter 5 of this Plan.

1.5 Target Wastes

For waste collection in the Short and Long-Term Plans, the target wastes are the wastes

collected by JCC and Blocks, which are “household wastes”, “market wastes” and “road sweeping wastes”. “Household wastes” mean the wastes discharged from households and individual business places (shops, hotels, offices, public agencies, etc.). “Market wastes” mean the wastes discharged from groups of shops (markets). “Road sweeping wastes” mean the wastes discharged by road sweeping. The target wastes are only the wastes which JCC and Blocks deal with because this Plan is for JCC and Blocks to implement waste management.

For final disposal in the Short and Long-Term Plans, the target wastes are the all wastes transferred to the final disposal site in Rejaf Payam, Juba County. This site receives the wastes not only from Juba City, but also from other Payams in Juba County.

Chapter 2 Present Situation and Issues on Waste Management in Juba

2.1 Outline of Target Areas

2.1.1 Basic Information of Juba and South Sudan

The target area of this Plan, Juba, is the capital city of South Sudan which became independent in July 2011. It is also the state capital city of Central Equatoria State which is one of 10 states of South Sudan.

Regarding the national economy, South Sudan highly depends on the petroleum revenue which occupies approximately 98% of the national revenue. GDP is approximately 19.2 billion USD (World Bank, 2011) and the economic growth rate is 1.9% (Southern Sudan Centre for Census, 2011), and the price escalation rate is 47.27% (World Bank, 2011). And the literacy rate in the whole Central Equatoria State is approximately 39% (the 5th Sudan Population and Housing Census, 2008).

South Sudan is an inland country and bordered by the Republic of the Sudan (hereinafter referred to as "Sudan") to the north, Ethiopia to the east, Kenya to the southeast, Uganda to the south, the Democratic Republic of the Congo to the southwest, and the Central African Republic to the west. From Uganda, the White Nile River flows from south to north through the capital city, Juba, toward Sudan. The area of Juba is approximately 180,000 km^2 (the 5th Sudan Population and Housing Census, 2008).

On the contrary to the desert climate in the north of South Sudan, Juba has a tropical rainforest climate. There is a rainy season from May to October. In rainy season, Juba has frequent sudden strong rain (squall), and people cannot use roads because many roads are unpaved and become muddy by rain. A lot of puddles can be found in the residential areas, and harmful insects, such as mosquitoes, grow in these puddles. Table 2-1 shows the meteorology data in Juba.

Table 2-1 Meteorology Data in Juba

Month	Mean Temperature °C		Mean Total Precipitation (mm)	Mean Number of Precipitation Days
	Daily Minimum	Daily Maximum		
Jan	20.1	36.8	5.1	1.4
Feb	21.7	37.9	11.0	2.0
Mar	23.6	37.7	36.7	6.6
Apr	23.4	35.4	111.5	11.6
May	22.6	33.5	129.9	12.4
Jun	21.9	32.4	117.8	10.3
Jul	21.1	31.1	144.7	13.0
Aug	21.0	31.6	127.5	11.5
Sep	21.1	33.1	103.7	8.6
Oct	21.3	34.0	114.5	10.4
Nov	20.9	34.7	43.1	6.5

Month	Mean Temperature °C		Mean Total Precipitation (mm)	Mean Number of Precipitation Days
	Daily Minimum	Daily Maximum		
Dec	20.0	35.9	8.2	1.9

Remarks)
- Date is the average of the monthly data for 30 years from 1971 to 2000.
- Mean number of precipitation day is the average day having more than 0.1mm precipitation.
- Precipitation includes rain and snow.

Source) World Meteorological Organization, web site "World Weather Information Service", referred in June 2014

2.1.2 Administrative Agencies in Juba

Originally, there was the only one administrative division and Juba County Office was the only one administrative agency. After independence, the central 3 Payams (Kator, Juba Town and Munuki) were separated from Juba County, and JCC was established to control these 3 Payams. Therefore, the main administrative agencies in Juba are Juba County Office and JCC.

(1) Juba County Office

Figure 2-1 shows the organization chart of Juba County Office. It controls 13 Payams in Juba County. Regarding waste management, it does not have any specialized departments.

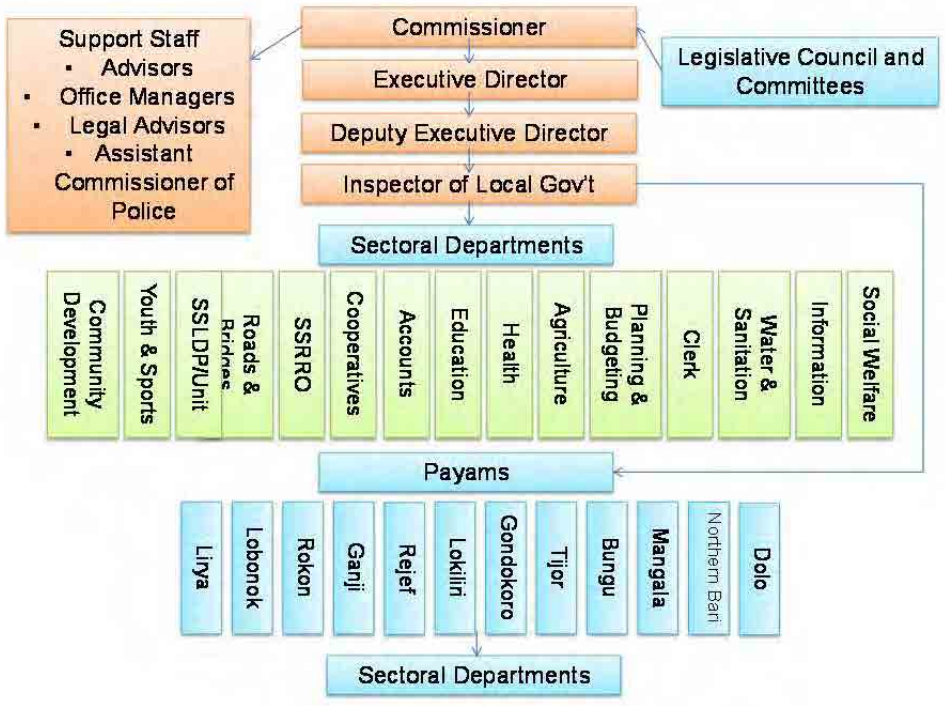


Figure 2-1 Organization Chart of Juba County Office

(2) JCC and Payam Offices under JCC

Figure 2-2 and Figure 2-3 show the organization charts of JCC and Payam Offices under JCC respectively.

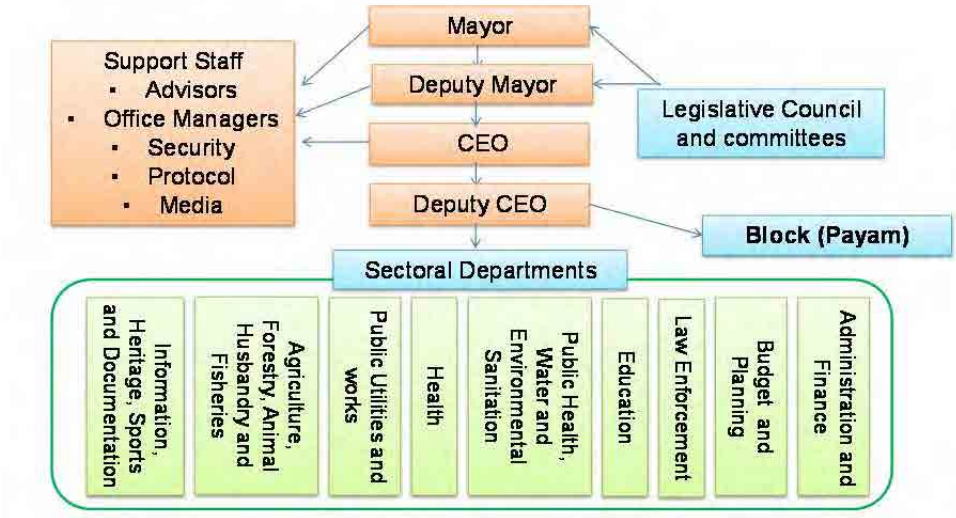


Figure 2-2 Organization Chart of JCC

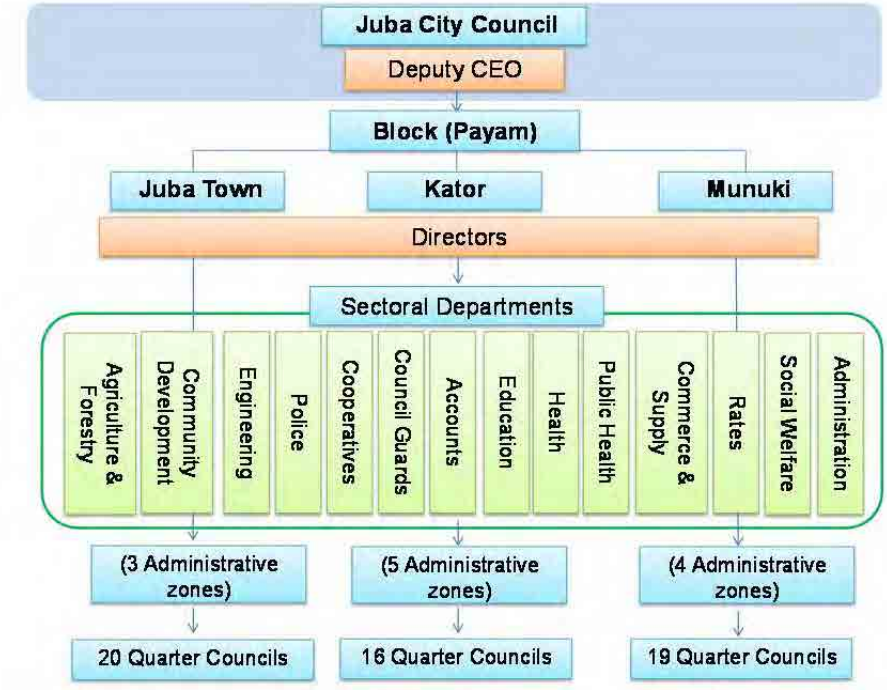


Figure 2-3 Organization Chart of Payam Offices under JCC

JCC is a relatively new organization, so the organizational system is not established completely. Some departments are not officially established and human resources are insufficient. And departments

between JCC and Payam Offices are not standardized. Only in JCC, the waste management department was established in 2012. The total number of officers of JCC and 3 Payam Offices is 877 persons.

2.1.3 Administrative Divisions and Number of Markets in Juba City

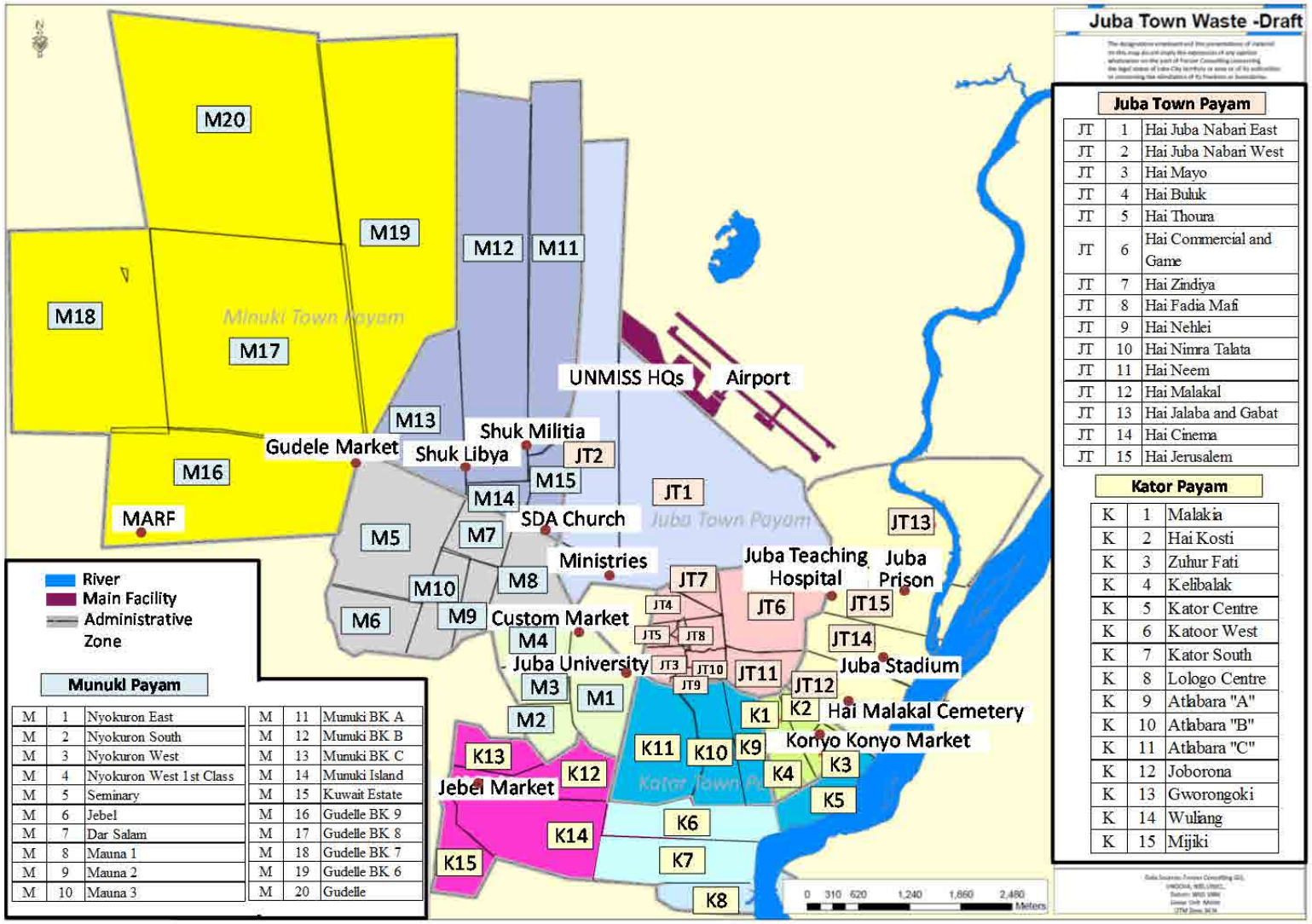
3 Payams in Juba City consists of several Administrative Zones. They function as administration borders. Each Payam allocates Public Health Officers and other officers in each Administrative Zone. Moreover, Administrative Zones consist of several communities, which are called as QCs. The Project implemented a hearing survey for each QC in 2012. Table 2-2 shows the outline of Administrative Zones and QCs, and Figure 2-4 shows the estimated map of Juba City. Juba Town Payam had 3 Administrative Zones and 15 QCs. Munuki Payam had 3 Administrative Zones and 20 QCs. Kator Payam had 4 Administrative Zones and 15 QCs. In total, Juba City had 10 Administrative Zones and 50 QCs. An average population per QC is approximately 300,000 people.

And markets are one of the main waste generation spots in Juba City. Therefore, The Project implemented a hearing survey to count the number of markets in Juba City. As a result, Juba Town Payam, Kator Payam and Munuki Payam had approximately 2,900, 4,900 and 1,300 shops respectively regardless of the size.

Table 2-2 Administrative Zones and QCs of Payams in Juba City

Payam	Administrative Zone	QC	Code	
Juba Town	Northern Zone	Hai Juba Nabari East	JT	1
		Hai Juba Nabari West	JT	2
	Southern Zone	Hai Mayo	JT	3
		Hai Buluk	JT	4
		Hai Thoura	JT	5
		Hai Commercial and Game	JT	6
		Hai Zindiya	JT	7
		Hai Fadia Mafi	JT	8
		Hai Nehlei	JT	9
		Hai Nimra Talata	JT	10
		Hai Neem	JT	11
	Eastern Zone	Hai Malakal	JT	12
		Hai Jalaba and Gabat	JT	13
		Hai Cinema	JT	14
		Hai Jerusalem	JT	15
Munuki	Nyokuron	Nyokuron East	M	1
		Nyokuron South	M	2
		Nyokuron West	M	3
		Nyokuron West 1st Class	M	4
	Mauna & Jebel	Seminary	M	5
		Jebel	M	6
		Dar Salam	M	7
		Mauna 1	M	8
		Mauna 2	M	9
		Mauna 3	M	10

Payam	Administrative Zone	QC	Code	
	Munuki	Munuki BK A	M	11
		Munuki BK B	M	12
		Munuki BK C	M	13
		Munuki Island	M	14
		Kuwait Estate	M	15
	Gudelle	Gudelle BK 9	M	16
		Gudelle BK 8	M	17
		Gudelle BK 7	M	18
		Gudelle BK 6	M	19
		Gudelle	M	20
Kator	Malakia	Malakia	K	1
		Hai Kosti	K	2
		Zuhur Fati	K	3
		Kelibalak	K	4
	Kator	Kator Centre	K	5
		Katoor West	K	6
		Kator South	K	7
		Logogo Centre	K	8
	Atlabara	Atlabara "A"	K	9
		Atlabara "B"	K	10
		Atlabara "C"	K	11
	Jebel	Joborona	K	12
		Gworongoki	K	13
		Wuliang	K	14
		Mijiki	K	15



Munuki Payam

M	1	Nyokuron East	M	11	Munuki BK A
M	2	Nyokuron South	M	12	Munuki BK B
M	3	Nyokuron West	M	13	Munuki BK C
M	4	Nyokuron West 1st Class	M	14	Munuki Island
M	5	Seminary	M	15	Kuwait Estate
M	6	Jebel	M	16	Gudelle BK 9
M	7	Dar Salam	M	17	Gudelle BK 8
M	8	Mauna 1	M	18	Gudelle BK 7
M	9	Mauna 2	M	19	Gudelle BK 6
M	10	Mauna 3	M	20	Gudelle

Juba Town Payam

JT	1	Hai Juba Nabari East
JT	2	Hai Juba Nabari West
JT	3	Hai Mayo
JT	4	Hai Buluk
JT	5	Hai Thoura
JT	6	Hai Commercial and Game
JT	7	Hai Zindiya
JT	8	Hai Fadia Mafi
JT	9	Hai Nehlei
JT	10	Hai Nimra Talata
JT	11	Hai Neem
JT	12	Hai Malakal
JT	13	Hai Jalaba and Gabat
JT	14	Hai Cinema
JT	15	Hai Jerusalem

Kator Payam

K	1	Malakia
K	2	Hai Kosti
K	3	Zuhur Fati
K	4	Kelibalak
K	5	Kator Centre
K	6	Katoor West
K	7	Kator South
K	8	Logo Centre
K	9	Atlabara "A"
K	10	Atlabara "B"
K	11	Atlabara "C"
K	12	Joborona
K	13	Gworongoki
K	14	Wuliang
K	15	Mijiki

Figure 2-4 Estimated Map of QC Boundary in Juba City

2.1.4 Waste Quantity

Waste quantity survey is one of the most important surveys for waste management. However, JCC does not have any experiences of official surveys for waste quantity. Therefore, the Project implemented waste quantity and quality survey in 2012. For reference, Table 2-3 provides the method of waste quantity and quality survey conducted under the Project in 2012.

Table 2-3 Method for Waste Quantity and Quality Surveys in the Project (2012)

	Waste Amount	Waste Composition
Period	8 days among 26th July to 3rd August, 2012	3 days among 6th August to 8th August, 2012
Target place	Residential Area: 2 areas in Kator Payam in Juba City (Atlaraba B and Atlabara C) Market: 1 market in Kator Payam in Juba City (Jebel Market)	
Sampling method	Random selection from all households (shops) in target places	Random selection from all samples of waste amount survey
Number of samples	Atlaraba B: 50 households Atlabara C: 50 households Restaurant in Jebel Market: 15 shops Other shops in Jebel Market: 37 shops	Atlaraba B: 10 households Atlabara C: 10 households Restaurant in Jebel Market: 3 shops Other shops in Jebel Market: 3 shops
Survey method	1) Collect wastes from all target households (shops) 2) Measure the weight of waste from each household (shop) (wet-base)	1) Mix all wastes from all target households (shops) and extract about 5 kg by the method of quartering 2) Measure whole weights and volumes (wet-base) 3) Categorize into 14 items and measure weight and volume of each item
Measurement items	Weight	Categorization (14 items: Organic, Plastic, PET bottle, Sand, Metal, Paper, Stone, Grass, Textile, Rubber, Wood, Animal, Glass and Fine materials), weight and volume of each item

(1) Unit Amount of Waste Generation

According to the survey results in 2012 by the Project, the average daily waste discharge from a household is 5.20 kg/household/day, the average number of residents in a household is 7.39 persons/household, and the average daily waste discharge from a person is 0.70 kg/person/day. For reference, the survey results in 2010 by a NGO, CESVI, showed that the average daily waste discharge from a person was 0.42 kg/person/day. The survey method by CESVI was not mentioned in their report, so it is difficult to compare it to our result. Just by simple comparison, our result of the average daily waste discharge from a person is 1.6 times larger than the result by CESVI. On the other hand, the report of World Bank, which target areas are urban cities in the world, showed that that the average waste discharge in Africa was 0.65 kg/person/day (World Bank (2012) "WHAT A WASTE, A Global Review of Solid Waste Management"). This report also showed that the average waste discharges in Lower Income and Lower Middle Income levels, which were almost same as the income level of South Sudan, were 0.60 kg/person/day and 0.79 kg/person/day respectively. Therefore, it can be said

that our result (0.70 kg/person/day) is in a proper range.

(2) Estimation of Collection Amount

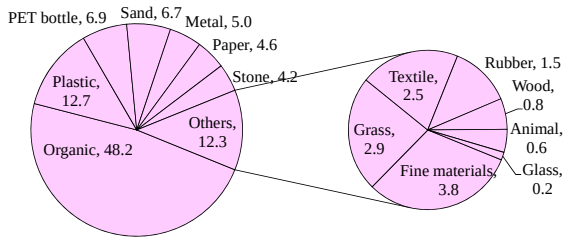
The Project estimated the collection amount with the result of incoming vehicle survey at the final disposal site. According to the result of this survey, the total collection amount by JCC and Payams, and private agencies can be estimated as 150 ton/day. Table 2-4 shows the collection amount and ratio by ordering and collecting agencies.

Table 2-4 Collection Amount and Ratio by Ordering and Collecting Agencies in 2013

Ordering Agency	Collecting Agency	Collection Amount	Sharing Ratio
		[ton/day]	[%]
JCC/Payam	JCC/Payam	65	43
JCC/Payam	Private	19	13
Private	Private	66	44
Total		150	100

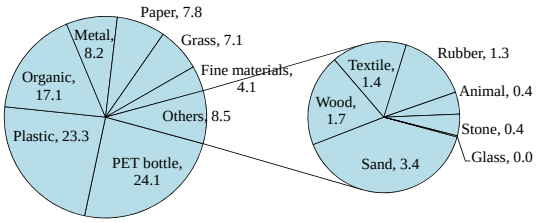
2.1.5 Waste Quality

Figure 2-5 and Figure 2-6 show the results of waste quality survey. Both in weight ratio and volume ratio, the ratios of Organic, Plastic and PET bottles occupy the greatest amount. The specific gravity is 0.10 ton/m^3. The waste characteristic can be reflected to this value that the number of bulky wastes is large.



Unit: wt%

Figure 2-5 Result of Waste Quantity Survey (weight wet-base)



Unit: vol%

Figure 2-6 Result of Waste Quantity Survey (volume wet-base)

Table 2-5 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 2-5 Comparison of Waste Quality Results between World Bank and the Project

Unit: %

	Organic	Paper	Plastic	Glass	Metal	Others
This Project	50	5	19	3	5	19
Low Income	64	5	8	3	3	17
Lower Middle Income	59	9	12	3	2	15
Upper Middle Income	54	14	11	5	3	13
High Income	28	31	11	7	6	17

2.2 Legal and Organizational System

2.2.1 Legal System

There are not any official legal systems specialized for waste management in Juba and South Sudan. Related laws are "Environmental Protection and Management Bill, 2013" and "Local Government Act, 2009". "Environmental Protection and Management Bill, 2013" is being prepared by Ministry of Environment, and has not been enacted yet. It has a section for waste management which describes prohibited matters, approvals by Ministry of Environment, and so on. "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.

2.2.2 Responsibility Demarcation for Waste Management in Juba

In the official meeting of the Project, JCC, Headquarters of Juba County, Payams and related agencies discussed and agreed to the responsibility demarcation for waste management in Juba as shown in Table 2-6. JCC has a full responsibility for waste collection, and its main roles are planning, vehicle maintenance and public awareness activities. Each Payam is in charge of daily waste collection work and service fee collection. HQs of Juba County have a full responsibility for Operation and Maintenance (hereinafter referred to as "O&M") of the final disposal site, and its main roles are planning and vehicle maintenance. Rejaf Payam is in charge of daily O&M work at the site.

Table 2-6 Responsibility Demarcation for Waste Management

	Juba City		Juba County	
	JCC	Kator, Juba and Munuki Payam	HQs	Rejaf Payam
1. Waste Collection				
● To collect fees for waste collection		○		
● To prepare waste collection plans	○			
● To utilize the allocated budget and implement collection works		○		
● To maintain collection vehicles	○			
● To raise public awareness and implement environmental education	○			
2. Final Disposal				
● To collect fees for waste disposal				○
● To pay fees for waste disposal	○	○		
● To prepare the operation plan for the existing dumping site			○	
● To utilize the allocated budget and implement disposal works for the existing dumping site				○
● To procure equipment			○	
● To maintain equipment				○
● To prepare the expansion plan			○	

2.2.3 Waste Management Flow in Juba City

Figure 2-7 shows the management flow of the target wastes in this Plan (household wastes, market wastes and road sweeping wastes).

In Juba City, the generated wastes are categorized according to the collection places. They are not categorized by their characteristics of wastes, such as hazardous wastes and medical (hospital) wastes, or by their generation sources, such as industrial wastes and municipal-like (office) wastes.

The generators or primary collectors discharge the wastes. The collection method is a mixture of station collection, house to house collection and road sweeping. Basically the implementation agencies of collection are each Payam and JCC. However, a part of QCs and individuals order the private individuals/companies to collect wastes because the collection services of JCC and each Payam are insufficient. These private collectors do not specialize in waste collection, but are just able to own or rent trucks and other vehicles. In the past, JCC tried to establish a registration system for private collectors by providing stickers in order to allow collection works only for registered collectors. However, this system was not functioned because of uncompromising activities by private collectors and lack of system management by JCC. Therefore, JCC and each Payam do not approve these private collectors officially, so their collection works are unofficial

The collected wastes in Juba City are transferred to the final disposal site in Rejaf Payam, Juba County because Juba City does not have any final disposal sites. Rejaf Payam operates and maintains this final disposal site. Only a part of valuables, such as plastics and aluminum cans, are collected by waste pickers at collection points and the final disposal site. These pickers sell these valuables to dealers, and dealers export them in foreign countries where they are recycled. The details of collection and final disposal works are explained in the next sections.

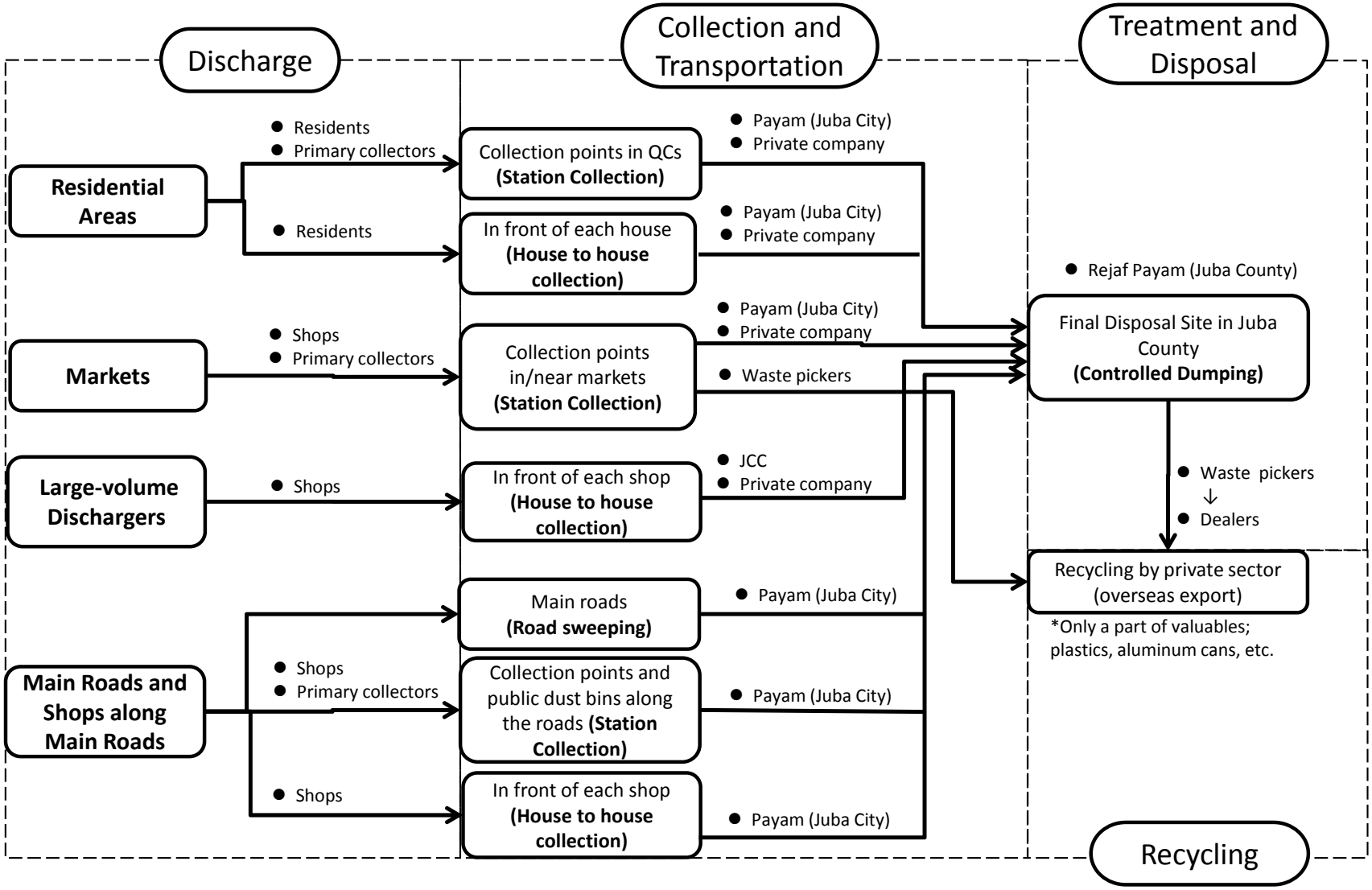


Figure 2-7 Waste Management Flow in Juba City

2.2.4 Waste Collection in Markets and Residential Areas in Juba City

(1) Collection System

Basically, Director and Deputy Director of Waste Management Department in JCC, and Public Health Officers of three Payams are in charge of waste collection and support each other. Waste collection is not categorized into land use; such as residential areas, markets and roads. And insufficient equipment and human resources make categorization difficult. Therefore, the present waste collection is mixture of road cleaning and house-to-house collection along the main roads. It is not efficient.

Since March 2013, JCC has started direct collection from large-volume dischargers, such as hotels and restaurants. Consequently, Payams collect wastes from all residents and enterprises except for the large-volume dischargers contracted with JCC. According to the official meeting and site activities of the Project, Table 2-7 shows the roles and present situation of JCC and Payams.

Table 2-7 Roles and Present Situation of JCC and Payams for Waste Collection

JCC		Payams	
Role	Present Situation	Role	Present Situation
• Preparation of collection plan • Management of Payams • Other daily management (compactor allocation, etc.)	Waste Management Department is not fully functioned because it was just established in 2013.	Waste collection from markets, residential areas and roads	Payams set collection schedules roughly, but they usually change them day by day because of political orders, etc.
• Making contracts with large-volume dischargers • Waste and fee collection from them based on the contracts	JCC made contracts with several large-volume dischargers, and has collected wastes from them based on the contracts. JCC is trying to collect fees from them.	Fee collection from markets and shops	Payams collect fees, but the fee price is smaller than the price JCC sets.
• Employment and management of drivers and assistant drivers for compactors owned by JCC • Maintenance of these compactors	Payams bear maintenance costs of compactors. JCC does not have financial source because they have just started fee collection from large-volume dischargers.	• Employment and management of supervisors and collection workers for compactors owned by JCC • Covering costs for fuel and disposal at the final disposal site	Additionally, Payams bear maintenance costs of compactors.
		• Employment and management of supervisors and collection workers for vehicles owned by Payams	Incompletely implemented.

JCC		Payams	
Role	Present Situation	Role	Present Situation
		• Covering costs for fuel, maintenance and disposal at the final disposal site	
		• Payment for rental vehicles to collect wastes (fuel cost, driver's salary, disposal fee, etc.) • Employment and management of supervisors and collection workers for rental vehicles	Incompletely implemented.

(2) Management of Collection Works and On-Site Workers

In each Payam, Public Health Officers manage the overall waste collection, and control collection works and collection vehicles allocated by JCC at the site. They are dispatched from the state government and waste management is one of their duties although they are not specialized officers for waste management. Collection workers are employed by Payam and allocated for each collection vehicle. They load wastes onto vehicles by manual.

(3) Human Resources for Waste Management in JCC and Payams

Table 2-8 shows allocation of human resources in JCC and Payams on waste management. In total, officers and full-time workers for waste management were 185 persons. It was approximately 20% of the total number of officers and full-time workers as 877 persons. Part-time workers for waste management were 447 persons, but this number might be larger if it included supervisors and road sweepers in Munuki Payam. Among them, collection workers were 302 persons and it occupied approproximately 70% .

Table 2-8 Allocation of Human Resources in JCC and Payams for Waste Management (as of the end of 2012)

Human Resource		JCC	Juba Town Payam	Kator Payam	Munuki Payam	Total
Officer (management)		2	5.8*	4.7*	4.1*	16.6*
Full-time worker	Driver	2	5	6	6	19
	Assistant driver	-	5	-	6	11
	Collection worker	-	52	-	40	92
	Road sweeper	-	-	36	10	46
	total	2	62	42	62	168
Part-time worker	Supervisor	2	2	12	If necessary	16
	Collection worker	10	40	150	10	210
	Road sweeper	12	41	-	If necessary	53
	total	24	83	162	10	279
Grand total		26	145	204	72	447
(breakdown)	Total of collection worker	10	92	150	50	302
	Total of road sweeper	12	41	36	10	99

Note) 1 person of full-time worker is a person working for waste management for 8 hours per day. 1 person of part-time worker is counted as one eighth of full-time worker.

2.2.5 O&M Organization for Final Disposal Site in Juba County

In October 2012, the organization for O&M at the final disposal site in Juba County (Juba County Controlled Dumping Site) was established under the initiative of Commissioner of Juba County. After that, Juba County increased the number of staff and defined the role of each staff with the support of the Project. Finally, this organization was developed for appropriate O&M as shown in Figure 2-8.

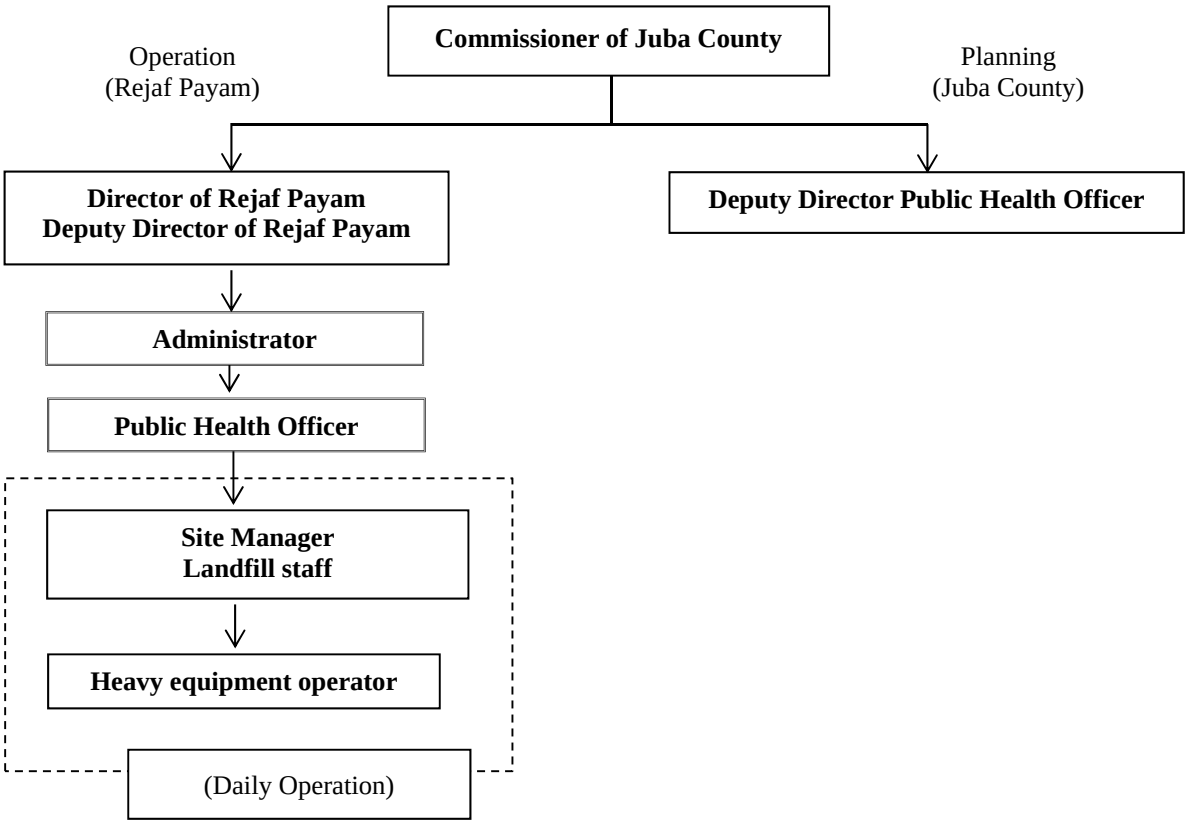


Figure 2-8 O&M Organization for Juba County Controlled Dumping Site

2.3 Financial System

2.3.1. Budgets and Costs for Waste Management in Juba City

Table 2-9 shows the budgets for the fiscal year of 2012 to 2013 in JCC and Payams. The total budget was 33.5 million SSP. Among them, the labor cost occupying approximately 30% (9.2 million SSP) was the largest. The special item of this fiscal year was the cost to construct new offices as 7.8 million SSP. There were two types of revenue; own revenue and subsidy from the state government. The subsidy was allocated only for JCC. JCC's revenue included approval fee for construction, business tax, license fee for commercial vehicles, charge for issuing licenses, and so on. Payams' revenue included rental fee for assets, license fee for shops in markets, property tax, and so on. The law, "Local Government Act, 2009", required to submit the budget plan to the assembly by the end of June. However, the budget plan for the fiscal year of 2012 to 2013 was approved in the beginning of November.

Table 2-9 Budgets for Fiscal year of 2012 to 2013 in JCC and Payams

Unit: 1000 SSP

Item			JCC	Juba Town Payam	Kator Payam	Munuki Payam	Total
Revenue	Own revenue		12,108	6,888	6,748	6,822	32,566
	Subsidy from the state government		977	-	-	-	977
	Total		13,085	6,888	6,748	6,822	33,543
Expenditure	Running expense	Labor	2,761	2,015	2,281	2,144	9,201
		Maintenance	200	200	330	500	1,230
		Fuel	600	475	350	550	1,975
		Rental vehicle	42	20	90	-	152
		Others	3,018	1,135	2,120	1,510	7,783
		Total	6,621	3,845	5,171	4,704	20,341
	Capital expense	Office construction	4,000	1,607	699	1,500	7,806
		Others	1,269	1,436	878	618	4,228
		Total	5,269	3,043	1,577	2,118	12,007
	Assembly operation		1,195	-	-	-	1,195
	Grand Total		13,085	6,888	6,748	6,822	33,543

2.3.2. Unit Cost for Waste Collection in Juba City

The Project implemented the hearing survey with JCC and Payams in 2013. As a result, the Project estimated the actual cost for waste collection in a year (from 2011 to 2012) as shown in Table 2-10.

This table did not include the waste disposal fee for Juba County. Comparing to the budgets shown in the above Table 2-9, the ratio of waste collection were 4% in JCC, 10% in Juba Town Payam, 50% in Kator Payam and 13% in Munuki Payam. The cost in Kator Payam was extremely large.

Table 2-10 Estimation of Total O&M Cost for Waste Collection in Juba City

Unit: 1,000 SSP

Item	JCC	Juba Town	Kator	Munuki	Total
Fuel	90	240	880	140	1,350
Maintenance	150	100	700	90	1,040
Rental vehicle	-	30	700	340	1,070
Consumable supplies (brooms, buckets, etc.)	20	30	230	40	320
Total	260	400	2,510	610	3,780

Remarks) JICA Expert Team estimated each costs based on O&M cost in a year from 2011 to 2012. The waste disposal fee for Juba County was not included.

As Table 2-4 shown in the above, the total amount of waste collection in 2013 was 150 ton/day. Among them, the collection amount ordered by JCC and Payams was 84 ton/day (the amount collected by JCC and Payams: 65 ton/day, and by private collectors: 20 ton/day). On the assumption that the working days in a year was 300 days, the total collection amount would be 25,200 ton/year. Therefore, the unit cost for waste collection was estimated as 150 SSP/ton.

2.3.3. Unit O&M Cost per Collection Vehicle in Juba City

Considering Table 2-10 shown in the above and results of the hearing survey, the Project averaged the actual costs and estimated the unit O&M cost per 25m^3 compactor as Table 2-11. Payams had to rent several vehicles (dump trucks), which capacity was only quarter of that of 25m^3 compactor, because of breakdown of 25m^3 compactor. The rental fee for one dump truck was approximately 32,600 SSP per month as shown in Table 2-12. It will be a matter of time that the working compactors at present might be inactive. However, JCC and Payams have no choice but to rent vehicles at present. It takes a lot of time to save money for procurement of new vehicles because waste collection is daily public service.

Table 2-11 Unit O&M Cost for 25m^3 Compactor (average actual cost)

Item	Contents	[SSP/month]	Payer
Salary	Driver (1 person)	1,000	JCC
	Assistant driver (1 person)	400	JCC
	Supervisor (2 persons in average)	1,560	Payams
	Workers (7.5 persons in average)	3,600	Payams
Fuel		7,500	Payams
Maintenance		5,083	Payams (JCC should pay, but Payams pay at present)

Item	Contents	[SSP/month]	Payer
Disposal fee for dumping site		2,400	Payams
Total (per 1 compacter)		21,543	
(paid by Payam)		20,143	

Table 2-12 Cost for Rental Dump Truck

Item	Contents	[SSP/month]
Rental fee	Including fuel fee, salary for driver and disposal fee	27,500
Salary	Supervisor (2 persons in average)	1,560
	Workers (7.5 persons in average)	3,600
Total (per 1 truck)		32,660

Note) Collection capacity of dump truck is approximately quarter of that of 25m^3 compactor.

2.3.4. Fee for Waste Collection Service in Juba City

JCC sets the prices of monthly fee for collection service, and revises every year. JCC collects fees from several large-volume dischargers contracted with JCC (hotels and other large-volume dischargers). Payams collect fees from residents, small or middle-scale shops and others.

At present, each Payam collects fee from markets and shops monthly. In average, Kator Payam, Munuki Payam and Juba Town Payam collect approximately 290,000 SSP/month, 60,000 SSP/month and 40,000 SSP/month respectively. Here, amounts of collected fee were different among Payams. The reasons might be caused from the number and type of shops, method of fee collection, and so on. At present, the main reasons might be that Kator Payam has several large markets and commercial buildings, and Public Health Officers have relatively high capacity to manage fee collection. As shown in the above Table 2-11, the unit O&M cost per 25m^3 compactor was approximately 21,543 SSP/month. Considering that three Payams collect approximately 390,000 SSP/month in total, the Project found that collected fee could cover the O&M cost of 20 units of 25m^3 compactor.

If JCC collects fees from contracted large-volume dischargers, they will obtain 63,250 SSP/month. At present, they started collecting fees, but the price of collected fees was smaller than that of each contract.

2.3.5. O&M Cost for Juba County Controlled Dumping Site

(1) Collection of Disposal Fee

Since July 2012, Rejaf Payam has collected disposal fee in order to secure the budget for O&M of Juba County Controlled Dumping Site. Large vehicles should pay 50 SSP and small vehicles should pay 25 SSP. Table 2-13 shows records of collected disposal fee. The total collected disposal fee from vehicles ordered by public agencies, such as Payams, from July 2012 to May 2013 was 184,775 SSP. Its monthly average was 15,398 SSP/month. The amount of collected fee from vehicles ordered by

private agencies was not clear. It is because such vehicles should pay at the check point, and officers at the check point collected not only disposal fee, but also other fees, such as material transportation.

Table 2-13 Records of Collected Disposal Fee

Disposal fee collection (July 2012 - Dec. 2012)

	2012 year												Sub-total		Monthly Average	
	July		August		September		October		November		December					
	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected
Juba payam	1,150	1,150	13,900	0	650	650	2,375	2,375	3,700	3,700	4,375	4,375	26,150	12,250	4,358	2,042
Kator Payam	4,525	4,525	18,850	18,850	9,850	800	10,900	10,900	9,600	9,600	18,825	18,825	72,550	63,500	12,092	10,583
Munuki Payam	1,650	1,650	2,175	2,175	2,750	2,750	4,625	4,625	4,550	4,550	4,900	4,900	20,650	20,650	3,442	3,442
Northern Bari Payam							750	0	900	0	1,000	0	2,650	0	442	0
Juba city council					10,300	0							10,300	0	1,717	0
Total	7,325	7,325	34,925	21,025	23,550	4,200	18,650	17,900	18,750	17,850	29,100	28,100	132,300	96,400	22,050	16,067

Disposal fee collection (Jun. 2013 - June 2013)

	2013 year												Sub-total		Monthly Average	
	January		February		March		April		May		June					
	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected
Juba payam	4,375	4,375	5,000	5,000	5,750	5,750	5,450		5,225		4,125		29,925	15,125	4,988	5,042
Kator Payam	18,825	18,825	10,925	10,925	6,700	6,700	10,200	10,200	10,200	10,200	8,000		64,850	56,850	10,808	11,370
Munuki Payam	4,900	4,900	5,000	5,000	5,650	5,000	5,850		5,050		5,700		32,150	14,900	5,358	4,967
Northern Bari Payam													0	0	0	0
Juba city council									1,500	1,500	3,150		4,650	1,500	2,325	1,500
Total	28,100	28,100	20,925	20,925	18,100	17,450	21,500	10,200	21,975	11,700	20,975	0	131,575	88,375	23,479	22,878

Disposal fee collection (July 2013 - December 2013)

	2013 year												Sub-total		Average	
	July		August		September		October		November		December					
	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected	Amount of charged	Amount of collected
Juba payam	8,225												8,225	0	8,225	0
Kator Payam	7,375												7,375	0	7,375	0
Munuki Payam	5,500												5,500	0	5,500	0
Northern Bari Payam													0	0	0	0
Juba city council	2,100												2,100	0	2,100	0
Total	23,200	0	0	0	0	0	0	0	0	0	0	0	23,200	0	23,200	0

(2) O&M Cost

Rejaf Payam has started operating the bulldozer newly procured by JICA since August 2012, the Project has started calculating the O&M cost. The average O&M cost from August 2012 to October 2012 was calculated as 38,300 SSP/month (Table 2-14).

Table 2-14 Average O&M Cost for Buldozer

Unit: SSP

Item	2012			
	August	September	October	Average
Fuel for bulldozer	13,500	18,000	19,200	16,900
Salary for landfill staff	3,120	5,120	5,120	4,450
Rental equipment for soil covering	15,120	15,120	15,120	15,120
Maintenance of bulldozer	4,500	0	1,000	1,830
Total	36,240	38,240	40,440	38,300

(3) Comparison between Collected Disposal Fee and O&M Cost

The average disposal fee collected from vehicles ordered by public agencies, which is 19,473 SSP/month, was smaller than calculated O&M cost as 38,300 SSP/month. If the collected disposal fee is calculated with the data of average number of incoming vehicles (mentioned later), the income from incoming vehicles will be 45,825 SSP (= 47 vehicles/day x 37.5 SSP/vehicle (average of large and small vehicles) x 26 days), and will be bigger than O&M cost. Therefore, O&M cost can be covered by disposal fee collected from incoming vehicles if Rejaf Payam collects fees from all incoming vehicles.

2.4 Waste Collection in Markets and Residential Areas

2.4.1. New Collection System Introduced by the Project

As a new collection system, it was introduced by the Project to collect wastes following the schedules specifying collection time and places. Traditionally most markets had stations where people discharged wastes. However, these stations seemed to be dumping sites because Payams did not collect wastes periodically. Therefore, Counterpart (hereinafter referred to as "C/P") agencies of the Project and JICA Expert Team started the pilot projects in Jebel Market (Kator Payam) and Juba Town Market (Juba Town Payam). We introduced a new collection system, in which market people discharged and Payams collected wastes following the schedules specifying collection time and places. The main advantages and issues of the new collection system are as follows;

[Advantages]

- Scattering wastes are decreased and wastes are accumulated only at collection points.
- Wastes are found only at discarding and collecting times. Hygiene and landscape of the areas are improved.
- Collection work becomes efficient because the collection routes become simple, collection time is shortened.
- O&M cost of this system is smaller than that of house-to-house collection because of efficient use of vehicles and human resources.
- Traffic problems happen less than that of house-to-house collection because house-to-house collection requires low speed operation and frequent stopping.
- Residents try to discharge wastes appropriately and make areas clean at community base.

[Issues]

- It is difficult to find persons who break the rule because this system cannot specify who discharges wastes.
- In some cases, it is difficult to decide or coordinate the places of collection points.
- It is necessary to set a person/group in charge of managing collection points and receiving complains.
- Dischargers should transfer the wastes to the collection points.

Considering the above issues, the Project cooperated with the market union. The instructors

monitored and supervised at the collection points in order to get people to understand the rule. And the market union managed the collection points and received complains and other opinions from people. According to the hearing survey of the Project, it was not a big issue for people to transfer the wastes to collection points because the periodical collection service is a big advantage for them much more. There were primary collectors in the markets before pilot projects. They transferred wastes instead of the actual dischargers with some charges. After the pilot project started, this business was expanded. Consequently, the burden to transfer wastes was decreased.

With such activities for solving issues and cooperation of market people, both markets have accepted this new collection system. The biggest reason of this success was improvement of hygiene and landscape. Before the pilot projects started both in Jebel Market and Juba Town Market, there were big illegal waste dumping spots and scattering wastes all over the areas. Although people should transfer the wastes to the collection points and keep the rule, the new system improved hygiene and landscape. It could be a great advantage for market people because they continued to follow the new system. The Pilot projects in residential areas achieved similar results. However, it was opposite from the pilot projects in markets that Payams put low priority to collect wastes in residential areas. As a result, Payams did not achieve the periodical collection perfectly.

Based on the results of the pilot projects, JCC tries to introduce this system into other markets. Actually Director and Deputy Director of Waste Management Department in JCC examined collection routes and consulted JICA Expert Team in order to realize expansion of the new collection system.

2.4.2. Collection Vehicles

Collection vehicles utilized in Juba City were compactors and trucks. Compactor is a vehicle for waste collection with special devise compacting and reducing the volume of loaded wastes. Truck is mainly a dump truck or tipper truck with an open carrier and a mechanical device to lean the carrier in order to unload the wastes at once.

For waste collection in Juba City, Payams used trucks and compactors owned by Payams with their budget; or compactors owned by JCC with budgets of JCC and Payams. Table 2-15 shows the list of vehicles owned by Payams. Except for these listed vehilces, Payams used some trucks for waste collection. Although each Payam had own system, Public Health Officers or Equipment Officers generally controlled vehicle allocation.

Table 2-15 Collection Vehicles Owned by Payams

Owner	Type	Amount	Capacity (m^3)	Purchased Year
Juba Town	Compactor	1	14	2012
Juba Town	Tipper truck	1	8	2007
Kator	Tipper truck	3	8	2007
Munuki	Compactor	1	14	2012
Munuki	Tipper truck	1	8	2007

Table 2-16 shows the current situation of compactors owned by JCC as of December 2013. In 2012, both JCC and Payams invested and bought these ten compactors. Among them, JCC used two units for waste collection from large-volume dischargers. For other waste collection, Kator Payam used three units, Juba Town Payam used three units and Munuki Payam used two units. However, these compactors were not new vehicles, but were manufactured more than 10 years ago. In December 2013, four vehicles were broken, and five vehicles worked only for half day because of mechanical troubles. Therefore, only one vehicle worked normally. Under such vehicle conditions, JCC usually changed the allocation although the demarcation of vehicles had already decided as mentioned above.

Table 2-16 Current Situation of Compactors Owned by JCC (as of December 2013)

Compactor No.	Capacity	Driver	Operator	Area (Original)	Area (as of 2nd Dec)	Vehicle No.	Condition	Production Year	Working Period [year]
1	$25m^3$	Scander Angalle Ladu	Christopher Awang	Juba Town	Juba Town	NO plate number	NOT WORKING (To allocate for Juba Town Market)	2002	11
2	$25m^3$	Sebit Justine Soraba	Francis Scander	Juba Town	Juba Town	CEG 431 A		2002	11
3	$25m^3$	Richard	Mark Bona Bungu	Juba Town	Juba Town	CEG 430 A	Working for a half day (mechanic troubles)	2000	13
4	$25m^3$	Abdala Marke	Jalal Wani	Kator		CEG 421	NOT working	2001	12
5	$25m^3$	Simon Lagu Wani	John Majok	Kator		CEG 423A	NOT working	1997	16
6	$25m^3$		Nuel Jackson Kamilo	Kator		CEG 429A	NOT working	2001	12
7	$25m^3$	Simon Lagu Wani	Daniel Oliver	Munuki	Munuki	CEG 420A	Working for a half day (mechanic troubles)	2001	12
8	$25m^3$	Alex Latiu Arklfu	Musa David	Juba City Coucil	Kator	CE 435 A	Working for a half day (To allocate in Kator from 13th Nov, 2013)	2002	11
9	$25m^3$	George Alfeo	Charles Victor	Munuki	Munuki	CE 428 A	Working for a half day (mechanic troubles)	1999	14
10	$25m^3$	Ladu		Juba City Council	JCC	CE 427 A	Working for a half day (mechanic troubles)	1999	14

Drivers and assistant drivers, who were employed by JCC, inspected these compactors daily in the workshop owned by JCC. Mechanics repaired these compactors in this workshop. If these compactors had heavy troubles, JCC ordered private companies to repair. For open dump trucks and compactors owned by Payams, they ordered JCC's workshop or private companies to repair. For example, one private workshop in Kator Payam received orders from not only JCC, but also UN and other organizations. There was another private workshop in Munuki, and Munuki Payam utilized it for repair. It was possible to procure spare parts of general dump trucks and small-scale compactors in Juba City. JCC has experiences to procure them.

2.4.3. Collection Capacity

JICA Expert Team calculated the present (as of November 2013) collection capacity of existing vehicles owned by JCC and Payams except for the broken-down vehicles. The applied formula was "Collection capacity [ton/day] = Vehicle capacity [m^3/unit] x Number of trip [trip/day] x Specific gravity [ton/m^3] x Loading rate x Operation rate x Efficiency rate". The collection capacity was calculated as 65 ton/day in total as shown in Table 2-17. It could be the maximum capacity of JCC and Payams unless they would procure the new vehicles because breakdown of remained compactors is highly possible. As shown in Table 2-4, waste amount collected by JCC and Payams was estimated as 84 ton/day. So waste amount collected by rental trucks was estimated as 19 ton/day.

Table 2-17 List of Existing Vechiles and Collection Capacity of JCC and Payams

Type	Vehicle Capacity	No. of Unit	No. of operation	Production Year	Working Period	Collection Capacity
	[m^3]	[Unit]	[Unit]		[Years]	[t/day]
Compactor	25	1	0	1997	16	0
Compactor	25	2	2	1999	14	15
Compactor	25	1	1	2000	13	7
Compactor	25	3	1	2001	12	7
Compactor	25	3	2	2002	11	15
Compactor	14	2	2	2012	1	11
Open dump truck (tipper truck)	8	5	5	2007	6	11
Total						65

2.5 Final Disposal

2.5.1. Record of Improvement Activities at Juba County Controlled Dumping Site

Table 2-18 shows the record of improvement activities how the open dumping site changed into Juba County Controlled Dumping Site.

Table 2-18 Record of Improvement Activities at Juba County Controlled Dumping Site

<table>
<tr><th>Year</th><th>Activity</th><th>Method</th><th>Area</th></tr>
<tr><td>2008</td><td>• UNMISS constructed a hole (approximately 1ha) and Juba County started to dispose wastes into this hole with <u>the open dumping method.</u></td><td rowspan="2">Open dumping</td><td rowspan="3">Phase 1</td></tr>
<tr><td>2012</td><td>• In April, <u>the Project started.</u>
• 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 (hereinafter referred to as “IEE”) was completed with the support of the Project in order to improve the existing dumping site.
• In September, the Project started <u>improving the existing dumping site (Phase 1 area), and instructing how to improve the management</u> of the final disposal site. The waste disposal method was also <u>improved from the open dumping method into the controlled dumping method.</u>
• <u>South Sudan side implemented IEE for the rest of the site.</u></td><td rowspan="2">Controlled dumping</td></tr>
<tr><td>2013</td><td>• In October, the Project <u>expanded the final disposal site (Phase 2 area)</u> using the rest of the site.
• In December, <u>Juba County started disposing wastes into the expanded area (Phase 2 area).</u> JICA decided that <u>the filed activity of the Project was suspended.</u></td><td>Phase 2</td></tr>
</table>

2.5.2. Outline of Juba County Controlled Dumping Site

Table 2-19 and Figure 2-9 show the outline after Juba County Controlled Dumping Site was completed.

Table 2-19 Oultline of Juba County Controlled Dumping Site

Item	Description
Name of the site	*Juba County Controlled Dumping Site*
Origin of disposal wastes	Juba Town Payam, Kator Payam, Munuki Payam, Rejaf Payam, Nothern Bari Payam

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Area of the site</td><td>25ha</td></tr>
<tr><td>Area for disposal</td><td>Phase 1: 3ha (completion)
Phase 2: 4ha (under operation)
Phase 3: 4ha (undeveloped)
Phase 4: 5ha (undeveloped)</td></tr>
<tr><td>Disposal period and capacity</td><td>
<table>
<tr><th></th><th>Disposal Period</th><th>Capacity (m^3)</th></tr>
<tr><td>Phase 1</td><td>2008 to November 2013</td><td>250,000</td></tr>
<tr><td>Phase 2</td><td>December 2013 to June 2017</td><td>410,000</td></tr>
</table>
</td></tr>
<tr><td>Disposal method</td><td>Controlled dumping method</td></tr>
<tr><td>Main Facility</td><td>Embankment, gas vent pipes, access road, operation road, administration building, fence, gate, dumping platform</td></tr>
</table>

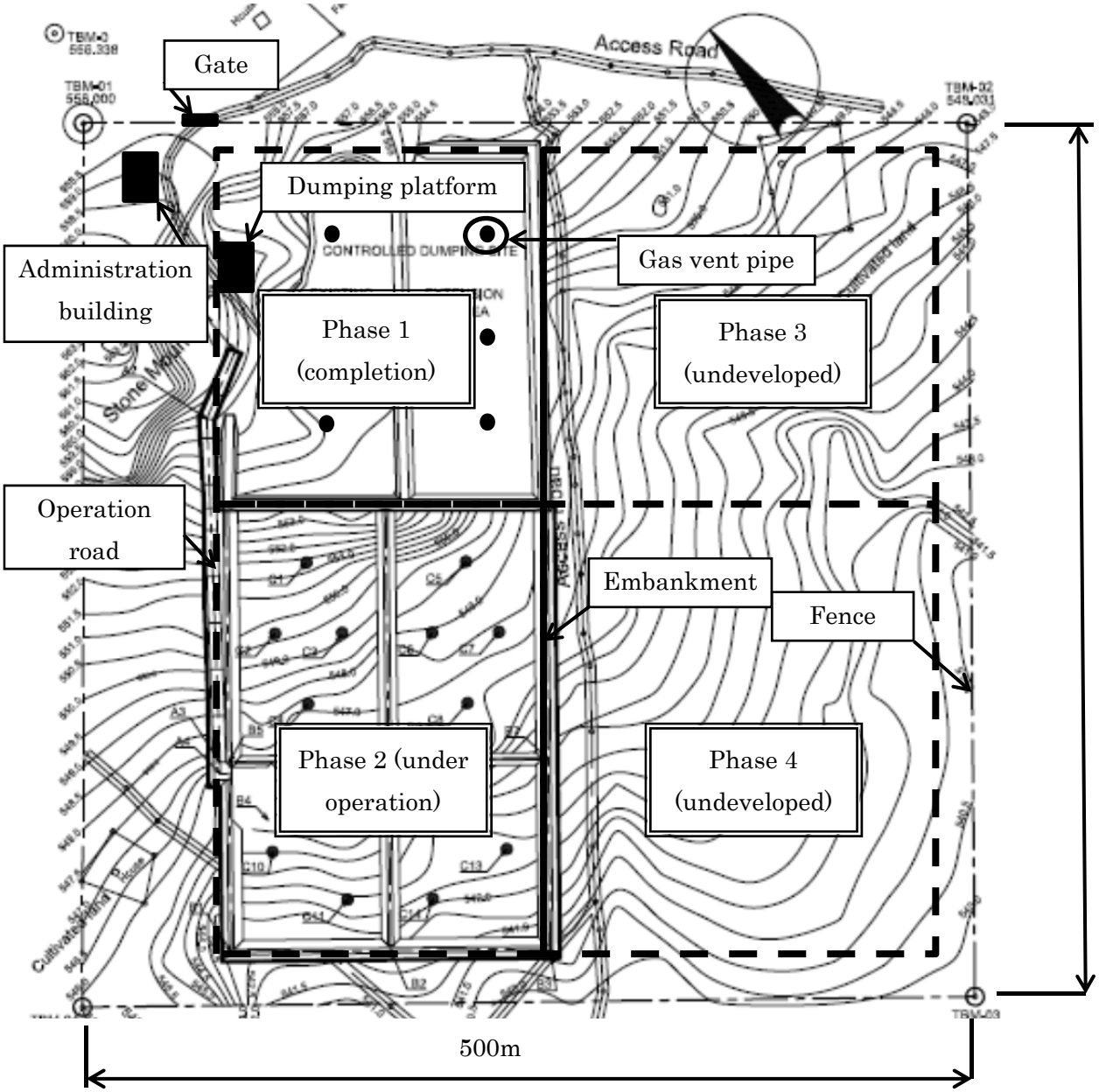
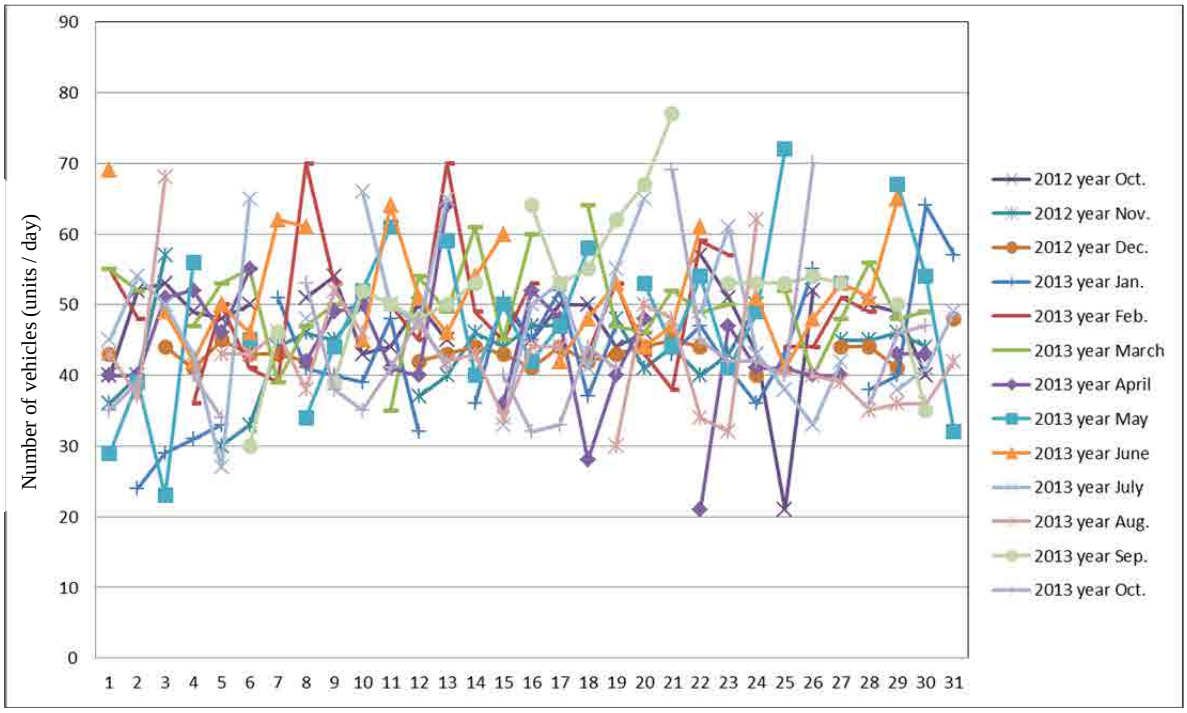


Figure 2-9 Schematic Drawing of Juba County Controlled Dumping Site

2.5.3. Incoming Vehicles and Wastes at Juba County Controlled Dumping Site

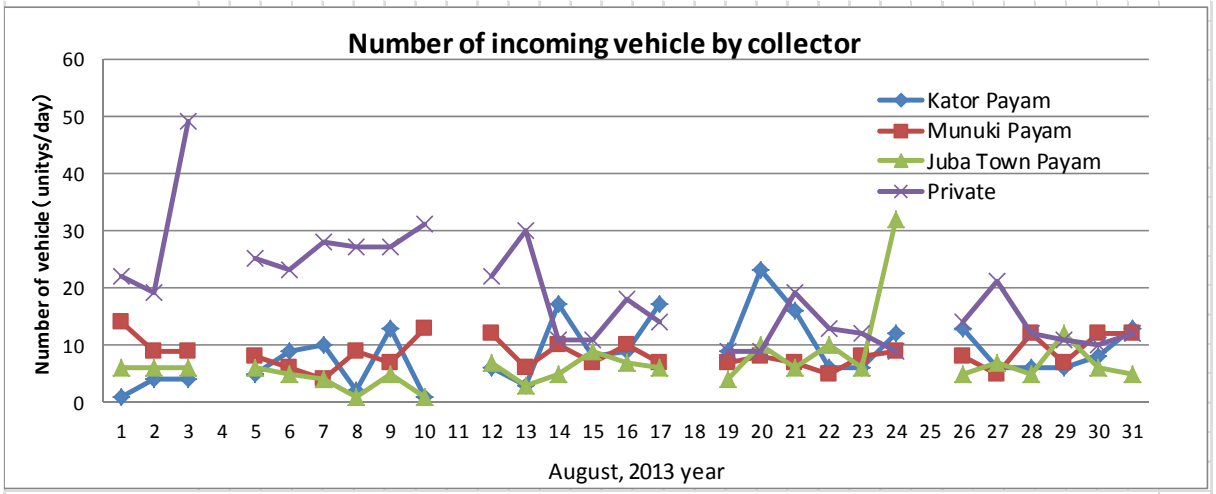
As shown in Figure 2-10, a field worker (called "landfill staff") has recorded the number of incoming vehicle every day at Juba County Controlled Dumping Site since October 2012. The average number of daily incoming vehicle was 47 vehicles/day. The incoming waste was estimated as 150 ton/day.



Year	2012 year			2013 year										Average
Month	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	
Total No.	1,227	1,088	993	1,100	1,185	1,303	1,138	1,198	1,303	1,251	1,157	1,097	1,031	1,159
Woking day	26	25	23	26	24	26	26	25	25	25	27	21	24	25
Average No	47	44	43	42	49	50	44	48	52	48	43	52	43	47

Figure 2-10 Number of Incoming Vehicle at Juba County Controlled Dumping Site

In addition to the total number of incoming vehicle, a landfill staff has recorded the agencies who ordered the vehicles to collect wastes as shown in Figure 2-11. According to the record, the ratio of private agencies to public agencies was 44% to 56%; among the public agencies 20% from Juba Town Payam, 20% from Kator Payam and 16% from Munuki Payam.



August

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Kator Payam	1	4	4	0	5	9	10	2	13	1	0	6	3	17	8	9	17	0	9	23	16	6	6	12	0	13	6	6	6	8	13	233
Munuki Payam	14	9	9	0	8	6	4	9	7	13	0	12	6	10	7	10	7	0	7	8	7	5	8	9	0	8	5	12	7	12	12	231
Juba Town Payam	6	6	6	0	6	5	4	1	5	1	0	7	3	5	9	7	6	0	4	10	6	10	6	32	0	5	7	5	12	6	5	185
Private	22	19	49	0	25	23	28	27	27	31	0	22	30	11	11	18	14	0	9	9	19	13	12	9	0	14	21	12	11	10	12	508
Sub- Total	43	38	68	0	44	43	46	39	52	46	0	47	42	43	35	44	44	0	29	50	48	34	32	62	0	40	39	35	36	36	42	1157

Figure 2-11 Number of Incoming Vehicle by Collector

2.5.4. Heavy Equipment for Waste Disposal

As heavy equipment for waste disposal, Rejaf Payam had only one bulldozer procured by JICA in August 2013 (Table 2-20). O&M cost for this bulldozer including fees for fuel and maintenance was covered by the disposal fee collected from users. The operator carried out daily maintenance, and Rejaf Payam ordered the dealer of CAT for the periodical maintenance and repair. Rejaf Payam covered soils on the disposed wastes twice a month. They used the bulldozer for compaction, and rented equipment for excavation and transportation of soils because they did not have any equipment except for the bulldozer.

Table 2-20 Outline of Bulldozer Procured by JICA

Type	Manufacturer and Capacity	Time of Procurement
Bulldozer	CAT, W=21t class	August 2013

2.5.5. O&M Situation of Juba County Controlled Dumping Site

Table 2-21 shows the present O&M situation at Juba County Controlled Dumping Site.

Table 2-21 Present O&M Situation at Juba County Controlled Dumping Site

Work item	Situation
1) Overall management • Operation record	• Site manager makes the operation record every day.
• Weekly meeting	• Weekly meeting is held at the administration building on every Monday. The chairperson reports issues to Director of Rejaf Payam.
2) Incoming vehicle management • Guidance for incoming vehicles to the dumping place	• Two landfill staff guides vehicles.
• Record of incoming vehicles	• Site manager makes the incoming vehicle record every day.
3) Disposal work • Disposal	• Waste disposal is done by the bulldozer. Site manager and Landfill staff instructs the operator of bulldozer.
• Soil covering	• Rejaf Payam uses collected disposal fee and rent heavy equipment for soil covering. They cover soil once per 2 weeks.
• Management of waste pickers	• There are not any fires and accidents (injury) at present. Waste pickers cleaned the site once per 2 weeks.
4) Facility management • Facility management	• Using the Operation Manual, all staff manage each facility.
• Management of heavy equipment	• Operator carries out daily management. Rejaf Payam orders the dealer for periodical maintenance.
• Extension of gas vent pipes	• Rejaf Payam extends gas vent pipes according to the progress of waste disposal. Sometimes heavy equipment and vehicles hit and break the pipes, but landfill staff repairs every time.
5) Environmental management • Groundwater	• Rejaf Payam measures pH, EC, COD, Nitrate nitrogen and Ammonia nitrogen with simple water analysis tools at the monitoring wells which were set by the geological and groundwater survey.
• Gas	• Rejaf Payam measures O2, CO2 and Methane and Hydrogen sulfide with simple gas analysis tools at the gas vent pipes.

2.6 Other Activities of the Project

2.6.1. Public Relations

(1) Present Situation

There was a responsible person for public relations (hereinafter referred to as "PR") in JCC; however the role of this person was not to provide information on public works including waste management. The main role was to shoot videos when the Mayor attended events, and to provide those videos for TV stations and other media. Although cooperation of residents is essential for PR on waste management, leaders of 50 QCs in Juba City have not enough capacity to manage each community. It seems difficult for them to be a main actor to provide information. Therefore, initiative of JCC or Payams to organize community is important.

JCC used mass media for PR; however they did not conduct community meetings for involvement of community so often.

Moreover, JCC did not examine the method to deliver waste management information despite of low understanding of residents.

(2) PR Activities in the Project

Considering the present situation, the Project implemented the following PR activities for smooth collection and disposal works. Through these activities, the Project promoted to get related officers and residents to understand and cooperate for waste management.

- Community meetings in residential areas and workshops in markets
- Lectures and bus tours to understand waste management
- Clean-up campaigns (in Jebel Market, West and East Nabari QCs, Lobulet bridge, and so on)
- Signboard to stop illegal dumping
- Bulletin board to share information of waste management
- Events (opening ceremony of Juba County Controlled Dumping Site, ceremony for bulldozer handing over, and so on)
- Press release for media

2.6.2. Recycling Activity

Waste collection had just started in Juba and the number of vehicles for collection was insufficient for covering the whole city. In this sense, it is difficult for the government to initiate recycling which requires more vehicles.

On the other hand, recycling of plastic bottles, which are the biggest amount of recyclables in Juba, failed to be recycled by a company from China. Currently, Environmental Rehabilitation Program (ERP, NGO related to France) collects plastic bottles with 0.25SSP/kg, crushes and exports through Uganda with the support of the French Government. It needs to be noted that the operational cost such as land use, water and electricity for crushing bottles was covered by the partner company, South Sudan Breweries Limited, and they received the financial support from the donor. Therefore, the whole operation is not profitable at present.

Other items for private recycling business were iron and aluminum, but their amounts are low in percentage for the whole waste composition.

2.7 Urgent Issues for Waste Management in Juba

2.7.1. Waste Collection

The following points are the urgent issues on waste collection.

(1) The absolute number of collection vehicle is insufficient.

In the first place, the absolute number of collection vehicles is seriously deficient. JCC and Payams should examine how to procure the vehicles. It is a matter of time that the existing vehicles would be out of use.

(2) JCC and Payams do not have data and records necessary for waste management.

JCC and Payams do not have data and/or keep records necessary for waste management. They should collect and keep at least hand-writing data and records on waste management, such as population, amount of waste, collection equipment, organization, finance, etc.

(3) Management system is not clear.

One of the frequent problem on the site is “we could not collect wastes because the vehicle did not come”. It is because the officers and workers do not know who to call and how to allocate vehicles. To make matters worse, they tend to remain the problem. Including the vehicle allocation, the overall system for management and command is not clear. According to the areas, several organizations are related to waste management, such as JCC, Payams, market unions, ethnic groups, etc. However, the relationship among these organizations is not clear.

(4) Collection service is unstable.

As mentioned above, Payams implement waste collection and road cleaning together. Especially along the main streets, Payams implement house-to-house collection. This collection method takes a lot of time and money. Moreover, Payams should change their schedules if they receive the sudden orders from JCC and the central government. This situation leads the negative spiral, that is, Payams cannot keep the schedules; wastes are piled up; the areas become unhygienic; Payams lose trusts from residents and shop owners; Payams cannot collects fees; Payams cannot make budget for O&M; and wastes are piled up more and more.

2.7.2. Final Disposal

The following points are the urgent issues on final disposal.

(1) Human resources for O&M are insufficient.
In O&M Organization, the O&M group managed by Rejaf Payam had functioned and its human resource had developed. On the other hand, the planning group managed by Juba County does not have any staff who can prepare the plans for future landfills.

(2) Budget for O&M is unstable.
O&M cost can be covered by collected disposal fee if Rejaf Payam collects fees from all users. However, Rejaf Payam did not achieve to collect fees from JCC and three Payams. Additionally, Rejaf Payam did not know the actual amount of fee collected at the check point because vehicles ordered by private agencies should pay not only disposal fee, but also material transportation fee and other fees at the check point.

(3) Heavy equipment for disposal work is insufficient.
Rejaf Payam does not have heavy equipment for soil covering, so they have to rent equipment at present. However, the rental fee in South Sudan was extremely expensive, and it accounted for 40% of all O&M cost. The frequency of soil covering is only twice a month. It seems that the need of heavy equipment is low. However, Rejaf Payam or Juba County can collect a lot of wastes with the heavy equipment except for working days of soil covering if they procure wheel loader and dump truck. Therefore, the need of heavy equipment is high for both waste collection and disposal.

(4) Capacity for O&M is under development.
Soil covering was frequently behind the schedule because Rejaf Payam took a long time to prepare the payment for rental equipment. At present, the amount of waste disposal becomes large. So the environmental management becomes important. Before December 2013, Rejaf Payam used measurement tools of the Project for environmental monitoring. It means Rejaf Payam does not have any environmental monitoring tools.

2.7.3. Other Activities

(1) PR by JCC and Payams

1) Each organization does not have officers for PR, and cooperation among organizations is insufficient.

There are not any officers for planning and implementing PR activities. Cooperation system inside of Juba City (JCC, each Payam and QCs) and between organizations (JCC, HQs of Juba County and Ministry of Environment) of Juba City is under development.

2) Public awareness is insufficient.

JCC and HQs of Juba County have never implemented activities to raise public awareness for waste management on their own, such as community meetings, bus tours, environmental education, and so on.

(2) Recycling Activity

If public agencies implement recycling activities, they should have vehicles for waste collection and for separated material collection. At present, JCC and HQs of Juba County did not show willingness to promote recycling positively. If they want to promote recycling, they should secure sufficient budget, human resources and vehicles, and implement appropriate environmental education and public awareness activities.

Chapter 3 Estimation of Future Population and Waste Amounts

3.1 Estimation of Future Population

The latest official population survey of South Sudan and Juba City (or three Payams) is "5th Sudan Population and Housing Census, 2008" implemented before independence. Since then, any official surveys have not been implemented for these areas. Even the latest statistical book, "Statistical Yearbook for Southern Sudan 2010 (issued by Southern Sudan Centre for Census, Statistics and Evaluation)", used the survey results in 2008 mentioned above. This book indicated the population of Juba City was 230,195 people (Juba Town Payam: 82,346 people, Kator Payam: 64,130 people and Munuki Payam: 83,719 people). The report of JICA Project for Irrigation Development Master Plan in South Sudan (September 2013) also utilized the same population data. The report of CESVI (NGO) set the population of Juba City in 2010 as one million people as of 2010. According to the JICA report for the basic data collection survey of waste management in southern area in Sudan (July 2010), "Approach Paper to UNEP", (October 2009) reported that the total population of three Payams was around 1.21 million people. However, this JICA report also noted that this population data should be examined.

On 3rd July, 2014, JCC submitted the population data to JICA Expert Team, It indicated the population of Juba City in 2013 (the base year) as 1.5 million people. Considering the instability of political and other situations in Juba City, JICA Project set three population cases considering ±20% fluctuation; Case 1: 1.2 million people, Case 2: 1.5 million people and Case 3: 1.8 million people. And the population growth rate of "5th Sudan Population and Housing Census, 2008", which was 2.052%, was applied for all cases. JICA Project assumed that this rate would not be changed dramatically through the whole target period of Long-Term Plan. Figure 3-1 shows the results of population estimation in all cases.

(1) Case 1

Case 1 set the population in 2013 as 1.2 million people. In this case, the population in the target year of Long-Term Plan, 2023, was estimated approximately 1.47 million people.

(2) Case 2 (Basic Case)

Case 2 set the population in 2013 as 1.5 million people. In this case, the population in 2023 was estimated approximately 1.84 million people.

(3) Case 3

Case 3 set the population in 2013 as 1.8 million people. In this case, the population in 2023 was estimated approximately 2.21 million people.

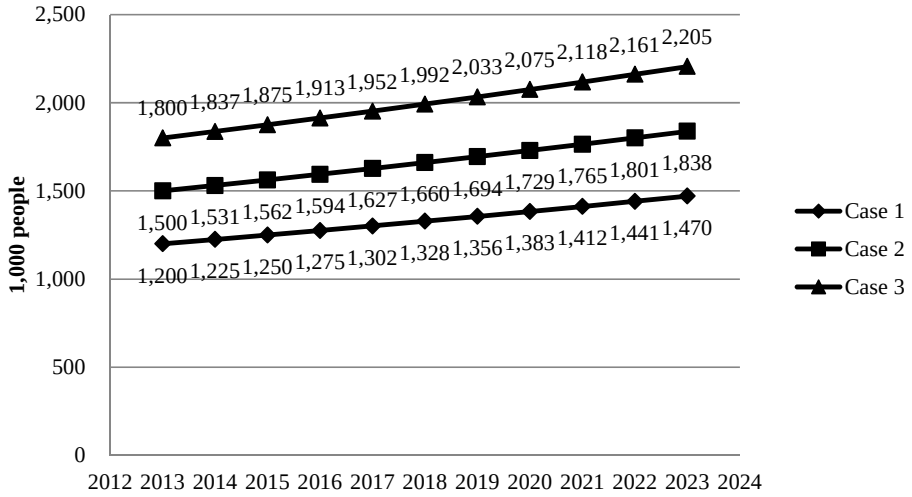


Figure 3-1 Estimation of Future Population in Juba City

3.2 Estimation of Future Waste Amounts

3.2.1 Waste Generation Amount

In this Plan, the target wastes are the wastes collected by JCC and Payams, which are "household wastes", "market wastes" and "road sweeping wastes". However, the reliable data on waste amount is very limited. Therefore, JICA Project estimated only the whole target waste with the data of population and the unit amount of household waste (amount of household waste per person per day). The estimation formula is as follows;

- [Generation amount of the target waste in the target year] ＝ [Population in the base year (2013)] × [Population growth rate] × [Unit amount of household waste in the base year (2013)] × [Increasing ratio of unit household waste]

JICA Project assumed that the unit amount of household waste would not be changed dramatically through the whole target period of Long-Term Plan. For the population data, estimation results in the above section 3.1 were applied. For the unit amount of household waste, the result of the waste quantity survey by JICA Project in 2012, 0.70 kg/person/day, was applied. Figure 3-2 shows the estimation results of future waste generation amount in Juba City in all cases.

(1) Case 1

In Case 1 (population in 2013 as 1.2 million people), the waste generation amount in 2013 and 2023 were estimated as 840 ton/day and 1,029 ton/day respectively.

(2) Case 2 (Basic Case)

In Case 2 (population in 2013 as 1.5 million people), the waste generation amount in 2013 and 2023 were estimated as 1,050 ton/day and 1,286 ton/day respectively.

(3) Case 3

In Case 3 (population in 2013 as 1.8 million people), the waste generation amount in 2013 and 2023 were estimated as 1,260 ton/day and 1,544 ton/day respectively.

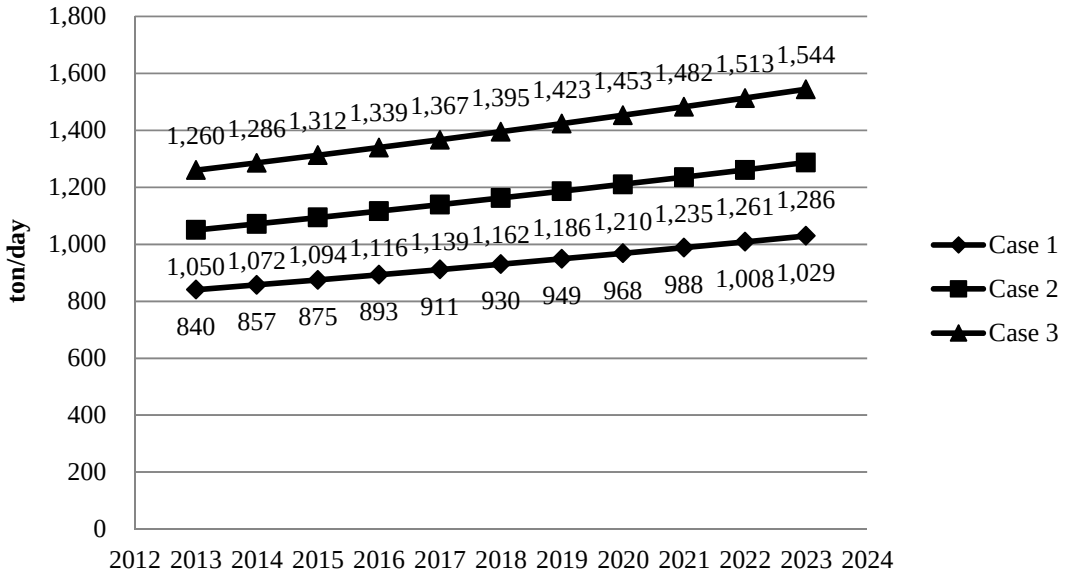


Figure 3-2 Estimation of Future Waste Generation Amount in Juba City

3.2.2 Waste Collection Ratio

(1) Case 1

According to Chapter 2, the amount of waste transferred from Juba City to Juba County Controlled Dumping Site was 150 ton/day in 2013. This amount can be set as the collection amount by JCC and Payams and private collectors in Juba City. In Case 1, the generation amount in 2013 was 840 ton/day. Therefore, the collection rate in 2013 was estimated as 18%.

(2) Case 2 (Basic Case)

The calculation method of the collection ratio in Case 2 is same as Case 1. In Case 2, the generation amount in 2013 was 1,050 ton/day. Therefore, the collection rate in 2013 was estimated as 14%.

(3) Case 3

The calculation method of the collection rate in Case 3 is same as Case 1. In Case 3, the generation amount in 2013 was 1,260 ton/day. Therefore, the collection rate in 2013 was

estimated as 12%.

As mentioned in the section 1.3, JICA Project set the target collection rate in 2023 as 20% larger than the collection rate in 2013. For reference, JICA Project considered the collection rate in 2018, which is the midpoint of Long-Team Plan. Table 3-1 shows the target collection rates of all cases.

Table 3-1 Estimation of Target Collection Rates

	Case 1	Case 2	Case 3
	[%]	[%]	[%]
2013	18	14	12
2018	28	24	22
2023	38	34	32

3.2.3 Waste Collection Amount

The collection amounts of the whole target waste were estimated with the results of waste generation and collection rate. For reference, JICA Project considered the collection amounts in 2018, which is the midpoint of Long-Team Plan. Table 3-2 shows the target collection amounts of all cases.

Table 3-2 Estimation of Target Collection Amounts

	Case 1	Case 2	Case 3
	[ton/day]	[ton/day]	[ton/day]
2013	150	150	150
2018	259	282	306
2023	390	441	493

Chapter 4 Long-Term Plan

4.1. Purpose of Long-Term Plan

The purpose of the Long-Term Plan is to establish the sustainable waste management system in Juba City in ten years (from the base year 2013 to the target year 2023). For the collection work, the target is to achieve 34 % of the collection rate in 2023 by stable collection with the expanded target areas. For final disposal, the target is to secure the site in which all collected wastes can be disposed of in a sanitary manner, and to implement the sanitary operation and management.

4.2. Organization and Legal System

4.2.1. Organization Specialized for Waste Management

(1) Definition of Responsibility Demarcation in the Organization

In order to implement stable waste management, it is necessary to expand Waste Management Department of JCC and establish Waste Management Department in each Payam. Figure 4-1 shows organization form which is suggested from JICA Expert Team. Responsibilities of each department are shown in Table 4-1.

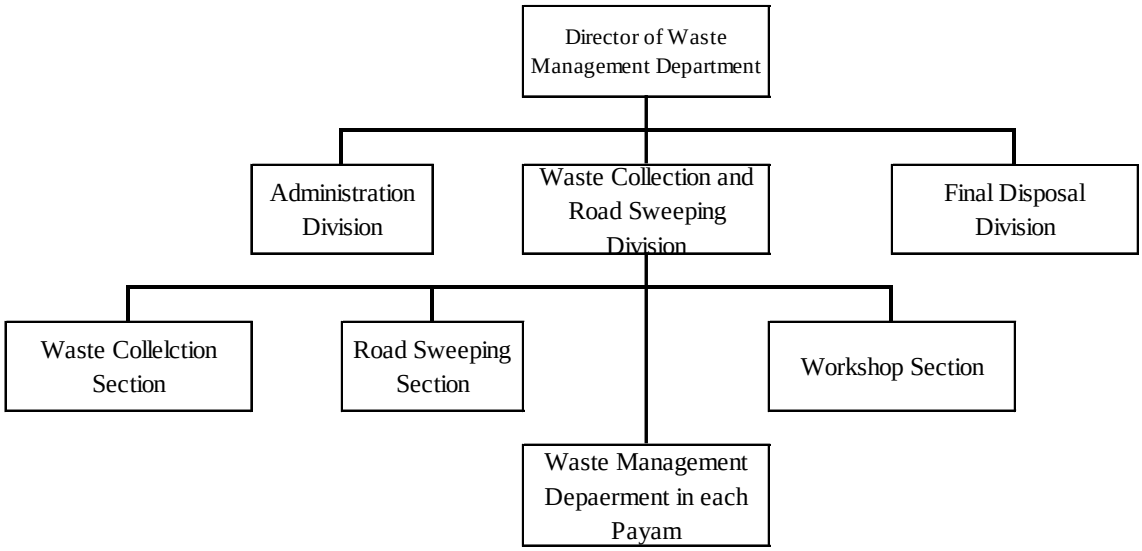


Figure 4-1 Structure of Waste Management Department of JCC and Coordination Plan with Payams

Table 4-1 Suggested Responsibility Demarcation Plan for JCC and Payam

Organization	Department			Role of Department
JCC	Waste Management Department	Director		• To supervise whole operation • To report to the Mayor • To manage human resource • To manage labor and safety • To operate JSWMG • To instruct private collectors
		Administration Division		• To prepare Activity Plans • To prepare Activity Reports • To prepare annual budget documents • To manage revenue and expenditure of the activities (including management of salary) • To raise public awareness
		Waste Collection and Road Sweeping Division	Waste Collection Section	• To secure and procure waste collection vehicles and equipment • To implement waste collection（for large-volume dischargers） • To supervise collection of each Payam
			Road Sweeping Section	• To secure and procure road sweeping vehicles and equipment • To supervise collection on weach Payam
			Workshop Section	• To maintain collection vehicles • To maintain road sweeping vehicles and equipment
		Final Disposal Division		• To manage transportation for JCC final disposal site • To prepare future disposal plan
Each Payam	Waste Management Department			• To implement collection (markets and residential areas) • To implement road sweeping • To secure and manage collection workers • To secure and manage road sweeping workers • To receive complains • To raise public awareness

(2) Cooperation and Coordination Between Organizations

Long-Term Plan aims realization of jurisdiction of activities in Table 4-2 and implementation structure in Figure 4-2 to implement proper waste collection continuously. It is necessary to gain cooperation of generators for expansion of collection, therefore, JCC and Ministry of Environment will cooperate on raising public awareness and environmental education.

Table 4-2 Jurisdiction of Waste Collection Activities in Long-Term Plan

	Ministry of Environment	Juba City	
		JCC	Payam
• To formulate and enforce waste management policy	◎		
• To establish and implement subsidy system	◎		
• To instruct waste management of local government	◎		
• To promote study for waste management technology	◎		
• To prepare collection plan and budget plan		◎	
• To manage private collectors		◎	
• To set collection fee for households, shops and markets		◎	
• To contract collection for large-volume dischargers		◎	
• To implement collection from households, shops and markets)			◎
• To implement collection for large-volume dischargers		◎	
• To collect collection fee from households, shops and markets			◎
• To collect collection fee from large-volume dischargers		◎	
• To maintain collection vehicles		◎	
• To cover maintenance cost for waste collection vehicles		◎ (Vehicles owned by JCC)	
• To instruct private collectors		◎	
• To raise public awareness and implement environmental education	◎	◎	

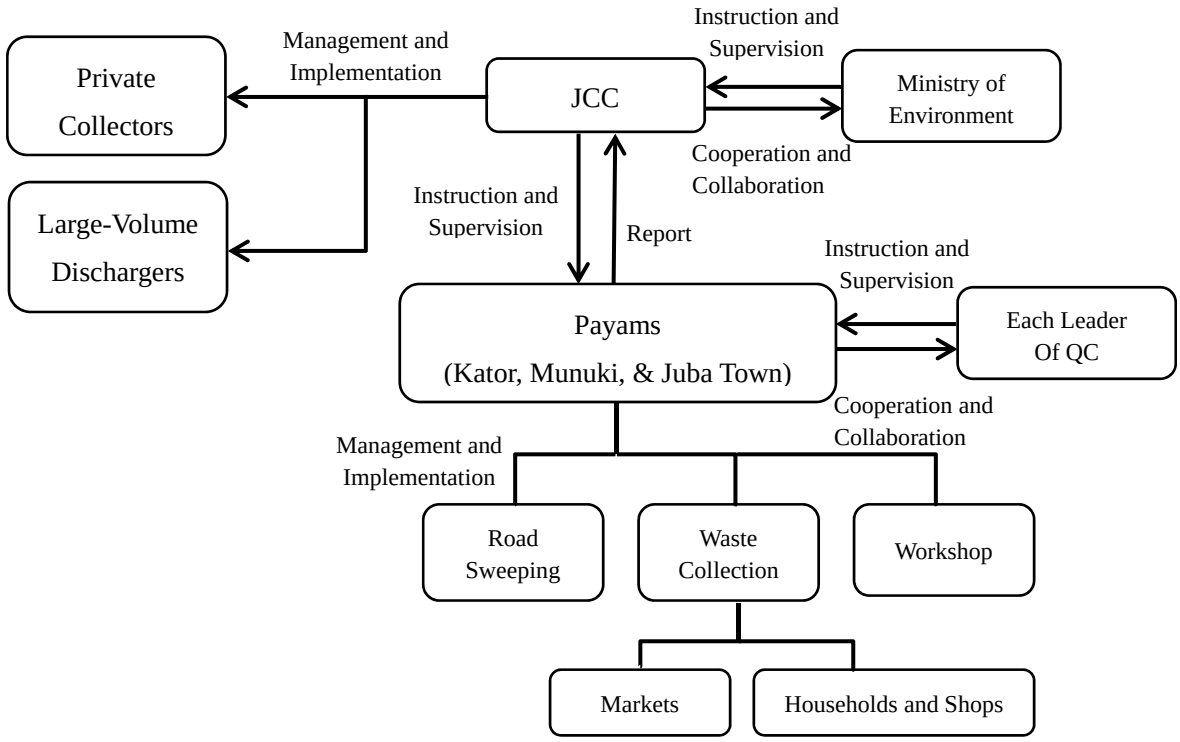


Figure 4-2 Collection Implement Structure in Long-Term Plan

4.2.2. O&M Organization for Final Disposal Site

To implement O&M of final disposal site continuously, Long-Term Plan aims realization of jurisdiction of activities in Table 4-3 and implementation structure in Figure 4-3. JCC needs to cooperate and collaborate with Ministry of Environment to gain support for purchase cost of heavy equipment and construction cost of new disposal site as well as instruction for O&M.

Table 4-3 Jurisdiction of Activities for Final Disposal Site in Long-Term Plan

Items	Ministry of Environment	Juba County	Rejaf Payam
• Superintendent for whole activities		◎	
• Preparation of O&M plan			◎
• Preparation of O&M budget plan			◎
• O&M activities	◎		◎
• Collection and management of disposal cost			◎
• Preparation of future plan of disposal site		◎	
• Securement of construction cost and procurement cost for heavy equipment	◎	◎	

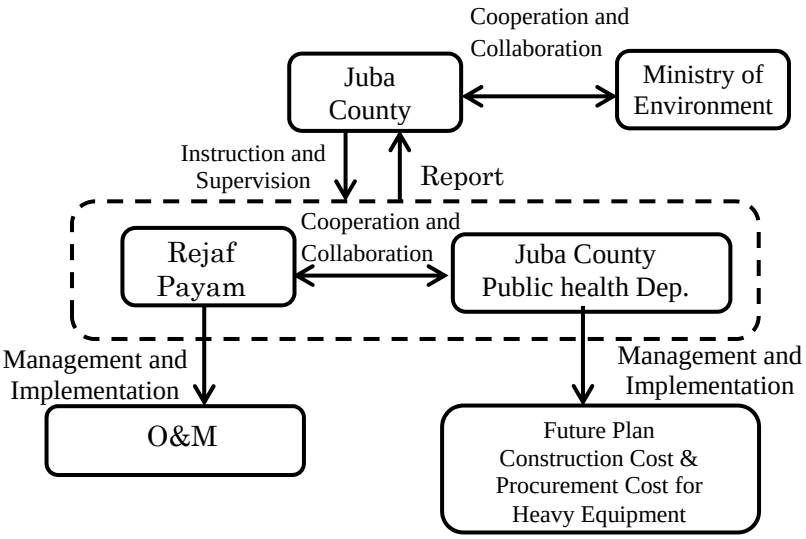


Figure 4-3 Implementation Structure for Final Disposal Site in Long-Term Plan

4.2.3. Legal System

It is an urgent matter to formulate laws related to waste management. The Project suggests including contents shown in Table 4-4.

Table 4-4 Plan of Items for Waste Management Related Laws

Planed Items	内容
Improvement of public health is the highest priority objective.	• The highest priority objective of waste management implementation is improvement of public health by collecting discharged waste as much as possible and it is properly disposed in landfill.
Proper and safe collection, treatment and disposal	• Implement proper and safe collection, treatment and disposal based on types of waste. • Unify waste treatment method in JCC and Payams. • JCC and Payams target 100% for waste collection rate. • Collected waste is necessarily treated by control dumping method
Responsibility, cooperation and coordination of municipality and private companies	• Unify responsibility of municipalities, coordination and coordination of related agencies in the country. • Make the system to specify private companies to implement waste collection and treatment method which is instructed and approved by municipality.
Discharger responsibility	• Dischargers such as residents and shop owners should discharge their waste following instruction of municipality, pay compensation for the service and cooperate waste management.
Disclosure of information	• Central government and JCC should disclose information such as detail of activities when it is requested.

4.3. Financial Administration

4.3.1. Budgetary Management of JCC

Framework of budgetary management of JCC should have following items.

1) Summary of Revenue and Expenditure for Waste Management Activity in a Fiscal Year

JCC needs to summarize revenue and expenditure of waste management activity for one year (fiscal year) under cooperation with each Payam. In order of this, "Annual Report" should be prepared. Director of Waste Management Department of JCC is responsible for this preparation. With this annual report, Director makes report to the Mayor of Juba City and gain approval from the Mayor. Planed contents for annual report are shown in Table 4-5.

Table 4-5 Planed Contents for Annual Report

	Items	Contents
1	Legal System	Related laws
2	Organization	Organization (organization chart, number of staff, name of the contact person)
		Jurisdiction of related agencies
3	Types of targeted waste and collection amount	Types of targeted waste, collection record by types (amount or volume)
4	Collection area and frequency, transportation to the disposal site	Waste collected areas, implementation agency and collection times are shown by QC as unit. Indicate each area's characteristics (residential area, market and so on).
		Record of Transportation to the Disposal Site
5	Collection method (type of service)	Collection method (specified time and places collection, house-to-house collection) and record of collection
6	Facilities used for waste management and operation time	Final disposal site (available transportation day and time, dimension, simplified map and so on)
		Workshop (operation day and time)
7	Vehicles and equipment used for collection	Specification and number of collection vehicles and equipment
8	Working days and working hours	Working days and hours of collection workers.
9	O&M (purchase of collection vehicles, construction, repair and so on)	Activity record for purchase of collection vehicles
		Activity record related O&M such as repair of equipment
10	Training	Safety and sanitary training for staff
		Operation training for new equipment
11	Public awareness, PR	Community meetings
		Explanation meetings (includes explanation in JCC)
12	Record of revenue and expenditure	Record of all revenue and expenditure related to above activities

2) Annual Activity Plan Including Next Year's Activity Budget Based on Annual Report

"Annual Activity Plan" shows next year's activity plan. And it is responsibility of the department which is in charge for planning in JCC (currently it is Director of Waste Management Department). It is desirable to appoint a staff who is in charge for budget, then prepare a budget plan under instruction of the Director. Submitting this annual activity plan to the Mayor enables to implement activities under approval of the Mayor. Based on the above (1)'s record (especially numerical data), annual activity plan is prepared following contents shown in Table 4-6.

Table 4-6 Contents of Annual Activity Plan

	Items	Contents
1	Legal System	Related new laws and revised laws (draft)
2	Organization	Organization plan (organization chart, number of staff, name of contact person etc.)
		Jurisdiction plan for related agencies
3	Types of targeted waste and collection amount	Types of targeted waste, planned waste collection amount or volume
4	Collection area and frequency, transportation to the disposal site	Plan for waste collected areas, implementation agency and collection times by QC as unit. Characteristics of targeted areas.
		Transportation plan for disposal site
5	Collection method (type of service)	Plan for collection method
6	Facilities used for waste management and operation time	Final disposal site (available transportation day and time, dimension, simplified map and so on)
		Workshop (operation day and time)
7	Vehicles and equipment used for collection	Specification and number of collection vehicles and equipment
8	Working days and working hours	Working days and hours of collection workers
9	O&M (purchase of collection vehicles, construction, repair and so on)	Purchase plan for collection vehicles
		O&M plan such as repair for equipment
10	Training	Safety and sanitary training for staff
		Operation training for new equipment
11	Public awareness, PR	Plan for community meetings
		Plan for explanation meetings (includes explanation in JCC)
12	Revenue and expenditure plan	Budget plan of all revenue and expenditure related to above activities

3) Fee Collection System

Fee collection system which is established by JCC should continue. However, JCC should set

the collection system carefully based on above 1) and 2) to make it realistic and gain adequate revenue to implement activities.

4.3.2. Account Management for Waste Collection and O&M of Disposal Site

(1) Opening of Specialized Account and Through Utilization

Currently, tax system is not established in Juba City. Therefore, after collection, specialized bank account for waste management should be opened and entire waste collection fee will be deposited and withdrew from here. The staff who can use the account should be limited only one person, and appointed as cashier. For deposit and withdraw from the account, approvals from Director of Waste Management Department and the Mayor are required. The disposal site opened specialized account for O&M in 2013, and started to deposit disposal cost from 2014. For deposit and withdraw from this account needs approval from Rejaf Payam Director.

(2) Account Management

The cashier who uses the account should report recent financial condition by documents to Director of Waste Management Department once a month. Then, Director of Waste Management Department should make financial report to the Mayor by writing once a year. Also, responding the request from the Mayor, the Director should report financial condition by document as needed. JCC should announce waste management related revenue and expenditure to citizens once a year by bulletin board and so on. In case of disposal site management, as same as above, the cashier should make report by document to Rejaf Payam Director once a month.

4.3.3. Fee Collection (Securement of Financial Resource）

The fee collection from residents is important as waste management is a public service that is hardly make profit. However, because it would not make financial benefit, the fee collection becomes difficult. Therefore, it is not easy to fully cover waste management only by fee collection. So, as direction for securement of financial resource, cost for daily waste management should be covered by fee collection and deficit will be filled by subsidy from the central government. At the same time, formulation of financial legal system for implementation of activity is also required. For construction of large facilities such as disposal site, financial resource mainly from the central government’s subsidy should be used. In case of Juba City, during the situation that tax system or budget implementation has not established, fee collection from waste collection should be main financial resource of daily activities to implement waste management.

Table4-7 shows planned target for securement of financial resource. The target value shall be decided after thorough discussion with the central government (Ministry of Interior) and budget department of JCC.

Table 4-7 Planned Target for Securement of Financial Resource

Items		Contribution Rate	
		Fee Collection	Subsidy from Central Government
Daily O&M	Waste Collection from market	90%	10%
	Waste collection from residential area	80%	20%
	O&M of disposal site	80%	20%
Purchase of equipment	Procurement for large for special equipment such as collection vehicles etc.	60%	40%
Construction of facilities	Construction of large-scale or special facilities such as disposal site etc.	20%	80%

4.4. Waste Collection in Markets and Residential Areas

4.4.1. Waste Collection System

(1) To separate the waste collection work and road sweeping work

At present, the waste collection work and road sweeping are implemented at the same time along the main roads in Juba City. The collection system along these roads is house-to-house collection. So it takes a lot of time, workers and vehicles. In order to increase the collection ratio, house-to-house collection should be reduced and the collection work should be efficient. The Long-Term Plan applies the station collection with the time schedule as the collection system, and separates the waste collection work and road sweeping work.

(2) To cooperation with private collectors and manage them

JCC plans to contract with private collectors for 60 trucks for waste collection in Juba City. The Project assumes that the ratio between public and private collection will be kept during the period of the Long-Term Plan. One of the reasons to keep this ratio is that JCC and Payams do not have enough workers, vehicles and budgets to implement collection works without private collectors. On the contrary, JCC and Payams cannot expand the ratio of private collectors because they do not have enough management capacity. The issues are the following two points.

1) Management capacity of JCC and Payams

With the support of the Project, JCC and Payams just have established the foundation for the waste management. JCC established Waste Management Department, allocated officers for this department, procured the second-hand vehicles, provided collection service for the large-volume dischargers and collect the service fee. Payams learned how to provide the appropriate collection service with the cooperation with JCC. However, JCC and Payams needs more experiences, techniques and knowledge of waste management in order to manage private collectors. It will take a long time to implement the appropriate collection work under the contract with the private collectors.

2) Capacity of private collectors to provide appropriate collection service

At present, there are not any private companies specialized in waste collection. The present private collectors are the rental car companies or individuals without any specialties. JCC and Payams should contract with the private companies or individuals who have enough quality and quantity of workers and equipment to collect wastes following the plans of JCC and Payams. It means that these private companies or individuals should have experiences and knowledge about waste collection.

In this Plan, the ratio between public and private collectors is assumed to be the same in the Long-Term Plan. However, JCC will establish and manage the registration system for private collectors during the Long-Term Plan. With this registration system, JCC will instruct and manage private collectors in order to implement stable collection works by both public and private collectors and to achieve the target collection rate.

4.4.2. Vehicle Procurement Plan (draft)

(1) Necessary collection capacity and conditions to procure

As mentioned in Chapter 1, the target is to increase the collection rate by 20% by 2023, compared with the rate in 2013. Table 4-1 shows the target vales of necessary collection capacity in each population cases set in Chapter 3.

Table 4-1 Target Collection Amount in Each Population Case

	Year	Population	Waste Generation	Collection Ratio	Necessary Collection Capacity	
					Total	JCC and Payams
		[person]	[ton/day]	[%]	[ton/day]	[ton/day]
Case 1	2013	1,200,000	840	18	150	65
	2018	1,328,278	930	28	259	111
	2023	1,470,268	1,029	38	390	168
Case 2	2013	1,500,000	1,050	14	150	65
	2018	1,660,347	1,162	24	282	121
	2023	1,837,835	1,286	34	441	190
Case 3	2013	1,800,000	1,260	12	150	65
	2018	1,992,416	1,395	22	306	131
	2023	2,205,402	1,544	32	493	212

In order to increase the collection capacities, JCC should examine the method to improve the operation management and to procure new vehicles. The Project suggested the following three options, selected the optimum option, and examined it in detail. Only Option 3 had a special condition that the necessary collection capacity will satisfy only the required amount in each year because Option 3 can be changed by the method, timing and budget source of procurement.

- Option 1: the status quo (to keep the present conditions)
- Option 2: to increase only the trips of existing vehicles without procurement of new vehicles
- Option 3: to increase the trips of existing vehicles and to procure new vehicles

The conditions to examine are as follows;

- The ratio of the client and collector is same as that in 2013.

i) Clients and collectors are JCC/Payam: 43% (as of 2013)

ii) Clients are JCC/Payam, and collectors are private collectors: 13% (as of 2013)

iii) Clients are private owners, and collectors are private collectors: 43% (as of 2013)

- The collection works under the contract with private collectors for 60 trucks will start from 2016 (hereinafter referred to as “Private Contract”). .Private Contract will be kept by 2023.

- The vehicle type of Private Contract is open dump truck. Considering the situation in Juba City, it is difficult to arrange 60 trucks with the large capacity. Therefore, the Project assumed to arrange 60 trucks with the middle capacity (4-ton truck, loading capacity: 2.4 m3). The vehicle allocation is followed the plan of the Mayor as 2 trips/vehicle/day and 2 days/week.

- The vehicle type for newly procurement is open dump truck with the large capacity (10-ton truck, loading capacity: 6 m3).

(2) Policy of Vehicle Procurement Plan (draft)

The necessary collection capacity is compared between Option 1 and Option 2. Table 4-2 shows the result. In Option 1, all population cases did not satisfied the necessary collection capacity in 2018 which is the middle point of the Long-Term Plan. In Option 2, Case 1 and Case 2 did not satisfy the necessary collection capacity in 2023, and Case 3 did not satisfied the necessary collection capacity in 2018. So, it is impossible to achieve the target collection ratio only by increasing the trips. Consequently, the Project selected Option 3 “to increase the trips of existing vehicles and to procure new vehicles”.

Table 4-2 Examination of Option 1 and Option 2

Case	Year	Necessary Capacity of JCC and Payams	Option 1: the status quo		Option 2: to increase only trips	
			Collection Amount	Balance with the Necessary Capacity	Collection Amount	Balance with the Necessary Capacity
		[a]	[b]	([b]-[a])	[c]	([c]-[a])
		[ton/day]	[ton/day]	[ton/day]	[ton/day]	[ton/day]
Case 1	2013	65	65	0	65	0
	2018	111	79	-32	112	1
	2023	168	47	-121	64	-104
Case 2	2013	65	65	0	65	0
	2018	121	79	-42	122	1
	2023	190	47	-143	64	-126
Case 3	2013	65	65	0	65	0
	2018	131	79	-52	127	-4
	2023	212	47	-165	64	-148

(3) Outline of Vehicle Procurement Plan (draft)

At present, it is impossible to decide the types and combination of newly procured vehicles. Therefore, the Long-Term Plan assumed to procure only open dump trucks. Table 4-3 shows the outline of the vehicle procurement plan (draft). In Case 1 (1.2 million people in 2013), JCC should procure 32 units of open dump trucks. In Case 2 (1.5 million people in 2013), JCC should procure 39 units of open dump trucks. In Case 3 (1.8 million people in 2013), JCC should procure 48 units of open dump trucks. It should be noted that JCC should satisfy the conditions mentioned above (1) and the additional conditions in Table 4-3. If JCC cannot clear some conditions, they should take additional measures, such as to change the sharing ratio between the public and private collectors.

Table 4-3 Outline of Vehicle Procurement Plan (draft)

Case	Year	Necessary Capacity of JCC and Payams	Option 3: to increase trips and procure new vehicles			Additional Conditions
			Procured vehicles	Collection Amount	Balance with the Necessary Capacity	
		[a]		[d]	([d]-[a])	
		[ton/day]	[vehicle]	[ton/day]	[ton/day]	
Case 1	2013	65	-	65	1	
	2018	111	-	112	1	Vehicles of Payams: 2 trips/vehicle/day Other vehicles: 1.5 trips/vehicle/day
	2023	168	**32**	168	0	All vehicles: 2 trips/vehicle/day
	Total		**32**			
Case 2	2013	65	-	65	1	
	2018	121	-	122	1	Compactor of JCC manufactured in 1999: 1.5 trips/vehicle/day Other vehicles: 2 trip/vehicle/day
	2023	190	**39**	190	0	All vehicles: 2 trips/vehicle/day
	Total		**39**			
Case 3	2013	65	-	65	1	
	2018	131	**2**	133	2	All vehicles: 2 trips/vehicle/day
	2023	212	**46**	213	1	All vehicles: 2 trips/vehicle/day
	Total		**48**			

According to the hearing survey by the Project in 2013, the price of Korean open dump truck with the large capacity was approximately 0.22 million SSP in Juba City. If this price will not be changed by 2023, the initial procurement cost for 32 trucks in Case 1 will be approximately 7

million SSP. The cost for 39 trucks in Case 2 will be approximately 8 million SSP. And the cost for 48 trucks in Case 3 will be approximately 10 million SSP.

4.4.3. Other Necessary Plans

JCC and Payams should examine not only the plans of vehicle procurement and operation management, but also the following necessary plans.

(1) Collection Service Areas and Vehicle Allocation Plan

JCC and Payams should largely expand the collection service QCs and markets in order to augment the collection rate by 20% by 2023, compared with the rate in 2013. JCC and Payams should discuss how to expand. At that time, they should consider the capacity of Payams, the priority of JCC or Payams, and the characteristics of QCs and markets, which are the road conditions, the distance to the dumping site and other collection sites, QC leaders and market unions, histories of QCs and market unions, ethnic groups, income groups, and others related to the collection work. If the capacity of Payam and the priority are the same, it is better to select areas which can be introduced the new collection system easier. After selecting the collection service QCs and markets, JCC should prepare the vehicle allocation plan considering the vehicle condition. At the same time, JCC should instruct Payams to provide the regular collection service according to the designated collection routes and schedules.

(2) Labors and Equipment Management Plan

According to the vehicle procurement plan in the Long-Term Plan, JCC and Payams should hire new drivers, operators and collection workers. From the record in 2013, one open dump truck needed one driver, two supervisors and 7.5 collection workers in average. It means one open dump truck needed 10.5 labors in total. In the Long-Term Plan, Case 1 needs 336 labors in total to procure 32 vehicles. Case 2 needs 410 labors in total to procure 39 vehicles. And Case 3 needs 504 labors in total to procure 48 vehicles. Not only labors, but also equipment is necessary, such as gloves and rakes. JCC and Payams are required to discuss on the cost sharing and how to employ and procure. At the same time, they should consider the officers who instruct the new labors and manage the new equipment. In the Short-Term Plan mentioned in Chapter 5, JCC and Payams will achieve to have the full-time worker(s) only for waste management. Considering the situation, JCC and Payams will increase more full-time workers to manage labors and equipment appropriately.

(3) Training Plan

Although JCC and Payams expand the collection service areas, they should provide the stable and appropriate collection service. To realize such service, not only the sufficient equipment, but also the qualified officers and workers are necessary. Therefore, the training plan is required for all levels of officers and workers in JCC and Payams. Though the training plan, each officer and worker should understand his/her responsibility and perform his/her mission.

(4) Vehicle and Equipment Maintenance Plan

In addition to the newly procured vehicles and equipment, JCC and Payams should increase the trips of all vehicles in comparison with those in 2013. Therefore, the present ad hoc maintenance system for vehicles and equipment should be improved. It is necessary to introduce the preventive maintenance system in which the equipment should be maintained before troubles. The contents of Vehicle and Equipment Maintenance Plan will be the daily check by drivers, periodical inspection by mechanics, daily and periodical meetings, stock management, procurement plan of spare parts, and training for mechanics.

(5) Data Management

In order to keep and develop the appropriate collection work, it is required to collect and arrange the information (data) precisely. The records, experiences and achievements will realize to reduce impossible, irregular and unnecessary works; and to plan and implement the efficient works. The necessary data is various, such as budgets, income and outcome, organization, human resources, equipment and collection activities. JCC and Payams should collect and manage data respectively, and then JCC needs to compile them for analysis.

4.5. Final Disposal Site

4.5.1. Estimated Disposal Amount

Currently, Juba County Controlled Dumping Site disposes waste which is generated from Juba City. In the future, it is planned to accept waste generated from Rejaf Payam which is implementing O&M for the disposal site. Therefore, for estimated disposal amount, incoming waste amount from Rejaf Payam should be added to incoming amount from Juba City which is calculated in Chapter 3. Incoming waste amount from Rejaf Payam is calculated by hearing from Rejaf Payam. In the waste transportation plan of Rejaf Payam, collection by 6 trips/day/car with 3 ton truck will start from 2014, and then number of trip will increase to 60 trips after 10 years.

Based on the above, estimated waste disposal amount is shown in Table 4-11 for each population case (Case 1: population of 2013 as 1.2 million, Case 2: population of 2013 as 1.5 million, Case 3: population of 2013 as 1.8 million) in based year 2013, 2018 as mid of Long-Term Plan, and 2023 as final target year.

Table 4-11 Estimated Waste Disposal Amount

Case	Year	Daily Incoming Amount			Disposal Amount				
		Juba City	Juba County	Total	Daily Waste Amount*1	Daily Cover Soil Amount *2	Total Daily Disposal Amount	Total Yearly Disposal Amount*3	Sum Total Disposal Amount of 10 Years
		[ton/day]	[ton/day]	[ton/day]	[m^3/day]	[m^3/day]	[m^3/year]	[m^3/year]	[m^3]
Case 1	2013	150	18	168	168	17	185	55,440	
	2018	259	54	313	313	31	344	103,295	
	2023	390	90	480	480	48	528	158,275	
	2023								1,151,910
Case 2	2013	150	18	168	168	17	185	55,440	
	2018	282	54	336	336	34	370	110,965	
	2023	441	90	531	531	53	584	175,257	
	Total (10 year)								1,239,895
Case 3	2013	150	18	168	168	17	185	55,440	
	2018	306	54	360	360	36	395	118,636	
	2023	493	90	583	583	58	641	192,238	
	Total (10 years)								1,327,880

*1 Specific gravity of waste：1.0 ton/m^3
*2 10% of waste amount
*3 Operating days in a year：300days

4.5.2. Remaining Landfill Volume

As shown in Figure 4-4, waste disposal started in Phase 1 area of Juba County Controlled Dumping Site from 2008, and it is completed in November 2013. In Phase 2 area, waste disposal started from December 2013 and currently it is under operation. Remaining landfill volume of Phase2 area to Phase 4 area is shown in Table 4-12.

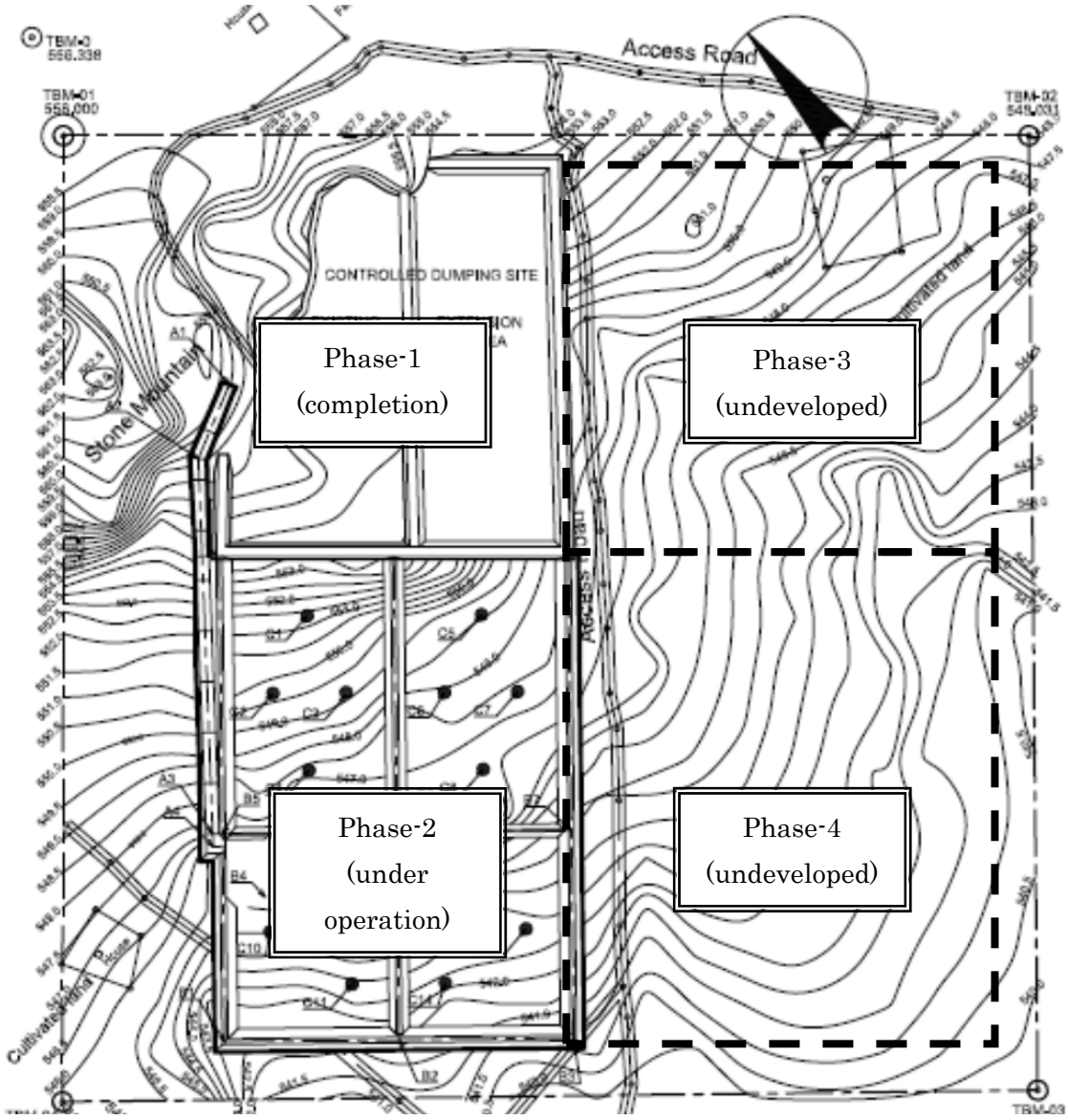


Figure 4-4 Development Plan of the Disposal Site

Table 4-12 Remaining Available Volume of Final Disposal Site

(in December 2013)

	Phase-2	Phase-3	Phase-4	Total
Remaining Available Volume	410,000m^3	370,000m^3	450,000m^3	1430,000m^3

4.5.3. Remaining Life Span of Disposal Site

Remaining life span of disposal site for each population case was calculated from remaining volume of each Phase and estimated disposal amount for each case. The result is shown in Table 4-13. Waste disposal is available until September 2024 in Case 1, March 2024 in Case 2, and September 2023 in Case 3.

Table 4-13 Remaining Life Span of Disposal Site in Each Case

	Phase-2	Phase-3	Phase-4
Case 1	2013/12 -2018/11 (5years)	2018/12 – 2021/11 (3years)	2021/12 – 2024/9 (2years 10months)
Case 2	2013/12 -2018/8 (4years 9months)	2018/9 – 2021/6 (2years 10months)	2021/7 – 2024/3 (2years 9months)
Case 3	2013/12 -2018/6 (4years 7months)	2018/7 – 2021/3 (2years 9months)	2021/4 – 2023/9 (2years 6months)

4.5.4. Future Plan of O&M and Expansion of Final Disposal Site

(1) Examination for Type of Final Disposal Site

The schedule will be different with Controlled Dumping Site or Sanitary Landfill, so future plan should make for both of them. Comparison of characteristics of these 2 types is shown in Table 4-14. It is desirable to choose Sanitary Landfill which has no risk for contamination of groundwater. However, plan and design, cost for construction and O&M is very different in both types, so while lessening leachate generation, managing groundwater contamination by monitoring, disposal by Controlled Dumping Site should be considered in case of the cost cannot be raised. For expansion area, discussion should be done with Ministry of Environment to decide which type to choose.

Table 4-14 Comparison between Controlled Dumping Site and Sanitary Landfill

Items		Controlled Dumping Site	Sanitary Landfill
Risk of Groundwater Contamination		**small**[*1]	**No risk**
Plan and Design	Cost	Rejaf Payam can cover the cost.	Rejaf Payam cannot cover the cost (Out sourcing cost: 30 million yen)
	Period	1 month	1 year
Construction	Cost	JCC can cover by renting heavy equipment. (rental cost of heavy equipment: 5.0 million yen)	Juba County cannot cover (outsourcing cost: 4.5 billion yen[*2])
	Period	1 month	1.5 years
O&M	Cost	1.2 million yen/month () (personnel cost, O&M cost for disposal site)	3.2 million yen/month[*3] (personnel cost, O&M cost for disposal site and leachate treatment facility)

*1: Though the coefficient of permeability of the soil materials underneath the landfill is low, there is small possibility of contamination of groundwater by leachate from disposal site.
*2: Quotation for construction cost of 2 ha disposal site was around 3.0 billion. Phase 3 and Phase 4 have area of around 4 ha. By considering scale merit as well, the construction cost is calculated 4.5 billion yen which is 1 1/2 times of 3.0 billion yen. However the cost is not including construction cost for leachate treatment facility.
*3: By referring other project, O&M cost of leachate treatment facility is estimated 2.0 million yen/month. Personnel cost and O&M cost for disposal site was calculated from actual value.

(2) Future Plan for Each Case

1) Case 1

In case of choosing Controlled Dumping Site, plan and design of Phase 3 disposal site should be done in one month from October 2018, and then construction should implement from November 2018 for one month. For Phase 4, plan and design should be done from October 2021 in one month, and then construction should be implemented from November 2021 for a month.

For Sanitary Landfill case, plan and design of Phase 3 should be done from June 2016 for a year, and construction should be implemented from June 2017 for one year and a half. For Phase 4, plan and design should be done from June 2019 for a year and construction should be implemented from June 2020 for one year and a half.

2) Case 2

For Controlled Dumping Site, plan and design of Phase 3 should be done from July 2018 for one month, and then construction should be implemented from August 2018 for one month. For

Phase 4, design and plan should be done from May 2021 for one month, and then construction should be implemented from June 2021 for a month.

For Sanitary Landfill Site, plan and design of Phase 3 should be done from March 2016, and then construction should be implemented from March 2017 for one and a half year. Plan and design of Phase 4 should be done from January 2019 for one year and construction should be implemented from January 2020 for one and a half year.

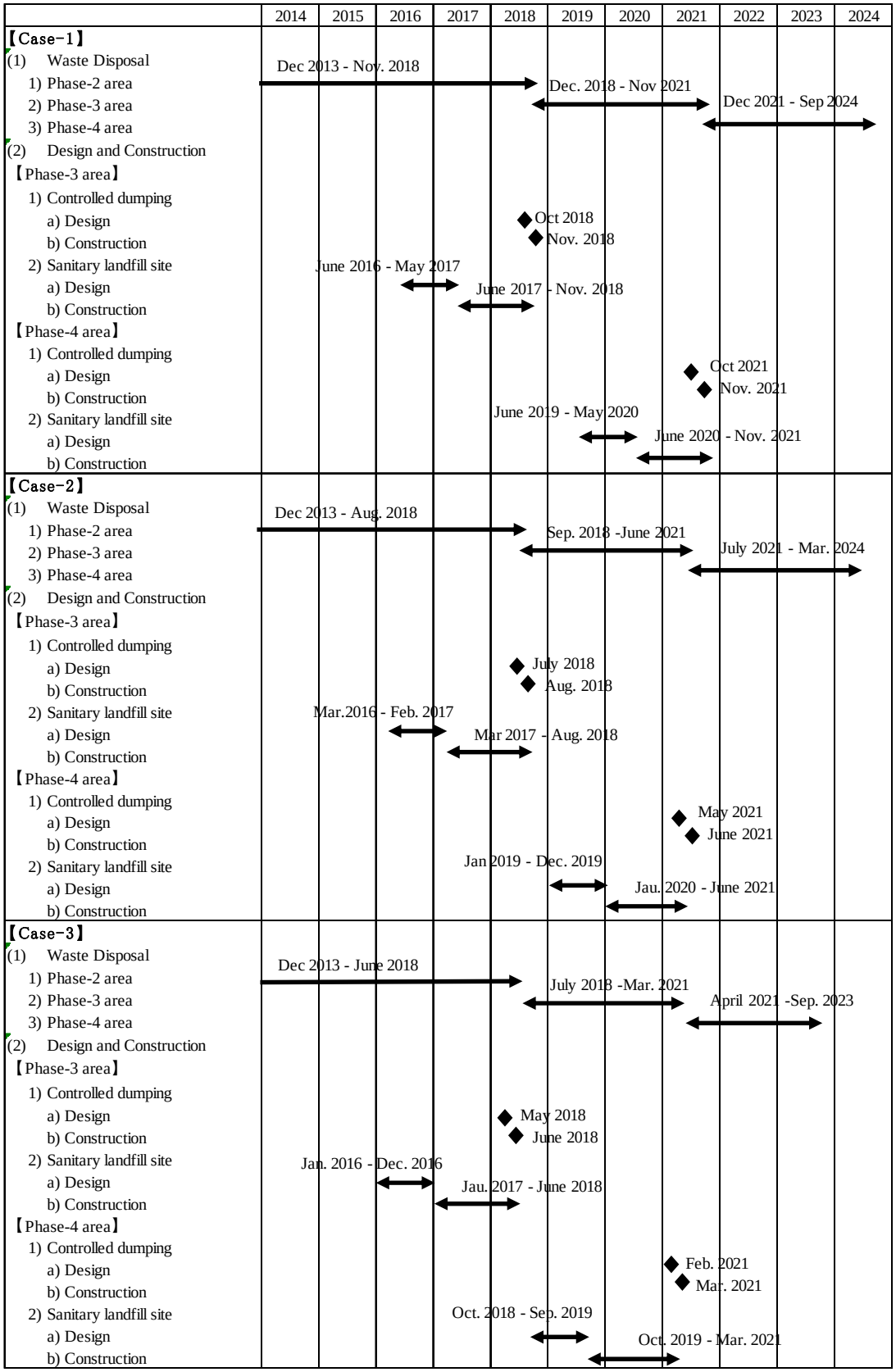
3) Case 3

For Controlled Dumping Site, plan and design of Phase 3 should be done from May 2018 for one month, and then construction should be implemented from June 2018 for one month. For Phase 4, design and plan should be done from February 2021 for one month, and then construction should be implemented from March 2021 for a month.

For Sanitary Landfill Site, plan and design of Phase 3 should be done from January 2016, and then construction should be implemented from January 2017 for one and a half year. Plan and design of Phase 4 should be done from October 2018 for one year and construction should be implemented from October 2019 for one and a half year.

Summary of above result is shown in Table 4-15.

Table 4-15 Future Plan for O&M and Expansion of Final Disposal Site



4.5.5. Future Plan for Heavy Equipment for Waste Disposal

(1) Existing Heavy Equipment for Waste Disposal

Juba County has 1 bulldozer as waste disposal heavy equipment which was procured by JICA in August 2018. The outline of this bulldozer is shown in Table 4-16. The work capacity of the bulldozer is 500m^3/day. Expected life time of the bulldozer is approximately 12 years, so it needs to be repurchased in 2025.

Table 4-16 Outline of Existing Bulldozer for Waste Disposal

Type	Specification	Work Capacity	Purchase Year	Expected Life Time	Purchase Cost
Bulldozer	Cat, D6R, W=19t	500m^3/day	August 2013	approx. 12.0 years	320,000$

(2) Future Plan for Heavy Equipment for Waste Disposal

By only considering expected life time of bulldozer, approximately 12 years, which means until 2025, there is no need to repurchase it until targeted year 2023. However, as shown in Table 4-11, disposal amount will be over 500m^3/day of work capacity of the bulldozer before 2023 in each population case. Therefore, one more bulldozer needs to be purchased. Purchase time for each case is shown in Table 4-17.

Table 4-17 Purchase Time of Bulldozer for Waste Disposal

Type	Specification	Work Capacity	Purchase Time		
			Case 1	Case 2	Case 3
Bulldozer	Cat, D6R, W=19t	500m^3/day	2023	2022	2021

Chapter 5 Short-Term Plan

5.1. Purpose of Short-Term Plan

This Short-Term Plan is a summary of initial actions of the Long-Term Plan and actions for urgent issues mentioned in Chapter 2. The purpose of the Short-Term Plan is to make preparation by 2015 for establishing the sustainable waste management system.

5.2. Urgent Issues and Actions

5.2.1. Waste Collection in Markets and Residential Areas

(1) Establishment of Operation and Management Organization

The responsible agency for waste collection in Juba City is JCC, and the implementation agencies are three Payams. As shown in Table 5-1 and
Table **5-2**, JCC and Payams have urgent issues and take actions to solve them according to policies in the short-term in order to make preparation for sustainable waste management system.

Table 5-1 Urgent Issues, Policy and Actions for JCC

Priority	Urgent Issues	Policy to Solve	Actions
1	Management system is not clear.	To establish a system to instruct and communicate with Payams	JCC should manage collection works by Payams and take the initiative of collection works in Juba City. It is necessary to establish a clear organization chart, and instruction and communication system by discussion with Payams. These drafts were shown in Figure 4-1 and Figure 4-2 in Chapter 4.
2	The absolute number of collection vehicle is insufficient.	To search for means to procure vehicles	JCC should search for means to procure collection vehicles immediately with the domestic budgets and the supports from foreign organizations. At that time, JCC should be careful for guarantee contents and maintenance methods. The existing 25m3 compactors are not guaranteed. And maintenance of these compactors is very difficult technically and mechanically. Utilizing the lessons learnt, JCC needs to procure vehicles working for the next ten years. Therefore, JCC should examine practical options to procure with the domestic budgets and the supports from foreign organizations. Among these options,

Priority	Urgent Issues	Policy to Solve	Actions
			JCC selects the most practical option, prepares and realizes it.
3	Ditto.	To operate existing vehicles appropriately to prolong their lifetime	It takes a time to procure new vehicles, therefore, JCC should maintain the existing vehicles as much as possible to prolong the lifetime of these vehicles by that time. JCC also should consider the vehicle allocation carefully, such as to allocate vehicles with troubles for the narrow areas or the areas with paved roads.
4	Collection service is unstable.	To increase full-time officers	At present, Waste Management Department of JCC has only two full-time workers; the deputy director and the director. In the future, JCC should lead the collection work in Juba City. Therefore, Waste Management Department of JCC needs enough workers to perform its duties. At least, the department needs two full-time workers additionally; one is in charge of instruction of Payams, and another is in charge of coordination with Juba County.
5	Ditto.	To instruct and communicate with Payams periodically	JCC needs to respond to the requests from Payams about the daily collection works at least because JCC is the responsibility agency of collection works. It is one of the duties of the director of Waste Management Department in JCC. To receive the requests from Payams directly, the director should hold a meeting with Payam regularly.
6	JCC and Payams do not have data and records necessary for waste management.	To collect necessary data	JCC needs to make and collect records of all waste management works done by JCC. JCC instructs Payams to make and collect records of all waste management works done by Payams. It is desirable that JCC will compile and manage all records. In the short-term, JCC and Payams should concentrate on only making and collecting each own records as much as possible. At least, they make a record about workers (number of workers, activities, troubles, etc.) and vehicle situation (number of vehicles, working situation, troubles, etc.) with a half-page of A4 paper as shown in Table 5-3.

Table 5-2 Urgent Issues, Policy and Action for Directors and Public Health Officers in Payams

Priority	Urgent Issues	Policy to Solve	Actions
1	Management system is not clear.	To establish a system to follow instruction by JCC	Payams should cooperate with JCC to establish a clear organization chart, and instruction and communication system. JCC will make a draft, and Payams will support. These drafts were shown in Figure 4-1 and Figure 4-2 in Chapter 4.
2	Collection service is unstable.	To implement stable and regular collection works	Payams, which are the implementation agencies of collection works, should provide the stable and regular collection service whatever happens. It is the most important point for the actual collection works. At present, workers of Payams tend to leave troubles without any actions in case of the mechanical troubles of vehicles. As the first step to change this situation, Payams should make a contact list for the troubles, and workers should report the reasons why they cannot collect wastes and the actions or plans how to manage it. Table 5-4 is a draft of the contact list for the troubles. Regarding to reporting, there are two ways: oral reporting and paper reporting. Payams should do both. In case that workers cannot collect wastes, Public Health Officers should report to Directors of Payams about the reasons, situation, contact persons and actions they take. Also they should make a paper report about all actions including the reporting to Directors.
3	Ditto.	To understand the importance of communication and network	Most troubles with residents and workers in collection works, such as protest action by the residents and a boycott of workers, come from a lack of communication. Public Health Officers should understand the importance of face-to-face communication with QC leaders, market unions, residents and other waste dischargers, such as community meetings and opinion exchange in the daily works. And the same and similar troubles happen in all Payams. Not only the vertical relationship with JCC, but also the horizontal relationship with Payams is

Priority	Urgent Issues	Policy to Solve	Actions
			important. It is not easy for Payams to establish the horizontal network. Therefore, Directors of Payams should request JCC to make an opportunity to realize it. And then Payams should hold regular meetings in each Payam and among Payams, and take meeting notes every time.
4	Ditto.	To increase full-time officers	Public Health Officer is not a full-time worker for waste management. However, Payams need full-time workers to realize the appropriate waste management. Directors of Payams should try to hire full-time workers only for waste management. In the short-term, each Payam should arrange at least one full-time worker for waste management.
5	JCC and Payams do not have data and records necessary for waste management.	To collect necessary data	Some Payams have already made a record of fee collection. However, Payams should record not only fee collection, but also all collection works every day, such as workers (number of workers, activities, troubles, etc.) and vehicle situation (number of vehicles, working situation, troubles, etc.). And the record should be submitted to Director. Table 5-3 shows a draft format of the record. A hand-writing record is acceptable. Directors should collect records from all areas and make a comment on the contents, frequency, etc.

Table 5-3 Daily Record Items (draft)

(The whole record should be a half page of A4 paper at least.)

Recording date	
Recorder	Name and organization (department)
Collection date	
Collection areas	Names of restaurants and hotels, or names of markets and QCs
Vehicles	Type
	Unit number of each type
	Condition and troubles
	Name of a driver
	Name of an assistant driver
Workers	Name of a supervisor
	Names of collection workers
	Condition and troubles
Equipment	Type

	Number of each type
Collection starting time	
Collection starting place	
Collection finishing time	
Collection finishing place	
Times to transfer wastes in the dumping site	
Time of coming back to the parking place	
Notes	Troubles for the whole collection work (accidents, interruption, complaint, etc.)
	Others (situation of QCs, waste generation, etc.)

Table 5-4 Contact List in Case of Troubles (draft)

Estimated Troubles	Reporter	First Contact	Second Contact (in case of absence of the first contact)	Third Contact (in case of absence of the first and second contacts)
$25m^3$ Compacter of JCC does not come to the site.	Vehicle allocation officer (only if Payam has this officer) or Public Health Officer	Driver of $25m^3$ Compacter of JCC	Supervisor of JCC workshop (Mr. Peter John)	Deputy director of Waste Management Department of JCC (Mr. Martin)
Vehicle of Payam does not come to the site.	Vehicle allocation officer or Public Health Officer	Driver	Vehicle allocation officer (only if Payam has this officer)	Director of Payam
Collection worker does not come to the site. / Collection equipment is not enough.	Vehicle allocation officer or Public Health Officer	Vehicle allocation officer (only if Payam has this officer)	Director of Payam	
Collection works cannot be implemented because of accidents or interference.	Public Health Officer	Director of Payam	Deputy director of Waste Management Department of JCC (Mr. Martin)	Director of Waste Management Department of JCC (Mr. Juma Katanga (Ms. Jina's successor))
	On-site workers including drivers	Vehicle allocation officer or Public Health Officer	Director of Payam	Deputy director of Waste Management Department of JCC (Mr. Martin)
Irregular order is announced.	Public Health Officer	Director of Payam	Deputy director of Waste Management Department of JCC	Director of Waste Management Department of JCC

Estimated Troubles	Reporter	First Contact	Second Contact (in case of absence of the first contact)	Third Contact (in case of absence of the first and second contacts)
Vehicle is broken.	Vehicle Allocation Officer or Public Health Officer	Director of Payam	Supervisor of JCC workshop	Supervisor of JCC workshop
Others	Public Health Officer	Director of Payam	Supervisor of JCC workshop	Director of Waste Management Department of JCC

(2) Establishment of Fee Collection System

In order to implement the actions mentioned above (1), JCC and Payams should secure the budgets. Additionally, JCC needs to procure the new vehicles in the long-term to achieve the target collection ratio as shown in Chapter 4. Therefore, JCC should make preparation for procurement in the short-term.

JCC needs to collect fees from the large-volume dischargers definitely in order to obtain the stable income. And JCC should utilize this income only for waste management. According to the meeting with the Mayor of JCC and JICA, and the hearing survey by JICA Expert Team, the Project confirmed that JCC would have a special bank account. The Mayor should order clearly how to utilize this account.

Each Payam needs to continue to collect fees from the shops in order to obtain the stable income. JCC plans to instruct Payams to collect fees by Public Health Officers, fee collectors and police officers. Directors of Payams should manage these collected fees and utilize only for waste management works.

(3) Plan of Vehicle Allocation and Procurement

JCC plans to make a contract with private truck owners in order to promote collection works with private vehicles. Considering the preparation of this contract, the Project assumes that the collection work of this contract will start from 2016. For reference, the Project assumes that the collection ratio will increase as same as the population growth ratio. And the Project applies the population cases mentioned in Chapter 3.

Table 5-5 shows the necessary amounts of collection wastes in each population case in the short-term plan (2014 and 2015).

Table 5-5 Reference Values of Necessary Waste Collection Amount in Short-Term Plan

	Client	JCC/Payam	JCC/Payam	Private owners	Total
	Collector	JCC/Payam	Private collectors	Private collectors	
	Sharing ratio	(43%)	(13%)	(66%)	(100%)
Case	[year]	[ton/day]	[ton/day]	[ton/day]	[ton/day]
All Cases	2013	65	19	66	150
Case 1	2014	74	22	75	170
	2015	83	24	84	191
Case 2	2014	76	22	77	175
	2015	87	25	88	200
Case 3	2014	78	23	79	179
	2015	91	26	92	209

As mentioned in Chapter 4, the collection amounts in all cases will decrease under the present vehicle allocation situation because existing vehicles will be old and waste generation will increase. Procurement of new vehicles is the easiest way to increase the collection amounts, however, it is financially difficult for JCC and Payams to procure immediately. Therefore, JCC and Payams will increase the trips of existing vehicles in order to increase the collection ratio in the Short-Term Plan. Table 5-6 shows the vehicle allocation plan.

Table 5-6 Vehicle Allocation Plan in Short-Term Plan

[Case 1]

	Number of Unit	Year of manufacture	Volume	Present number of trip	Planning number of trip	
				2013	2014	2015
	[nos]		[m^3]	[trip/nos/day]		
compactor (JCC)	2	1999	25	1.0	1.0	1.0
compactor (JCC)	1	2000	25	1.0	1.0	1.0
compactor (JCC)	1	2001	25	1.0	1.0	1.5
compactor (JCC)	2	2002	25	1.0	1.0	1.5
compactor (Payam)	2	2012	14	1.0	1.5	1.5
open dump truck (tipper) (Payam)	5	2007	8	1.0	1.5	1.5

[Case 2]

	Number of Unit	Year of manufacture	Volume	Present number of trip	Planning number of trip	
				2013	2014	2015
	[nos]		[m^3]	[trip/nos/day]		
compactor (JCC)	2	1999	25	1.0	1.0	1.0
compactor (JCC)	1	2000	25	1.0	1.0	1.5
compactor (JCC)	1	2001	25	1.0	1.0	1.5

compactor (JCC)	2	2002	25	1.0	1.0	1.5
compactor (Payam)	2	2012	14	1.0	1.5	1.5
open dump truck (tipper) (Payam)	5	2007	8	1.0	1.5	1.5

[Case 3]

	Number of Unit	Year of manufacture	Volume	Present number of trip	Planning number of trip	
				2013	2014	2015
	[nos]		[m^3]	[trip/nos/day]		
compactor (JCC)	2	1999	25	1.0	1.0	1.5
compactor (JCC)	1	2000	25	1.0	1.0	1.5
compactor (JCC)	1	2001	25	1.0	1.0	1.5
compactor (JCC)	2	2002	25	1.0	1.5	1.5
compactor (Payam)	2	2012	14	1.0	1.5	1.5
open dump truck (tipper) (Payam)	5	2007	8	1.0	1.5	1.5

However, all cases cannot achieve the target collection ratio only with the existing vehicles in the long-term. It means JCC should procure new vehicles in the long-term. As mentioned above, JCC should make preparation for procurement during the period of the Short-Term Plan. Regarding to the type of new vehicles, the Project suggests open dump trucks or compacters with less than 12m^3 capacity. It is because that JCC can maintain these types of vehicles; JCC have experiences of repair; and their spare parts can be obtained in Juba City easier than those of 25m^3 compactor. JCC's workshop and private workshops cannot repair compactors with 25m^3 or larger capacity, but they have enough experiences of repairing open dump trucks and small-capacity compacters and of obtaining their spare parts. Collection with compactors is much efficient than that with open dump trucks, however, maintenance of open dump truck is easier than that of compactors. Therefore, the first priority is to procure open dump truck.

JCC may have several ways to procure with the budget of South Sudan and with the foreign support. It should be noted that waste management work is indispensable to improve public health although it is usually called as the final infrastructural work. Of course, it is the large project for JCC to procure several new vehicles. However, JCC should examine measures to procure vehicles immediately, analyzing the direct impacts by a lack of waste collection on the living environment, such as generation of vermin and offensive odor, and the indirect impacts, such as increase of diseases and limit of land use by insanitary environment.

(4) Expansion Plan of Collection Service

As same as the estimation mentioned in the above (3) (Plan of Vehicle Allocation and Procurement), the Project assumes that the collection ratio will increase as same as the population growth ratio, and applies the unit waste generation as 0.7kg/person/day. As the estimation results, Table 5-7 shows the expansion plan of collection service. Considering the population per QC is about 30,000 persons in average, Case 1 will add two QCs as the target collection areas by 2015 in comparison with the areas in 2013. In the same way, Case 2 will add three QCs and Case 3 will add five QCs as the target collection areas by 2015 in comparison with the areas in 2013.

Regarding to the collection system, the Project suggests to apply the station collection with the time schedule. This system needs the cooperation of waste dischargers. However, it can utilize workers and vehicles effectively and reduce the necessary time to collect wastes in comparison with that of house-to-house collection. Therefore, the Short-Term Plan applies the station collection with the time schedule.

Table 5-7 Collection Expansion Plan in Short-Term Plan

		Total collection amount (public and private collectors)	Reference value: Target collection amount(public and private collectors)	Service population	Reference
	[year]	[ton/day]	[ton/day]	[person]	
Case 1	2013	150	－	214,286	
	2014	－	170	242,857	To increase one QC additionally as a collection area in comparison with the areas in 2013
	2015	－	191	272,857	To increase two QCs additionally as collection areas in comparison with the areas in 2013
Case 2	2013	150	－	214,286	
	2014	－	175	250,000	To increase one QC additionally as a collection area in comparison with the areas in 2013
	2015	－	200	285,714	To increase three QCs additionally as collection areas in comparison with the areas in 2013
Case 3	2013	150	－	214,286	
	2014	－	179	255,714	To increase two QCs additionally as collection areas in comparison with

		Total collection amount (public and private collectors)	Reference value: Target collection amount(public and private collectors)	Service population	Reference
					the areas in 2013
	2015	－	209	298,571	To increase five QCs additionally as collection areas in comparison with the areas in 2013

(5) Implementation Schedule

As the summary of all actions mentioned above, Table 5-8 and Table 5-9 shows the implementation schedules of action plans for collection works by JCC and Payams respectively.

Table 5-8 Implementation Schedule of Action Plan for Waste Collection by JCC in Short-Term Plan

Priority	Policy	Action	Contents	2014				2015			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1	To establish a system to instruct and communicate with Payams	To establish a clear organization chart, and instruction and communication system by discussion with Payams.	To discuss with Payams on the present situation and a future image of organization and instruction and communication system	←	—	—	→				
			To make a draft of the system and build consensus with Payams					←	—	→	
			To obtain the approval from Mayor of JCC for the new organization chart and instruction and communication system						▲		
2	To search for means to procure vehicles	To examine practical options to procure with the domestic budgets and the supports from foreign organizations.	To examine the procurement options with the domestic budgets	←	—	—	→				
			To prepare to implement the most priority option with the domestic budgets					←	—	—	→
			To decide the procurement amount and timing in the option with the domestic budgets								▲
			To examine the procurement options with the supports from foreign organizations				←	—	→		
			To prepare to implement the most priority option with the supports from foreign organizations							←	→
3	To operate existing vehicles appropriately	To improve the maintenance of the existing vehicles as much as possible to prolong the lifetime of these vehicles.	To analyze the present maintenance situation and prepare the improvement plan	←	—	—	→				
			To implement the improvement					←	—	→	

Priority	Policy	Action	Contents	2014				2015			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
	to prolong their lifetime		plan								
			To discuss the improvement plan with Payams and revise it						↔		
			To implement the revised improvement plan							↔	↔
4	To increase full-time officers	To increase two full-time workers in Waste Management Department of JCC (one is in charge of instruction of Payams, and another is in charge of coordination with Juba County)	To prepare a new full-time worker in charge of instruction of Payams	↔	↔	↔	↔				
			To start the work of a new full-time worker in charge of instruction of Payams				▲				
			To prepare a new full-time worker in charge of coordination with Juba County	↔	↔	↔	↔	↔	↔	↔	↔
			To start the work of a new full-time worker in charge of coordination with Juba County								▲
5	To instruct and communicate with Payams periodically	To respond to the requests from Payams about the daily collection works	To understand the present condition and confirm the duties by the regular discussion with Payams	↔	↔	↔	↔				
			To instruct Payams with the improvement plans				↔	↔			
			To revise the plans by the discussion with Payams						↔		
			To instruct Payams with the revised improvement plans							↔	↔
6	To collect necessary data	To collect and accumulate records of collection workers and vehicles as much as possible	To collect data of collection workers and vehicles before and in 2014	↔	↔	↔	↔				
			To make inventory of collected data				↔	↔			

Priority	Policy	Action	Contents	2014				2015			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
			To start make records of collection workers and vehicles n 2015					←	—	→	
			To make inventory of collected records								↔

Table 5-9 Implementation Schedule of Action Plan for Waste Collection by Each Payam in Short-Term Plan

Priority	Policy	Action	Contents	2014 Jan-Mar	2014 Apr-Jun	2014 Jul-Sep	2014 Oct-Dec	2015 Jan-Mar	2015 Apr-Jun	2015 Jul-Sep	2015 Oct-Dec
1	To establish a system to follow instruction by JCC	To support JCC to establish a clear organization chart, and instruction and communication system prepared by JCC	To submit the detailed present situation and discuss with JCC on the present situation and a future image of organization and instruction and communication system	←	—	—	→				
			To confirm a draft of the system prepared by JCC and build consensus with JCC					←	→		
			To obtain the approval from Mayor of JCC for the new organization chart and instruction and communication system						▲		
2	To implement stable and regular collection works	Directors: to make a contact list for the troubles Public Health Officer: to report to the Directors about the reasons of troubles and countermeasures	To make a contact list in case of troubles and improve it	←	—	—	→				
			Public Health Officer: to make a oral and paper report to the Director about the reasons why the collection service is not provided, and countermeasures	←	—	—	—	—	—	—	→
3	To understand the importance of communication and network	To have regular meetings in Payam and among Payams, and take meeting notes every time	To hold a monthly meeting among Payams and take a meeting note	←	- -	- -	- -	- -	- -	- -	→
			To hold a weekly meeting in Payam and take a meeting note	←	—	—	—	—	—	—	→
4	To increase full-time	To allocate one full-time worker only for waste	To prepare a new full-time worker only for waste management work in	←	—	—	→				

Priority	Policy	Action	Contents	2014				2015			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
	officers	management work in each Payam	each Payam								
			To start the work of a new full-time worker				▲				
5	To collect necessary data	Public Health Officer: to make a daily record of all activities of waste management works (workers, vehicles, equipment, troubles, etc.) and to submit it to the Director Director: to collect daily records from all areas and accumulate them	Directors: to make a monthly feedback about the daily records	←	- - -	- - -	- - -	- - -	- - -	- - -	→
			Public Health Officer: to make a daily record and to submit it to the Director	←	———	———	———	———	———	———	→
6	To increase the trips of existing vehicles	To increase the trips of existing vehicles of JCC and Payams confirming the population situation and target collection amount	To increase the collection amount by increasing the trios of existing vehicles of JCC and Payams	←	———	———	———	———	———	———	→
7	To expand the collection service areas	To expand the collection service QCs with the station collection system with the time schedule confirming the population situation	To make preparation to increase the service QC	←	———	———	———	→			
			To start the collection work in the new QCs			←	———	———	→		
			To confirm the situation of the station collection with the time schedule					←	———	———	→

5.2.2. Final Disposal Site

(1) Strengthening of Management Organization

The O&M group of disposal site which Rejaf Payam is in charge for, human resources of the group has developed and is functioning well. On the other hand, in planning group which is Juba County in charge, currently there is no engineer who can make future disposal site plan. Therefore, it is necessary to secure engineers who studied in civil engineering or environment field.

(2) Implementation of Groundwater Monitoring

The coefficient of permeability of the soil materials underneath the landfill is low in Juba county controlled dumping site. However, there is still small possibility for contamination of groundwater by leachate from the landfill. Groundwater monitoring has implemented by using JICA's measuring tool. From now on, Rejaf Payam should implement groundwater monitoring by itself. Measuring items are as follows, same as before, the monitoring should be done every month to check contamination of groundwater by leachate. It should be considered in Rejaf Payam whether to implement monitoring by purchasing simple measuring tool or to outsource the monitoring. The following table shows the cost in case of purchasing simple measuring tool.

Table 5-10 Cost for Items of Groundwater Monitoring and Measuring Tool

Ph	EC (ms/cm)	COD (mg/l)	NH_4^+-N (mg/l)	NO_3-N (mg/l)
300$	300$	50$	50$	50$

COD, NH_4^+-N and NO_3-N are costs of test reagent for 1 year.

(3) Preparation of Disposal Plan in Phase 2 Area

For Phase 2 area, a disposal plan for disposing the height of crown of embankment should be prepared. This disposal plan will be prepared by cooperation of Japanese experts and Rejaf Payam, then should be revised by Rejaf Payam based on the site condition.

(4) Preparation of Statement of Income and Expenditure

Regarding revenue, disposal fee is collected at check point and is recorded every day. However, for expenditure, because there is no fixed form, it is prepared with different form every month. The statement of income and expenditure should be prepared by fixed form every month. Draft of this form will be prepared by cooperation between Japanese experts and Rejaf Payam and then it should be revised by Rejaf Payam while using it.

(5) Consideration for Purchase of Heavy equipment for Cover Soil

Rejaf Payam is implementing soil covering by renting heavy equipment because it does not have own heavy equipment for that work. The renting cost of heavy equipment in South Sudan is very expensive, as it occupies 40 % of operating cost, it is necessary to consider purchase of the heavy equipment. For purchase method, procurement by own fund or procurement by support from outside are considered. In case of own fund, the fund will be disposal cost. It is difficult to procure by own fund because as incoming number of vehicles is declining, the disposal cost is decreasing. Following table shows required heavy equipment for cover soil and its purchase cost.

Table 5-11 Heavy Equipment for Cover Soil and Purchase Cost

Type	Specification	Cost
Wheel loader	Bucket size 2.5m^3	100,000 $
Dump truck	10t class	70,000 $

(6) Implementation Schedule

Based on above, implementation schedule of O&M action plan for disposal site by Rejaf Payam is summarized as shown in Table 5-12.

Table 5-12 Implementation Schedule of O&M Action Plan for Disposal Site in Rejaf Payam for Short-Term Plan

Priority	Urgent Issues	Action	Contents	2014 Jan-Mar	2014 Apr-Jun	2014 Jul-Sep	2014 Oct-Dec	2015 Jan-Mar	2015 Apr-Jun	2015 Jul-Sep	2015 Oct-Dec
1	To Strengthen management organization	To recruit engineers	To consider necessary knowledge and experience	↔	↔	↔	↔				
			To gain approval from Commissioner of Juba County				▲				
			To start recruiting						↔	↔	
			To select engineers						▲		
2	To implement groundwater monitoring	To prepare groundwater monitoring plan and secure implementation cost	To examine measuring items	↔	↔						
			To prepare monitoring plan			↔	↔				
			To consider whether implement directly or outsourced					↔			
			To consider method to raise fund					↔			
			To start monitoring				▲				
3	To prepare disposal plan for Phase 2 area	To examine disposal plan in Weekly meeting	To calculate disposal period until crown of embankment		↔						
			To calculate disposal period higher from crown of embankment			↔					
			To prepare disposal plan				↔				
			To start disposal based on the plan				▲				
4	To prepare statement of income and expenditure	To prepare statement of income and expenditure.	To report current income and expenditure	↔	↔						
			To make format for statement of income and expenditure			↔	↔				
			To prepare statement of income and expenditure			▲					
5	To consider purchase of heavy equipment for cover soil	To prepare several options for purchase of heavy equipment.	To select equipment for cover soil	↔	↔						
			To collect quotation			↔	↔				
			To examine method to raise fund				↔	↔			
			To consider options by support from abroad				↔	↔			
			To consider procurement method for heavy equipment				▲				

5.2.3. Financial Plan

For reference, the Short-Term Plan shows the estimation of O&M cost except for the disposal fees and labor costs. It should be noted that the following results are the estimation because the obtained reliable data is limited. As shown in Table 2-10 in Chapter 2, the annual O&M cost for the collection work in Juba City was estimated as 3,780,000 SSP including the costs of fuel, repair, rental vehicles and expendables. The total waste collection amount in 2013 was estimated as 150 ton/day. Among this amount, the waste amount collected by JCC and Payams was calculated as 84 ton/day. The Project assumed the annual working days are 300 days/year. The annual waste amount collected by JCC and Payams was calculated as 25,200 ton/year, and the annual O&M cost was calculated as 150 SSP/ton. Therefore, the annual O&M cost which JCC and Payams would bear is calculated as Table 5-13

Table 5-13 O&M Cost Estimation for Waste Collection by JCC and Payams by 2015 (except for labor costs)

[Case 1]

	Daily Collection Amount (ordered by JCC and Payams)	Annual Collection Amount	Annual OM Cost (except for disposal fees and labor costs)
	[ton/day]	[ton/year]	[1,000 SSP/year]
2013	84	25,200	3,780
2014	96	28,800	4,320
2015	107	32,100	4,815

[Case 2]

	Daily Collection Amount (ordered by JCC and Payams)	Annual Collection Amount	Annual OM Cost (except for disposal fees and labor costs)
	[ton/day]	[ton/year]	[1,000 SSP/year]
2013	84	25,200	3,780
2014	98	29,400	4,410
2015	112	33,600	5,040

[Case 3]

	Daily Collection Amount (ordered by JCC and Payams)	Annual Collection Amount	Annual OM Cost (except for disposal fees and labor costs)
	[ton/day]	[ton/year]	[1,000 SSP/year]
2013	84	25,200	3,780
2014	101	30,300	4,545
2015	117	35,100	5,265

Regarding to the disposal fee for Juba County, the disposal fee for a large vehicle is 50 SSP/vehicle/trip. Considering the number of vehicles and trips, the disposal fee for the wastes collected by the existing vehicles of JCC and Payams can be estimated as Table 5-14. In addition to it, JCC and Payams should pay the disposal fee for the wastes collected by the private collectors.

Table 5-14 Estimation of Waste Disposal Fees for Waste Collected by Existing Vehicles of JCC and Payams

[Case 1]

	Number of Vehicle	Trip	Disposal Fee	
	[nos]	[trip/nos/day]	[SSP/day]	[1,000 SSP/year]
2013	13	1.0	650	195
2014	6	1.0	825	248
	7	1.5		
2015	3	1.0	900	270
	10	1.5		

[Case 2]

	Number of Vehicle	Trip	Disposal Fee	
	[nos]	[trip/nos/day]	[SSP/day]	[1,000 SSP/year]
2013	13	1.0	650	195
2014	6	1.0	825	248
	7	1.5		
2015	2	1.0	925	278
	11	1.5		

[Case 3]

	Number of Vehicle	Trip	Disposal Fee	
	[nos]	[trip/nos/day]	[SSP/day]	[1,000 SSP/year]
2013	13	1.0	650	195
2014	4	1.0	875	263
	9	1.5		
2015	13	1.5	975	293

Republic of South Sudan
Ministry of Environment
Juba City Council
Juba County

Republic of South Sudan

PROJECT FOR CAPACITY DEVELOPMENT ON

SOLID WASTE MANAGEMENT IN JUBA

Technical Cooperation Products

November, 2014

Japan International Cooperation Agency

(JICA)

Yachiyo Engineering Co., Ltd.

GE
JR
14-181

Republic of South Sudan

PROJECT FOR CAPACITY DEVELOPMENT ON SOLID WASTE MANAGEMENT IN JUBA

Technical Cooperation Products

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5. Guideline of Waste Collection

at Markets and Residential Areas

JICA Project for Capacity Development on Solid Waste Management in Juba, The Republic of South Sudan

Guideline of Waste Collection

at Markets and Residential Areas

Table of Contents

Introduction

This document gives ideas on waste collection at markets and residential areas. This is not a manual, but a guide to show how to maintain waste collection when waste collection system is introduced.

The contents are based on the experiences in Juba City, which confirmed through the pilot projects during the Project for Capacity Development on Solid Waste Management in Juba, the Republic of South Sudan, under Japan International Cooperation Agency ("JICA"). Reading this guideline leads to a deeper understanding of the intentions of the pilot projects.

Figure 1 Community meeting for waste collection introduction

1. Selection of Waste Collection Points

1.1 Markets

In the selection of waste collection points, it is easier to start with the organization which controls the waste collection at markets and negotiates with shops owners etc. In the case of Jebel market, market unions were managing the waste collection, so the discussion with the leaders of the market unions was done first.

There are some cases where no strong leaders exist at markets, such as the case of Juba market, which made it more difficult to introduce the waste collection system. Especially in the process of introducing waste collection, Payams or Blocks should have strong leaders who have sufficient understandings of waste collection; for example, Mr. Gamardin who played this role in Kator Block.

In addition, enough collection places for the waste collection vehicles and the cooperation with shop owners are essential. More importantly, human resources who can take the leaderships are secured from markets and governmental side.

Figure 2 Waste collection at markets

1.2 Residential Areas

Regarding the waste collection at residential areas, it is essential that quarter councils are collaborative with the collection work and are trusted by the residents, where community meetings can be organized; quarter councils should have human resources to properly explain about waste collection to the residents; local government should have active staff members.

In addition, the road conditions should be good to implement the waste collection at residential areas. Paved roads are required for residential collection, according to collection routes. The paved roads were available at Atlabara B & C, where collection vehicles can follow; however, at Atlabara A they were not available.

It is also necessary to have collection points where waste collection vehicles can stay and pick up the waste for about 30 minutes.

2. Decision of Waste Collection Methods

2.1 Markets

"Fixed-time and fixed-point collection system" is the most suitable e collection method at markets in Juba; the residents bring the waste to a certain collection point at a fixed time. This was demonstrated by the pilot project.

Fixed-time and fixed-point collection system has advantages in terms of public awareness raising, because the residents are always involved in the collection activities. Moreover, this system does not require any equipment such as containers and cranes; only signboards to show collection points are necessary. In Juba, signboards of 1m x 2m were installed.

2.2 Residential Areas

"Fixed-time and fixed-point collection system" is the most suitable collection method at residential areas in Juba as well. The main reasons are as follows:

a) Leaders of quarter councils take the initiatives and decide waste collection points together with the residents, which lets the people understand the collection points clearly.

b) This system helps in educating the public (in increasing awareness) by involving the public in routine waste collection

c) Only signboards (40cm x 60cm) are necessary, apart from the waste collection vehicles.

① This system is efficient, because waste collection time can be reduced by one third or by one fifth.

Figure 3 Waste collection at residential areas

3. Public Awareness Activities

3.1 Markets

The outline of public awareness activities are as follows:

a) Community meetings should be organized before the introduction of the waste collection, and waste collection and discharge methods should be explained and decided with the residents.

b) In the case of Jebel market, 300 bins (70 liters) were distributed before the introduction of the waste collection. It was encouraged to use bins or plastic bags for waste discharge.

c) The series of these waste collection activities are considered as part of public awareness raising.

① Review meetings should be held with the residents 2-3 months after the introduction, in order to review the progress. During the meeting, the public satisfaction should be measured; the complaints from the public are considered to adjust the waste collection activities.

3.2 Residential Areas

Community meetings help to raise public awareness.

a) The following points are discussed during the community meetings:

- Explanation of waste collection system
- Clarification of waste collection points, routes, time

b) Review meetings should be held with the residents 2-3 months after the introduction, in order to measure the public satisfaction; the complaints from the public are considered to adjust the waste collection activities.

Figure 4 Installation of collection signboards

4. Design of Waste Collection System based on Collection Routes and Points

4.1 Markets

The results of the Time and Motion Survey are utilized for designing the waste collection at markets. The main viewpoints are a) How many collection points should be set up, b) How long it takes to go through all the collection points, c) How may trips are necessary to the dumping site, d) How many times a week the waste should be collected, e) How many no-collection days can be secured, f) How the vehicle allocation should be scheduled, etc.

In Jebel market, the collection points were established with the following conditions: one hour of waste collection time at each point; two trips per day to the dumping site; collecting waste every day except Sunday. Every Monday is considered as a recovery day and one more trip was added on every Monday. In Juba market, two collection points were set up with 45-60 minutes of waste collection time at each point.

4.2 Residential Areas

The results of the Time and Motion Survey are also utilized for the design of waste collection at residential areas. It should be examined how waste collection routes should be; how many collection points should be established; and how long it takes to collect waste at each point. Collection vehicles should be filled up after collection of one fixed route.

In order to cover almost all the collection areas, waste collection vehicles should pass through approximately 25 collection points per trip; the number of collection points is 20 -25 at Atlabara B & C. When the collection vehicles are full, they go to the dumping site once, and then restart collecting the waste from the point they stopped the collection. Average number of trips in residential areas was 2, and waste was collected twice a week. Residents are instructed to discharge waste only on the fixed days.

Figure 5 Community meeting at residential areas

5. Maintenance of Waste Collection Points

5.1 Markets

It sometimes happens that waste is scattered, not collected at fixed points, and the collection points get dirty; some collection points get unsanitary with urination by the people; some signboards are burnt or broken. These behaviors give the people bad images of the waste collection, and such working environment is also not appropriate. The following points should be considered for the maintenance of waste collection points:

a) How to discharge waste should be explained clearly to the market unions and shop owners.

b) Community meeting should be organized to explain about the proper use of the collection points.

c) The explanation to the primary waste collectors is also essential, because shop owners sometimes hire primary waste collectors to bring their waste to the waste collection points.

d) In Jebel market, some people bring waste to collection points from the outside of the market at night; it is necessary to consult with Kato Block and take countermeasures, such as assigning staff members to night duty.

e) Countermeasures to urination at waste collection points: Especially in Juba market the urination at waste collection points have not stopped; the fence was established but it did not work well; the explanation should be repeatedly done.

f) Waste discharge: it is not easy to collect waste if the people do not use buckets or plastic bags; community meetings should be held to explain to shop owners and primary waste collectors.

5.2 Residential Areas

In residential areas it often happens that the people do not follow a new collection system, especially just after the introduction, even though collection days, time and points are decided.

a) Community meetings should be regularly organized for more explanation, if the people do not follow the time after the introduction of the waste collection.

b) It is necessary to write a warning notice on the signboards at collection points, so that waste is not scattered around collection points. During community meetings, more explanation should be done to encourage the use of buckets and plastic bags.

c) The unevenness in the collected amount of waste among collection points can be adjusted (for example, by changing the collection points). Signboards should be reinstalled if broken or lost. .

6. Monitoring of Waste Collection Activities

6.1 Markets/ Residential Areas

The outline to monitor waste collection activities is as follows:

a) Satisfaction of waste collection should be measured by questionnaires etc., because waste collection is a public service. Complaints should be considered to improve the service.

b) Current conditions of waste collection should be confirmed. The items to be confirmed are as follows:

i) Whether the working condition is sanitary, or not.

ii) Whether the people discharge waste with buckets/plastic bags, or not.

iii) Whether all the waste is collected, or not.

iv) Whether the waste is scattered around collection points, or not.

v) Whether the signboards are not broken, or not.

vi) Whether the primary waste collectors bring waste to collection points, or not.

vii) Whether the people follow the fixed collection points and time, or not.

viii) Whether the waste collection points are clean, or not.

ix) Whether the residents around collection points complain about waste service, or not.

x) Whether the residential areas are collaborative with collection service, or not.

xi) Whether the cleaners work properly, or not.

The above points should be checked and analyzed to reflect on the waste collection service.

7. Safety Work

7.1 Market/ Residential Areas

Waste collection service can be unsanitary demanding working under the sun. Therefore, the following instruction should be followed:

a) Cleaners should use masks and gloves during the work.

b) Cleaners should wash hand and face after the work.

c) Cleaners should drink enough water during the work.

d) Cleaners should contact the leader in the case of poor health.

e) Cleaners should take enough rest regularly during the work.

f) Cleaners should contact the leader and go to the hospital in the case of injuries

Safety sanitary committee should be established in the future to improve the working environment.

Figure 6 Installation of signboards at markets

6. Landfill Plan for Juba County

Controlled Dumping Site (Phase-2)

Landfill Plan
for Juba County Controlled Dumping Site (Phase-2)

September, 2014

JICA Expert Team

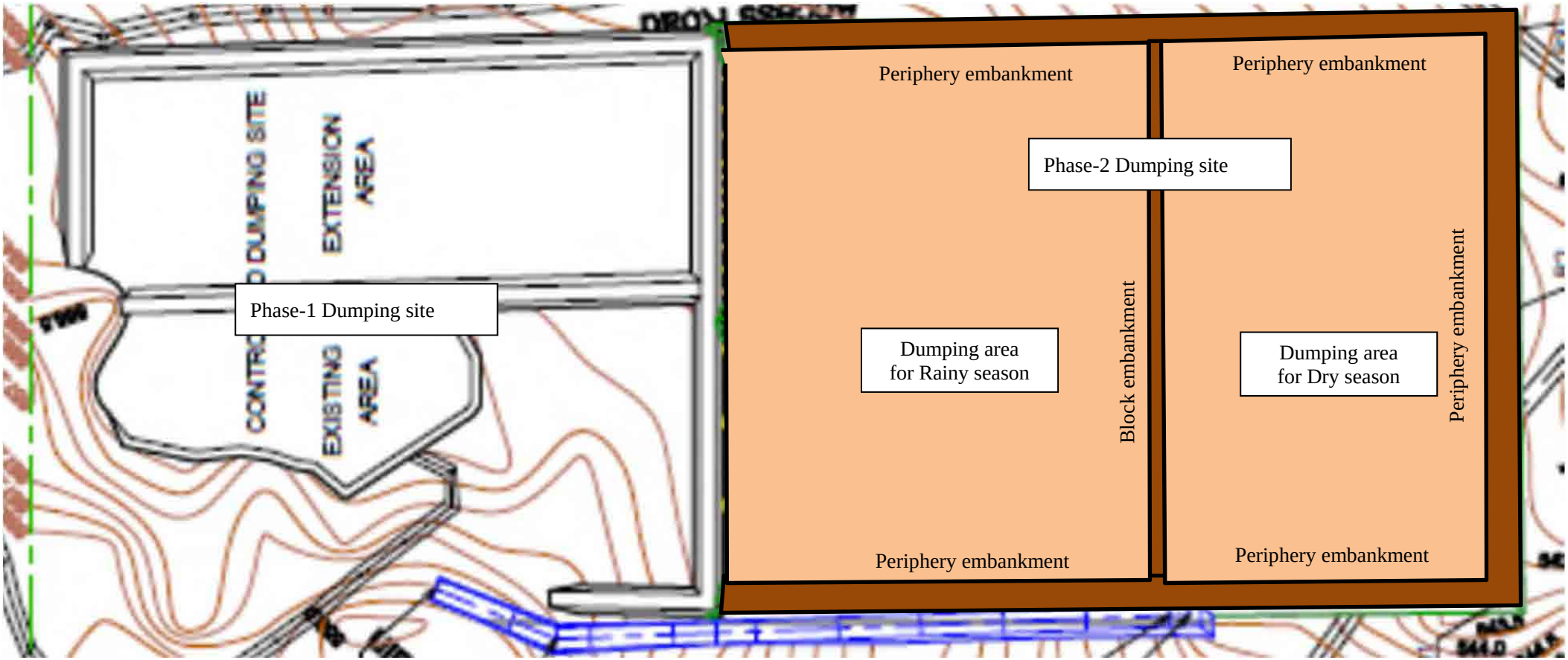
(1) Purpose of this plan

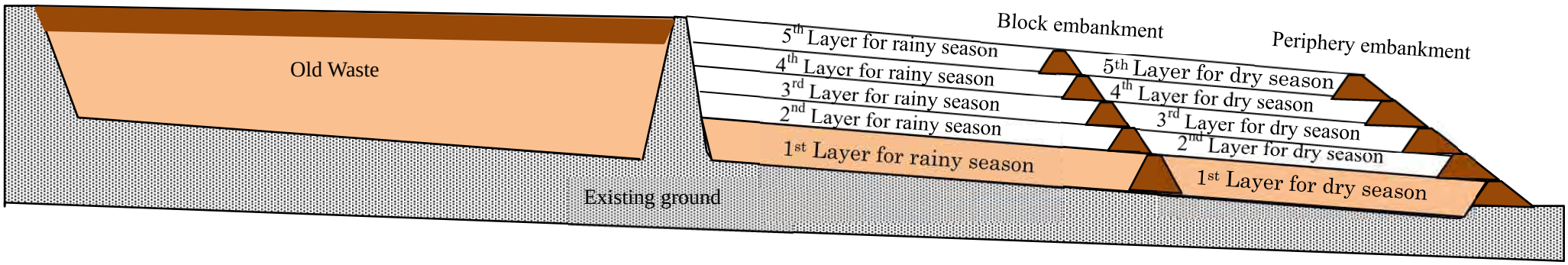
- This plan explains the landfill methods from the second layer of the Juba County Controlled Dumping Site (Phase-2).

(2) Landfill methods at Phase-2 area

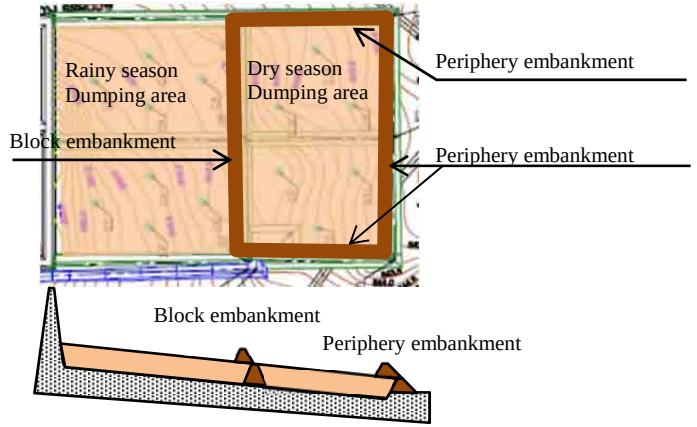
- Utilize the part close to Phase 1 in the rainy season, and the farther part in the dry season
- Prevent waste outflow by installing embankment on the outer periphery before landfilling waste
- Build embankment with waste and cover the outside part with soil
- Make good use of the dry season to construct the embankment at rainy- areas
- Keep 2.5 m for the height of each landfilling layer, including soil cover
- Landfill waste from the downstream
- Implement soil cover at least every two weeks, to prevent waste scattering, odor spreading and leachate occurrence
- Dump waste at the Phase 1 side, in case it is difficult to enter the muddy site in rainy season

(3) Overall plan of Phase-2 area

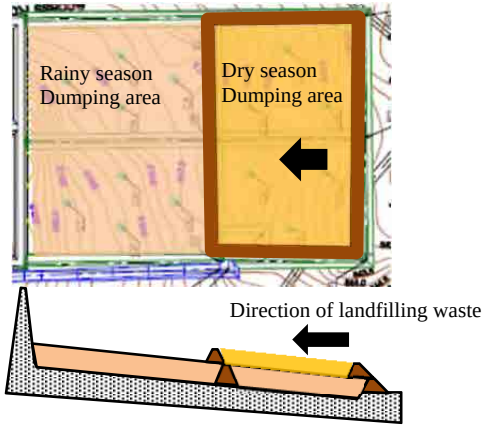




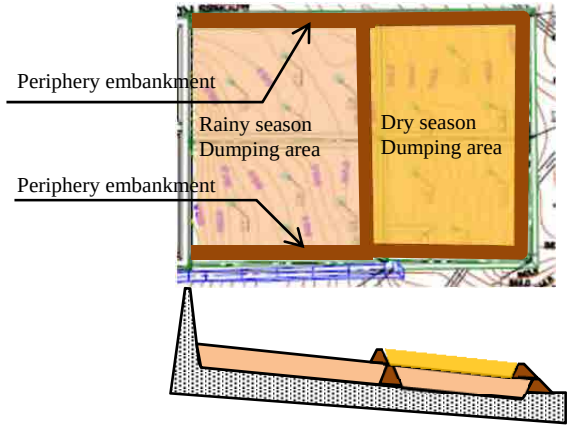
Procedure to landfill waste (the same for all layers)



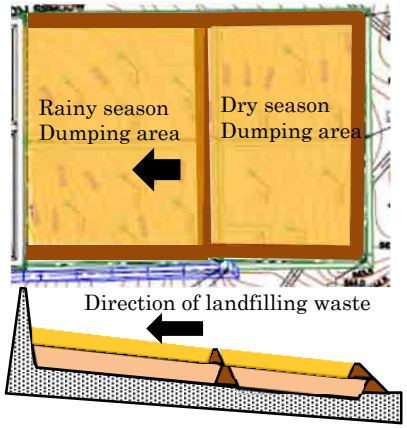
1. Construct periphery embankment in the dry-season of the dumping area (Refer to the next page for the embankment construction methods)



2. Landfill waste only inside the embankment constructed (shown in the figure at left). Dump waste from the downstream side.

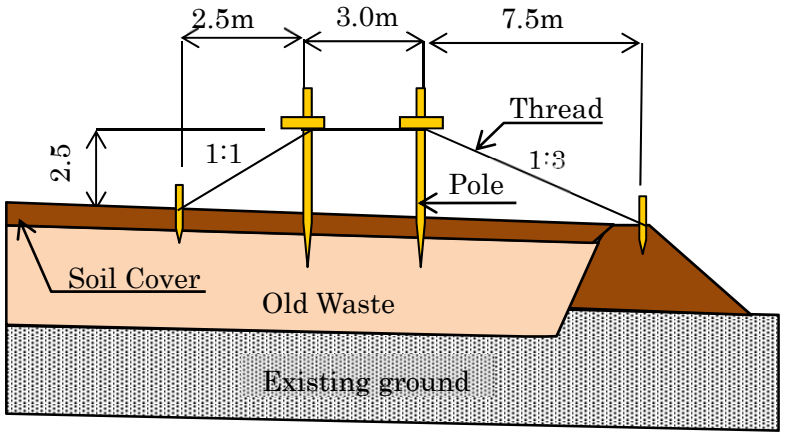


3. Build periphery embankment at the rainy-season dumping area, but before the rainy season begins (Refer to the next page for the embankment construction methods)

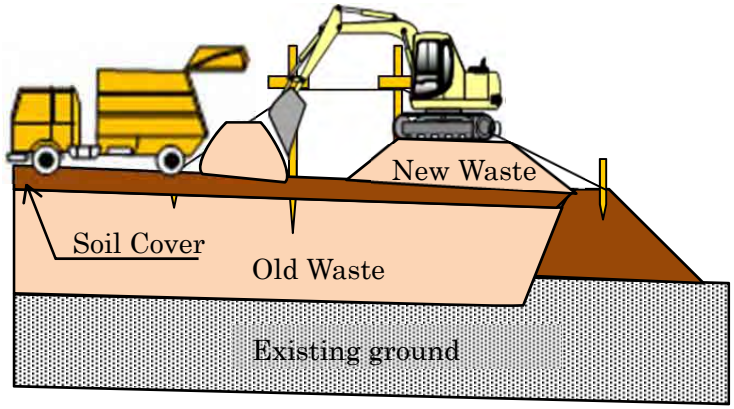


4. Landfill waste inside the embankment constructed (Shown in the figure at left). Dump waste from the downstream side. In case the vehicles cannot enter the muddy site, it can be considered to dump waste at Phase 1 side.

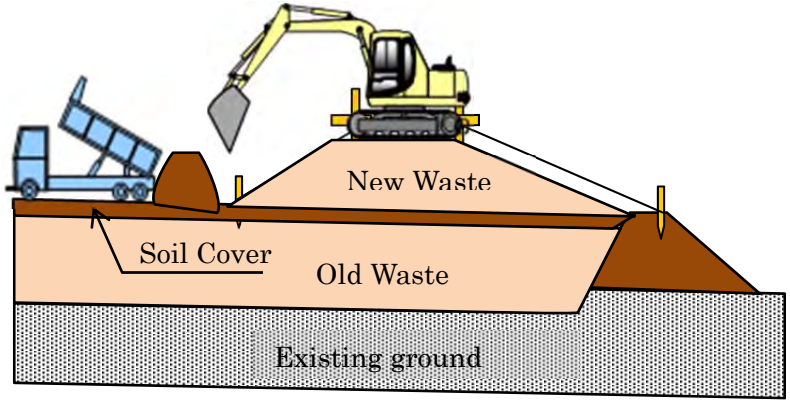
Construction method of periphery embankment



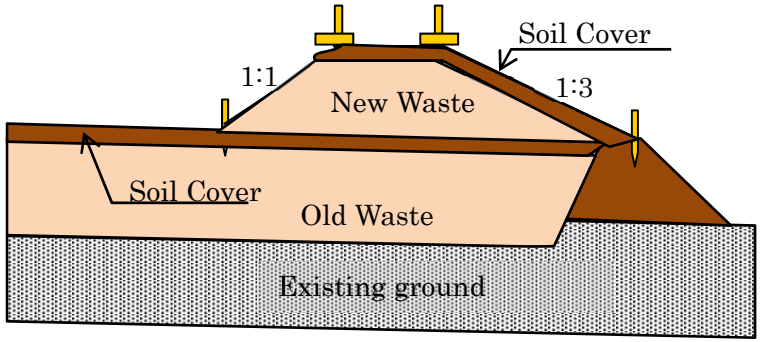
1. Set up landmarks to construct the embankment. The landmarks indicate the shape of embankment with wood piles/iron bars and thread. The slope gradient of the block embankment is 1:1 for both inside and outside.



2. Dump the incoming waste close to the embankment. Construct the embankment by pushing up the waste with an excavator, according to the landmarks. Waste compaction should be fully done with an excavator and a bulldozer.



3. Implement approximately 50 cm of soil cover at the outside slope and levee crown of embankment. Dump cover soil in front of the embankment and cover soil by an excavator.



4. Compact the covered soil sufficiently with an excavator and a bulldozer, so that the rain water will not penetrate into the soil

7. Project Activity Photo Collection

Project for Capacity Development

on Solid Waste Management in Juba

Project Activity Photo Collection

November 2014


JICA
Garbage Collection System


JICA
Garbage Collection System


JICA
Garbage Collection System
Garbage Collection Point No.
Collection Time Table


JICA
Garbage Collection System
Garbage Collection Point No.
Collection Time Table


3R


WASTE FREE


JICA


SOLID WASTE COLLECTION
IMPROVEMENT
PILOT PROJECT
BY JUBA SOLID WASTE MANAGEMENT GROUP AND
JAPAN INTERNATIONAL COOPERATION AGENCY
JICA


SOLID WASTE
MANAGEMENT
PROJECT IN JUBA


CAT


Jebel Market Waste Collection Point 1
WASTE FREE JUBA


FAUN


TUSKER
QUALITY LAGER

9. Annual Activity Report on Solid Waste Management

THE PROJECT FOR CAPACITY DEVELOPMENT

ON SOLID WASTE MANAGEMENT IN JUBA

Annual Activity Report on Solid Waste Management in Juba

Year 2012/2013

From November 2012 to October 2013

Juba City Council

Japan International Cooperation Agency

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1. Introduction

In Juba, Japan International Cooperation Agency ("JICA") started a project to improve solid waste management ("SWM") from October 2011, and regular waste collection has begun since July 2012. SWM generally includes the collection, transport, processing or disposal, recycling, environmental education, and monitoring of waste materials. SWM is generally undertaken to reduce negative impacts on health, the environment and aesthetics.

This report summarizes the solid waste management data for the period from November 2012 to October 2013.

We believe that the report will help many stakeholders and readers to recognize the importance of Solid Waste Management and to know the activities of Juba City.

2. Profile of Juba City

Some basic information of Juba City related to waste collection is mentioned in Table 1.

Table 1 Basic Information of Solid Waste Management in Juba City

Items	Data
Juba City population (estimated)	1.5 million (2011-2014)
Juba City service area	71.22 km^2 (2012)
Number of Blocks	3
Number of Quarter Council	55
Waste generation amount	Approximately t/day (2012)
Waste collection amount	Approximately 150 t/day (2012)
Area of disposal site	Juba County Controlled Dumping Site (25 ha)
Central garage	At Juba, near the Central Prison
Total containers	45
Waste management officials	63
Number of drivers	20
Number of cleaners	324
Headquarter Phone	0954648777 (Mr. Juma Katanga)
Juba City website	N/A

3. Profile of Waste Management Organization

In Juba City, the City Council is responsible for waste collection and disposal by mobilizing necessary resources such as workers and trucks, while the residents have the responsibility to bring their waste to waste collection points. Waste collection from shops in markets has been carried out by some private companies, which transport waste to collection points or sometimes to vacant lands.

Before the establishment of the Environmental Sanitation Department, the SWM activities used to be implemented by each Payam. The Environmental Sanitation Department aims at integrated SWM by one department with a unified chain of command.

The current activities are described as follows:

a) **Re-organization of Environmental Sanitation Department:**

Juba City Council integrated three blocks under the Juba City Council, and the Department of Environmental Sanitation was formed, which controls all the solid waste management in Juba. After all the solid waste management was under Juba City Council, it was divided into five zones, including financial management.

b) **Re-organization of the staff-redeployment:**

After bringing together the staff of three blocks under the Juba City Council, then all the staff members were deployed to five zones under the Juba City Council. Each zone has a zonal coordinator and supervisors. The outline of each zone is as follow:

Zone	Number of health officers	Areas in charge
Zone A	6	Kator Block, Konyokonyo market
Zone B	7	Juba Town Block
Zone C	6	Kator Block, Munuki Block, Jebel market
Zone D	3	Munuki Block
Zone E	1	Hotels

c) **Efficiency and effectiveness:**

After the decentralization, all the work was improved, such as supervision. Command chain got clearer.

d) **Establishment of five collection administrative zones:**

Five collection administrative zones were established for easier and smooth administration, and they do monitor, evaluate and implement the activities of solid waste management.

e) **Allocation of zonal coordinators:**

Each zone has a zonal coordinator and supervisors to work closely with each block. Zonal coordinators are expected to have their own office at each zone.

f) **New office space for Environmental Sanitation Department:**

Due to the congestion of current office, a new office space was secured and under preparation.

3.1 Waste Flow

Figure 2 illustrates the waste flow in Juba City. Waste is generated from the residents, markets, large volume dischargers, such as hotels and restaurants. Basically, wastes are brought to the collection points from the source by waste generators, and then transported to the final disposal site by the Environmental Sanitation Department of Juba City Council. Valuables are collected by private sectors for recycling.

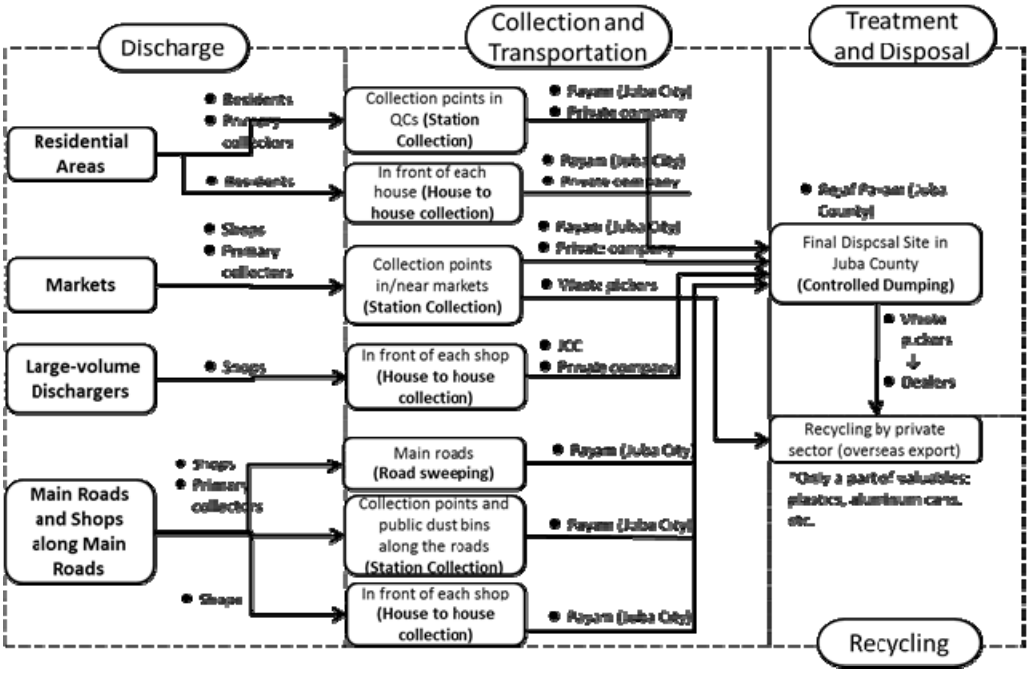

Figure 1 Waste Flow in Juba City

3.2 Waste Management Issues and Directives to Solution

Juba City faces many SWM issues; hence, they plan directives to solution as shown in Table 2.

Table 2 Management Issues and Directives to Solution

Management issues	Directives to solution
Lack of finance	To provide subsidy To strengthen fee collection To introduce taxation system
Poor vehicle maintenance	To provide necessary equipment to the garage To supply spare parts To train mechanics To hire special experts To improve the management of spare parts
Inadequate trucks	To purchase more compactors To hire trucks To mobilize funds
Not enough office space	To construct a new building
Road network is poor hindering collection	To improve the roads
Human resource capacity	To conduct trainings especially in solid waste management, accounting, sanitation, mechanics, etc.
Disrespect for laws and by –laws	To raise public awareness To strengthen the enforcement (fines etc.)
Lack of cooperation with council staff	To raise public awareness To strengthen the enforcement (fines etc.)
Health and safety policy	To strengthen the existing bylaws To create public awareness
No separation of waste	To segregate waste To raise public awareness
Lack of recycling facilities	To make policies to attract investors

4. Waste Amount and Waste Composition

4.1 Waste Amount

Due to the increase of the population of Juba City, the City Council has been facing unpredictably increasing waste generation amount. Accordingly, the waste collection amount of Juba City has also been increasing day by day. Uncollected waste has been recognized as the root cause of the unsanitary environment such as scattered garbage, offensive odor, drain clogging, water pollution and mosquitoes. Waste collection amount and collection ratio by collector are shown in Table 3.

Table 3 Waste Collection Amount and Collection Rate

Data collection period	Waste collection amount	Collection ratio by Block
10/2012-10/2013	47 vehicles/day 150t/day	Juba Block 20% Kator Block 20% Munuki Block 16% Private 44%

In order to understand the actual waste amount disposed at landfill sites, the Project Team conducted incoming vehicles survey at the dumping site and estimated the waste amount in the absence of a weighbridge.

4.2 Waste Composition

The Project Team conducted waste composition survey for 8 days in July 2012 to grasp the waste composition. The result shows that 48% of waste is organic waste; 12% is plastic waste; 7% is PET bottle waste.

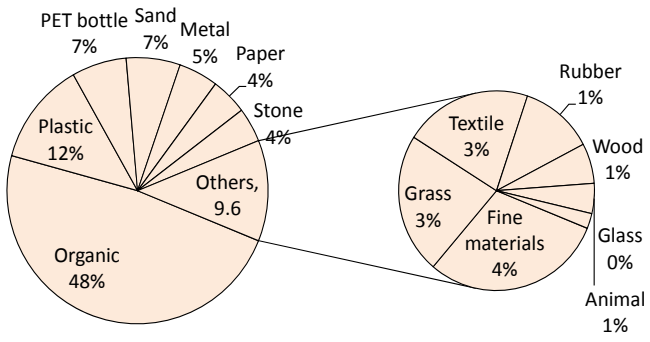

Figure 2: **Waste Composition**

5. Waste Collection and Transportation

5.1 Waste Collection

The current waste collection system is described as follows:

a) Hiring of vehicles for collections

- To mitigate the shortfall of council trucks
- To measure-up to the volume of the solid waste
- The trucks hired daily; the minimum is 18, the maximum is 52. The target number is shown as follows. The hiring cost is 600 SSP per trip.

Zone	Target number of hired trucks	Actual number (as of October, 2014)
Zone A	8	8
Zone B	29	10
Zone C	9	9
Zone D	6	6
Zone E	1	1

b) Collection schedule

- To ensure coverage of areas of collection/markets/main roads/hotels/institutions and residential area accessible.
- The detail schedule is shown as follows:

Area	Detail	Collection schedule
Residential areas	Atlabara, etc.	Twice a week
Markets	Jebel, Konyokonyo, Juba, Munuki Lybeya, Melecia, Nyokuron, Rockcity, Gudele 1, Atlabara B, Suk sita, Markas, Jeran, Melekia	Everyday
Main roads	Airport road, Ministry road, Airport - Muturia- Melekia- Juba University - Custom, Municipal road	Everyday

c) Methods of collection

- The methods of collection are: to use Plastic bags, Dust bins, Garbage containers, Shovels and Sacks
- Waste is collected by Compactors, Tippers, and Excavators.

d) Residential waste collection

- Waste at residential areas are collected twice a week (Tuesday/ Saturday), Hi Thoura, Atlabara, Tomping etc.; all the 55 QCs are not covered. Private vehicles also collect waste at residential areas for 5 SSP/bucket.

e) Contracts with hotels

56 contracts have been made. The average collection fee is 500- 6,000 SSP monthly.

f) Staff, workers and payment system

- Contracted staff (paid by cash monthly, approximately 324 contracted staff - cleaners)
- Employed staff (63 staff including Juma Katanga etc.)
- Casual workers (paid daily, 199 staff)

5.2 Waste Collection Vehicles

Juba City has 10 waste compactors whose total capacity is estimated to be 250 m^3 /day. However, of which 6 vehicles are presently out of order. Table 4 shows the list of the existing collection vehicles.

Table 4 Existing Collection Vehicles of Juba City

No.	Capacity	Vehicle No.	Condition	Production Year
1	$25m^3$	NO plate number	NOT Working (To allocate for Juba Town Market)	2002
2	$25m^3$	CEG 431 A		2002
3	$25m^3$	CEG 430 A	Working for a half day (mechanic troubles)	2000
4	$25m^3$	CEG 421	NOT working	2001
5	$25m^3$	CEG 423A	NOT working	1997
6	$25m^3$	CEG 429A	NOT working	2001
7	$25m^3$	CEG 420A	Working for a half day (mechanical troubles)	2001
8	$25m^3$	CE 435 A	Working for a half day (To allocate in Kator from 13th Nov, 2013)	2002
9	$25m^3$	CE 428 A	Working for a half day (mechanical troubles)	1999
10	$25m^3$	CE 427 A	Working for a half day (mechanical troubles)	1999

Other than the vehicles above, following vehicles were owned and maintained by each Block.

No.	Owner	Capacity	Type	Condition	Production Year
1	Juba	$9m^3$	Tipper (Isuzu)	On road/ Not bad	N/A
2	Juba	$14m^3$	White & Blue Compactor (Nissan Diesel)	On road/ Not bad	N/A
3	Juba	$1.3\ m^3$	Tractor (Ferguson)	Working	N/A
4	Juba	$1.3\ m^3$	Tractor (Ferguson)	Working	N/A
5	Kator	$8m^3$	Tipper (Isuzu)	Out of order	N/A
6	Kator	$8m^3$	Tipper (Isuzu)	Out of order	N/A
7	Kator	$8m^3$	Tipper (Fuso)	Out of order	N/A
8	Kator	$1.3\ m^3$	Tractor (Ferguson)	Working	N/A

9	Kator	1.3 m^3	Tractor (Ferguson)	Out of order	N/A
10	Munuki	8m^3	Tipper (Isuzu)	Working	N/A
11	Munuki	14m^3	White & Blue Compactor (Nissan Diesel)	Working	N/A
12	Munuki	1.3 m^3	Tractor (Ferguson)	Working	N/A
13	Munuki	1.3 m^3	Tractor (Ferguson)	Working	N/A

Compactor

Pilot project at Jebel market

Pilot project at residential area

Figure 3 Waste Collection Vehicles

5.3 Pilot Project for Waste Collection (supported by JICA)

The allocation schedule of waste collection vehicles both at markets and residential areas are shown in Table 5 and 6.

Table 5 Allocation Schedule of Waste Collection Vehicles (Markets)

Market	Allocation			Mon	Tue	Wed	Thu	Fri	Sat
Jebel Market	Kator Block		Type	Tipper	Tipper	Tipper	Tipper	Tipper	Tipper
			Unit	2 unit	2 unit	2 unit	2 unit	2 unit	2 unit
Juba Town Market	Juba Town Block	Point 1	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
			Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit
		Point 2	Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
			Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit

Table 6 Allocation Schedule of Waste Collection Vehicles (Residential Areas)

Block	Target Area	Allocation	Mon	Tue	Wed	Thu	Fri	Sat
Kator Block	Atlaraba B	By Block		Tipper: 1 unit				Tipper: 1 unit
	Atlaraba C	By Block		Tipper: 1 unit				Tipper: 1 unit
Juba Town Block	Hai Thoura	By Block			Compactor: 1 unit			Compactor: 1 unit
Munuki Block	Gudele Block 8	By Block				Compactor: 1 unit		

5.4 Waste Collection at Main Street, Hotels and Restaurant by Juba City

(1) Main Street

Juba City is in charge of collecting waste from main streets, as outlined in Table 7.

Table 7 Waste Collection at Main Streets

Street name, street points	Collection information (collection frequency, collection vehicles)
Airport road	Daily, compactor
Juba Ministry road	Daily, compactor
Juba University road (Melekia- Juba University)	Daily, tipper
Gudele road (- Doha)	Daily, compactor
Custom - Rock City road	Daily, tipper
Juba bridge - Konyokonyo road	Daily, tipper
Tombura road – Konyokonyo	Daily, tipper
High Cinema road	Daily, compactor
Mobil - UNDP	Daily, compactor
Hi Thoura - Police/KCB	Daily, compactor
Airport - Mudria- Mobil	Daily, compactor

(2) Hotel and Restaurant

Juba City collects the waste generated from hotels and restaurants on a contract basis. Juba City contracts with hotels and restaurants as shown in Table 8.

Table 8 Waste Collection at Hotels and Restaurants

No	Hotels and restaurants name	Contact price	Contract date	Collection frequency
1	New Sudan	4,000 SSP	14/06/2013	Twice a week
2	Keren Hotel	3,200 SSP	03/05/2013	Twice a week
3	Concord H	2,000 SSP	24/05/2013	Twice a week
4	Afex River	3,000 SSP	01/05/2013	Twice a week
5	Rock Shiel	2,000 SSP	01/06/2013	Twice a week
6	Habesh H	2,000 SSP	01/05/2013	Twice a week
7	Oasis Camp H	2,000 SSP	25/05/2013	Twice a week
8	Dembesh H	4,000 SSP	29/04/2013	Twice a week
9	Nile Comfort	2,000 SSP	23/04/2013	Twice a week
10	White Nile	2,000 SSP	01/05/2013	Twice a week
11	Nile Beach	3,200 SSP	01/05/2013	Twice a week
12	Wood Land	1,200 SSP	01/05/2013	Twice a week
13	Quality Hotel	4,000 SSP	01/05/2013	Twice a week
14	New York Hotel	4,000 SSP	01/05/2013	Twice a week
15	Juba Grand	4,000 SSP	01/05/2013	Twice a week
16	Star Hotel	4,000 SSP	01/05/2013	Twice a week
17	Transit H	2,000 SSP	01/09/2013	Twice a week
18	Summer H	2,000 SSP	14/06/2013	Twice a week
19	Queen of Shebba	2,000 SSP	01/05/2013	Twice a week
20	River Nile	2,000 SSP	01/09/2013	Twice a week
21	Hamza Inn	2,000 SSP	14/06/2013	Twice a week

22	Notos Bar	1,500 SSP	01/05/2013	Twice a week
23	Sahara Hotel	3,200 SSP	01/05/2013	Twice a week
24	Sabbah Hospital	1,000 SSP	01/06/2013	Twice a week
25	Intra Africa	2,000 SSP	22/04/2013	Twice a week
26	Royal Garden	2,000 SSP	22/04/2013	Twice a week
27	Nile Industries	4,000 SSP	22/04/2013	Twice a week
28	Juba Bridge	4,000 SSP	22/04/2013	Twice a week
29	Da Vinci	2,000 SSP	18/04/2013	Twice a week
30	Heritage	2,000 SSP	22/04/2013	Twice a week
31	Blue Gold	1,000 SSP	22/04/2013	Twice a week
32	Amas H/ restaurant	1,000 SSP	22/04/2013	Twice a week
33	Heron Hotel	2,000 SSP	22/04/2013	Twice a week
34	John Sam R	1,000 SSP	17/07/2013	Twice a week
35	Muki Hotel	1,000 SSP	17/07/2013	Twice a week
36	Juba Raha	2,000 SSP	14/06/2013	Twice a week
37	Mesgana G-H	1,200 SSP	01/05/2013	Twice a week
38	Kush Hotel	2,000 SSP	22/04/2013	Twice a week
39	Sun Shine	750 SSP	22/04/2013	Twice a week
40	Toronto	750 SSP	22/04/2013	Twice a week
41	Chele Restaurant	500 SSP	22/04/2013	Twice a week
42	Ghurmay Restaurant	1,000 SSP	22/04/2013	Twice a week
43	Kush -B-R	1,000 SSP	22/04/2013	Twice a week
44	Bedouw H	2,000 SSP	01/06/2013	Twice a week
45	All Saints	1,000 SSP	01/09/2013	Twice a week
46	Hanibal Hotel	1,000 SSP	N/A	Twice a week
47	JICA Guest House	200 SSP	N/A	Twice a week
48	M. of Petroleum House	200 SSP	10/05/2013	Twice a week
49	M. of Justice H.	200 SSP	17/07/2013	Twice a week
50	Traffic Police	1,000 SSP	30/10/2013	Twice a week
51	M. of Info H.	200 SSP	N/A	Twice a week
52	Jennys Palace	500 SSP	N/A	Twice a week
53	Juba Airport	6,000 SSP	01/05/2013	Twice a week
54	Wild Life International Government	1,500 SSP	30/01/2014	Twice a week
55	Vice President House	500 SSP	30/11/2013	Twice a week
56	Hon. Juma Nunu House	500 SSP	01/06/2014	Twice a week

6. Final Disposal

6.1 Outline of Landfill Site

Juba City uses a landfill site with a total area of 25 ha, equipped with a management office, 2,000m length fence, gates and a dumping platform to be used during the rainy season. The site is managed by Rejaf Payam, Juba County. The drawing of the landfill site is described in Figure 5, while the outline of landfill site is shown in Table 9.

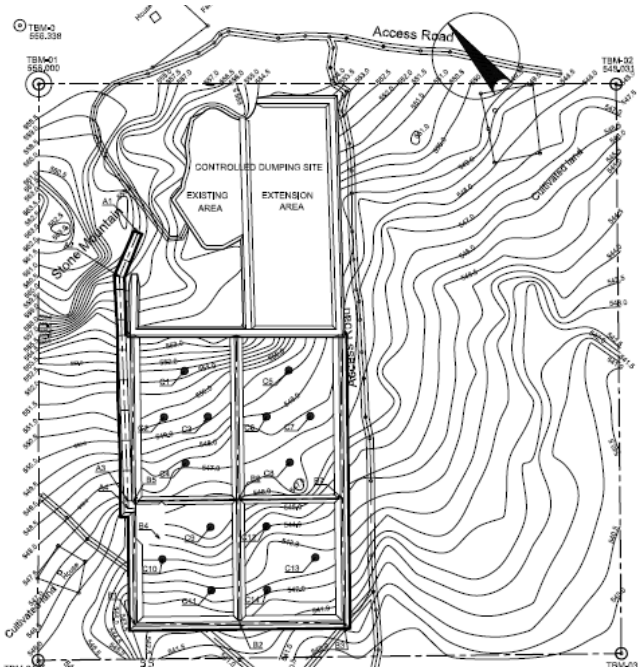

Figure 4 Drawing of Landfill Site

Table 9 Outline of Landfill Site

Items	Contents	
Name of landfill site	Juba county controlled dumping site	
Waste comes from	Juba Town Block, Kator Block, Munuki Block, Rejaf Payam, Nothern Bari Payam	
Area	25ha	
Dumping area	Phase 1 : 3ha (Full) Phase 2 : 4ha (Now in use) Phase 3 : 4ha (Not yet constructed) Phase 4 : 5ha (Not yet constructed)	
Life span and receiving capacity		
Phase	Dumping period	Capacity (m^3)
Phase 1	From 2008 to November 2013	250,000
Phase 2	From December 2013 to June 2017	410,000
Dumping method	Control dumping site	
Facility	Bank, gas venting pipes, access roads, internal roads, management office, fence, gate, dumping platform	

6.2 Operation Work

The operation work at the landfill site consists of waste discharge, compaction, soil cover on waste by heavy equipment to avoid insects and odor generation, and slope preparation to protect the slope from rain water. Phase 1 area has been already filled and now Phase 2 area is being used. Phase 3 and 4 have not been constructed yet. Control dumping method is applied at the current site. Staff members have been preparing a plan and manual on dumping operation and maintenance accordingly.

		
Waste management office	Bull dozer for landfill site provided by JICA	Phase 2 construction

Figure 5 Curent Situation of Landfill Operation Work

	
Visitor at dumping site	Gas measurement

Figure 6 Activities at landfill site

7. Budget

7.1 Financial Results and Budget

(1) Solid Waste Management Cost of Year 2012/2013

Since November 2012, Jebel market waste collection and landfill site have been operated in a good condition. Revenue and expenditure are summarized in Table 10.

Table 10 Financial Results and Budget

(a) Juba City Council (July, 2014 - June, 2015)

Category	Item	Amount (SSP)
1. Waste Collection		
(a) Revenue	Large volume discharger (hotels and restaurants under the contract)	-
	Business establishment (Markets, hotels, restaurants etc.)	6,420,000
	Residential Areas	388,100
	Others (City rates, license fee etc.)	(99,700)* fine
(b) Expenditure	Salary	
	Allowance (incentives, overtime)	640,000
	Contracted service (including waste disposal fee to the landfill)	4,725,800
	Repair to maintenance	475,000
	Supply of tools and materials (fuel)	656,800
	Capital Expenditure	410,200

(b) Juba County (February, 2014- August, 2014)

Category	Item	Amount
1. Landfill		
(a) Revenue	Fee collection	19,870 SSP/ month
	Others	-
(b) Expenditure	Salary	5,480SSP/ month
	Fuel	9,600SSP/ month
	Maintenance	700 SSP/ month
	Soil cover	8,000 SSP/month
	Transportation	500 SSP/month

8. Regulations Related to Solid Waste Management

Juba City has presently started drafting Juba City Council ordinance. The outline is shown in Table 11.

Table 11 Solid Waste Management Ordinance and Rules (First draft)

Solid waste management ordinance (draft)		Rules and remark
Chapter 1	**Objectives and limitation**	-
1.1 Objectives	(1) Protect public health, prevent public nuisances and contamination of air, soil surface water, groundwater and other environment through control and proper treatment of solid waste	-
	(2) Assure that all individuals are both informed and responsible for their actions regarding solid waste	-
	(3) Support activities that will promote 3Rs	-
	(4) Impose penalties and fines concerning illegal disposal activities	-
	(5) Augment, supplement and support the existing South Sudan controls pertaining to solid waste.	
1.2 Limitations	(1) Applied only in Juba City	-
	(2) Applied for the solid waste generated from houses (domestic waste), and shops & offices (commercial waste) in principle	-
	(3) Tentative measures for other waste to reduce risk on public health and environmental contamination	(1) Measures on following waste: Medical waste, Non-hazardous industrial waste
	(4) Exclude construction waste and hazardous waste (to be studied)	
1.3 Definition	● Type of waste (municipal waste, household, industrial, medical, non-hazardous and hazardous waste) ● Collection, Disposal, Control dumping, Generator of waste, Open burning	(1) Type of waste to be treated by Juba City (2) Type of waste to be studied
Chapter 2	**Proper treatment and disposal of solid waste**	
2.1 Target waste	(1) Juba City shall collect, transport and dispose domestic waste and commercial waste generated in JUBA CITY in principle	-
	(2) Juba City will take necessary tentative measures for other waste to reduce risk on public health and environmental contamination.	● Same as 1.2, (3)
2.2 Service area	(1) Solid waste management service is provided to all areas in Juba City according to their needs and their payment of fees.	-
2.3 Proper treatment and disposal	(1) Juba City is responsible to provide collection, transportation and proper disposal of domestic and commercial waste.	
	(2) Juba City may take tentative measures for other waste	● Tentative measures for specified waste mentioned in 1.2 (3)

Solid waste management ordinance (draft)		Rules and remark
	(3) Juba City should prepare necessary equipment and facilities to implement proper treatment	
	(4) Juba City shall continue to study to improve its service of collection, treatment and disposal.	
Chapter 3	**Annual Plan**	
3.1 Annual solid waste management plan	(1) Annual solid waste management plan (collection, transportation and disposal) should be prepared and decided in Juba City Council meetings	(1) Contents of Annual solid waste management plan
3.2 Annual financial plan	(1) a. Annual Financial Plan (revenue and expenditure) should be discussed and decided in Juba City Council meeting and approved by Mayor. b. Annual financial plan should be submitted to mayor of Juba City Council	(2) Contents of financial plan
Chapter 4	**Standard method**	
4.1 Collection & Transportation	(1) Collection from houses and shops: a. No primary collection by Juba City. b. Standard service is twice a week	(1) Minimum service will be once a week
	(2) Collection from large amount discharger: a. Service will be provided according to his needs and the cost shall be covered by each discharger	(2) Large waste amount discharger is the customer who requests and/or is provided a hauled container.
	(3) Juba City will not collect other waste in principle.	
4.2 Disposal	(1) Household & commercial waste shall be disposed at designated control landfill site	(1) Designated landfill site -Juba County Controlled Dumping site
	(2) Tentative measures for disposal of other waste will be taken by Juba City to reduce risk.	
Chapter 5	**Charge and obligation of Juba City Council**	
5.1 Charge for solid waste management service	(1) Charge is decided based on the cost to cover the solid waste management service including dumping fee	
	(2) Service charge is decided by Juba City and collected by Juba City every month.	
5.2 Charge for large amount discharger	(1) Charge for large amount discharger will be set to cover the cost for service requested by large amount discharger. (2) Payment will be based on the agreement between Juba City and large amount discharger	(1) Large amount discharger (delivered a hauled container)
	(3) Juba City will study on charge for medium and small scale business establishment.	
Chapter 6	**Monitoring of solid waste management service**	
6.1 Monitoring	(1) Juba City shall conduct daily monitoring of the solid waste management service and the operation of the disposal site	
6.2 Public	(1) Block should monitor cleanliness of his	

Solid waste management ordinance (draft)		Rules and remark
inspection	area and service of Juba City. (2) Residents should monitor and communicate with their Blocks to create a consensus of their evaluation	
6.3 PR activities	(1) Juba City will conduct community meetings to communicate with the residents when requested by Blocks	
	(2) Juba City will conduct PR activities to obtain cooperation and support from residents in Juba City.	
6.4 Opinion and claim	(1) Juba City accepts any comments and claim on solid waste management service provided by Juba City via Tel/Fax, website and by e-mail.	
Chapter 7	**Juba City organization and obligation of its staff**	
7.1 Operation of Juba City	(1) Juba City Solid Waste Department body is fully responsible to operate the Juba City.	
7.2 Structure of Juba City organization		(1) Job description of each Division
7.3 Recruit of staff		
7.4 Working day	(1) Solid waste management service is provided 6 days/week (excluding Sunday), approximately 310 day/year.	
	(2) Working hours are 8:00 to 17:30 in principle (8 hours /day).	
	(3) Collection of waste and disposal of waste starts at 9:00 to 17:00.	
	(4) Night shift will be considered for better service	
7.5 Insurance and welfare		

9. Demarcation of Responsibility

Demarcation of responsibility is shown in Table 12.

Table 12 Demarcation of Responsibility on Solid Waste Management

	Ministry of Environment	Juba City		Juba County	
		Juba City Council	Blocks	HQs	Rajaf Payam
1. Waste Collection					
● To set the fee price for collection service for residential areas/markets		◎			
● To collect fee for collection service from residential areas/ markets		◎			
● To collect fee for collection service from large waste amount dischargers		◎			
● To prepare waste collection plans		◎			
● To utilize allocated budget and implement collection works		◎			
● To maintain collection vehicles		◎	◎		
● To bear the cost of vehicle maintenance		◎			
● To raise public awareness and implement environmental education		◎	◎		
2. Final Disposal					
● To collect fees for final disposal					
● To pay fees for final disposal		◎			
● To prepare the operation plan for the existing dumping site				◎	◎
● To utilize allocated budget and implement disposal works at the existing dumping site				◎	
● To procure equipment					◎
● To maintain equipment				◎	
● To prepare the expansion plan					◎
3. Legal system					
● To prepare the national policy and laws	◎				
● To prepare the subsidy system	◎				

10. Conclusion

The future plan, challenges and the way forward are described as follows:

10.1 Future Plans

a) Purchase of at least 10 compactors.
b) Construction of an office for waste management.
c) Training on Capacity building
d) Collections at the residential areas
e) Purchase of mechanical tools.

10.2 Challenges

a) Inadequate trucks
b) Maintenance of the available trucks
c) Office space
d) Road network is poor hindering collection
e) Human resource capacity
f) Disrespect for laws and by –laws
g) No cooperation with council staff
h) Health and safety policy
i) Composition of waste.
j) Garage is not well equipped

10.3 Way forward

a) Hire or procurement of trucks
b) Improvement of the system and level of maintenance of the available trucks
c) Hire of ample office space, including operations yard
d) Opening and routine maintenance of feeder/access road net work
e) More training and hiring qualified staff
f) Creating awareness for laws and by –laws
g) Creating awareness co-operation with council staff
h) Ensuring timely payments of rates
i) Formulation and observance of health and safety policy
j) Pursuing waste segregation mechanism

10. Annual Activity Plan on Solid Waste Management

THE PROJECT FOR CAPACITY DEVELOPMENT

ON SOLID WASTE MANAGEMENT IN JUBA

Annual Activity Plan on Solid Waste Management in Juba

Year 2015/2016

From July 1st, 2015 to June 30th, 2016

Juba City Council

Japan International Cooperation Agency

Table of Contents

List of Tables and Figures

1. Introduction

The Republic of South Sudan (hereinafter referred to as "South Sudan") became independent from the Republic of Sudan in July 2011 after the election in January 2011. In order to strengthen solid waste management in Juba, pilot projects for the improvement of waste collection and landfill had been commenced with the support of Japan International Cooperation Agency (hereinafter referred to as "JICA").

As a part of the pilot project on collection improvement, Juba City Council (hereinafter referred to as "JCC") introduced the new collection system, which was the station collection with the time schedule, receiving the support of the Project for Capacity Development on Solid Waste Management in Juba (hereinafter referred to as "JICA Project") by JICA from April 2012. With this new system, JCC started providing the collection service a market (Jebel Market) and residential areas (Atlabara B & C) in July 2012. Then, JCC added two residential areas (Hai Thoura and Gudele Block 8) in November 2012, and another market (Juba Town Market) in July 2013 as the service target places. As collection vehicles, JCC procured 10 units of compactor in August 2012.

Wastes in Juba City are disposed in a final disposal site in Juba County. This site was originally only 1ha, however, Juba County expanded as 25ha. In JICA Project, a fence and an administration building was constructed in this site, and a bulldozer was procured for operation. At present, Juba County collects disposal fees from the incoming vehicles for operation cost of this site.

Site activities of JICA Project were suspended temporary because of the issue of public safety in December 2013. However, JCC continues the collection work without the vehicle allocation from JICA Project although they have many difficulties.

Annual Activities Plan is prepared here based on the Annual Activities Report, which is a summary of activities on solid waste management in a year, so that JCC can utilize it to clarify the directions of solid waste management and secure the necessary budget.

2. Basic Data for Annual Activities Plan

2.1 Data of Solid Waste Management Work by JCC

Table 1 shows data of solid waste management work by JCC for preparation of Annual Activities Plan.

Table 1 Data of Solid Waste Management Work by JCC

Items	Data
Juba City population（estimated）	1.5 million (2011-2014)
Juba City service area	71.22 km^2 (2012)
Number of Payam	3
Number of Quarter Council	55
Waste generation amount(estimated)	Approximately t/day (2012)
Waste collection amount	Approximately 150 t/day (2012)
Area of disposal site	Juba County Controlled Dumping Site (25 ha)
Central garage	At Juba, near the Central Prison
Total containers	45
Waste management officials	63
Number of drivers	20
Number of cleaners	324
Headquarter Phone	0954648777 (Mr. Juma Katanga)
Juba City website	N/A

2.2 Waste Management Flow

Figure 1 shows the management flow of waste from Juba City.

Blocks collect wastes generated in residential areas and markets and transport to the final disposal site in Juba County. JCC sets the price of the fee for collection service. Large-volume dischargers, such as restaurants and hotels, make contracts with JCC and JCC directly collects wastes from them. The contract amount depends on the type and scale of business. Rejaf Payam in Juba County operates and manages the final disposal site. Some wastes are collected for recycling in Juba City and the final disposal site, but there are not any clear systems for recycling.

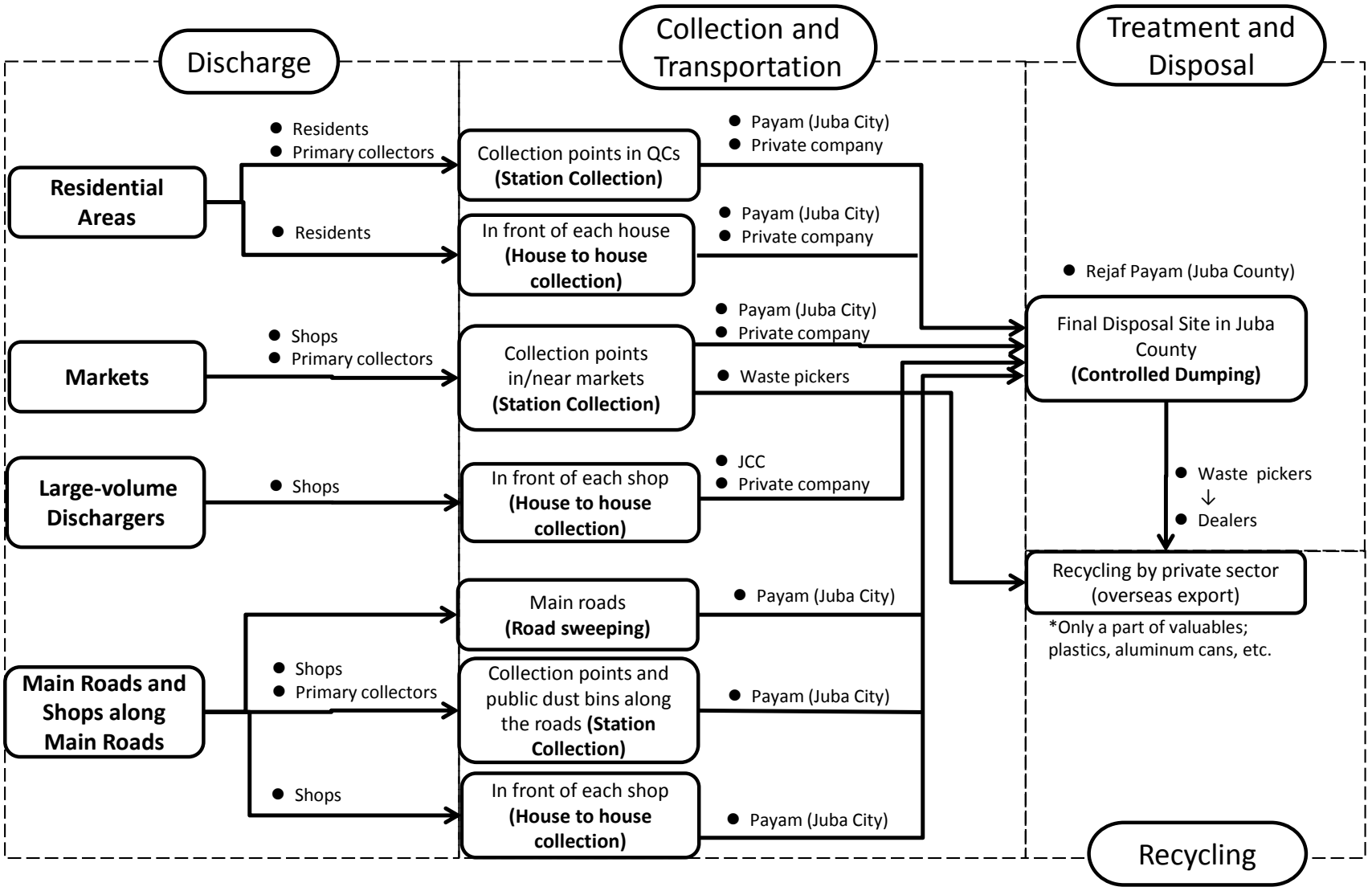

Figure 1 Management Flow of Wastes from Juba City

3. Policy for Solid Waste Management in Juba City

JCC just started the waste management as the public service. So they have a lot of issues in all fields to settle, but it is not easy for JCC to settle them immediately. Table 2 shows the list of issues and policy how to settle them.

Table 2 Policy for Solid Waste Management in Juba City

	Issue	Policy to Settle	Target Actions in the Next Fiscal Year	Primary Action
1	Lack of Collection Vehicle	To examine to utilize not only compactors but also general vehicles for the collection work To examine to procure dump trucks and other general vehicles with affordable prices To examine to receive the subsidy and grant from the central government as the first budget source for vehicle procurement	To start collection with rental vehicles and vehicles of JCC and Blocks after securing the budget To examine to make a request for a support of donors	Department of Environmental Sanitation should bring a budget proposal to the Director of Planning and Budgeting, to be discussed at the Executive Council Meeting, headed by the Mayor.
2	Lack of Officers for Solid Waste Management Work	To allocate officers only for solid waste management work systematically To examine deployment of capable officers from the Ministry of Health- CES.	To allocate one officer for the collection work, and one officer for works related to the final disposal (At present, Environmental Sanitation Department of JCC has Director and Deputy Director) To deploy a new mechanic for vehicle maintenance systematically	Director of Environmental Sanitation should make a request to the CEO for allocation of new officers and employment of a new mechanic.
3	Lack of Official Procedure for Securing Budget	To collect fees from all waste dischargers for the collection service To establish the tax system at the same time (It is impossible to operate the whole waste management work only by the fees for the collection service.)	To collect fees from all the collection areas To collect fees from all contracted large-volume dischargers To examine to establish the tax system One officer from Department of Environmental Sanitation should submit a proposal to operate the solid waste management with the tax.	To prepare the plan of fee collection and start the fee collection according to this plan
4	Lack of Official Procedure for Securing Budget for Facility Construction	To examine to build workshops, parking space, and site offices for waste management with subsidy from the central government To examine to institutionalize this subsidy system	To make a proposal for the subsidy from the central government	To start discussion with the central government

	Issue	Policy to Settle	Target Actions in the Next Fiscal Year	Primary Action
5	Lack of Public Awareness Activities	To provide the collection service to the public and hold community meetings in order to obtain the understanding and credibility of the residents.	To explain the management flow of waste treatment by Juba City Council in community meetings To prepare leaflets for community meetings	To hold community meetings at least twice in each service area (primary and review meetings)
6	Undeveloped Law System	To prepare a regulation for the solid waste management work in Juba City based on the actual work (refer to "9. Regulations Related to Solid Waste Management" mentioned later)	To concentrate on the actual work in order to make a draft of the regulation in near future	To start examining contents of a regulation based on the actual work Director of Environmental Sanitation should make a draft of a regulation.
7	Undeveloped Organizational System	To establish a clear organizational system for solid waste management; the responsibility agency is JCC, and implementation agency is Blocks (The independent organization is desirable in the future, but several capable officers in all fields are necessary.)	To keep the present system to implement the solid waste management work To expand this system if necessary	To implement the solid waste management work with the present system
8	Lack of Capacity for Operation and Maintenance	To make a contract with a private workshop with the high capacity of vehicle maintenance To maintain vehicles of JCC and Blocks with both JCC's workshop and private workshops as much as possible	To survey the private workshops and their capacity of vehicle maintenance To examine outsourcing	Director of Environmental Sanitation should direct to implement the survey of private workshops.
9	Necessity to Encourage Private Companies for Outsourcing collection work	To make preparation to encourage private companies for outsourcing the collection work To examine contents of the contract including procurement of vehicles by private companies	To provide the collection service directly by JCC and Blocks To examine the possibility of outsourcing To hold an opinion exchange meeting for private companies	Director of Environmental Sanitation should direct to implement the survey for the possibility of outsourcing
10	Necessity of Securing Future Disposal Sites	To prepare the new disposal site because the remaining lifespan of the present disposal site is only several years To find around 20ha to 30ha site which is not far from the center of Juba City	To find several candidate sites with 20ha to 30ha area in Juba City	Director of Environmental Sanitation should direct to implement the survey for the candidate sites for the final disposal site
11	Lack of Planning Officers	To obtain know-how of planning under the donor's guidance because there are not many officers who have enough knowledge and	To request donors' support for solid waste management	To request donors' support for solid waste management

	Issue	Policy to Settle	Target Actions in the Next Fiscal Year	Primary Action
		experiences of planning		
12	Lack of Methods to Reduce a Large Amount of Wastes	To examine how to reduce wastes all the time	To explain the necessity of waste reduction in community meetings To make leaflets for waste reduction	Director of Environmental Sanitation should direct to establish a committee for waste reduction, and start discussion in this committee. To search for the experiences and methods of waste reduction of other countries

4. Operation System

As the organization for waste management, JCC has Waste Management Department. In this department, there are two officers; Director and Deputy Director.

The implementation agency of the collection work is Block. Each Block collects wastes generated in their own area. And Blocks have officers in charge of waste management who direct vehicle allocation. Only for the large-volume dischargers, JCC directly collects wastes.

At present, JCC plans to centralize the collection work.

JCC has a workshop in the parking space for vehicle maintenance. They employ one mechanic person from a private company.

The final disposal site is in Rejaf Payam in Juba County, which means it is out of Juba City. Rejaf Payam collects the disposal fee from incoming vehicles for operation of the final disposal site. They allocate several staff for operation.

4.1 Staff in JCC

Table 3 shows the numbers of staff in JCC. The total number of staff in JCC is 377. There are two types of staff; namely “Classified Staff” and “Unclassified Staff”. The former is the staff seconded from the State Government, and the latter employed directly by JCC.

The staff is graded from 1 to 17; the grade 2 is the highest (the grade 1 is currently vacant.) The staff seconded from the State Government is classified in the grades from 2 to 14; on the other hand, the own employed staff in the grade from 10 to 17.

Table 3 Staff in JCC (tbc)

		Classified Staff														
	Department	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Sub Total
	Mayor' office Dept.				1			1		1			1		1	5
1	D/Mayor' office Dept.					1		1	1	1	1				1	6
2	Adm. & finance Dept..		1	2	1	3		5	3	4	4		2	11		36
3	Education Dept.			1	1	1		1	2	1						7
4	**Public Health**					**1**		**1**	**1**	**1**						**4**
5	Social Welfare								1	1			1	4		7
6	Cult.& Information					1		1		1			1		1	5
7	Veterinary Dept.								1	1			1	1		4
8	Public works Dept.					1				1	1		1		4	8
9	Agriculture Dept.					1					1				1	3
10	Forestry Dept.								1						4	5
	Grand Total															90

		Un-Classified Staff									Grand Total
	Department	10	11	12	13	14	15	16	17	Sub Total	
	Mayer' office Dept.		1	0	1	0	1	1		4	9
1	D/Mayer' office Dept.		1	0	1	0	1	1		4	10
2	Adm. & finance Dept..		3	0	107	0	5	4	1	120	156
3	Education Dept.			0	1	0	1	1		3	10
4	**Public Health**			**0**	**1**	**0**	**1**	**2**		**4**	**8**
5	Social Welfare			0	1	0	1	2		4	11
6	Cult.& Information		1	0	1	0		1	3	6	11
7	Veterinary Dept.			0		0		5	2	7	11
8	Public works Dept.		1	0	2	4	3			10	18
9	Agriculture Dept.		1	1	2	5	2			11	14
10	Forestry Dept.			0				3	8	11	16
	Grand Total									184	274

Note) Classified Staff: Seconded staff from the State Government, Unclassified Staff: Recruited staff by JCC

4.2 Staff in Charge of Waste Management

As the current waste management work, each Block collects wastes under the direction of JCC. Table 4 shows the list of staff in charge of waste management in JCC and Blocks. In JCC, Waste Management Department has two officers; Director and Deputy Director. Each Block has officers in charge of waste management.

Table 4 List of Staff in Charge of Waste Management in JCC and Blocks (tbc)

	Juba City Council			Juba Town Block			Kator Block			Munuki Block		
	Position	Name	G	Position	Name	G	Position	Name	G	Position	Name	G
1	Director	Juma Katanga	4	Dep. D		5	Senior Inspector	Alphonse Pitia	5	Senior Inspector	Geoffrend Ladu	5
2	Dep. D	Martin Manase	5	Zone D		5	Senior Inspector	Taban Henry	5	Dep. Inspector	James David	7
3				Zone D		5	Senior Inspector	Alfred Loro	5	Officer	Stephen Tako	9
4				Zone D		8	Senior Inspector	Crisensio Wari	7	Officer	Lubang David	9
5				Inspector	Khamis Wani	9	Inspector	Gammardin Mogga	8	Officer	Lina Issac	9
6				Inspector	Silvestro Peter	9	Inspector	Algelina Rizig	9	Officer	Afrah Zacaria	9
7				Inspector	Nassia Hassan	9	Senior Officer	Anthony Loku	9	Officer	Filba William	9
8				Inspector		9	Officer	Ramadan Andrea	9	Officer	Beatrace John	9
9				Assis. Officer		11	Officer	Eva William	9	Officer	Sarah Christopher	9
10				Assis. Officer		11	Assis. Officer	Luka Loro	10	Officer	Bettty Silimo	9
11				Assis. Officer		14	Assis. Officer	Alex Luate	10	Assis. Officer	Stephen Nyombu	12
12				Timekeeper		8	Assis. Officer	Benjamin Lemi	14	Assis. Officer	Ladu David	12
13							Assis. Officer	Rose Whyness	14	Assis. Officer	Michael Angelo	14
14										Assis. Officer	Simon Lomonga	14
15										Assis. Officer	James Ramadhan	12

4.3 Occupational Category of Staff engaging in Solid Waste Management Work

Table 5 shows the occupational category of staff engaging in solid waste management work in JCC and Payams. Total number of staff engaging in solid waste management work is 185 persons that correspond to 20% of the whole number of staff in JCC and Payams. The number of the part-time workers is 447 persons; this number will increase if includes field supervisor and road sweeper of Munuki Payam. Total number of collection worker is 302 that represent the remarkable high percentage, equaling to 70% of total staff engaging in solid waste management work.

Table 5 Occupational Category of Staff in Charge of Waste Management in JCC and Blocks (as of the end of Year 2012) (tbc)

Staff		JCC	Juba Town Block	Kator Block	Munuki Block	Total
Officer (manager)		2	5.8*	4.7*	4.1*	16.6*
Full-time worker	Driver	2	5	6	6	19
	Assistant	-	5	-	6	11
	Collection worker	-	52	-	40	92
	Road sweeper	-	-	36	10	46
	Sub total	2	62	42	62	168
Part-time worker	Supervisor	2	2	12	as necessary	16
	Collection worker	10	40	150	10	210
	Road sweeper	12	41	-	as necessary	53
	Sub total	24	83	162	10	279
Grand Total		26	145	204	72	447
(supplementary explanation)	Total of Collection worker	10	92	150	50	302
	Total of Road sweeper	12	41	36	10	99

Note) Full-time worker (8 hours/day) was counted as 1 person. Other types of workers were counted according to the working time.
Source) Result of questionnaire survey to JCC and Blocks by JICA Project (June 2013)

4.4 Workshop of JCC

JCC has the workshop. It is 3,500m^2 in area including an office, a workplace, a storehouse and garage as shown in Figure 2 and Figure 3. Incidentally, these facilities have been demolished, and the new facilities are now under the construction there.

Figure 2 Overview of Workshop Area

Figure 3 Garage for 10 Compactors

Currently 7 staffs are working for the workshop as presented in Table 6.

Table 6 Staff in Workshop of JCC

Administration	2 persons: 1 Manager, 1 Store Keeper
Engineering	4 persons: 1 Technician, 1 Supervisor, 1 Mechanic, 1 Assistant Mechanic
Security	1 person: 1 Security Guard

Source) JCC

However, the machinery, the equipment and the tool necessary for workshop are very poor quantitatively and qualitatively. The stock of spare-parts is a small quantity and only for simple maintenance. Accordingly, the breakdown vehicles cannot be repaired promptly. At present, 6 compactors are not in operation because of breakdown (springs, hydraulic pressure and gear).

5. Target Amount of Collection Waste

According to the incoming wastes into the final disposal site, the collection amount can be estimated as 150 ton/day with 47 vehicles (average value from October 2012 to October 2013). Table 7 shows the sharing ratio that Juba Town Block, Kator Block, Munuki Block and private collectors are 20%, 20%, 16% and 44% respectively. In case that the working days in a year is set as 300 days, the annual target amount of waste collection is calculated as 450,000 ton/year (= 150 ton/day x 300 days).

Table 7 Amount of Collection Wastes and Sharing Ratio

Period of Data Collection	Amount of Waste Collection	Sharing Ratio
From October 2012 to October 2013	47 vehicles/day 150 ton/day	Juba Town Block 20% Kator Block 20% Munuki Block 16% Private Collectors 44%

6. Collection and Transportation Work

6.1 Equipment for Collection Work

In June 2013, JICA Project implemented the questionnaire and interview survey on vehicle and staff for solid waste management work of JCC and Blocks. The results of the survey are described below.

6.1.1 Collection Vehicles

JCC has 10 compactors although all of them were second-handed. These compactors were purchased by JCC and Blocks jointly. At present, 2 units are allocated to JCC, 2 units to Juba Town Block, 3 units to Kator Block and 2 units to Munuki Block. Incidentally, 3 units of Kator Block have been out of order and kept waiting for repairing since August 2013 at the workshop garage. However, the date to fix them is unpredictable because of lack of spare parts.

Table 8 Compactors owned by JCC

Manufacturer	Chassis No.	Capacity	Year of Manufacture	Year of Purchase	Amount of Purchase
Mercedes	K535044	$25m^3$	2001	2012/8	US$ 78,263 /compactor including freight
	K537043		2001		
	K392171		1999		
	K707737		2002?		
	K528453		2001		
	K450313		2000		
	K707448		2002		
	K420698		1999		
Man	L030118		2002		
	M223807		1997		
10 compactors in total (JCC: 2 units, Juba Town Block 2 units, Kator Block: 3units, Munuki Block 2 units)			Total Amount: US$ 782,630		

Source) Questionnaire survey to JCC and 3 Blocks done in June of 2013

Other vehicles are actually operating but aged. 6 tractors and 20 containers were granted by USAID in 2007. However, most of containers have been unused and kept at the garage in the workshop of JCC.

Table 9 Other Vehicles

Owned by	Nos.	Manufacturer	Capacity	Year of Manufacture	Year of Purchase	Amount of Purchase
Tipper Truck						
Juba Town Block	1	Isuzu	$8m^3$	n/a	n/a	n/a
Kator Block	2	Isuzu				
	1	Fuso				
Munuki Block	1	Isuzu			2007	
Total	5					
Compressed-Type Compactor						
Juba Town Block	1	Nissan Diesel	$14m^3$	n/a	2012	n/a
Munuki Block	1					
Total	2					
Tractor						
Juba Block	2	Massey Ferguson	-	2007	Granted by USAID in 2007	n/a
Kator Block	2					
Munuki Block	2					
Total	6					
Container						
Juba City Council and 3 Blocks	20	Stored in the garage of Workshop	$5\ m^3$	2007	Granted by USAID in 2007	n/a

Source) Questionnaire survey to JCC and 3 Blocks done in June of 2013

Compactor

Pilot Project in Jebel Market

Pilot Project in Residential Area

Figure 4 Collection Work in Juba City

6.2 Collection Work

JCC and Blocks will continue the present collection work. Especially they will continue the new collection system, which is the station collection with the time schedule, in 4 residential areas and 2 markets. JICA Project supported the collection work of JCC and Blocks at the site by December 2013. Utilizing the knowledge and experiences through JICA Project, JCC and Blocks should try to keep the collection system.

Table 10 Collection Vehicle Allocation Plan (Market)

Market	Allocation			Mon	Tue	Wed	Thu	Fri	Sat
Jebel Market	Kator Block		Type	Compactor	Compactor	Compactor	Compactor	Compactor	Compactor
			Unit	1 unit	1 unit	1 unit	1 unit	1 unit	1 unit
Juba Town Market	Juba Town Block	Point 1	Type	Open truck		Open truck		Open truck	
			Unit	1 unit		1 unit		1 unit	
		Point 2	Type	Compactor		Compactor		Compactor	
			Unit	1 unit		1 unit		1 unit	

Table 11Collection Vehicle Allocation Plan (Residential Areas)

Payam	Target Area	Allocation	Mon	Tue	Wed	Thu	Fri	Sat
Kator Block	Atlaraba B	By Block						Compactor 1 unit
	Atlaraba C	By Block						Compactor 1 unit
Juba Town Block	Hai Thoura	By Block		Compactor 1 unit				
	Lobulet Bridge	By Block				Open Truck 1 unit		
Munuki Block	Gudele Block 8	By Block				Compactor 1 unit		

6.3 Collection Work along Main Streets and for Large-Volume Dischargers

6.3.1 Collection Work along Main Streets

Table 12 shows the collection work along the main streets in Juba City.

Table 12 Collection Work along Main Streets

Street name, street points	Collection information (collection frequency, collection vehicles)
Airport road	Daily, compactor
Juba Ministry road	Daily, compactor
Juba University road (Melekia- Juba University)	Daily, tipper
Gudele road (- Doha)	Daily, compactor
Custom - Rock City road	Daily, tipper
Juba bridge - Konyokonyo road	Daily, tipper
Tombura road – Konyokonyo	Daily, tipper
High Cinema road	Daily, compactor
Mobil - UNDP	Daily, compactor
Hi Thoura - Police/KCB	Daily, compactor
Airport - Mudria- Mobil	Daily, compactor

6.3.2 Collection Work for Large-Volume Dischargers

JCC started the collection work for large-volume dischargers, such as restaurants and hotels, under the contract with each discharger. JCC needs to expand this collection work as shown in Table 13.

Table 13 Collection Plan for Large-Volume Dischargers

No	Hotels and restaurants name	Contact price	Contract date	Collection frequency
1	New Sudan	4,000 SSP	14/06/2013	Twice a week
2	Keren Hotel	3,200 SSP	03/05/2013	Twice a week
3	Concord H	2,000 SSP	24/05/2013	Twice a week
4	Afex River	3,000 SSP	01/05/2013	Twice a week
5	Rock Shiel	2,000 SSP	01/06/2013	Twice a week
6	Habesh H	2,000 SSP	01/05/2013	Twice a week
7	Oasis Camp H	2,000 SSP	25/05/2013	Twice a week
8	Dembesh H	4,000 SSP	29/04/2013	Twice a week
9	Nile Comfort	2,000 SSP	23/04/2013	Twice a week
10	White Nile	2,000 SSP	01/05/2013	Twice a week
11	Nile Beach	3,200 SSP	01/05/2013	Twice a week
12	Wood Land	1,200 SSP	01/05/2013	Twice a week
13	Quality Hotel	4,000 SSP	01/05/2013	Twice a week
14	New York Hotel	4,000 SSP	01/05/2013	Twice a week
15	Juba Grand	4,000 SSP	01/05/2013	Twice a week
16	Star Hotel	4,000 SSP	01/05/2013	Twice a week
17	Transit H	2,000 SSP	01/09/2013	Twice a week
18	Summer H	2,000 SSP	14/06/2013	Twice a week
19	Queen of Shebba	2,000 SSP	01/05/2013	Twice a week
20	River Nile	2,000 SSP	01/09/2013	Twice a week
21	Hamza Inn	2,000 SSP	14/06/2013	Twice a week
22	Notos Bar	1,500 SSP	01/05/2013	Twice a week
23	Sahara Hotel	3,200 SSP	01/05/2013	Twice a week
24	Sabbah Hospital	1,000 SSP	01/06/2013	Twice a week
25	Intra Africa	2,000 SSP	22/04/2013	Twice a week
26	Royal Garden	2,000 SSP	22/04/2013	Twice a week
27	Nile Industries	4,000 SSP	22/04/2013	Twice a week
28	Juba Bridge	4,000 SSP	22/04/2013	Twice a week
29	Da Vinci	2,000 SSP	18/04/2013	Twice a week
30	Heritage	2,000 SSP	22/04/2013	Twice a week
31	Blue Gold	1,000 SSP	22/04/2013	Twice a week
32	Amas H/ restaurant	1,000 SSP	22/04/2013	Twice a week
33	Heron Hotel	2,000 SSP	22/04/2013	Twice a week
34	John Sam R	1,000 SSP	17/07/2013	Twice a week
35	Muki Hotel	1,000 SSP	17/07/2013	Twice a week
36	Juba Raha	2,000 SSP	14/06/2013	Twice a week
37	Mesgana G-H	1,200 SSP	01/05/2013	Twice a week
38	Kush Hotel	2,000 SSP	22/04/2013	Twice a week
39	Sun Shine	750 SSP	22/04/2013	Twice a week
40	Toronto	750 SSP	22/04/2013	Twice a week
41	Chele Restaurant	500 SSP	22/04/2013	Twice a week
42	Ghurmay Restaurant	1,000 SSP	22/04/2013	Twice a week
43	Kush -B-R	1,000 SSP	22/04/2013	Twice a week

44	Bedouw H	2,000 SSP	01/06/2013	Twice a week
45	All Saints	1,000 SSP	01/09/2013	Twice a week
46	Hanibal Hotel	1,000 SSP	N/A	Twice a week
47	JICA Guest House	200 SSP	N/A	Twice a week
48	M. of Petroleum House	200 SSP	10/05/2013	Twice a week
49	M. of Justice H.	200 SSP	17/07/2013	Twice a week
50	Traffic Police	1,000 SSP	30/10/2013	Twice a week
51	M. of Info H.	200 SSP	N/A	Twice a week
52	Jennys Palace	500 SSP	N/A	Twice a week
53	Juba Airport	6,000 SSP	01/05/2013	Twice a week
54	Wild Life International Government	1,500 SSP	30/01/2014	Twice a week
55	Vice President House	500 SSP	30/11/2013	Twice a week
56	Hon. Juma Nunu House	500 SSP	01/06/2014	Twice a week

7. Operation of Final Disposal Site

7.1 Operation and Maintenance of Final Disposal Site

7.1.1 Organization for Operation and Maintenance of Final Disposal Site

The organization for operation and maintenance (hereinafter referred to as "O&M") of the final disposal site (Juba County Controlled Dumping Site) was led by the Commissioner of Juba County and established in October 2012. After the establishment, the number of members was increased and the role demarcation was clarified step by step, and finally the organization was ready to implement appropriate O&M as shown in Figure 5.

The improvement points from 2012 are as follows;

- Rejaf Payam hired all staff for operation.
- Deputy Director of Rejaf Payam inducted as Deputy Director and took charge of fee collection by private vehicles.
- Mr. Towongo was appointed as a landfill manager.
- Rejaf Payam hired an operator for the bulldozer.

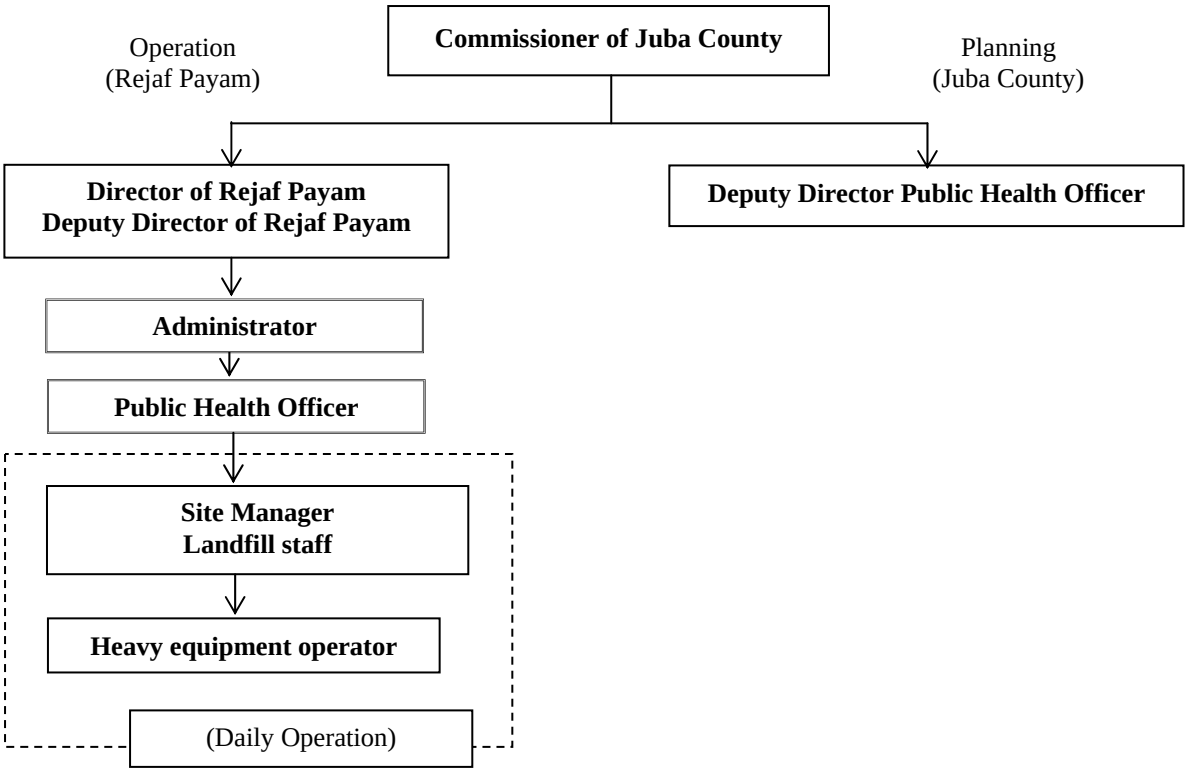

Figure 5 Organization for O&M of Juba County Controlled Dumping Site

7.1.2 Collection of Disposal Fee for O&M

1) Collection of Disposal Fee

Rejaf Payam has collects the disposal fee for O&M in order to secure the O&M cost since July 2013. Large vehicles should pay 50 SSP and small vehicles should pay 25 SSP.

The total collected fee from vehicles ordered by public agencies, such as Blocks, from July 2013 to May 2014 was 184,775 SSP. Its monthly average was 19,473 SSP/month.

The amount of collected fee from vehicles ordered by private agencies was not clear. It is because such vehicles should pay at the check point, and officers at the check point collected not only disposal fee for O&M for Juba County Controlled Dumping Site, but also other fees, such as material transportation. From now on, Deputy Director of Rejaf Payam prepares solutions for this matter.

2) Operation Cost

In order to operate the bulldozer newly procured by JICA from August 2013, Rejaf Payam started calculation of the O&M cost. As shown in Table 14, the average O&M cost for 3 months (from August to October 2013) was calculated as 38,300 SSP/month. For example, the detailed calculation result in August is shown as follows;

1.	Fuel for Bulldozer	: 13,500 SSP	(2,250 L/month x 6 SSP/L)
2.	Salary for landfill staff	: 3,120 SSP	(Operator, Manager, Staff x 2 persons)
3.	Rental fee of equipment for soil covering	: 15,120 SSP	(7,560 SSP/time x 2 times)
Total		31,740 SSP	

Table 14 O&M Cost for Juba County Controlled Dumping Site (from August to October 2013)

Item	August	September	October	Average
Fuel for bulldozer	13,500	18,000	19,200	16,900
Salary for landfill staff	3,120	5,120	5,120	4,450
Rental fee of equipment for soil covering	15,120	15,120	15,120	15,120
Maintenance of bulldozer	4,500	0	1,000	1,830
Total	36,240	38,240	40,440	38,300

3) Comparison between Collected Disposal Fee and O&M Cost

The average collected disposal fee from vehicles ordered by public agencies, which is 19,473 SSP/month, is smaller than calculated O&M cost as 38,300 SSP. If the collected fee is calculated with the data of average number of incoming vehicles, the income from all incoming vehicles will be 44,850 SSP (= 46 vehicles/day x 37.5 SSP/vehicle (average of large and small vehicles) x 26 days), and will be bigger than O&M cost. Therefore, O&M cost can be covered by fee collection from incoming vehicles if Rejaf Payam collects fees from all incoming vehicles.

8. Budget

8.1 Whole Budgets of JCC and Blocks

Table 15 shows the financial year 2013/14 budgets of JCC, Juba Town Block, Kator Block and Munuki Block.

The expenditures totaled up to 59 million SSP, among which the personnel expenditure was the biggest and its proposition reached at 30%. It should be noted that the capital spending on the construction of new office building was remarkable in this financial year budget (7.8 million SSP).

The revenue composed of the own revenues and the grant from the State Government. The own revenue of JCC is raised from such income as various permits, business license fee, vehicle license fee and certificate issue fee. On the other hand, the 3 Blocks generate the own revenues from income such as rent of property, market plot license fee and property tax. Incidentally, the grant from the State Government is allocated only to JCC.

According to the "Local Government Act, 2009", every local government should submit the budget request to the legislative council by the end of June; however, the 2012/13 budget of JCC was approved in the beginning of November 2012. Meanwhile, the 2013/14 budget of the JCC is on the process of finalizing as of end September

Table 15 Budget of Financial Year 2013/2014 in JCC and Blocks

Unit: 1,000 SSP

Budget Item			JCC	Juba Town Block	Kator Block	Munuki Block	Total
Revenue	Own Revenue		12,108	6,888	6,748	6,822	32,566
	State Government Grant		977	-	-	-	977
	Total		13,085	6,888	6,748	6,822	33,543
Expenditure	Recurrent	Personnel	2,761	2,015	2,281	2,144	9,201
		Repair & Maintenance	200	200	330	500	1,230
		Fuel	600	475	350	550	1,975
		Vehicle Rent	42	20	90	-	152
		Other Misc.	3,018	1,135	2,120	1,510	7,783
		Total	6,621	3,845	5,171	4,704	20,341
	Capital	Construction of Office	4,000	1,607	699	1,500	7,806
		Other Misc.	1,269	1,436	878	618	4,228
		Total	5,269	3,043	1,577	2,118	12,007
	Legislative Council		1,195	-	-	-	1,195
	Grand Total		13,085	6,888	6,748	6,822	33,543

Source) Budget Report of Financial Year 2012/2013 of JCC and 3 Blocks

Table 16 Budget Category and Amount in each Category of Financial Year 2012/2013

Code	Category	Amount [SSP]
21	Wages and salaries	
211	Wages and salaries	1,941,957
212	Incentives and overtimes	300,000
213	Pension contribution	506,000
214	Social benefit	13,976
	Sub total	2,761,933
22	Use of good and services	
221	Travel	170,000
222	Staff training anf itherstaff cost	163,000
223	Constructed services	1,186,000
224	Repairs and mainrtemance	485,000
225	Utilitoes and communications	81,680
226	Supplies tools and materials	1,249,600
227	Other operation expence	404,492
228	oil production cost	0
	Sub total	3,739,772
23	Transfers	
231	Transfer conditional saralies	0
232	Transfers capital	0
234	Transfers other oil	0
235	Transfers international organization	0
236	Transfer to service delivery unit	0
24	Other expenditure	
241	Interest	0
242	Subsidies	0
243	Grants and Loans to Bussiness	60,000
244	Social assistance benefit	60,000
	Sub total	120,000
28	Capital Expenditure	
281	Infrastructure and land	4,055,000
282	Vehicles	936,000
283	Specialized equipment	277,615
	Sub total	5,268,615
	Grand total	11,890,320

8.2 Expenditures on Solid Waste Management Work

Table 17 shows the expenditures on the solid waste management work which JCC and Blocks spent in the financial year of 2011/2012. These expenditures are compared with the total recurrent expenditures of the 2012/2013 budget of JCC and 3 Blocks respectively because the 2011/2012 budgets were un-obtainable. The comparison revealed that 4% for JCC, 10% for Juba Town Block, 50% for Kator Block and 13% for Munuki Block. It is obvious that Kator Block spent the biggest amount on the solid waste management work among JCC and 3 Blocks.

Table 17 Expenditure on Solid Waste Management Work by JCC and Blocks (Financial Year of 2011/2012)

Unit: 1,000 SSP

Item of Expenditure	JCC	Juba Town Block	Kator Block	Munuki Block	Total
1. Fuel	90	240	880	140	1,350
2. Repair and Maintenance	150	100	700	90	1,040
3. Rent (Collection Vehicle)	-	30	700	340	1,070
4. Cleaning Materials (Broom, Bucket, etc.)	20	30	230	40	320
Total	260	400	2,510	610	3,780

Source) Questionnaire survey to JCC and 3 Blocks (June of 2013)

9. Regulation Related to Solid Waste Management (draft)

JCC should implement their routine works and start examination of a regulation for solid waste management simultaneously. Detailed contents should be examined after the solid waste management work of JCC is on track. Table 18 shows the draft of Solid Waste Management Ordinance.

Table 18 Solid Waste Management Ordinance and Rules (First Draft)

Solid waste management ordinance (draft)		Rules and remark
Chapter 1	**Objectives and limitations**	-
1.1 Objectives	(1) Protect public health, prevent public nuisances and contamination of air, soil surface water, groundwater and other environment through control and proper treatment of solid waste	-
	(2) Assure that all individuals are both informed and responsible for their actions regarding solid waste	-
	(3) Support activities that will promote 3Rs	-
	(4) Impose penalties and fines concerning illegal disposal activities	-
	(5) Augment, supplement and support the existing South Sudan controls pertaining to solid waste	
1.2 Limitations	(1) Applied only in Juba City	-
	(2) Applied for the solid waste generated from houses (domestic waste), and shops & offices (commercial waste) in principle	-
	(3) Tentative measures for other waste to reduce risk on public health and environmental contamination	(1) Measures on following waste: Medical waste, Non-hazardous industrial waste
	(4) Exclude construction waste and hazardous waste (to be studied)	
1.3 Definition	● Type of waste (municipal waste, household, industrial, medical, non-hazardous and hazardous waste) ● Collection, Disposal, Control dumping, Generator of waste, Open burning	(1) Type of waste to be treated by Juba City (2) Type of waste to be studied
Chapter 2	**Proper treatment and disposal of solid waste**	
2.1 Target waste	(1) Juba City shall collect, transport and dispose domestic waste and commercial waste generated in JUBA CITY in principle	-
	(2) Juba City will take necessary tentative measures for other waste to reduce risk on public health and environmental contamination.	● Same as 1.2, (3)
2.2 Service area	(1) Solid waste management service is provided to all areas in Juba City according to their needs and their payment of fees.	-
2.3 Proper treatment and disposal	(1) Juba City is responsible to provide collection, transportation and proper disposal of domestic and commercial waste.	
	(2) Juba City may take tentative measures for other waste	● Tentative measures for specified waste mentioned in 1.2 (3)
	(3) Juba City should prepare necessary equipment and	

Solid waste management ordinance (draft)		Rules and remark
	facilities to implement proper treatment	
	(4) Juba City shall continue to study to improve its service of collection, treatment and disposal.	
Chapter 3	**Annual Plan**	
3.1 Annual solid waste management plan	(1) Annual solid waste management plan (collection, transportation and disposal) should be prepared and decided in Juba City Council meetings	(1) Contents of Annual solid waste management plan
3.2 Annual financial plan	(1) a. Annual Financial Plan (revenue and expenditure) should be discussed and decided in Juba City Council meeting and approved by Mayor. b. Annual financial plan should be submitted to mayor of Juba City Council.	(2) Contents of financial plan
Chapter 4	**Standard method**	
4.1 Collection & Transportation	(1) Collection from houses and shops: a. No primary collection by Juba City b. Standard service is twice a week	(1) Minimum service will be once a week
	(2) Collection from large amount discharger: a. Service will be provided according to his needs and the cost shall be covered by each discharger.	(2) Large waste amount discharger is the customer who requests and/or is provided a hauled container.
	(3) Juba City will not collect other waste in principle.	
4.2 Disposal	(1) Household & commercial waste shall be disposed at designated control landfill site	(1) Designated landfill site -Juba County Controlled Dumping site
	(2) Tentative measures for disposal of other waste will be taken by Juba City to reduce risk.	
Chapter 5	**Charge and obligation of Juba City Council**	
5.1 Charge for solid waste management service	(1) Charge is decided based on the cost to cover the solid waste management service including dumping fee	
	(2) Service charge is decided by Juba City and collected by Juba City every month.	
5.2 Charge for large amount discharger	(1) Charge for large amount discharger will be set to cover the cost for service requested by large amount discharger. (2) Payment will be based on the agreement between Juba City and large amount discharger	(1) Large amount discharger (delivered a hauled container)
	(3) Juba City will study on charge for medium and small scale business establishment.	
Chapter 6	**Monitoring of solid waste management service**	
6.1 Monitoring	(1) Juba City shall conduct daily monitoring of the solid waste management service and the operation of the disposal site	
6.2 Public inspection	(1) Blocks should monitor cleanliness of his area and service of Juba City. (2) Residents should monitor and communicate with their Blocks to create a consensus of their evaluation	
6.3 PR activities	(1) Juba City will conduct community meetings to communicate with the residents when requested by Blocks.	

Solid waste management ordinance (draft)		Rules and remark
	(2) Juba City will conduct PR activities to obtain cooperation and support from residents in Juba City.	
6.4 Opinion and claim	(1) Juba City accepts any comments and claim on solid waste management service provided by Juba City via Tel/Fax, website and by e-mail.	
Chapter 7	**Juba City organization and obligation of its staff**	
7.1 Operation of Juba City	(1) Juba City Solid Waste Department body is fully responsible to operate the Juba City.	
7.2 Structure of Juba City organization		(1) Job description of each Division
7.3 Recruit of staff		
7.4 Working day	(1) Solid waste management service is provided 6 days/week (excluding Sunday), approximately 310 day/year.	
	(2) Working hours are 8:00 to 17:30 in principle (8 hours /day).	
	(3) Collection of waste and disposal of waste starts at 9:00 to 17:00.	
	(4) Night shift will be considered for better service	
7.5 Insurance and welfare		

10. Responsibility Demarcation for Solid Waste Management Work

Table 19 shows the responsible demarcation for the solid waste management work.

Table 19 Responsibility Demarcation for Solid Waste Management Work

	Ministry of Environment	Juba City		Juba County	
		Juba City Council	Blocks	HQs	Rajaf Payam
1. Waste Collection					
● To set the fee price for collection service for residential areas/markets		◎			
● To collect fee for collection service from residential areas/ markets		◎			
● To collect fee for collection service from large waste amount dischargers		◎			
● To prepare waste collection plans		◎			
● To utilize allocated budget and implement collection works		◎			
● To maintain collection vehicles		◎	◎		
● To bear the cost of vehicle maintenance		◎			
● To raise public awareness and implement environmental education		◎	◎		
2. Final Disposal					
● To collect fees for final disposal					◎
● To pay fees for final disposal		◎			
● To prepare the operation plan for the existing dumping site				◎	◎
● To utilize allocated budget and implement disposal works at the existing dumping site				◎	
● To procure equipment					◎
● To maintain equipment				◎	
● To prepare the expansion plan					◎
3. Legal system					
● To prepare the national policy and laws	◎				
● To prepare the subsidy system	◎				