

**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**  
**Project Completion Report**

**November, 2014**

**Japan International Cooperation Agency  
(JICA)**

**Yachiyo Engineering Co., Ltd.**

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In this report the following exchange rates are applied (as of November, 2014)

Exchange Rate

SSP1 = JPY 37.477 (November, 2014)

**Project Activities No. 1 Waste Collection Improvement**

 A group of people gathered under a white tent at an outdoor market. A banner in the foreground reads "SOLID WASTE COLLECTION IMPROVEMENT PILOT PROJECT" with the JICA logo and mentions the "JUBA SOLID WASTE MANAGEMENT GROUP AND JUBA INTERNATIONAL COOPERATION AGENCY".	 A man in a white shirt is speaking to a group of people seated on the ground. A large red and blue bin is in the foreground.
<p>Community meeting for pilot project at Juba Town Market</p>	<p>Community meeting for pilot project at Juba Town Market</p>
 A group of people are seated on benches in a room with green walls, listening to a presentation.	 Workers in yellow shirts are collecting waste in a large open area. A truck is visible in the background.
<p>Review workshop at Jebel Market</p>	<p>Waste collection at Jebel Market</p>
 A group of people are seated on blue plastic chairs in an outdoor setting, engaged in a discussion.	 A group of people are gathered around a table, with a pink bin in the foreground. A banner is visible in the background.
<p>Community meeting for pre-discussion and distribution of bins (Gudele Block 8)</p>	<p>Community meeting for pre-discussion and distribution of bins (Atlabara)</p>

**Project Activities No. 2 Waste Collection Improvement**

	
<p>Installation of signboards at Jebel Market</p>	<p>Waste collection at Juba Town Market</p>
	
<p>Meeting with primary waste collectors at Jebel Market</p>	<p>Waste collection by compactors procured by Juba City Council (Atlabara)</p>
	
<p>Waste collection at Atlabara</p>	<p>Meeting with waste collection workers</p>

### Project Activities No. 3 Landfill Improvement

	
Landfill before the improvement	Landfill after the improvement
	
Opening ceremony for improved landfill	Opening ceremony for improved landfill
	
Newly constructed gates	Newly constructed administration office

### Project Activities No. 4 Landfill Improvement

	
Construction of dumping platform for rainy seasons	Construction of access roads for rainy seasons
	
Installation of gas vent pipes	Guidance of landfill operation
	
Construction work for landfill expansion	Guidance of landfill expansion work

### Project Activities No. 5 Landfill Improvement

	
<p>Handover ceremony for a bulldozer procured by JICA</p>	<p>Operation of a bulldozer</p>
	
<p>Cleanup activities at the landfill by waste pickers</p>	<p>Boring survey at the landfill</p>
	
<p>Environmental monitoring (Measurement of landfill gas)</p>	<p>Monitoring of landfill waste quality</p>

**Project Activities No. 6 Public Relations, Recycling**

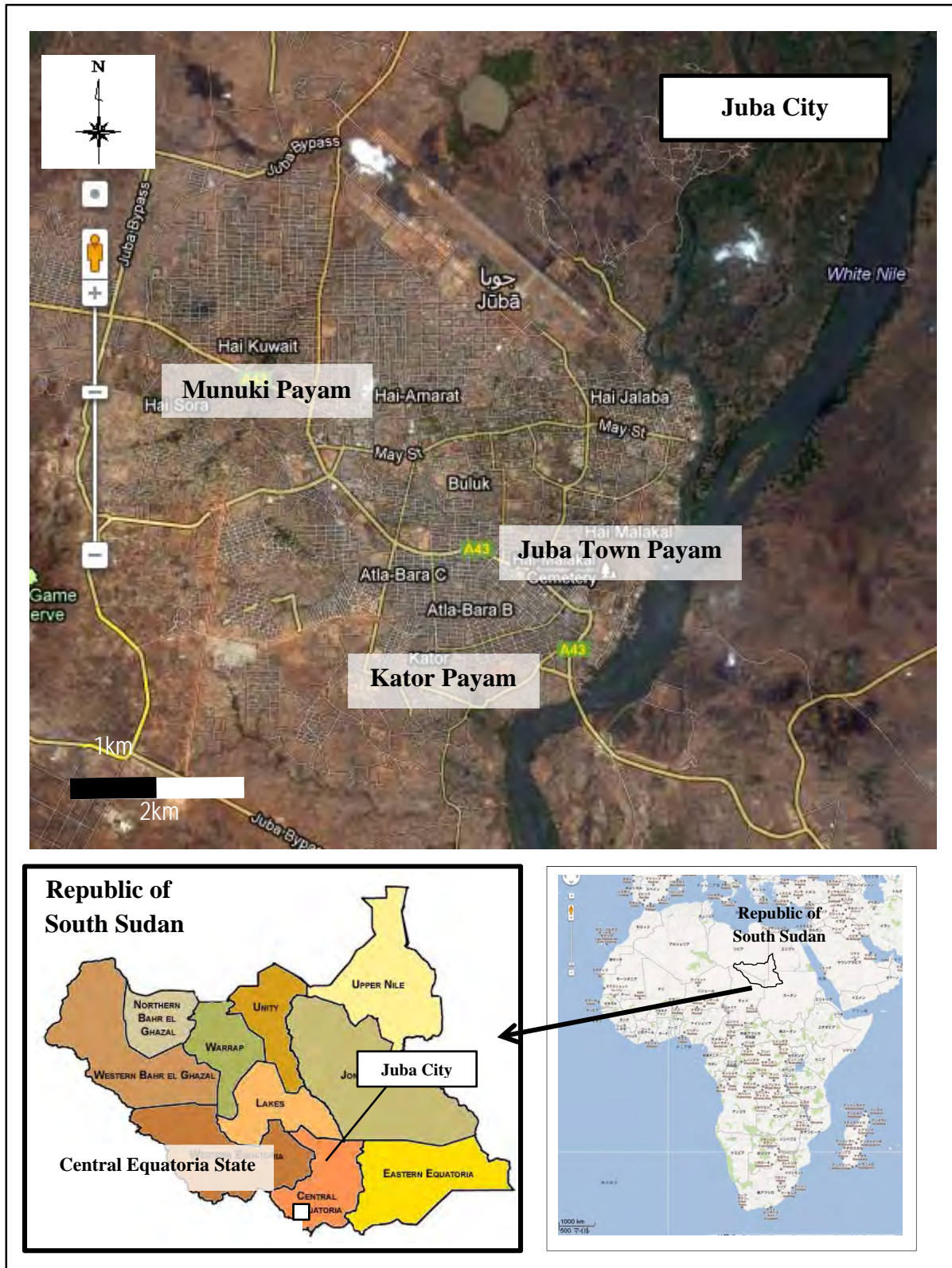
	
<p>Awarding of drawing contest</p>	<p>Site visit at residential waste collection through media tour</p>
	
<p>Site visit at landfill Through media tour</p>	<p>Participants of bus tour</p>
	
<p>Installation of a bulletin board at Kator Payam</p>	<p>Explanation of waste separation at Kator Payam</p>



**Project Activities No. 7 Others**

	
<p>1<sup>st</sup> JCC (May, 2012)</p>	<p>2<sup>nd</sup> JCC (November, 2012)</p>
	
<p>JCC at Uganda (April, 2014)</p>	<p>Juba Solid Waste management Group (May, 2012)</p>
	
<p>Waste amount and quality survey</p>	<p>Capacity assessment</p>

## Target Areas of This Project



# **Project for Capacity Development on Solid Waste management in Juba, Republic of South Sudan Project Completion Report**

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## List of Abbreviations

Abbreviations	English
CES	Central Equatoria State
C/P	Counterpart
cap.	capita
EIA	Environmental Impact Assessment
JCC	Joint Coordinating Committee
JFY	Japanese Fiscal Year
JICA	Japan International Cooperation Agency
JSWGM	Juba Solid Waste Management Group
M/M	Minutes of Meeting
M/P	Master Plan
MOU	Memorandum of Understanding
NGO	Non-Government Organization
O&M	Operation and Maintenance
PDM	Project Design Matrix
PO	Plan of Operation
QC	Quarter Council
R/D	Record of Discussion
RSS	Republic of South Sudan
SWM	Solid Waste Management
T&M	Time and Motion survey

## **Chapter 1 Introduction**

In July 2011, the Republic of South Sudan (“South Sudan”) became independent. In the country’s capital, Juba, the deteriorating urban sanitation environment, caused by issues such as rapid urbanization and economic growth and the fast-growing population, has been a matter of concern.

Solid waste management is highly important when making efforts to improve the city’s urban sanitary environment. However, in Juba (both in Juba City and Juba County), there were no established systems for waste disposal and waste collection. Except for some businesses such as markets and hotels, waste was not collected on a regular basis. As a result, solid waste was dumped illegally all around the city and the population’s risk of being affected by illness including infectious diseases has been increasing. In addition, in the existing solid waste landfill located 13km away from the center of Juba City (composed of 3 districts of Juba Town, Kator and Munuki), waste was dumped in this non-access controlled open site, with an excavated hole, and this could have a negative influence on the surrounding environment. Since transportation of waste also was not managed appropriately, there was another problem in that solid waste was dumped along the access road to the landfill site. Furthermore, no particular plans had been made to improve the present situation. Reflecting on these circumstances, it was an urgent matter to strengthen the capacity to solve these issues of the Ministry of Environment responsible for solid waste-related measures and plans and of the Juba City Council responsible for solid waste management.

Based on the above background and in response to the request of South Sudan, the Japan International Cooperation Agency (“JICA”) reached an agreement with South Sudan by signing a Record of Discussions (“R/D”) in July 2011 to offer assistance for 3 years for capacity development on solid waste management in Juba.

In this Project, JICA supported pilot projects such as waste collection at market/residential areas and landfill operation/management with the Ministry of Environment and Juba City Council. Moreover, laws, plans and activities related to waste management were reviewed; establishment of a waste management association was supported; and, a waste management plan was prepared. Through this project, the capacity on environmental management in all the areas mentioned above was improved.

In the first year of this Project (October, 2011- March, 2013), several basic surveys related to waste management were implemented. Since July 2012, the waste collection pilot project for the market was implemented in Jebel Market, Kator Payam, and the waste collection pilot project for the residential area was implemented in Kator Payam. Since October 2012, the waste collection pilot project for residential area was implemented in Juba Town Payam and Munuki Payam. And compactors which Juba City Council procured were utilized for these collection pilot projects. For final disposal, around

25ha was secured in Juba County for the dumping site. The fence (total length: around 2,000m), the gate and the control building were constructed for this site. This site has been managed as the controlled dumping site.

In the second year of this Project (April, 2013 -October, 2014), the waste collection pilot project for the market was implemented in Juba Town Market, Juba Town Payam since July 2013. And Juba City Council made contracts with the large amount dischargers and started to provide the waste collection service by their own efforts. In order to dispose wastes smoothly in the rainy season, the dumping platform was constructed in the dumping site, Juba County. Also the new bulldozer was procured and donated by JICA for operation and maintenance of this dumping site. South Sudan side has operated this new bulldozer with their budget. And the geological and groundwater surveys around the dumping site were implemented, and the design how to expand the disposal areas in the site was prepared. The survey for organization and finance of waste management was started and JICA Expert Team support to realize the idea of Juba City Council to establish a new public company for waste management. One of the awareness raising and PR activities, periodical bus tour was implemented. Here, the waste management in Juba is being rapidly expanded.

However, because of the security issues according to political conflicts, the project had no other choice but to stop on-site operation by Japanese expert team. In consultation with the stakeholders, the project was switched into remote operation through the monitoring of counterparts (“C/P”) and guidance by Japanese expert team. Even though it was remote operation, the efforts to make the project sustainable was made.

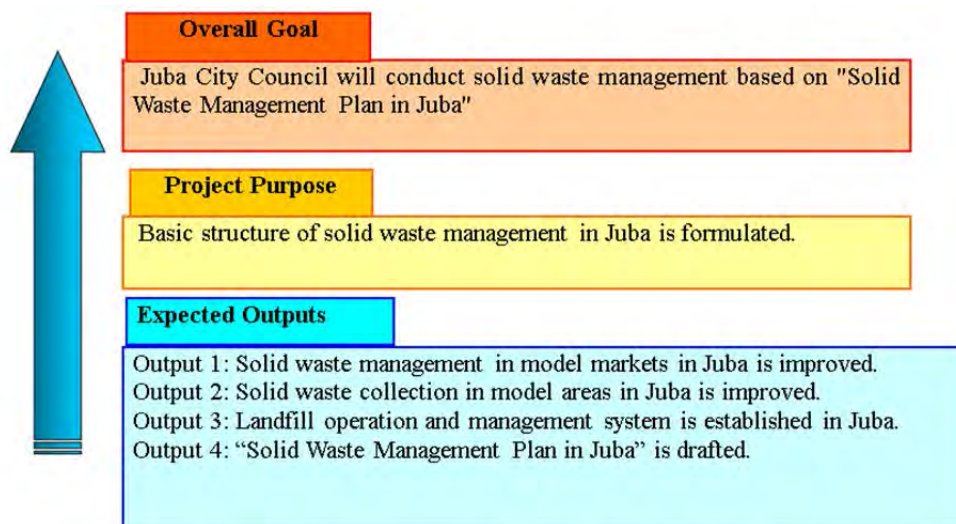
In October, 2014, the preparatory meeting of Joint Coordination Committee (“JCC”) was held in the Republic of Uganda (“Uganda”). During the preparatory meeting, the outputs such as solid waste management plan were prepared, and the project outputs were presented in the last JCC.

## Chapter 2 Profile of the Project

### 2.1 Project Outline

As the project outline, the overall goal, project purpose and outputs, which are indicated in the Project Design Matrix (“PDM”), are shown in Figure 2-1.

There are 4 project outputs: Waste collection improvement at markets (Output 1), Waste collection improvement (Output 2), Existing landfill improvement (Output 3), Preparation of Waste management plan reflecting Output 1-3 (Output4).

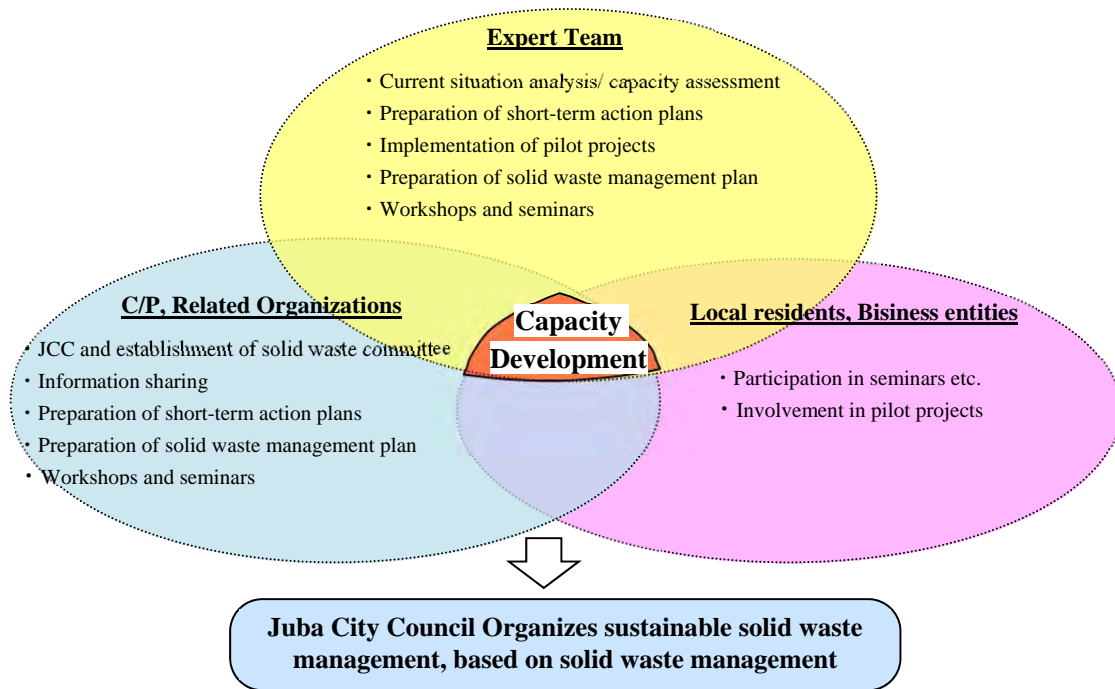


**Figure 2-1 Project Framework**

In this project, the current situation of waste management in Juba was grasped, analyzed and examined, after which and the urgency and importance of the issues was examined, and accordingly plans for pilot projects was prepared in order to solve these issues. Based on these plans and experiences gained during the implementation, a waste management plan was drafted. In addition, for the sustainable management of this plan by the South Sudan side, the trainings were carried out, and OJT (On the Job Training) was essential, which was also expected by the South Sudan side. In the instructions, advice and technical transfer during pilot projects, the work was done in a collaborative manner in order to enable the C/Ps to obtain the capacity to implement sustainable waste management by themselves by the end of this project. Bearing this in mind, technical transfer in pilot projects was implemented not only for “during the project”, but also “after the project”, for sustainable management.

The overall goal was that Juba City Council implements waste management in a sustainable manner based on a waste management plan. Therefore, as is shown in Figure 2-2, this project provided

suggestions to the South Sudan side and helped them to implement sustainable waste management by themselves after the project completion. In addition, during the process of implementation, activities such as PR, education and seminars/workshops were held for related agencies including C/Ps, local people, and business owners. These activities spread awareness on waste management improvement for all the stakeholders such as administrative officers, local people and business owners.



**Figure 2-2 Project Direction**

The latest PDM, approved by JCC in June, 2013, is shown in Table 2-1.

**Table 2-1 Latest version of PDM (PDM version 3)**

Project Name: the Project for Capacity Development on Solid Waste Management in Juba  
 Duration of the Project: 3 years (tentatively 2011 Oct to 2014 Sep)  
 Target Group: Juba City Council, Ministry of Environment

Target Area: Juba City

<b>Narrative Summary</b>	<b>Objectively Verifiable Indicators</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
<b>Overall Goal</b>			
Juba City Council will conduct solid waste management based on the "Solid Waste Management Plan in Juba"	At least 10% of the projects on the "Solid Waste Management Plan in Juba" will be implemented.	Juba solid waste management report	1. Juba city will continuously secure the necessary budget for solid waste management.
<b>Project Purpose</b>			
Basic structure of solid waste management in Juba is formulated.	Result of capacity assessment for C/P staff is improved.	Questionnaire survey at the beginning and the end of the Project. Periodic cleaning service is continuously implemented.	1. Administration system in Juba won't be changed drastically.
<b>Outputs</b>			
1. Solid waste management in model markets in Juba is improved.	Satisfaction of the stakeholders in model markets is improved.	Questionnaire survey at the beginning and the end of the Project.	1. C/P organization will secure the necessary number of personnel (including their payment) and budget for the project.
2. Solid waste collection in model areas in Juba is improved.	Satisfaction of the stakeholders in model areas is improved.	Questionnaire survey at the beginning and the end of the Project.	
3. Fundamental landfill operation and management system is established in Juba.	Operation and management condition of the landfill is recorded constantly.	Landfill management report (the report prepared by the project)	
4. "Solid Waste Management Plan in Juba" is drafted by "Juba Solid Waste Management Group"	Draft of the "Solid Waste Management Plan in Juba City" is submitted to the Mayor.	Draft of the "Solid Waste Management Plan in Juba City"	

Activities	Input	External conditions		
1-1 To survey and identify the problems of solid waste management in markets 1-2 To design pilot activities for the market and select model markets 1-3 To implement and monitor pilot activities 1-4 To summarize reports of the results and main findings of pilot activities 1-5 To survey and identify the problems of solid waste management in residential areas  2-1 To design pilot activities for the residential area and select model areas 2-2 To implement and monitor pilot activities 2-3 To summarize reports of the results and main findings of pilot activities	1. Japanese side (1) Dispatch of the Experts on the following expertise -Residents service (Waste) improvement' -Market waste management -Waste collection -Landfill operation and management  (2) Equipment for the related activities for the Project  (3) C/P training in Japan or third country			
3-1 To survey and identify existing problems in landfill sites 3-2 To design improvement plan for landfill management 3-3 To implement and monitor the plan designed in 3-2 3-4 To summarize reports of the results and main findings of the activities  4-1 To establish Juba Solid Waste Management Group which is managing pilot activities 4-2 To review legal systems and the administrative structure for solid waste management in South Sudan 4-3 To review the existing solid waste management plan in South Sudan 4-4 To prepare the draft of the "Solid Waste Management Plan in Juba" based on activity 1, 2, 3 and 4-1, 4-2 and 4-3 4-5 To hold workshops for discussing the draft prepared in 4-4	2. South Sudan side (1) Assign of counterpart personnel (C/Ps) (2) Facilities, equipment necessary for the project implementation (3) Meeting room (4) Office space for the Japanese experts (5) Other necessary expenses for the activities 1) Salaries and other allowance for government officials 2) Expenses for utility such as electricity, water supply, and gasoline 3) Operational expenses for customs clearance, storage and domestic transportation	<table border="1"> <thead> <tr> <th data-bbox="1632 703 2018 735">Pre-conditions</th> </tr> </thead> <tbody> <tr> <td data-bbox="1632 735 2018 1278">           1. Political conditions in South Sudan will be stable.            2. Landfill will be secured and available whenever C/P organizations need to use it.         </td> </tr> </tbody> </table>	Pre-conditions	1. Political conditions in South Sudan will be stable. 2. Landfill will be secured and available whenever C/P organizations need to use it.
Pre-conditions				
1. Political conditions in South Sudan will be stable. 2. Landfill will be secured and available whenever C/P organizations need to use it.				

## 2.2 History of the Project

As is mentioned in the Chapter 1, the on-site operation was stopped in December, 2013, because Japanese expert team could not operate the project in Juba. However, C/Ps continued the pilot projects by themselves. C/Ps allocated collection vehicles for waste collection pilot projects, and also kept on collection disposal fee at the dumping site, which was used for the fuel and rental fee for cover soil; they continued the activities, in spite of the reduction of total disposal fee amount.

Since February, 2014, two local project staff were hired again, who monitored the project activities. JCC was held in Uganda, and the progress and improvement of pilot projects were discussed. The contents of solid waste management plan were also explained.

In October, 2014, another JCC was held through telephone conference system. The project outputs were summarized and shared; the way forwards for the future solid waste management in Juba were discussed.

On-site operation was done from April, 2012- December, 2013, when the internal conflicts happened in South Sudan. During this period of on-site operation, the activities for output 1-3 were implemented and monitored such as collection improvement at markets and residential areas and landfill improvement. Even though the activities were temporally suspended after December, 2013, the activities were continued and monitored through the remote operation by Japanese expert team. In addition, a solid waste management plan was drafted. The project schedule is shown in Figure 2-3.

Fiscal Year	1st Year												2nd Year																							
	2012												2013												2014											
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
Colelction improvement at markets	← Preparation of pilot projects						Implementation/ Monitoring of pilot projects						Suspension of project activities	← Monitoring of pilot projects by remote operation																						
Colelction improvement at residential areas	← Preparation of pilot projects						Implementation/ Monitoring of pilot projects							← Monitoring of pilot projects by remote operation																						
Landfil improvement	← Preparation of pilot projects						Implementation/ Monitoring of pilot projects							← Monitoring of pilot projects by remote operation																						
Solid waste management plan (draft)														← Preparation of the plan																						

**Figure 2-3 Schedule of Project Implementation**

After the political conflicts, the waste collection was restarted, and the dumpsite operation was done properly. Even though the project period was shorts, both the governmental people and



residents understood the importance of the public service, and the positions of environmental health department manager and deputy manager were newly assigned.

The capacity development (“CD”) also has a certain level of impact. The activities which have significant effects were as follows:

- To promote comprehensive understanding of solid waste management
- To establish Juba Solid Waste Management Group (“JSWMG”) was established, and to discuss the issues repeatedly
- To learn waste collection work through the activities
- To provide the C/Ps with the opportunities to explain the people
- To create public opinions through the implementation of the project
- To learn the construction and maintenance of a landfill through the experiences
- To give the explanation of technical backgrounds
- To train the C/Ps to think about the future solid waste management in Juba
- To introduce solid waste management in other countries and to deepened the understanding of their level of solid waste management
- To learn the connection of solid waste management with the society

The history of the project activities is shown in Table 2-2.

**Table 2-2 History of Project Activities**

Date	Activities
2012/4/1	Departure of JICA expert team
2012/4/3	Arrival of JICA expert team
2012/4/4	JSWMG was started to be organized as a core project group, consisting of Juba City Council, each Payam and the landfill staff.
2012/4/5	The information on waste discharge in Juba was collected. Waste collection companies were interviewed, but the enough information was not collected.
2012/4/6	Some construction companies were interviewed, because there were no information on construction companies for topographic survey and landfill construction.
2012/4/10	Explanation for topographic survey was done.
2012/4/10	The meetings with the Commissioner of Juba County and Deputy City Mayor of Juba City Council were held and the outline of the project activities was explained.
2012/4/11	The meeting with the Minister of Environment was held, and the outline of project activities was explained.
2012/4/12	1 <sup>st</sup> JSWMG meeting
2012/4/13	The meetings with Ministry of Health and Ministry of Housing were held, and the outline of project activities was explained.
2012/4/17	2 <sup>nd</sup> JSWMG meeting

Date	Activities
2012/4/19	The meeting with UNEP to seek the collaboration.
2012/4/20	The bank account was opened.
2012/4/25	3 <sup>rd</sup> JSWGMG meeting (JSWGMG meetings were held every week)
2012/4/25	Capacity assessment was started to seek the possibility to implement waste management service even though there were no public service experiences, no organizations, no financial sources and no landfill in Juba.
2012/5/3	The introduction of pilot projects of fixed-time collection system was examined. The signboards to install at waste collection points were designed.
2012/5/3	1 <sup>st</sup> JCC was held, and the project outline was explained; however, the discussion was far from realistic, such as landfill gas utilization and recycling activities.
2012/5/15	The official letter was issued on the confirmation of landfill site (25 ha), based on the discussion on the agreement on 1 <sup>st</sup> JCC.
2012/5/17	The construction of temporal landfill site office was examined, which was also discussed during the JSWGMG meeting. C/Ps discussed how to use the office, even though it was still unrealistic.
2012/5/17	The subcontracting companies were examined for waste amount and quality survey.
2012/5/17	The locations of three signboards were decided to prevent illegal dumping at the landfill site.
2012/5/23	Three signboards were installed to prevent illegal dumping at the landfill site.
2012/5/25	Organizational capacity assessment for Ministry of Environment was done.
2012/5/30	The installation of temporary landfill office was completed.
2012/5/31	The meeting with Juba City Council (Mayor, Deputy City mayor) was held to discuss the collaboration with Ministry of Physical Infrastructure and the perspectives of solid waste management in Juba.
2012/6/19	The topographic drawing of the dumping site was completed.
2012/6/21	Signboards were made for waste collection points as a collection improvement pilot project.
2012/6/22	It was discussed to hire heavy equipment of the Ministry of Housing, Central Equatoria State, but the negotiation was not successful, and the project has to find another way for heavy equipment.
2012/6/25	The pilot project areas were decided: 900 shops at Jebel market and 100 households at Atlabara B & C respectively.
2012/6/25	The schedule of pilot project (community meetings with quarter councils, etc.) was agreed among Kator Payam and Jebel market office.
2012/6/27	Ministry of Environment requested the completion of EIA before the construction of landfill; however, the methodology of EIA was not officially decided.
2012/6/28	Recycling survey was done.
2012/6/29	The discussion on the EIA was done between JICA expert team and JICA.
2012/6/29	100 bins were procured for waste collection pilot project.
2012/6/29	The explanation to the Deputy Director of Kator Payam was done and agreed.
2012/6/30	The organization of project implementation was confirmed during the JSWGMG meeting. The members were allocated for the roles such as public relations and guidance of collection points.
2012/7/3	The discussion on EIA was done between Minister of Environment and JICA representative, but no conclusion was reached because there were no laws and legislations.
2012/7/3	The meeting with the head of Jebel market was held. The introduction of a pilot project was agreed, and the number of trips and collection points was decided.
2012/7/3	The meeting with Atlabara office, Kator Payam, was held to explain the pilot project outline.

Date	Activities
2012/7/4	EIA was prepared and submitted, according to the request of Ministry of Environment.
2012/7/4	The discussion with Philling Environment (private waste collection company) was done to negotiate hiring collection vehicles, which was not successful, because of the high price and lack of equipment.
2012/7/4	Community meetings were held at Atlabara B & C to start a pilot project.
2012/7/6	Time and motion survey was done in order to design waste collection system at markets and residential areas.
2012/7/9	The negotiation with a private company was done to hire dump trucks.
2012/7/10	Waste amount and composition survey was started.
2012/7/11	Community meetings were held at Jebel market (five times).
2012/7/16	The negotiation was done with the Philling Environment again, which was not successful.
2012/7/17	The Ministry of Environment informed that EIA was not necessary.
2012/7/18	The bins were distributed for waste discharge at markets and residential areas.
2012/7/19	Staff to implement pilot projects was hired at Jebel market: 10 cleaner, 1 instructor, 3 instructors to the residents, 1 head of cleaners.
2012/7/19	The contract of dump trucks was completed for waste collection.
2012/7/19	An article about the project was issued on a local newspaper (Juba Post).
2012/7/19	JSWGM members visited pilot project sites to understand collection methods.
2012/7/20	Clean up was done at the whole market before the launching of pilot projects.
2012/7/21	Waste collection improvement pilot projects were initiated at Jebel market and Atlabara B & C.
2012/7/26	Waste amount and composition survey and public awareness survey were started.
2012/8/1	JSWGM members, UNEP and local media (Citizens newspaper) visited collection areas and dumping site.
2012/8/1	Banners were attached to the dump trucks for waste collection improvement pilot project.
2012/8/7	Fee collection methods were discussed.
2012/8/9	Ministry of Infrastructure, Central Equatoria State, claimed that the landfill was not included in the State master plan, which was adjusted later.
2012/8/15	C/Ps requested to include the landfill into the State master plan.
2012/8/16	10 compactors procured by Juba City Council arrived at Mombasa, Kenya.
2012/8/18	Both JICA and Payam were supposed to allocate collection vehicles, but it was found that Kator Payam did not allocate them as scheduled, because of the breakdown of the vehicles. Juba City Council hired one mechanic, but he could not repair them because of the lack of spare parts.
2012/8/22	The mine was found in the landfill site, but it was found that the mine was fake.
2012/8/25	Review meeting was held at Atlabara B for collection improvement pilot projects.
2012/8/30	The project requested UN to research about the mines around the landfill site and to issue a letter of security. Then, the landfill improvement was restarted.
2012/9/3	The meeting with Deputy City Mayor was done to discuss a new solid waste management organization and pilot project activities.
2012/9/5	JICA headquarters visited the pilot project sites.
2012/9/13	The improvement of existing landfill site was started.
2012/9/20	The survey on disposal fee collection at the check point was done.
2012/9/21	The explanation on a picture contest was done.
2012/9/24	The meeting with Deputy Mayor was done to discuss project office space with Minutes of Understanding.

Date	Activities
2012/10/2	The construction of landfill administration office was started.
2012/10/3	Incoming vehicles survey at the landfill was started.
2012/10/13	JICA headquarters visited the project site (waste collection, landfill) for monitoring.
2012/10/15	The new waste collection rate was issued in Juba. The fee was raised a lot.
2012/10/26	The meeting with Directors was done to deepen the understanding of waste collection.
2012/10/26	The meeting with Juba City Council was done in order to collaborate with the cleanup campaign organized by Juba City.
2012/10/27	Ministry of Environment decided not to implement EIA. The controlled dumping site system was applied, because the contamination was not considered as serious according to the survey done by the project.
2012/10/28	The meeting with Juba City Council was held to explain the launching of waste collection pilot project in Munuki Payam and Juba Town Payam. 2 waste collection points were added (4 collection points in total).
2012/10/31	It was found out that primary waste collectors worked at the markets, who collected waste at shops and bring it to waste collection points. Primary waste collector survey was done in order to grasp the current collection system.
2012/10/31	Organizational structure was changed: the project leader became a chief advisor, and JICA long-term expert was integrated as a project team member in charge of public relations and recycling.
2012/11/7	Mapping of residential areas was done (the borders of administration areas were surveyed.).
2012/11/16	Each Payam adopted the same collection system introduced by JICA. Juba City Council organized a meeting at their office to explain the system; JICA experts were invited as lecturers.
2012/11/8	Third country training was prepared (The C/Ps of Sudan and South Sudan visited a project of Dhaka, Bangladesh)
2012/11/16	The waste collection at Hai Thoura and Gudele was started (4 collection areas in total).
2012/12/2	8 C/Ps went to Dhaka, Bangladesh for the third country training (-December 8 <sup>th</sup> ).
2012/11/9	Munuki Payam newly started waste collection: meeting with quarter councils leaders was held on November 3 <sup>rd</sup> ; signboards were installed at waste collection points on November 7 <sup>th</sup> .
2012/11/12	The awarding ceremony of a drawing contest was held; excellent works were issued on a calendar, which was distributed at C/Ps' organizations.
2012/11/12	JCC meeting
2012/11/22	Middle evaluation of individual capacity assessment was done.
2012/11/23	The embankment of landfill expansion area was constructed.
2012/11/20	The special bank account for disposal fee was open.
2012/11/29	1 <sup>st</sup> quarter council meeting was held.
2012/12/1	The Third Country training was held at Dhaka, Bangladesh (- December 9).
2012/12/6	Landfilling at an expansion area was commenced.
2012/12/8	Signboards at a landfill were installed.
2012/12/12	Reporting meeting at JICA South Sudan office was held on the Third Country training.
2012/12/20	Preparation of a training in Japan
2013/1/20	5 C/Ps joined the training in Japan (- January 30 <sup>th</sup> ).
2012/2/1	Japanese Self Defense Force visited waste collection sites and landfill.
2012/2/2	JICA headquarters visited waste collection sites and landfill.
2012/2/9	JICA road project team visited waste collection sites and landfill.

Date	Activities
2012/2/12	IEE authorization letter from Ministry of Environment was received.
2012/2/20	QC meetings were held. Reporting meeting at JICA South Sudan office was held on the training in Japan.
2012/2/21	Landfill expansion plan was confirmed for the coming construction work, after the discussion with Ministry of Environment.
2013/2/22	JICA road project team did regular cleanup activities at the No. 6 bridge to support this project and to avoid illegal dumping.
2013/2/25	Ms. Jina took up a new post of waste management in Juba City Council.
2013/3/12	Monitoring at No. 6 bridge was started, especially who had dumped waste illegally, and the installation of signboards was planned there.
2013/3/16	The number of JICA collection trucks was reduced at Jebel market, Kator Payam, because they had already allocated collection vehicles as scheduled.
2013/3/26	Construction of a new Kator payam office
2013/4/4	Project office was established at Kator Payam office. At first the Ministry of Environment was supposed to provide an office space, which was not unrealizable; Juba City Council also planned to provide an office at the main office of Juba City Council (the second floor), but the construction was not completed yet; CEOP of Juba City Council sent a letter of asking a rental fee (400,000 yen per month); Kator Payam director kindly offered a project team for an office space, and confirmed it in January, 2013.
2013/4/8	Rejaf payam director visited a landfill site, and recognized the importance of securing an enough fund for the continuous operation. It was agreed that waste pickers would not be gotten rid of from the landfill site.
2013/4/15	The meeting with quarter councils and Juba Town Payam was done, to explain about cleanup at Juba Nabari by Japanese Self Defense Force.
2013/4/15	The signboards were installed at Lobulet bridge to avoid illegal dumping, and waste collection was started there on April 18.
2013/4/16	The meeting with Japanese Self Defense Force was held about the cleanup at Juba Nabari.
2013/4/26	Visit at PET bottle recycling site conducted by NGO
2013/5/9	A group of Japanese governmental office in Juba visited a project site.
2013/5/15	1 <sup>st</sup> cleanup activities at Juba Nabari with the collaboration of Japanese Self Defense Force
2013/5/25	1 <sup>st</sup> preparatory meeting to establish a new solid waste management organization was held.
2013/5/30	The survey on fee collection at large-volume waste discharger (hotels), markets and residential areas was done. Juba City Council contracted with large-volume waste discharger and commenced fee collection. They also started regular fee collection at markets with new collection rate, and prepared for fee collection at certain areas of residential areas.
2013/5/30	Collection points at No.6 bridge were established, and regular collection was started (collaboration with JICA road project).
2013/5/30	The reasons why Munuki Payam could not allocate collection vehicles were surveyed; the breakdown is one of the reasons, so the hiring collection vehicles were taken as a countermeasure. The regular waste collection was restarted at Munuki Payam.
2013/6/3	Survey on groundwater quality at landfill was done
2013/6/4	JCC meeting was held.
2013/6/6	The 1 <sup>st</sup> bus tour was organized (10 bus tours were organized during this project.).
2013/6/6	The project activity report was submitted to Japan Society of Material Cycles and

Date	Activities
	Waste Management.
2013/7/13	The financial data was started to be collected.
2013/7/16	The construction of dumping platform for the rainy season was done at the dumpsite.
2013/7/17	JICA expert team requested the proper allocation of waste collection vehicles.
2013/7/18	The survey on maintenance of compactors and on the capacity assessment of recovering breakdown was done. 5 vehicles of 10 in total were not repaired.
2013/7/19	The 2 <sup>nd</sup> committee meeting of preparatory meeting was held.
2013/7/19	JICA procured a bulldozer.
2013/7/20	Capacity assessment for 2 <sup>nd</sup> year was done from the viewpoints of public service implementation.
2013/7/28	The 10 drivers of compactors were confirmed, but there were some issues of contract and health conditions. The maker, conditions and production year etc. of compactors were checked.
2013/7/28	The contract with public awareness survey at new collection areas was made.
2013/7/29	Soil investigation was done by a subcontracted company.
2013/7/31	The waste collection at Jebel market was started (three collection points). In sum, two markets and 4 residential areas were covered by the pilot project.
2013/8/2	The photo collection of the project activities was prepared.
2013/8/13	The big signboards were installed at 2 collection points.
2013/8/13	It was discussed how to recover once the collection was not done regularly. The recovery work was explained.
2013/8/13	The landfill expansion plan was designed; the layout was discussed.
2013/8/15	The presentation of the training in Japan was done at JICA South Sudan office.
2013/8/15	Waste collection at the activity areas of Japanese Self Defense Force was discussed.
2013/8/16	JICA expert team organized a study meeting with the theme of Juba solid waste management, targeting for Japanese experts from other projects.
2013/8/17	Permeability test was done by the borings at the dumpsite, and the geological profiles were prepared.
2013/8/18	The results of incoming vehicles at landfill were prepared.
2013/8/18	The landfill operation manual was prepared.
2013/8/30	Regular landfill cleanup activity by waste pickers was done.
2013/9/2	Geological and groundwater survey and water source survey were done at the dumpsite.
2013/9/17	The collection point No.3 at Juba market was moved, because of the rejection by residents.
2013/9/20	The waste minimization pilot project was started at Juba City Council and Kator Payam.
2013/9/24	1 <sup>st</sup> committee meeting to establish a new waste management organization was held.
2013/10/1	The Juba mayor was replaced in sudden with a new mayor.
2013/10/4	2 <sup>nd</sup> committee meeting to establish a new waste management organization was held.
2013/10/10	4 <sup>th</sup> bus tour was organized with the participation of Atlabara B & C.
2013/10/12	3 <sup>rd</sup> committee meeting to establish a new waste management organization was held.
2013/10/17	The meeting with Japanese Self Defense Force was held to discuss landfill expansion construction.
2013/10/21	Project booklet was prepared.
2013/10/23	The meeting with the Commissioner of Juba County was held to explain the construction of landfill expansion.

Date	Activities
2013/10/25	The meeting with a new City mayor was held to discuss the issues faced during the project and to request the collaboration.
2013/10/29	The survey of incoming vehicles at landfill was done.
2013/11/7	The discussion to implement landfill expansion was done with Japanese Self Defense Force.
2013/11/11	The meeting with a new City mayor was held to explain the breakdown of collection vehicles, fee collection, waste collection activities and landfill improvement.
2013/11/11	Project leaflets (3 types) were discussed.
2013/11/13	5 <sup>th</sup> bus tour was organized with the participation of Hai Thoura, Gudele Block 8 and media.
2013/11/15	The meeting with Japanese Self Defense Force was held to organize cleanup activities at Nabari area where they constructed roads.
2013/11/18	Public awareness survey at Nabari area was prepared.
2013/11/18	The opening ceremony of landfill expansion areas was held.
2013/11/20	The meeting with a media project was held to seek the collaboration for the records of project activities.
2013/11/22	Time and motion survey was done to grasp the whole status of waste collection.
2013/11/22	Community meetings were held to explain about the waste collection at Hai Thoura.
2013/11/27	The meeting to coordinate vehicles allocation between Juba City Council and each Payam was held, and the possibility of regular meetings was discussed.
2013/11/27	The meeting with the head of Juba City Council workshop was held to discuss the methods of repairing collection vehicles.
2013/11/27	Bulletin boards were installed at Juba City Council, Juba County and each payam for public relations of the project.
2013/12/6	The broken temporary office at the landfill was repaired.
2013/12/11	6 <sup>th</sup> bus tour was held with the participation of the stakeholder from Jebel market, Konyokonyo market and Libya market.
2013/12/23	JICA temporally withdrew from South Sudan because of the political conflicts.
2014/2/14	1 <sup>st</sup> meeting to report the monitoring results was held at JICA headquarters.
2014/1/20	The meeting with JICA headquarters to discuss the project directions: the activities monitored by remote operation from Japan, and two JCC meetings will be held in Uganda.
2014/2/21	2 <sup>nd</sup> meeting to report the monitoring results was held at JICA headquarters.
2014/3/7	3 <sup>rd</sup> meeting to report the monitoring results was held at JICA headquarters.
2014/4/3	Juba City Council gave a trial of waste collection centralization.
2014/4/25、	JCC meeting in Uganda
2014/5/28	Fixed-time collection system was introduced at Konyokonyo market.
2014/6/3	Juma Katanga was replaced with Jina for the head of Environmental Sanitation Department.
2014/7/17	JSWGM members discussed the JCC meeting results with Juba City mayor.
2014/7/24	The representative of JICA South Sudan had a discussion with Juba City mayor about the project directions.
2014/10/6-8	The preparatory meeting of JCC was held in Uganda.
2014/10/16	JCC meeting (telephone conference between South Sudan and Japan)

### 2.3 C/P

The implementation agencies of the partner's government for this project are shown in Table 2-3.

At the beginning of the project, the Ministry of Environment and Juba City Council were the project C/P. During the JCC in June, 2013, Juba County was added into C/P, which has jurisdiction over 13 Payams (Wards), where the landfill is located in Juba City, etc.

**Table 2-3 Implementation Agencies of Partner's Government**

1. C/P	Ministry of Environment (RSS: Republic of South Sudan), Juba City Council, Juba County
2. 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)
3. Beneficiaries (1) Direct Beneficiaries (2) Indirect Beneficiaries	Ministry of Environment (RSS), Juba City Council, Juba County Juba Citizens (Approximately 240,000 persons)

Juba Solid Waste Management Group forms the project implementation system and is composed of C/Ps and related agencies members. Membership and roles are indicated in Table 2-4.

**Table 2-4 Membership and roles**

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

In order to implement efficient and effective technical assistance under the project, support was given to the establishment of a joint coordination committee ("JCC") and for convening regular meetings. Generally, JCC met every 6 months; however the JCC held additional meetings to



discuss and confirm the following as the needs arise. The expected composition of JCC is shown in Table 2-5.

- To approve work plans for annual project implementation based on PO within the R/D framework
- To review the progress and achievement of the project as a whole (approval of the project progress report)
- To survey and take measures against major problems arising in relation to the project
- To approve the project completion report
- To revise PDM and PO as need arises

**Table 2-5 Structure of JCC**

Role	Members
Chairperson	Director General, Ministry of Environment
Members of the Southern Sudan side	Project Director, Project Manager, representative of the Ministry of Housing and Physical Planning, representative of the Ministry of Health, representative of the Ministry of Finance and Economic Planning, representative of Juba county government and other individuals appointed by the chairperson
Members of the Japanese side	Expert Team, JICA Southern Sudan Office, Chief Advisor and other individuals appointed by JICA

## 2.4 Waste Generation

### 2.4.1 Waste Quantity and Quality

#### (1) Survey Methodology

Waste quantity survey was implemented in 8 days from 26th July to 3rd August, 2012. The samples were randomly selected as 100 households in 2 model residential areas. Wastes from each household were collected and measured. Waste quality survey was implemented in 3 days from 6th August to 8th August, 2012. The samples were randomly selected as 20 households in 2 model residential areas. Wastes from all samples were mixed and about 5 kg wastes were extracted by the method of quartering. After measuring whole weights and volumes (wet-base), wastes were categorized into 14 items, and weight and volume of each item were measured.

#### (2) Unit Quantity of Waste

According to the survey results in the residential areas, the average daily waste generation from a household is 5.20 kg/household/day, the average number of residents in a household is 7.39 person/household, and **the average daily waste generation from a person is 0.70 kg/person/day.**

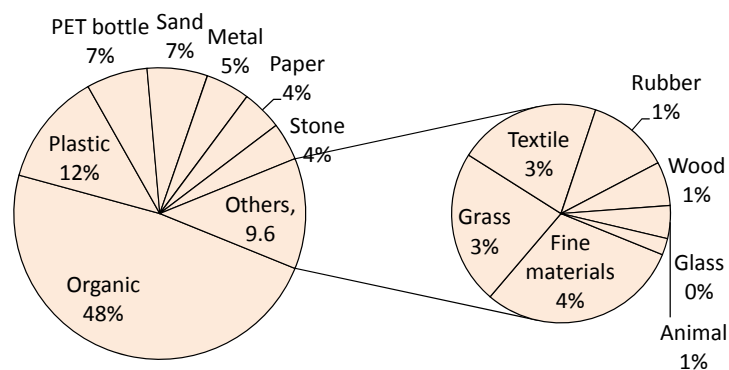
According to the survey results in 2010 by NGO, namely CESVI, the average daily waste generation from a person was 0.42 kg/person/day. The survey method by CESVI was not mentioned in their report, so it is difficult to compare to our result. Just by simple comparison, our result of the average daily waste generation from a person is 1.6 times as large as the result by CESVI. According to the report of World Bank (WHAT A WASTE, A Global Review of Solid Waste Management (2012)), the average waste generation in Africa is 0.65 kg/person/day. And the average waste generations in Lower Income and Lower Middle Income levels, which are almost same as the income level of South Sudan, are 0.65 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.

In case of the target market, the average daily waste generation from a shop is 6.56 kg/shop/day.

(3) Waste Quality

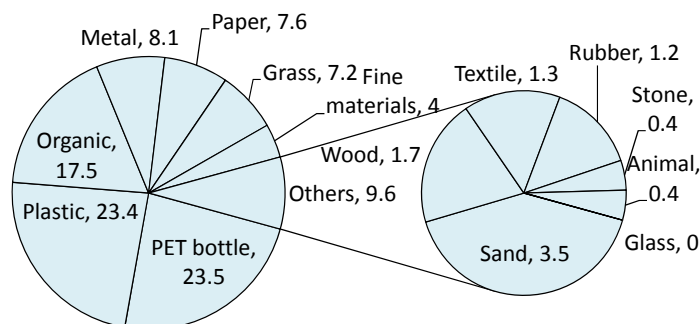
The weight and volume ratios of waste composition in the residential areas are shown in Figure 2-4 and Figure 2-5.

**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<sup>3</sup>. The waste characteristic can be reflected to this value that the number of bulky wastes is large.**



Unit: wt%

**Figure 2-4 Weight Ratio of Waste Composition in Residential Areas (wet-base)**



Unit: vol%

**Figure 2-5 Volume Ratio of Waste Composition in Residential Areas (wet-base)**

Table 2-6 shows the comparison between the result from the report of World Bank and our result. Regarding to the ratio of Organic, our result is between the results of Upper Middle and High

Income levels. However, **the ratio of Plastic is bigger than the result of High Income level.** According to our site survey, the amount of food wastes, such as left overs, were extremely large. For these characteristics, we can assume 2 main reasons. One reason is how to use supplies. In other developing countries, it is common that people use food and other supplies 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 hygiene reasons.** 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 2-6 Comparison between Waste Quality by World Bank and by this 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

The average weight and volume ratios of waste composition in the target market are summarized in the following table. Both in weight ratio and volume ratio, the ratios of Plastic, Paper and PET bottles occupied the majority, while the ratios of Organic, Plastic and PET bottles occupied the majority in residential areas. And the specific gravity was 0.06 ton/m<sup>3</sup>, which is larger than the specific gravity in the residential areas (0.10 ton/m<sup>3</sup>). It means that **the wastes from markets can be more bulky than those from residential areas.**

**Table 2-7 Weight and Volume Ratios of Waste Composition in Market (wet-base)**

Average	Weight	Weight %	Volume	Volume %	Specific Gravity
	[kg]	[weight %]	[cm <sup>3</sup> ]	[volume %]	[ton/m <sup>3</sup> ]
Paper	1.28	25.5	21,662	26.3	
Plastic	1.16	25.0	19,188	24.3	
PET bottle	0.66	13.8	24,282	30.9	
Organic	0.41	8.1	2,821	3.6	
Textile	0.25	4.9	3,629	4.3	
Animal	0.23	4.3	698	0.8	
Metal	0.23	4.5	5,977	6.6	
Glass	0.19	4.4	1,134	1.6	
Stone	0.16	3.7	229	0.3	
Sand	0.15	3.2	153	0.2	
Rubber	0.04	0.9	339	0.5	
Wood	0.02	0.4	86	0.1	
Grass	0.00	0.0	0	0.0	
Fine materials	0.06	1.4	274	0.4	
Total	4.83	100.0	80,472	100.0	0.06

### 2.3.2 Waste Generation Amount in Target Residential Areas

According to the survey results of interview with QCs in the first year of this Project, the population in each target area was estimated. Using the population growth rate of 2.052% reported in the 5th Sudan Population and Housing Census, 2008 (Statistical Yearbook for Southern Sudan 2010, Southern Sudan Centre for Census, Statistics and Evaluation), the target populations in 2012 and 2013 were estimated as shown in the following table.

**Table 2-8 Population Estimations in Target Residential Areas for 2012 and 2013**

Payam	QC	Population in 2012	Population in 2013
Juba Town Payam	Hai Thoura	3,000	3,062
Munuki Payam	Gudelle Block 8	10,000	10,205
Kator Payam	Atlabara B	1,500	1,531
Kator Payam	Atlabara C	1,229	1,254
Total		15,729	16,052

According to the survey results of waste quantity and quality in residential areas, the unit average daily waste generation from a person is 0.70 kg/person/day and the specific gravity is

0.10 ton/m<sup>3</sup> in the residential areas in Juba City. With these data, the daily waste generations from target residential areas in 2012 and 2013 were estimated as shown in the following table.

**Table 2-9 Estimation of Daily Waste Generated Amounts from Target Residential Areas in 2012 and 2013**

Payam	QC	Year 2012		Year 2013	
		[ton/day]	[m <sup>3</sup> /day]	[ton/day]	[m <sup>3</sup> /day]
Juba Town Payam	Hai Thoura	2.1	21.0	2.1	21.4
Munuki Payam	Gudelle Block 8	7.0	70.0	7.1	71.4
Kator Payam	Atlabara B	1.1	10.5	1.1	10.7
Kator Payam	Atlabara C	0.9	8.6	0.9	8.8
Total		11.0	110.1	11.2	112.4

### 2.3.2 Waste Generation Amount in Target Markets

The target market areas are Jebel Market and Juba Town Market. According to the interview survey in Jebel Market in the first year of the Project, the number of shops was around 900 shops. The precise number could not be confirmed in this Project. Therefore, the number of shops was estimated as 900 shops in Jebel Market under the assumption that the number of shops would not increase. According to the site survey in Juba Town Market in this year, the number of shops was counted as 249 shops. As same as Jebel Market, the number of shops would not be changed.

According to the survey results of waste quantity and quality in markets, the unit average daily waste generation from a person is 6.56 kg/person/day and the specific gravity is 0.10 ton/m<sup>3</sup> in markets. With these data, **the daily waste generation from Jebel Market was estimated as 5.9 ton/day (98.4 m<sup>3</sup>/day) and the daily waste generation from Juba Town Market was estimated as 1.6 ton/day (27.2 m<sup>3</sup>/day).**

## Chapter 3 Project Outputs and Achievement

### 3.1 Achievement of Project Purpose

Project Purpose: Basic structure of solid waste management in juba is formulated.

Indicator: Capacity assessment results are improved.

According to the results of capacity assessment, the capacity was improved if you compare the beginning of the project (Average score: 2.0) with the second year of the project (Average score: 2.4) (Refer to 4.2 Capacity Assessment).

At the beginning of this project, there were no staff members in charge of solid waste management, no collection equipment and no solid waste management organization; under this condition, it was expected to launch solid waste management service. There were no supervisors at the landfill, and waste was open dumped; officers of Juba City Council, Payam and residents have no knowledge on solid waste management. It was necessary to see the visible conditions, which they could realize what the solid waste management service is.

Therefore, Juba Solid Waste Management Group (“JSWVG”) was organized as a human resource development organization for solid waste management and a training organization. The members consist of approximately 10 members: Ministry Environment (1 member), Juba City Council (2 members), Payam (1 from each Payam), landfill (1 member), Ministry of Environment, CES (1 member) etc. JSWVG meetings were held once a week to discuss and deepen the understanding of the project and solid waste management. Around 60 meetings were held in total from April, 2012 to December, 2013, and the site visits were also organized.

In order to raise awareness, many community meetings and discussion meetings were held at markets and residential areas. In addition, several bus tours were organized in order to visit the site of waste collection, transportation and disposal. The targets were Ministry of Environment, Juba City Council, Payam, journalists, primary school students and residents. Bus tours were plans ten times; however, six bus tours were held because of the political conflicts.

Recycling activities were done in order to raise the awareness of governmental officers. Other activities were also organized: installation of bulletin boards for public relations, preparation of

leaflets for awareness raising, drawing contests for high school students, publication of calendars with the excellent drawings, preparation of photo collection. The T-shirts were distributed at the markets, residential areas and landfill, and the cleanup activities were organized. By this work, C/P deepened the understanding of solid waste management. Based on the questionnaire, it was shown that the people in Juba got deeper understanding of solid waste management activities.

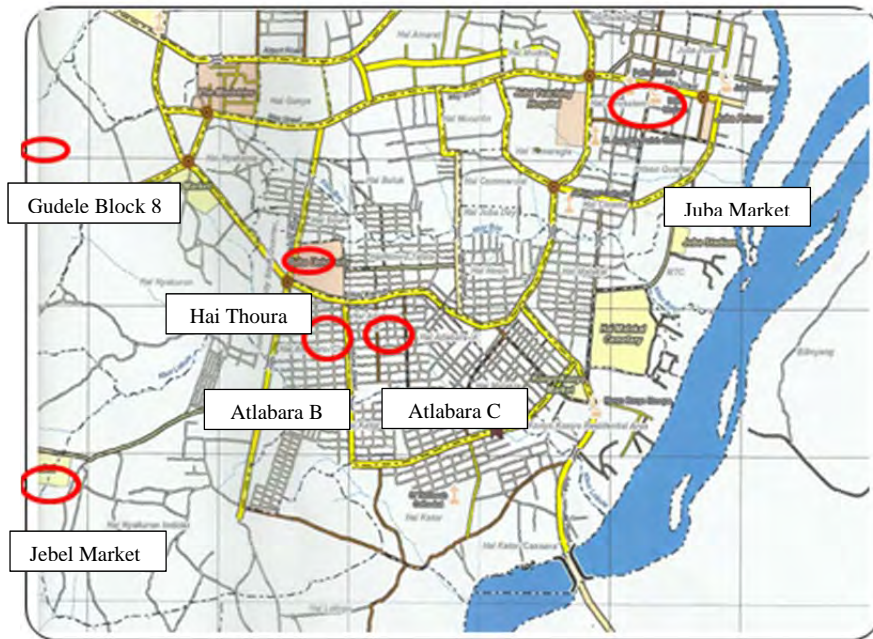
Fixed-point collection system was started at Jebel Market in July, 2012; three waste collection points were set up, and the collection time was 10 a.m. and 2 p.m. Kator Payam dispatched collection vehicles three times a week, while JICA also did three times a week. Later, the number of dispatched vehicles by JICA was reduced. This pilot project had been gone well, but after the political conflicts in December, 2013, the waste collection became difficult. In July, 2013, waste collection improvement pilot project was launched in Juba Town Market.

As for residential areas, the waste collection system was introduced in Atlabara B & C (Kator Payam). At first, the waste collection had been done properly; but since May, 2013, the dispatched vehicles by JICA became the main collectors, because of the repeated breakdown of Juba City's compactors. Under these circumstances, each Payam directors tried to collect waste by hired vehicles, but they had lost the motivation and dispatched the vehicles irregularly, while JICA continued to dispatch collection vehicles. Juba City Council has also started fee collection with contract with hotels and restaurants since May, 2014, which has been working well.

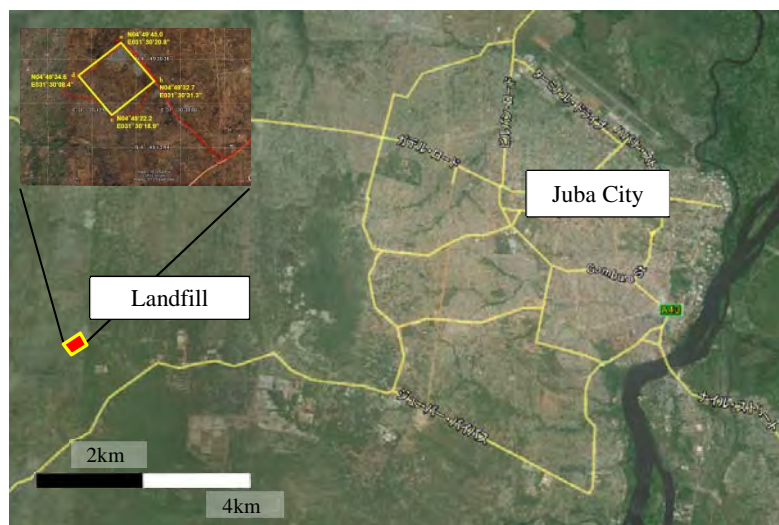
Regarding the landfill improvement, a) Operation & maintenance organization was established, b) Heavy equipment for landfilling work was procured by JICA, c) Allocated staff members learned landfill operation & maintenance such as the control of waste, and made working records and incoming vehicles records, d) Disposal fee was collected, which was used for landfill operation. The level of achievement was not limited to pilot project level, but reached to the practical level on site.

It was not achieved to secure financial source by fee collection, in order to operate solid waste management work.





**Figure 3-1 Location of waste collection improvement pilot project**



**Figure 3-2 Location of landfill improvement pilot project**

### 3.2 Achievement of Outputs

The following four outputs and the indicators were set up for this project.

Outputs	Indicators
Output 1 : Solid waste management in model markets in Juba is improved.	Satisfaction of the stakeholders in model markets is improved.
Output 2 : Solid waste collection in model areas in Juba is improved.	Satisfaction of the stakeholders in model areas is improved.
Output 3 : Fundamental landfill operation and management system is established in Juba	Operation and management condition of the landfill is recorded constantly.
Output 4 : "Solid Waste Management Plan in Juba" is drafted by "Juba Solid Waste Management Group"	Draft of the "Solid Waste Management Plan in Juba City" is submitted to the Mayor.

The achievement of the above four outputs are described as follows:

### 3.2.1 Output 1: Solid waste management in model markets in Juba is improved.

At the beginning of the project, there were no staff for waste collection, no waste collection equipment and no budget for waste management; however, the following level was achieved through the project.

1. Establishment of operation & maintenance organization	Waste collection workers and drivers were secured.
2. Procurement of equipment	Juba City Council procured 10 compactors for waste collection, even though they are second hand.
3. Introduction of fixed-time and fixed points collection	The system is continued at all the targeted collection points.
4. Vehicle allocation plan	Collection vehicles for Jebel Market and Juba Town Market were allocated with the same system introduced by JICA. It was expected to continue, according to the plan of Juba City Council.
5. Recording and reporting of operation & maintenance	Collection leaders recorded allocation of vehicles and cleaners; JICA expert team checked the records.
6. Securing of operation &	Sufficient maintenance budget of vehicles was not

maintenance budget	secured yet; there is the possibility the C/Ps would secure the budget of the next year.
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The satisfaction survey on waste collection for stakeholders at pilot project areas was done, before and after the pilot projects. The results were shown in the table below, which shows the improvement of satisfaction.

**Table 3-1 Percentage of stakeholders satisfied with waste collection at markets**

Target markets	Pilot project	
	Before the implementation	After the implementation
Jebel Market	53%	79% (1 year after the launching of the pilot project; surveyed in July, 2013)
Juba Town Market	73%	N/A

### 3.2.2 Output 2: Satisfaction of the stakeholders in model areas is improved.

At the beginning of the project, there were no staff for waste collection, no waste collection equipment and no budget for waste management; however, the following level was achieved through the project.

1. Establishment of operation & maintenance organization	Waste collection workers and drivers were secured.
2. Procurement of equipment	Juba City Council procured 10 compactors for waste collection, even though they are second hand.
3. Introduction of fixed-time and fixed points collection	The system is continued at all the targeted collection points.
4. Vehicle allocation plan	JICA and South Sudan side dispatched one and two vehicles per week respectively at four residential areas (model areas). It was expected to continue, according to the plan of Juba City Council.
5. Recording and reporting of operation & maintenance	Collection leaders recorded allocation of vehicles and cleaners; JICA expert team checked the records.

6. Securing of operation & maintenance budget	Sufficient maintenance budget of vehicles was not secured yet; there is the possibility the C/Ps would secure the budget of the next year.
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### 3.2.3 Output 3: Fundamental landfill operation and management system is established in Juba

At the beginning of the project, there were no staff for landfill management, no landfill operation equipment and no budget for operation and maintenance; however, the following level was achieved through the project. The working records to identify the conditions of landfill operation and maintenance and the incoming vehicles and fee collection records were regularly taken on site, which were reported to the Director of Rejaf Payam.

1. Establishment of operation & maintenance organization	Operation & maintenance organization was established (the head is Juba County Commissioner). The number of the total members is 10 including the Commissioner. Six staff members permanently work on site.
2. Procurement of landfill operation equipment	A bulldozer for landfill operation was procured by JICA.
3. Methods of waste filling	The bulldozer did waste levelling and compaction on site and the soil was covered on it later, which was environmental friendly landfill method.
4. Operation & maintenance	Operation manual and waste filling plan was prepared and the operation was done based on the documents.
5. Recording and reporting of operation & maintenance	Site manager took working records, incoming vehicles records and disposal fee records collected by an accountant. Weekly meetings were held on site, and the data was passed to the Director of Rejaf Payam.
6. Securing of operation & maintenance budget	Disposal fee was collected by incoming vehicles, which was utilized for operation & maintenance cost. 20,000SSP per month was collected on average. The bank account on disposal fee was opened.
7. Securing of landfilling	Bulldozer was utilized for landfill construction with the

capacity	direct operation by JICA expert team. Approximately four years of landfill capacity was secured.
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3.2.4 Output 4: "Solid Waste Management Plan in Juba" is drafted by "Juba Solid Waste Management Group"

Solid waste management plan in Juba was drafted and submitted to the Mayor of Juba City. The plan consist of short-term and long-term plan, which include laws, institutional and financial aspects, waste collection, landfill and others.

The short-term plan was prepared in order to prepare the system of sustainable solid waste management, and the target year was set as 2015. Primary actions to be taken towards the long-term plan and actions to solve urgent issues were described.

The long-term plan was drafted to establish the system of sustainable solid waste management in 2023, or 10 years after the base year (2013). The target waste collection rate was set as 34% in 2023, by more stable waste collection and expansion of target collection areas. It is also targeted to secure the sufficient capacity and proper operation for sanitary landfill. The organizational, legal and financial aspects were also described.

The above contents were confirmed and approved by South Sudan side during the preparatory meeting of JCC and JCC meeting held in October, 2014. In the preparatory meeting, an annual activity report and plan on solid waste management were finalized.

## Chapter 4 Activity Results

### 4.1 Various Survey Results

#### 4.1.1 Landform and Geological Conditions

##### (1) Overview of Landform and Geological Conditions

The landfill is located approximately 13km west-northwest of Juba city at the top of south-facing hillside which consisted of gneiss. Landform of the surrounding area of the landfill is less steep than 1:50, no obvious water-systems except some small ponds found in the lowest place.

The surrounding bedrock is **basement rock complex** such as basic schist and granite gneiss, and some small gabbro dikes can be found. The property of the bedrock is fresh with weathering degree, rarely seen cracks, and regarded as impermeability. Generally, the outer layer is strongly weathered, but there are some cases that fresh bedrocks exposed in spots around hilltop cannot be found any weathered layer.

##### (2) Boring Survey and Permeability Test

By the boring survey at 5 locations at the landfill, thickness of weathered layer and ground water level are examined. BH-1 to BH-4 holes reached hard bedrock layer at 2-4m depth and ground water was not found in each holes. For BH-5 hole, examination conducted to 12.5m depth, and ground water was found around 9.5m depth.

By the result of permeability test which using boring holes, permeability coefficient of strongly weathered gneiss was found approximately  $1 \times 10^{-6}$ (cm/sec), and the one for rather weathered gneiss was approximately  $1 \times 10^{-4}$ (cm/sec).

Meanwhile, at the collection pit of cover soil adjacent to the landfill, it is consistent to the result above that puddles are shown at the point where strongly weathered layer remained, and are not shown when excavate to surface of half weathered layer.

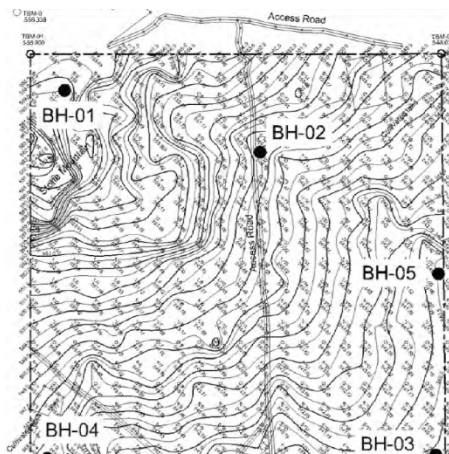


Figure 4-1 Location of boring (BH-1 -5)

### (3) Hydrological Environment Survey

Recording and simplified water analysis for spring water, well water, and seepage water were conducted in the area of approximately 1km from the landfill on the survey. In the area of north and west side of the landfill, spring groundwater was seen at part of the slope. The place where the spring water was found is on the slope adjacent to fresh impermeable bedrock, and the groundwater level is relatively shallow. Conversely, the south side where the landfill is located, spring water was not found on the slope. And there are relatively big contiguous puddles from several meters to dozens of meters on the shallow valley 500m away from the landfill in the east-west direction, considered to be the exit of seepage water. There are a few settlements using this seepage water as domestic water along the valley, and south side of the valley. Moreover, there are about 3 housings plowing the field which adjacent to the west side of the landfill. Even there was rainfall of approximately 50mm on the previous day of the survey period (in the rainy season, August), there was not seen any flow of the water on the valley-alongside which shows amount of surface water is small. On the eastern side of the landfill, puddles are not even seen and sometimes the seepage water runs dry.

The leachate was collected from the degassing holes of the landfill. The density of EC, COD,  $\text{NH}_4^+$ , and  $\text{NO}_3^-$  of the leachate are 1-3 order higher than spring water, well water, water in the monitoring hole and stagnant water at the end of the landfill. **This shows organic waste is actively decomposed.**

#### (4) Hydrological and Geographical Analysis

Geological structure (weathering structure) and hydrogeology model are examined considering the results of geological ground survey and hydrological survey. In the model, leachate from the landfill penetrates unsaturated zone, advects thin permeable layer which exists approximately 10m depth from the surface (the weathering degree is rather weathered to rather fresh), then spout in the valley on the southern side of the landfill. It is calculated that the duration of the time which the leachate reached unsaturated zone then reached BH-5 hole (monitoring hole) 300m away takes approximately 36 years (8.4m/year), after that, needed approximately more 200 years till spout from the alongside of shallow valley.

This calculation result is consistent with the fact that BH-05 hole which 300m away from the landfill reveals no specific effect from the leachate after 5 years passed since landfill of solid waste started.

#### (5) Consideration and Proposal for Monitoring

Expansion of the landfill to the east, west, and south side area will be needed by the time the north side area which currently operating is filled up in the future. From the geological aspect, west and east side areas are preferable except south side area which closest to the spring.

Moreover, in current situation where appropriate treatment for the leachate is difficult, minimizing generation of the leachate, building the structure prevents penetration of the leachate, and also minimizing landfilling amount of solid waste are necessary. In particular, possible reduce of the disposal area and appropriate soil-covering are necessary during the rainy season. Likewise, developing hardly-permeable layer at the basement of the landfill is also considered to be effective in the area where strongly weathered layer is not found. Furthermore, **by promoting recycle of the solid waste to reduce the amount of the landfilled waste, decreasing of soil and groundwater pollution by organic pollutants is enabled.** Additionally, purification utilizing in-situ decomposition technology is expected.

Pollution risk is considered to be very small as follows;



- ♦ The depth which has possibility of contamination is assumed to be shallow area near the surface (around 10m depth) because fresh part of gneiss basement is regarded almost impermeable.
- ♦ For leachate, due to organic waste consists mostly of waste, absorption by soil is not much expected, but with management of the landfill such as appropriate soil-covering it is considered to decrease to the minimum. Precipitation of around 1000mm throughout the year and active evapotranspiration due to high temperature are also considered as advantages.

However, because pollution risk still remains, periodic monitoring of leachate is needed. There is BH-05 hole which can conduct leachate monitoring on south-east side slope of the landfill, meanwhile, for the south-east side monitoring is unavailable. For this matter, addition of monitoring hole is proposed.

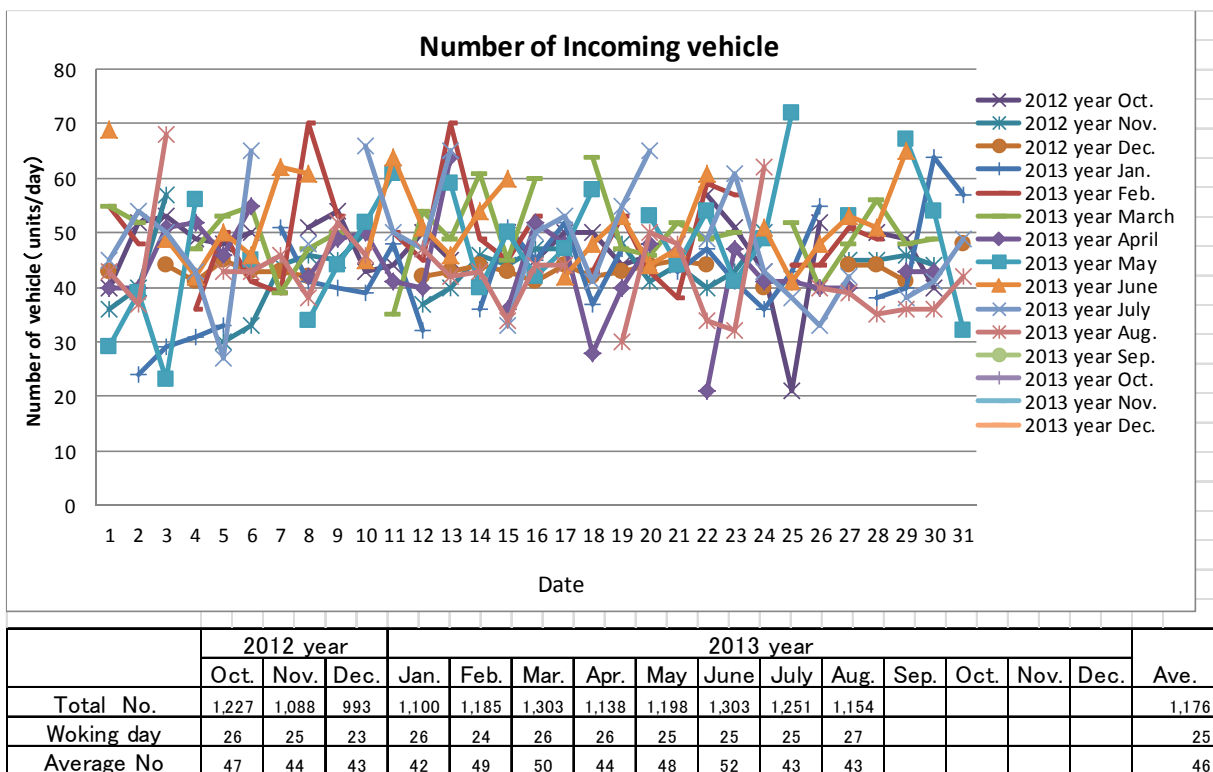
Furthermore, groundwater around the landfill shows high electrical conductivity despite unaffected by leachate it is considered to be effective to take simplified analysis of  $\text{NO}_3^-$ ,  $\text{NH}_3$ , and COD as indicators.

#### 4.1.2 Incoming Vehicle Survey at Landfill Site

##### (1) Total Number of Daily Incoming Vehicle

Landfill staff has recorded the number of incoming vehicle every day at Juba County Controlled Dumping Site since October 2012. The minimum, maximum and average numbers of daily incoming vehicle are 20 vehicles/day, 71 vehicles/day and 46 vehicles/day respectively. The number of incoming vehicles in July and August 2013 was 43 vehicles/day, which was less than the average number. One of the reasons could be break down of compactors of each Payam.

**Table 4-1 Number of Incoming Vehicles**

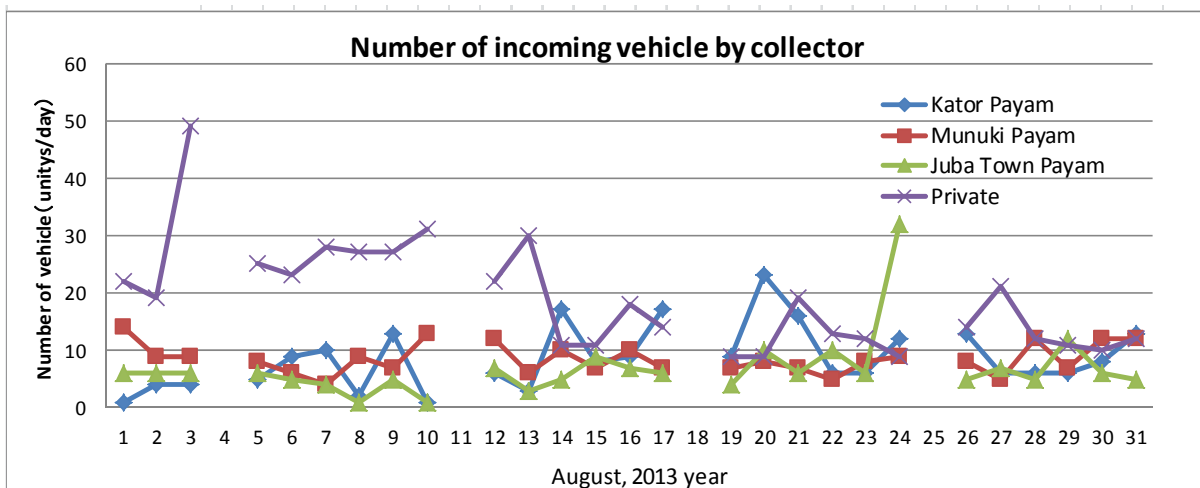


##### (2) Agency Ordering Vehicles

In addition to the total number of incoming vehicle, landfill staff has recorded the agency who ordered the vehicles every day at Juba County Controlled Dumping Site since August 2013. According to the record of August 2013, the ratio of private agencies was 44% and the ratio of public agencies was 56%; 20% from Kator Payam, 20% from Munuki Payam and 16% from

Juba Town Payam. Therefore, the ratios of private agencies and public agencies were mostly same.

**Table 4-2 Number of Incoming Vehicles by Collector**



		August																															Total
		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	
<b>Kator Payam</b>		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
<b>Munuki Payam</b>		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
<b>Juba Town Payam</b>		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
<b>Private</b>		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
<b>Sub- Total</b>		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

### 4.1.3 Recycling Survey

#### (1) Purpose of Survey

The purpose of this survey is to confirm the recycling activities and the amounts being handled in Juba City. An interview survey for waste pickers at the existing disposal site and recycling intermediaries was conducted.

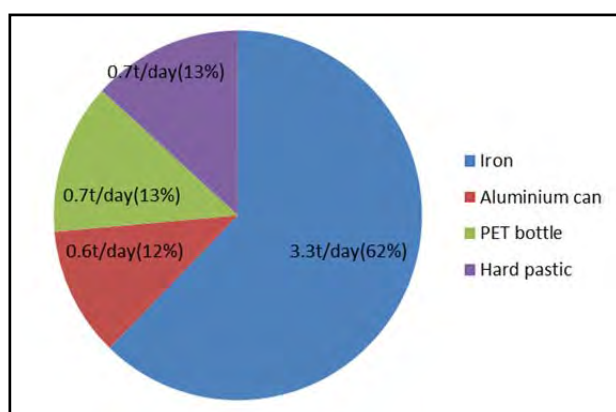
#### (2) Results of Survey

##### a) Collection Amount and Type of Recyclable Materials Collected

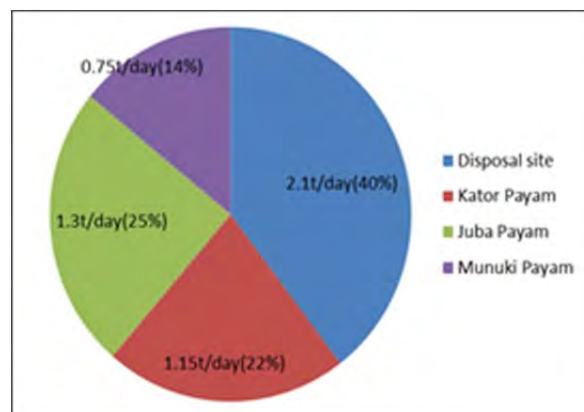
According to the survey results, the types of recyclable materials in the recycling market of Juba City were Iron, Aluminum cans, PET bottles and Hard Plastics. As shown in Figure 4-1, the total daily collection amount was 5.3 ton/day. Breakdowns of the daily collection amounts of Iron, Aluminum cans, PET bottles and Hard Plastics were 3.3 ton/day, 0.6 ton/day, 0.7 ton/day and 0.7 ton/day respectively.

##### b) Area-Wise Collection Amount of Recyclable Materials

As shown in Figure 4-2, the daily amounts collected in Disposal Site, Juba Town Payam, Kator Payam and Muniki Payam were 2.1 ton/day, 1.3 ton/day, 1.15 ton/day and 0.75 ton/day respectively.



**Figure 4-2 Type and Collection Amount of Recyclable Materials**



**Figure 4-3 Area-Wise Collection Amount of Recyclable Materials**

##### c) Recycling Intermediary

As shown in Table 4-3, only one company dealt with Aluminum cans. This company is a joint venture between companies of Korea and South Sudan. This company presses the collected Aluminum cans

and exports them. Also only one private individual dealt with both PET bottles and Hard plastics. And 10 individuals dealt with Iron.

**Table 4-3 List of Recycling Intermediary by Recyclable Materials**

Name of broker	Recyclable material			
	Aluminum	Iron	PET bottle	Hard plastic
War Kir for General Trading & Industry.	0.6t/day	-	-	-
Private Business-A	-	-	0.7t/day	0.7t/day
Private Business-B	-	0.7t/day	-	-
Private Business-C	-	0.25t/day	-	-
Private Business-D	-	0.4t/day	-	-
Private Business-E	-	0.2t/day	-	-
Private Business-F	-	0.6t/day	-	-
Private Business-G	-	0.2t/day	-	-
Private Business-H	-	0.2t/day	-	-
Private Business -I	-	0.2t/day	-	-
Private Business -J	-	0.25t/day	-	-
Private Business -K	-	0.3t/day	-	-
<b>Total</b>	<b>0.6t/day</b>	<b>3,3t/day</b>	<b>0.7t/day</b>	<b>0.7t/day</b>

d) Material Flow of Recyclable Material

Figure 4-4 shows the material flow of recyclables market in Juba City. Waste pickers and other primary collectors collected Aluminum cans and sold them to Joint venture operations between companies of South Korea and South Sudan. This joint venture pressed these cans and exported them to a recycling company in South Korea. Also waste pickers and other primary collectors collected PET bottles and hard plastics and sold them to a private individual. This intermediary exported these materials to a plastic factory in Kenya. Regarding Iron, the primary collection was the same as other

materials. Waste pickers and other primary individuals sold the Iron to certain private individuals. These intermediaries exported the iron to steel rolling factories in Uganda.

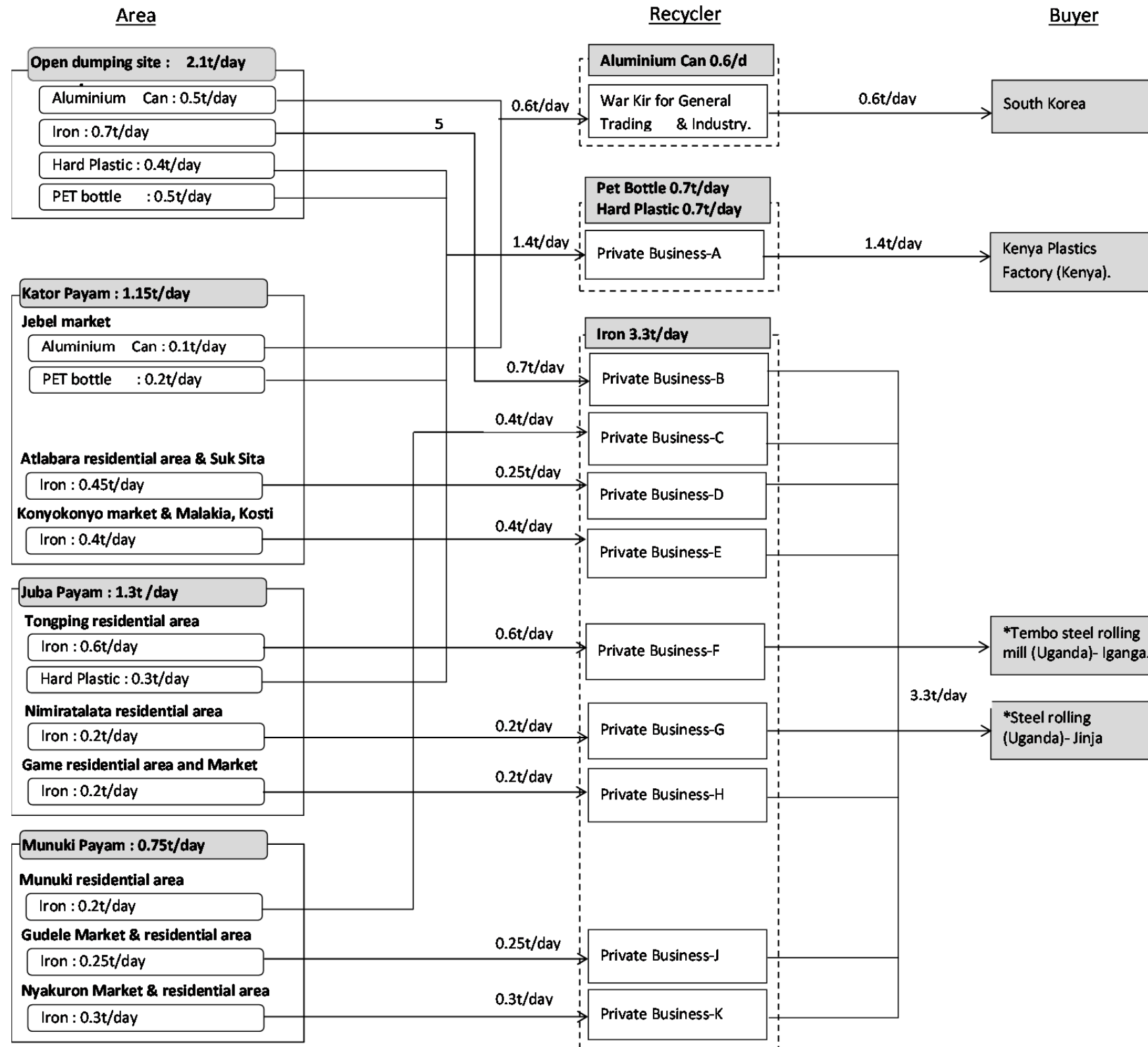


Figure 4-4 Material Flow of Recyclable Materials

#### 4.1.4 Awareness Survey in Residential Area

##### (1) Outline and Purpose

Since the last year, C/Ps and JICA Expert Team had cooperated with the cleaning activity by Japanese Self Defense before the road construction. In order to utilize this cooperation activity, JICA Expert Team selected 2 QCs (Juba Nabari East QC and Juba Nabari West QC) along this road as the target residential areas and planned to start the collection pilot project in these areas. Before starting, C/Ps and JICA Expert Team implemented the survey by a local sub-contractor, and the survey item was shown in Table 4-4. JICA Expert Team expects that C/Ps will utilize these survey results and will introduce the collection system with the designated time and place.

**Table 4-4 Survey Items for New Target Residential Areas**

Item	Content
Target Area	100 households/2QCs (Juba Nabari East QC and Juba Nabari West QC)
Method	Surveyors visited each household and conducted an interview with a questionnaire. Questionnaire was written in English, but surveyors used Juba Arabic for each interview.
Questionnaire Items	<ul style="list-style-type: none"> <li>• Years of residence</li> <li>• Attitude toward cleanup in community</li> <li>• Situation of waste discharge, collection and payment of collection fee</li> <li>• Knowledge and understanding of waste collection</li> <li>• Satisfaction of waste collection service</li> </ul>

##### (2) Results and Analysis

###### a) Number of Respondents

Respondents in Juba Nabari East QC and Juba Nabari West QC were 57 persons and 54 persons respectively. The total number of respondents was 111 persons.

###### b) Years of Residence

As shown in Table 4-5, more than 70% of respondents in each QC answered that the years of residence was more than 1 years. In general, a community develops according to the length of years of residence, and residents cooperate for collection work depending on the community's



development level. So it is possible that residents can accept and follow the new collection system.

**Table 4-5 Years of Residence**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Less than 6 months	6	11%	8	15%
Less than 1 year	7	12%	8	15%
More than 1 year	44	77%	38	70%
No answer	0	0%	0	0%
Total	57	100%	54	100%

c) Attitude toward cleanup in community

Table 4-6 shows the summary of answers to the question “Do you think Juba Nabari West/East is clean?”. 67% of respondents in Juba Nabari East QC and 83 % of respondents in Juba Nabari West QC answered “No”. There are several points of view for cleanness, and the waste collection is one of them. So it is possible that that the present collection service is not appropriate.

**Table 4-6 Answers to Question “Do you think Juba Nabari West/East is clean?”**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
QC is clean	19	33%	9	17%
QC is NOT clean	38	67%	45	83%
No answer	0	0%	0	0%
Total	57	100%	54	100%

Table 4-7 shows the summary of answers to the question “Are you willing to join the events in order to make your community clean?”. 82% of respondents in Juba Nabari East QC and 87 % of respondents in Juba Nabari West QC answered “Yes”. Positive attitude toward waste collection, cleanup or community activity was confirmed in both QCs.

**Table 4-7 Answers to Question “Are you willing to join the events in order to make your community clean?”**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Yes	47	82%	47	87%
No	10	18%	7	13%
No answer	0	0%	0	0%
Total	57	100%	54	100%

Table 4-8 shows the summary of answers to the question “Have you attend the clean-up campaigns by Japan Self Defense Forces?”. 68% of respondents in Juba Nabari East QC answered “Yes”. On the other hand, just 38% of respondents in Juba Nabari West QC answered “Yes”. As mentioned above, respondents in both QCs showed positive attitude toward cleanup or community activity, however, respondents in Juba Nabari East QC took action more than those in Juba Nabari West QC.

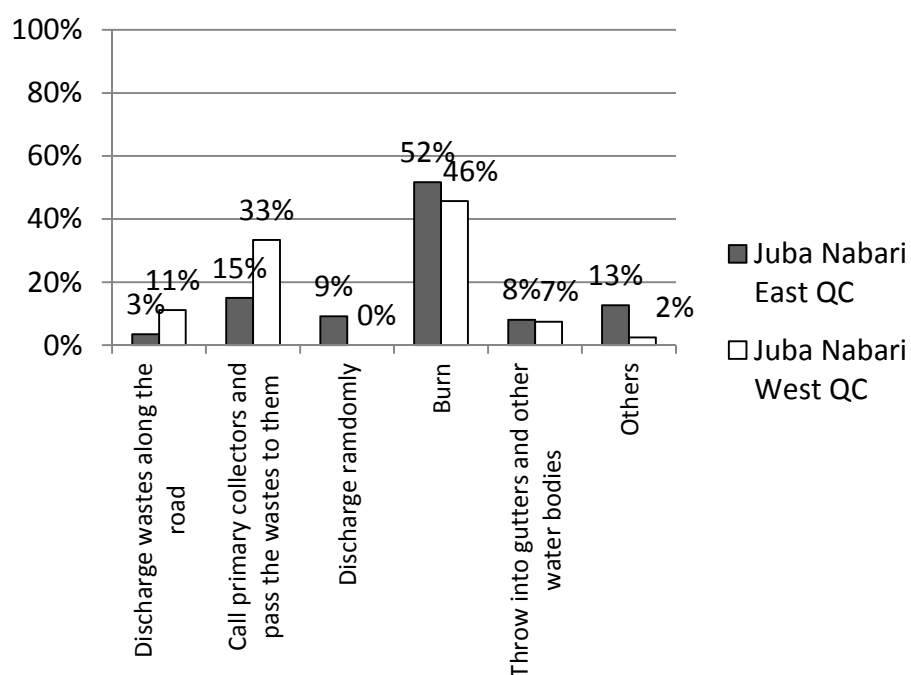
**Table 4-8 Answers to Question “Have you attend the clean-up campaigns by Japan Self Defense Forces?”**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Yes	39	68%	20	37%
No	18	32%	34	63%
No answer	0	0%	0	0%

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Total	57	100%	54	100%

d) Situation of Waste Discharge, Collection and Payment of Collection Fee

Figure 4-5 shows the summary of answers to the question “How do you usually discharge and dispose solid wastes?”. Almost half of respondents in both QCs answered “Burn”. In Juba Nabari West QC, the total ratio of respondents answering “Discharge wastes along the road” and “Call primary collectors and pass the wastes to them” was 40%. So the residents in Juba Nabari West QC received the collection service. And 7% to 8% of respondents in both QCs answered “Throw into gutters and other water bodies”. This attitude would give the negative impact on the maintenance of the road constructed by Japanese Self Defense Forces.



**Figure 4-5 Method to Discharge Solid Waste (Multiple Choice)**

Table 4-9 shows the summary of answers to the question “Does Juba Town Payam collect wastes regularly?”. 91% of respondents in both QCs answered “No”. This result indicates that

Payam had the low priority for waste collection in residential areas, and did not provide the periodical waste collection service in residential areas.

**Table 4-9 Answers to Question “Does Juba Town Payam collect wastes regularly?”**

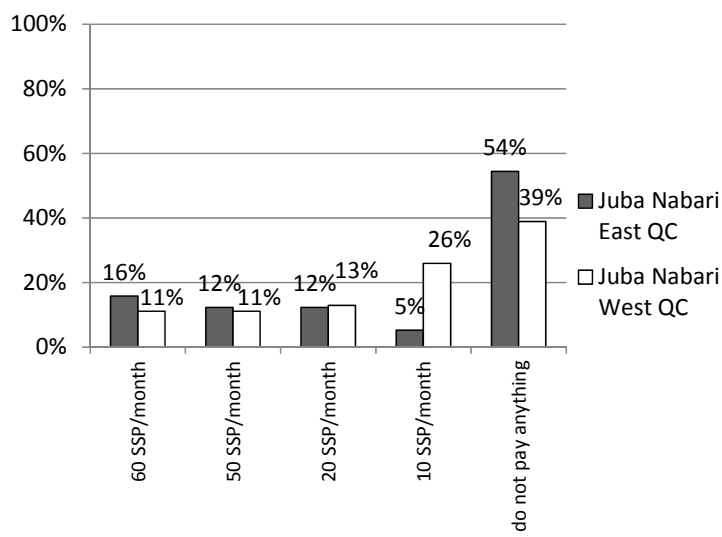
Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Yes	5	9%	5	9%
No	52	91%	49	91%
No answer	0	0%	0	0%
Total	57	100%	54	100%

Table 4-10 shows the summary of answers to the question “If you have any troubles on waste collection, who do you call?”. More than half of respondents in both QCs answered “Others”, and the ratios of “QC” and “Payam” were small. This result indicates that there might be a person or organization leading the community activity for waste collection. It is necessary to find out the situation of this person or organization. If this person or organization is not appropriate to have a responsibility for community activity for waste collection, QC and Payam should involve in the community activity more and lead the community.

**Table 4-10 Answers to Question “If you have any troubles on waste collection, who do you call?”**

Answer (multiple choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
QC	11	18%	7	13%
Payam	9	15%	7	13%
Police	1	2%	1	2%
Others	40	66%	40	73%
Total	61	100%	55	100%

Figure 4-6 shows the summary of answers to the question “How much SSP do you pay for waste collection now?”.



**Figure 4-6 Answers to Question “How much SSP do you pay for waste collection now?”.**

54% of respondents in Juba Nabari East QC and 39 % of respondents in Juba Nabari West QC did not pay anything. For reference, Juba City Council set the fee for waste collection from 2012 to 2013 as Table 4-11. In both QCs, some of respondents paid 60 SSP/month. They might follow the setting of Juba City Council. Half or less than half of respondents in both QCs paid some money, so Payam implemented the fee collection at least. However, it is necessary to examine the setting price of fee, collection methodology, collection service, etc.

**Table 4-11 Price of Fee for Waste Collection Decided by Juba City Council**

	2011-2012	2012-2013
	[SSP/month]	[SSP/month]
1st class	30	60
2nd class	25	50
3rd class	20	20
4th class	20	20

e) Knowledge and Understanding of Waste Collection

Table 4-12 shows the summary of answers to the question “Do you know that the waste collection and disposal need a lot of money?”. More than 80% of respondents in both QCs answered “Yes”. It means that most of residents seemed to understand the cost for waste collection and disposal. If the collection service is improved, it is highly possible that their understanding connects to their payment of waste collection fee.

**Table 4-12 Answers to Question “Do you know that the waste collection and disposal need a lot of money?”**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Yes	45	79%	46	85%
No	12	21%	8	15%
No answer	0	0%	0	0%
Total	57	100%	54	100%

Table 4-13 shows the summary of answers to the question “How do you think the attitude of residents for waste collection?”. 87% of respondents in Juba Nabari West QC seemed to understand the necessity of public involvement. Although 74% of respondents in Juba Nabari East QC seemed to understand the necessity of public involvement, 25% of respondents in this QC seemed to think that only Juba City Council and Payam had a responsibility. Therefore, not only the improvement of the waste collection service, but also public awareness activity is necessary especially for Juba Nabari East QC.

**Table 4-13 Answers to Question “How do you think the attitude of residents for waste collection?”**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Residents need to cooperate with Juba City Council and Juba Town Payam, and Juba City Council and Juba Town Payam should collect wastes appropriately.	42	74%	47	87%
Residents do not need to do anything, but Juba City Council and Juba Town Payam should collect wastes appropriately.	14	25%	4	7%
I do not know.	1	2%	3	6%
No answer	0	0%	0	0%
<b>Total</b>	<b>57</b>	<b>100%</b>	<b>54</b>	<b>100%</b>

f) Satisfaction of Waste Collection Service

Table 4-14 shows the summary of answers to the question “Are you satisfied with the service of waste collection by Juba Town Payam?”. 93% of respondents in both QCs answered “No”. With the results mentioned above, the comprehensive improvement and review are necessary for waste collection service, such as the collection frequency, collection method, public awareness, etc.

**Table 4-14 Satisfaction of Waste Collection Service**

Answer (single choice)	Juba Nabari East QC		Juba Nabari West QC	
	[No. of Answer]	[%]	[No. of Answer]	[%]
Satisfied	4	7%	4	7%
Unsatisfied	53	93%	50	93%
No answer	0	0%	0	0%
Total	57	100%	54	100%

#### 4.1.5 Surveys in Target Markets

##### (1) Awareness Survey at Jebel Market

###### a) Purpose and Outline

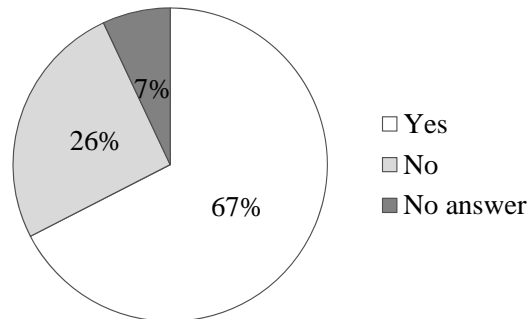
On 20th July 2013, C/Ps and JICA Expert Team held the workshop for review the collection pilot project in Jebel Market. The number of attendants was more than 50 persons (shop owners). As one of the program of this workshop, C/Ps and JICA Expert Team implemented the awareness survey. The purpose of this awareness survey is to confirm the market people's awareness after 1 year from the commencement of the pilot project. Among the attendants, 50 persons were randomly selected as the respondents for the awareness survey. Questionnaire was written in English and Juba Arabic, and local staff of JICA Expert Team explained in Juba Arabic and English at the same time. As a result, the answer collection ratio was 86% (43 persons/50 persons) and all respondents used the questionnaire in English.



b) Results

1) Satisfaction

The following figure shows the satisfaction of the present collection system. Around 79% respondents were satisfied with the present collection system. The average satisfaction ratio before the pilot project was around 53% (small-size shop: 67%, middle-size shop: 39%). It can be said that the satisfaction level was raised by the pilot project.

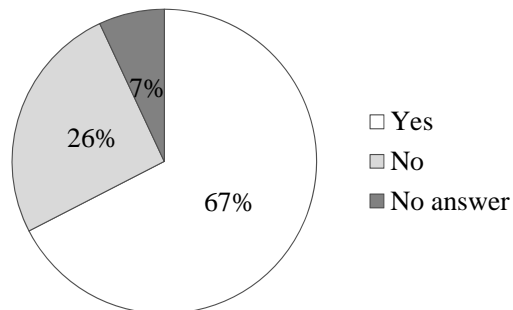


(Yes: Satisfied, No: Unsatisfied)

**Figure 4-7 Satisfaction Ratio of Present Collection in Jebel Market**

2) Cleanness

The result of the question whether the market became cleaner than before pilot project or not is shown in the following figure. Around 67% respondents thought that the market became cleaner than before. This result shows the effectiveness of the pilot project.



(Yes: market became cleaner. No: market did not become cleaner.)

**Figure 4-8 Awareness about Cleanness in Jebel Market**

### 3) Willingness to Pay

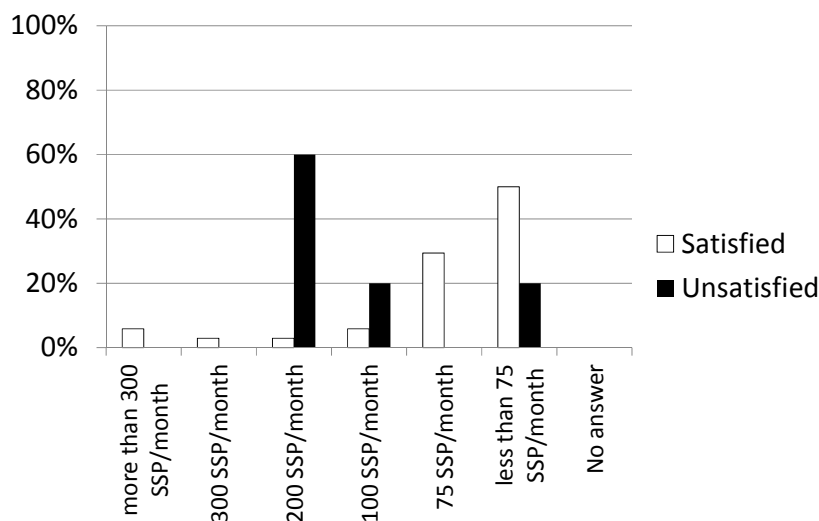
The following table shows the willingness to pay for the collection service if the present service continues. Around 70% respondents answered 75 SSP/month and less than it. In 2013, Juba City Council raised the amount of collection as 300 SSP/month from 75 SSP/month in 2012. 300 SSP/month is higher than the general unit cost in Japan. And this amount is not affordable for shops considering the willingness to pay.

**Table 4-15 Willingness to Pay for Present Collection Service in Jebel Market**

Item	Ratio
More than 300 SSP/month	5%
300 SSP/month	2%
200 SSP/month	9%
100 SSP/month	9%
75 SSP/month	23%
Less than 75 SSP/month	47%

#### c) Examination

Around 80% of respondents in Jebel Market were satisfied with the present collection service, so it can be said that the satisfaction level is high. Around 70% of respondents thought the market became clean, and it shows the effectiveness of the pilot project. Around 70% respondents answered 75 SSP/month and less than it as willingness to pay for the present collection service. Here, the following figure shows the relationship between the satisfaction and willingness to pay. In general, “Willingness to pay is high because satisfaction level is high.” However, it is not always true as shown in the following figure. It is difficult to know the satisfaction and willingness to pay only by the questionnaire survey. At the final evaluation stage of the Project, not only the quantitative analysis, but also examinations from various viewpoints are necessary.



**Figure 4-9 Relationship between Satisfaction and Willingness to Pay in Jebel Market**

**(2) Survey for Basic Information in Juba Town Market**

In this year, JICA Expert Team added one target market for the pilot project. The selection process is mentioned later. Juba Town Market was selected as the new target market and JICA Expert Team collected the basic information including the primary collection.

a) Purpose

The purpose of this survey is to obtain the basic information and to understand the primary collection and public awareness in Juba Town Market as the situation before pilot project. The quantitative results will contribute to evaluate the pilot project. The survey was implemented by a local sub-contractor.

b) Method and Outline

Survey method and outline are as follows;

**Table 4-16 Survey method and outline**

Item	Outline																																											
Period	From 10 <sup>th</sup> August 2013 to 1 <sup>st</sup> October 2013																																											
Area	Core part of Juba Town Market																																											
Sampling method	Randomly selected from the shops with temporal structure such as parasols and sheets																																											
Sample	53 shop owners																																											
Method	Surveyors visited each shop owner and conducted an interview with a questionnaire. Questionnaire was written in English, but surveyors used Juba Arabic for each interview.																																											
Contents	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 25%;">How to answer</th> <th style="width: 70%;">Question</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">Single choice</td> <td>Years of business</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Single choice</td> <td>Cleanness of the market</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Single choice</td> <td>Use of primary collectors</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">Single choice</td> <td>Fee for using primary collectors</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">Single choice</td> <td>Waste discharge/disposal method</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">Multiple choice</td> <td>Waste discharge/disposal time</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">Single choice</td> <td>Knowledge of collection service by Payam</td> </tr> <tr> <td style="text-align: center;">8</td> <td style="text-align: center;">Single choice</td> <td>Satisfaction of the present collection service</td> </tr> <tr> <td style="text-align: center;">9</td> <td style="text-align: center;">Single choice</td> <td>Frequency of collection by Payam</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">Single choice</td> <td>Cleanness of collection areas</td> </tr> <tr> <td style="text-align: center;">11</td> <td style="text-align: center;">Multiple choice</td> <td>Agency/person to complain</td> </tr> <tr> <td style="text-align: center;">12</td> <td style="text-align: center;">Single choice</td> <td>Willingness to attend the events to clean the market</td> </tr> <tr> <td style="text-align: center;">13</td> <td style="text-align: center;">Single choice</td> <td>Present paying fee for collection service</td> </tr> </tbody> </table>			How to answer	Question	1	Single choice	Years of business	2	Single choice	Cleanness of the market	3	Single choice	Use of primary collectors	4	Single choice	Fee for using primary collectors	5	Single choice	Waste discharge/disposal method	6	Multiple choice	Waste discharge/disposal time	7	Single choice	Knowledge of collection service by Payam	8	Single choice	Satisfaction of the present collection service	9	Single choice	Frequency of collection by Payam	10	Single choice	Cleanness of collection areas	11	Multiple choice	Agency/person to complain	12	Single choice	Willingness to attend the events to clean the market	13	Single choice	Present paying fee for collection service
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12	Single choice	Willingness to attend the events to clean the market																																										
13	Single choice	Present paying fee for collection service																																										

c) Results and Examination

1) Outline and Awareness of Shop Owners

Outline and awareness of shop owners (respondents) are summarized in the following table. 68% of respondents thought that the market was not clean. This result is same as the awareness survey at the workshop in Juba Town Market mentioned later. And 92% of respondents have a willingness to attend the events to clean the market, so it can be said that the awareness level is high. Consequently, Juba Town Market is appropriate for the pilot project because the respondents recognized the cleanness of the market and had a willingness to attend cleaning activity. And it is effective to involve the market leaders as main actors because many respondents usually complained to the market leaders.

**Table 4-17 Outline and Awareness of Shop Owners in Juba Town Market**

Q-No.	How To Answer	Question	Answer Option		No. of Answer	Ratio
1	Single select	Years of business (When do you open your shop in Juba Town Market?)	1	Less than 1 month ago	4	8%
			2	Less than 3 months ago	9	17%
			3	Less than 6 months ago	11	21%
			4	Less than 1 year ago	10	19%
			5	More than 1 year ago	17	32%
			6	No answer	2	4%
2	Single select	Cleanness of the market (Do you think that Juba Town Market is clean?)	1	Yes	17	32%
			2	No	36	68%
10	Single select	Cleanness of collection areas (Are waste collection points clean?)	1	Yes	22	42%
			2	No	31	58%
12	Single select	Willingness to attend the events to clean the market (Are you willing to join the events in order to make Juba Town Market clean?)	1	Yes	49	92%
11	Multiple select	Agency/person to complain (If you have any troubles about waste collection, who do you call?)	1	Market leaders	22	42%
			2	Payam	12	23%
			3	Juba City Council	15	28%
			4	Police	0	0%
			5	Others	10	19%

## 2) Waste Discharge and Disposal

As the waste discharge method, 60% of respondents discharged wastes at the collection points where Payam trucks came, and 32% of respondents passed wastes to primary collectors. The ratios of respondents to discharge randomly, burn or throw into gutters and other water bodies are low. Therefore, there is a foundation to accept the station collection system. And 55% of respondents utilized the service by primary collectors. So some of the respondents, who discharged wastes at the collection points where Payam trucks came, utilized the service by primary collectors. Therefore, it is necessary to involve and train the primary collectors. About waste discharge time, it is difficult to collect wastes in the afternoon because of the traffic jam at the main street in front of Juba Town Market. As a result of the survey, it was found that 75% of respondents discharged wastes in the morning. So it is possible to introduce the collection system with designated time and place. However, it is necessary to implement training to keep

the collection time because more than the half of respondents discharged wastes in the afternoon. Regarding to the payment for collection service, 75% of residents paid only 75 SSP/month or less than it.

**Table 4-18 Situation of Waste Discharge and Disposal in Juba Town Market**

Q-No.	How To Answer	Question	Answer Option		No. of Answer	Ratio
5	Single select	Waste discharge/disposal method (How do you usually manage wastes?)	1	Primary collectors collect and discharge	17	32%
			2	Discharge at points where Payam trucks come	32	60%
			3	Discharge randomly	1	2%
			4	Burn	2	4%
			5	Throw into gutters and other water bodies	0	0%
			6	Others	0	0%
			7	No answer	0	0%
3	Single select	Use of primary collectors (Do you usually call primary collectors to discharge wastes?)	1	Yes	29	55%
			2	No	23	43%
			3	No answer	1	2%
6	Multiple select	Waste discharge/disposal time (What time do you usually manage wastes?)	1	Morning	40	75%
			2	Noon	12	23%
			3	Afternoon	28	53%
			4	Night	1	2%
13	Single select	Present paying fee for collection service (How much SSP do you pay for waste collection now?)	1	300 SSP/month	4	8%
			2	200 SSP/month	1	2%
			3	100 SSP/month	10	19%
			4	75 SSP/month	3	6%
			5	less than 75 SSP/month	18	34%
			6	I don't pay now.	17	32%
4	Single select	Fee for using primary collectors (If you call primary collectors, how much do you pay for them per once?)	1	I don't use a primary collector	15	28%
			2	1 SSP/time or less	14	26%
			3	5 SSP/time or less	19	36%
			4	10 SSP/time or less or more than 10 SSP/time	4	8%
			5	No answer	1	2%

### 3) Knowledge about Collection Service by Payam

89% of respondents recognized the collection service by Payam, so it can be said that the recognition level is high. However, 75% of respondents answered that the collection by Payam

was not periodically. Therefore, only 13% of respondents were satisfied the present collection service by Payam.

**Table 4-19 Knowledge about Collection Service by Payam in Juba Town Market**

Q-No.	How To Answer	Question	Answer Option	No. of Answer	Ratio	
7	Single select	Knowledge of collection service by Payam (Do you know Juba Town Payam collects wastes with a yellow-orange compactor to clean Juba Town Market?)	1	Yes	47	89%
			2	No	6	11%
			3	No answer	17	32%
9	Single select	Satisfaction of the present collection service (Does Payam collect wastes regularly?)	1	Yes	13	25%
			2	No	40	75%
8	Single select	Frequency of collection by Payam (Are you satisfied with the waste collection system in Juba Town Market now?)	1	Yes	7	13%
			2	No	45	85%
			3	No answer	1	2%

### (3) Awareness Survey in Juba Town Market

#### (1) Purpose and Outline

On 27th July 2013, C/Ps and JICA Expert Team held the workshop for explanation of the new collection system in Juba Town Market for starting the pilot project. The number of attendants was more than 50 persons (shop owners). As one of the program of this workshop, C/Ps and JICA Expert Team implemented the awareness survey. The purpose of this awareness survey is to confirm the market people's awareness before the commencement of the pilot project. Among the attendants, 50 persons were randomly selected as the respondents for the awareness survey. Questionnaire was written in English, and local staff of JICA Expert Team explained in Juba Arabic and English at the same time. As a result, the answer collection ratio was 80% (40 persons/50 persons).

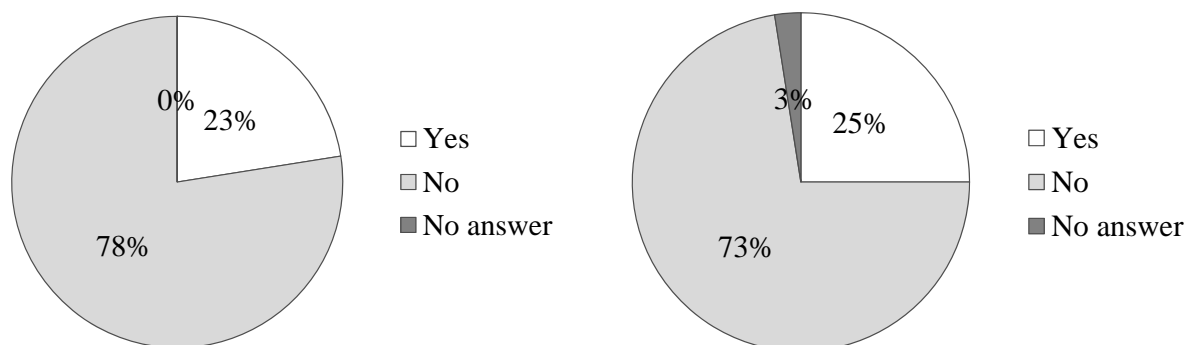
#### (2) Results

##### 1) Cleanness

The result of the question whether the market was clean before the pilot project started is shown in the following figure. Around 78% respondents thought that the market was not clean.

## 2) Satisfaction

The following figure shows the satisfaction of the present collection system. Around 73% respondents were not satisfied with the present collection system. Therefore, it is necessary to improve the collection service and its system.



(Yes: market was clean. No: market was not clean.)

(Yes: Satisfied, No: Unsatisfied)

**Figure 4-10 Awareness about Cleanness in Juba Town Market**

**Figure 4-11 Satisfaction Ratio of Present Collection in Juba Town Market**

## 3) Fee for Collection Service

The following table shows the present situation about payment for the collection service. Only 4% of respondents paid 300 SSP/month as Juba City Council set. Even 75 SSP/month seems to be expensive for residents because only 29% of residents paid this amount.

**Table 4-20 Present Payment for Collection Service in Juba Town Market**

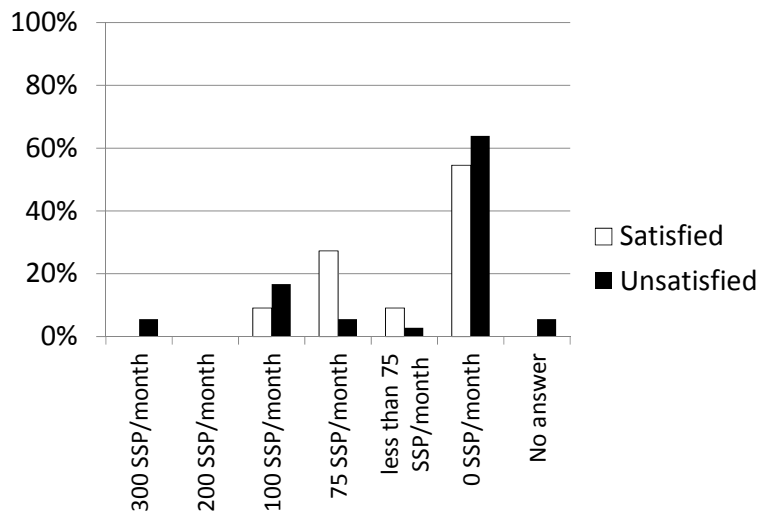
Item	Ratio
300 SSP/month	4%
200 SSP/month	0%
100 SSP/month	15%
75 SSP/month	10%
Less than 75 SSP/month	4%
0 SSP/month	63%
No answer	4%



(3) Examination

Around 80% of respondents in Juba Town Market evaluated that the present market was not clean. Around 70% of respondents were not satisfied with the present collection service, and paid only 75 SSP/month and less than it.

Here, the following figure shows the relationship between the satisfaction and payment. It seems that there is a relationship between the ratio of not-paying and satisfaction, however, it is not applied that the payment amount is high because satisfaction level is high for overall. As same as the results in Jebel Market, it is necessary for evaluation of satisfaction and other awareness to examine from various viewpoints.



**Figure 4-12 Relationship between Satisfaction and Payment in Juba Town Market**

#### 4.1.6 Survey of Fee for Service by Juba City Council

Separately from collection by each Payam, Juba City Council started the collection service for large amount dischargers in March 2013. The compactor allocation is that 3 units are used by each Payam and 1 unit is used by Juba City Council. As shown in the following table, Juba City Council contracted with each customer and the collection fee is based on the price set by Juba City Council for 2013. The actual service has started since the beginning of May 2013. Juba City Council divided the customers into 2 groups, and has collected 3 times per week for each group. And Juba City Council planned to gather the fee from customers from July 2013. Actually, there are several issues for operation of this service, such as how to deal with the large amount dischargers contracted with the private collection companies, the possibility to take the income from Payams, how to utilize the gathered fee by Juba City Council and Payams, etc. However, it is one of the proofs that Juba City Council leaned and practiced the policy that JICA Expert Team explained many times; “At first, the public agency should provide appropriate and periodical collection service, and obtain credibility from general people. Then the public agency should make the sustain service with the gathered fee for the service.”

**Table 4-21 Contract List for Collection Service by Juba City Council (as of May 2013)**

No	Name	Monthly fee	Contract Date	Type	Class
1	Mac & T Ltd. Da Vinci Lodge	2,000	2-Mar-13	Hotel	3rd
2	Ghivmay Ghebruselal Restaurant	1,000	22-Apr-13	Restaurant	Small
3	Juba Bridge Hotel	4,000	22-Apr-13	Hotel	1st
4	Dembesh Hotel SS Ltd	4,000	1-May-13	Hotel	1st
5	Guoht Hotel	4,000	1-May-13	Hotel	1st
6	New York Hotel	4,000	1-May-13	Hotel	1st
7	Notos Bar and Loundge	1,500	1-May-13	Restaurant	Medium
8	Nile Comfort Inn Hotel	2,000	2-May-13	Hotel	3rd
9	Nile Beach Hotel	3,200	1-May-13	Hotel	2nd
10	Amas Hotel (small restaurant)	1,000	22-Apr-13	Restaurant	Small
11	Star Hotel	4,000	2-May-13	Hotel	1st
12	Juba Grand Hotel	4,000	2-May-13	Hotel	1st
13	Royal Garden Hotel	3,200	22-Apr-13	Hotel	2nd
14	Sahara Hotel	3,200	1-May-13	Hotel	2nd
15	Heron Camp Site	2,000	22-Apr-13	Hotel	3rd
16	Ministry of Petroleum and Mining	200	10-May-13	Official Quarters	Ministries National Government
17	White Nile Hotel	2,000	1-May-13	Hotel	3rd
18	Blue Gold Hotel (small restaurant)	1,000	22-Apr-13	Restaurant	Small

No	Name	Monthly fee	Contract Date	Type	Class
19	Toronto Hotel	750	22-Apr-13	Company	3rd
20	Heritage Hotel	2,000	22-Apr-13	Hotel	3rd
21	Kusu Resort Hotel	2,000	22-Apr-13	Hotel	3rd
22	Intra Africa Hotel	2,000	22-Apr-13	Hotel	3rd
23	Flex River Camp	3,000	1-May-13	Lodge	
24	Hebesha Confimental Hotel	2,000	2-May-13	Hotel	3rd
25	Queen of Sheba Bar and Restaurant	2,000	1-May-13	Restaurant	Large
26	Keren Hotel Ltd	3,200	1-May-13	Hotel	2nd

#### 4.1.7 Time & Motion Survey

##### (1) Time & Motion Survey (2012)

##### a) Schedule of Time & Motion Survey

Time & Motion Survey was carried out according to the schedule shown in Table 4-22.

**Table 4-22 Schedule of Time & Motion Survey**

Date	Category	Area
30 <sup>th</sup> June	Residential area	Atlabara B
6 <sup>th</sup> July	Market area	Jebel Market
7 <sup>th</sup> July	Residential area	Atlabara A
11 <sup>th</sup> July	Market area	Jebel Market
13 <sup>th</sup> July	Market area	Jebel Market
14 <sup>th</sup> July	Residential area	No collection
18 <sup>th</sup> July	Market area	No collection

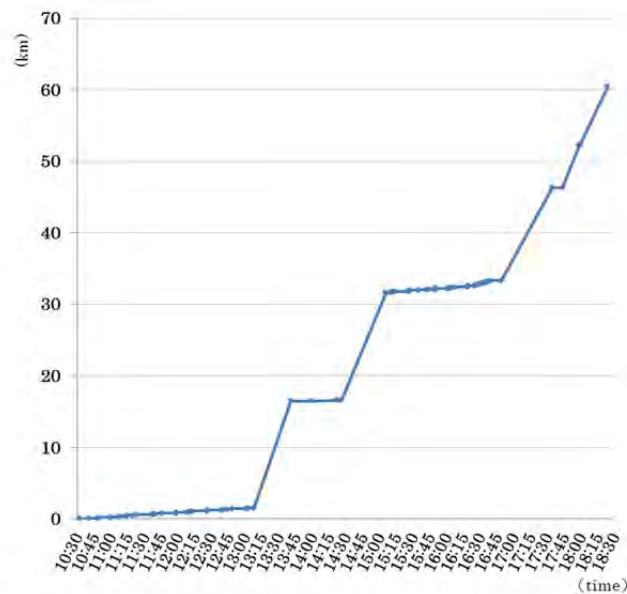
##### b) Waste Collection Survey at Residential Areas (Source: July 7th data)

The survey was conducted at residential areas in Kator Payam and Atlabara A, served by a collection vehicle (10 ton capacity), four workers and one driver. Findings of the Time & Motion Survey are as follows:

- Waste was regularly collected at Kator Payam every Saturday. In the first week, the collection was implemented, but the collection was not implemented in the next two weeks. It means the collection was not regularly implemented. Locations of the collection points, or where to discharge and collect the waste, were not planned in a systematic way.
- Regarding the collection methods, collection points were decided after discussing among the workers at Kator Payam Office every Saturday.
- Collection route was not specifically fixed. The route was along the roads at Atlabara B and C, where areas are clearly delineated; however, the route meandered around the vacant lots of the residence areas at Atlabara A.
- One of the Kator Payam officers instructed local people to cleanup an illegal dumping area,

but they refused to comply with his instructions.

- Collection method was as follows: when a collection truck came to a collection point, local people brought out the waste packed in plastic bags or bins, to the truck. The distance to a collection point was in some instances more than 100 meters. Local people seemed to be cooperative.
- After local people finished carrying the waste, the collection vehicle moved on to the next point.
- There were communities among the local people, even though they were not clearly organized. The way to discharge the waste was controlled without any rules. Each Quarter Council seemed to have a group, and the local people seemed to follow the leader's instruction to discharge the waste.
- Each collection vehicle completed 2 trips per day to the landfill site.
- The maximum waste collected per trip was approximately 6 tons.



**Figure 4-13 Result of Time & Motion Survey**



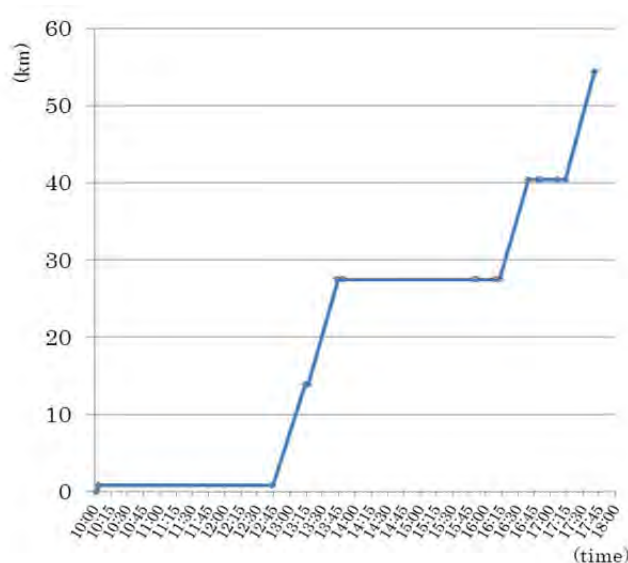
**Figure 4-14 Route of Waste Collection**

c) Waste Collection Results at Market

Time & Motion survey was conducted at the Jebel Market with a 10 ton truck, 8 workers and one driver. The findings of the Time & Motion Survey were as follows:

- It had been reported that waste is collected at Kator Payam from Monday to Friday; however, this was not always the case.
- There were two large dumping areas, where waste was collected.
- There were primary collection workers; some of them collected waste from the stores and bring it to the truck, while in other cases the employees of stores directly brought the waste to the truck.
- The local people brought the waste packed in plastic bags and bins, to the waste dumping sites.
- When the truck became full, it went to the dumpsite.
- One collection vehicle made 2 trips per day to the landfill.

As is shown in the following figure, there were 2 collection points, and it took two hours to load the waste at each collection point.



**Figure 4-15 Results of Time & Motion Survey at Market**

(2) Time & Motion Survey (2013)

a) Outline and Purpose

In order to understand the waste collection situation all over Juba City, it is necessary to understand the operation situation of 10 compactors (25m<sup>3</sup>) procured by Juba City Council because these compactors collect most of wastes in Juba City. C/Ps and JICA Expert Team implemented the time and motion survey for these compactors and rental trucks by the Project. The purpose of the survey was to confirm the differences between the compactors and rental trucks, and to find the issues of waste collection by compactors. C/Ps and JICA Expert Team planned to implement the survey twice; 1<sup>st</sup> time was the preliminary survey from November to December, 2013 and 2<sup>nd</sup> time was the main survey from January to February, 2014. However, C/Ps and JICA Expert Team had to stop in the middle of the preliminary survey because of the worsening public security. Therefore, the following results are only the intermediate results which C/Ps and JICA Expert Team obtained.

b) Methodology

Table 4-23 and Table 4-24 show the schedules and results of preliminary survey from November to December, 2013.

**Table 4-23 Schedule and Result of Preliminary Time and Motion Survey (Surveyor 1)**

Date		Target	Result	Remark	
November	21	Thursday	Rental truck (trial (Hai Thoura + others))	No	Mistake of surveyor
	22	Friday	Rental truck (Gudele Block 8 + others)	No	Mistake of surveyor
	23	Saturday	Rental truck (Juba Town Market)	No	Mistake of surveyor
	24	Sunday	off		
	25	Monday	Rental truck (Jebel Market)	No	Mistake of surveyor
	26	Tuesday	Rental truck (Atlabara B + others)	No	Mistake of surveyor
	27	Wednesday	off		
	28	Thursday	Rental truck (Hai Thoura + others)	No	Mistake of surveyor
	29	Friday	Compactor 2 (Juba Town)	OK	
	30	Saturday	Compactor 2 (Juba Town)	OK	
December	1	Sunday	off		
	2	Monday	Compactor 2 (Juba Town)	OK	
	3	Tuesday	Compactor 2 (Juba Town)	OK	
	4	Wednesday	Compactor 2 (Juba Town)	OK	
	5	Thursday	Compactor 2 (Juba Town)	No	Not to obtain because of the public security
	6	Friday	Compactor 7 (Munuki)	No	
	7	Saturday	Compactor 7 (Munuki)	No	
	8	Sunday	off		
	9	Monday	Compactor 7 (Munuki)	No	
	10	Tuesday	Compactor 7 (Munuki)	No	
	11	Wednesday	Compactor 7 (Munuki)	No	



Date		Target	Result	Remark
	12	Thursday	Compactor 7 (Munuki)	No
	13	Friday	Compactor 8 (Kator)	No
	14	Saturday	Compactor 8 (Kator)	No
	15	Sunday	off	
	16	Monday	Compactor 8 (Kator)	Not implemented
	17	Tuesday	Compactor 8 (Kator)	
	18	Wednesday	Compactor 8 (Kator)	
	19	Thursday	Compactor 8 (Kator)	

**Table 4-24 Schedule and Result of Preliminary Time and Motion Survey (Surveyor 2)**

Date		Target	Result	Remark
November	21	Thursday	Rental truck (trial (Juba Town Market))	No Mistake of surveyor
	22	Friday	Rental truck (Jebel Market)	No Mistake of surveyor
	23	Saturday	off	
	24	Sunday	off	
	25	Monday	Rental truck (Jebel Market)	OK
	26	Tuesday	Rental truck (Juba Town Market)	OK
	27	Wednesday	Rental truck (Atlabara C + others)	OK
	28	Thursday	Rental truck (Juba Town Market)	No Mistake of surveyor
	29	Friday	Compactor 3 (Juba Town)	No Mistake of surveyor
	30	Saturday	Compactor 3 (Juba Town)	OK
December	1	Sunday	off	
	2	Monday	Compactor 3, (Juba Town)	OK
	3	Tuesday	Compactor 3 (Juba Town)	OK
	4	Wednesday	Compactor 3 (Juba Town)	OK

Date		Target	Result	Remark
	5	Thursday	Compactor 3 (Juba Town)	OK
	6	Friday	Compactor 9 (Munuki)	OK
	7	Saturday	Compactor 9 (Munuki)	No
	8	Sunday	off	
	9	Monday	Compactor 9 (Munuki)	No
	10	Tuesday	Compactor 9 (Munuki)	No
	11	Wednesday	Compactor 9 (Munuki)	No
	12	Thursday	Compactor 9 (Munuki)	No
	13	Friday	Compactor 10 (JCC)	No
	14	Saturday	Compactor 10 (JCC)	No
	15	Sunday	off	
	16	Monday	Compactor 10 (JCC)	Not implemented
	17	Tuesday	Compactor 10 (JCC)	
	18	Wednesday	Compactor 10 (JCC)	
	19	Thursday	Compactor 10 (JCC)	

JICA Expert Team hired two surveyors for this preliminary time and motion survey. Surveyors recorded the time, distance, place and contents of collection work when the target vehicles started and stopped. They took several days to learn how to record; therefore, JICA Expert Team could not obtain the several results.

Regarding to measure the distance, surveyors could not record the distances from the compactors and rental trucks because odometers of these vehicles were broken. Therefore, JICA Expert Team hired two rental cars with working odometers. Surveyors in these cars followed the compactors and rental trucks, and recorded the distances.

Regarding to measure the time for rental truck by the Project, the start point was set as the time when the truck arrived at Jebel Market, and the finish point was set as the time when the truck arrived at the landfill site in the final trip. Regarding to measure the time for compactors, the

start point was set as the time when the compactor left from the workshop of Juba City Council, and the finish point was set as the time when the compactor arrived at the workshop.

c) Results and Analysis

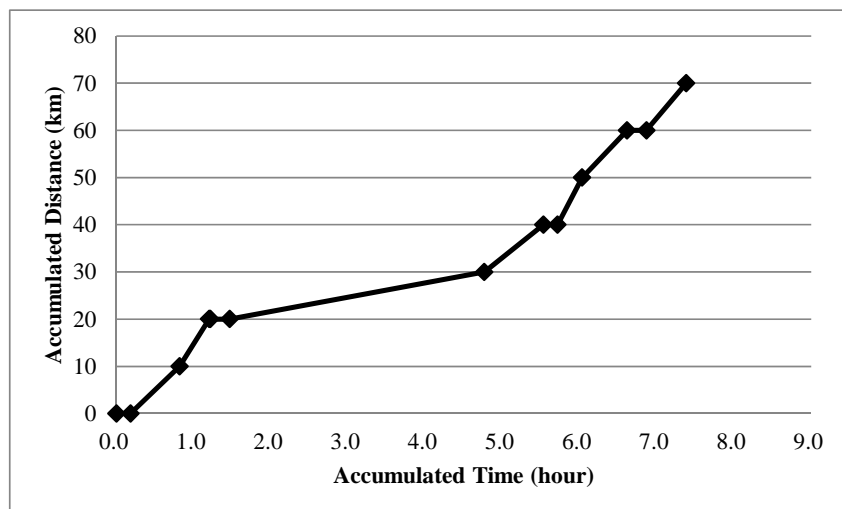
1) Rental Truck by the Project

i. Jebel Market

Table 4-25 shows the main results. Figure 4-16 shows the accumulated distance and time.

**Table 4-25 Main Results of Preliminary Time and Motion Survey in Jebel Market**

Item	Unit	Results
Date of survey	Year/Month/Date	2013/11/25
Average time of collection work	Minute	11
Number of trip	Trip	4
Total accumulated distance	Km	70
Total accumulated time	Hour	7



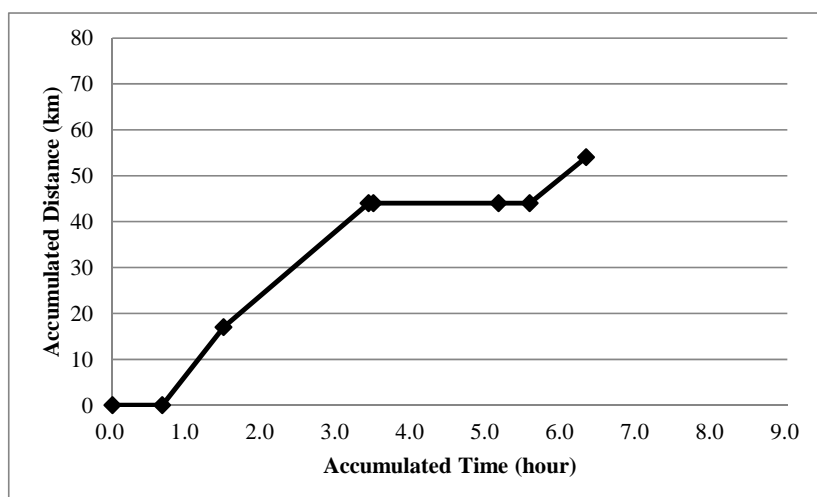
**Figure 4-16 Accumulated Distance and Time by Time and Motion Survey in Jebel Market**

ii. Juba Town Market

Table 4-26 shows the main results. Figure 4-17 shows the accumulated distance and time.

**Table 4-26 Main Results of Preliminary Time and Motion Survey in Juba Town Market**

Item	Unit	Results
Date of survey	Year/Month/Date	2013/11/26
Average time of collection work at Point 1	Minute	100
Average time of collection work at Point 2	Minute	37
Number of trip	Trip	2
Total accumulated distance	Km	54
Total accumulated time	Hour	6



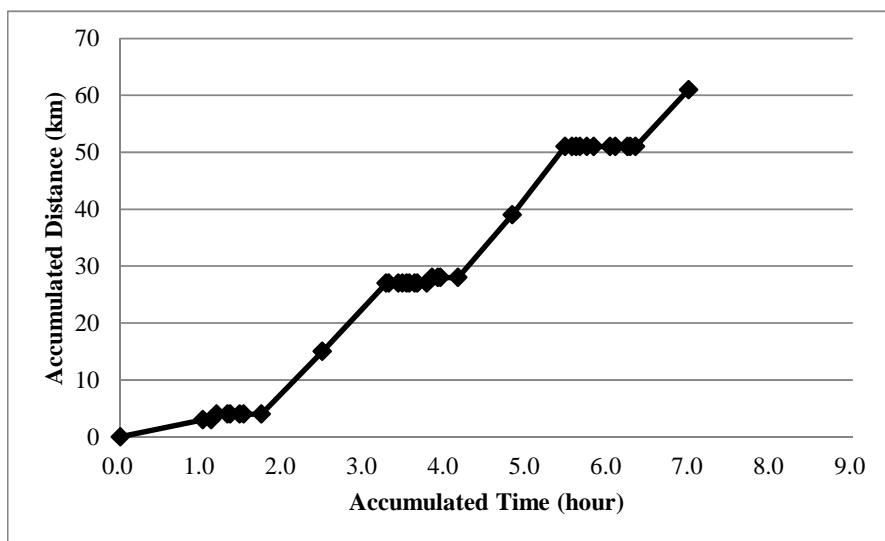
**Figure 4-17 Accumulated Distance and Time by Time and Motion Survey in Juba Town Market**

iii. Atlabara C

Table 4-27 shows the main results. Figure 4-18 shows the accumulated distance and time.

**Table 4-27 Main Results of Preliminary Time and Motion Survey in Atlabara C**

Item	Unit	Results
Date of survey	Year/Month/Date	2013/11/27
Number of collection points	Point	15
Average time of collection work at point	Minute	7
Number of trip	Trip	3
Total accumulated distance	Km	61
Total accumulated time	Hour	7



**Figure 4-18 Accumulated Distance and Time by Time and Motion Survey in Atlabara C**

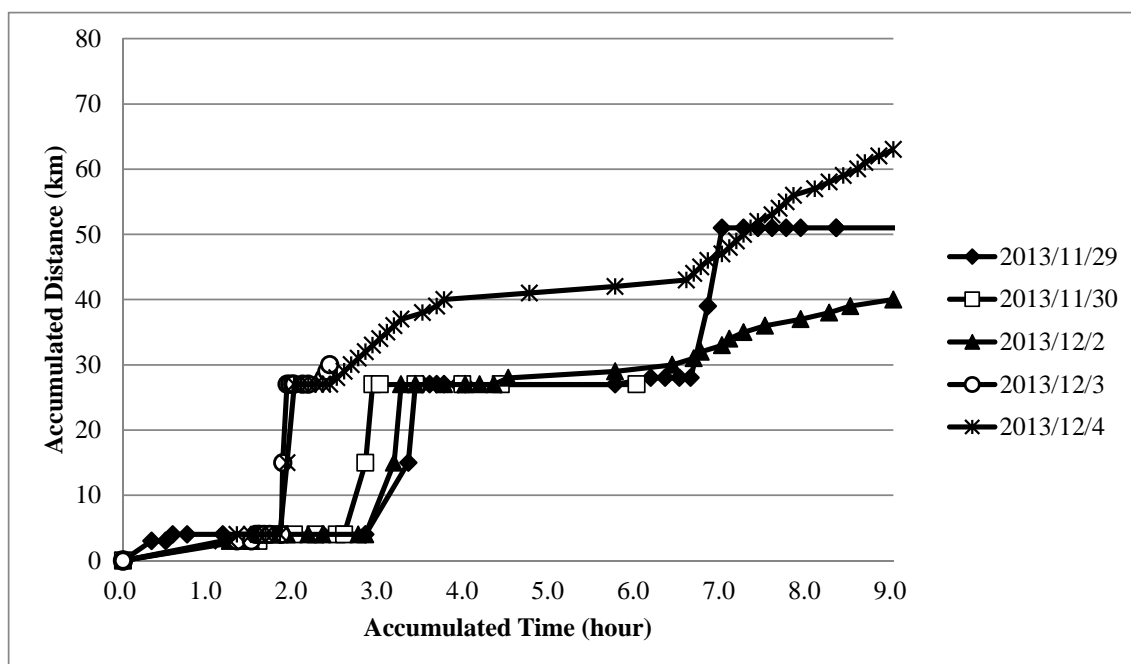
2) Compactor No.2 (Juba Town Payam)

Table 4-28 shows the main results. Figure 4-19 shows the accumulated distance and time. The number of collection point was varied day by day. Comparing to the results of Atlabara C, which is one of the target areas of the Project, the number of collection point was larger; the

average working time at point was longer; the accumulated distance was shorter; and the number of trip was smaller. It is because that Juba Town Payam implements road cleaning and waste collection (house to house collection in some areas) at the same time. If Juba Town Payam decrease the number of collection point, they can reduce the average working time at point and increase the number of trip. It means they can increase the transportation amount.

**Table 4-28 Main Results of Preliminary Time and Motion Survey for Compactor No.2**

Item	Unit	Results					
Date of survey	Year/Month/ Date	2013/ 11/29	2013/ 11/30	2013/ 12/2	2013/ 12/3	2013/ 12/4	Average
Number of collection points	Point	28	13	24	14	25	20.8
Average time of collection work at point	Minute	14	14	14	5	6.2	10.6
Number of trip	Trip	2	1	1	1	1	1.2
Total accumulated distance	Km	51	27	40	30	64	42.4
Total accumulated time	Hour	9	6	9	2	9	7



**Figure 4-19 Accumulated Distance and Time by Time and Motion Survey for Compactor No.2**

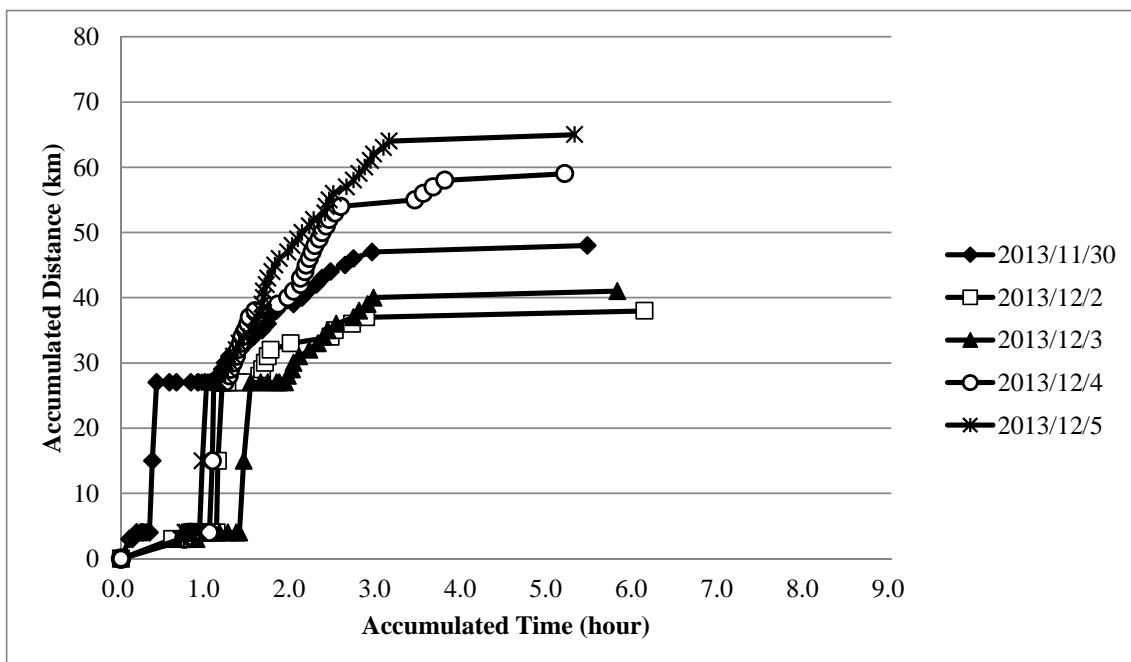
3) Compactor No.3 (Juba Town Payam)

Table 4-29 shows the main results. Figure 4-20 shows the accumulated distance and time. As same as the results of Compactor No.2, the number of collection point was varied day by day. The average number of collection point and the average working time are mostly same as the results of Atlabara C. However, it cannot be said that the collection work with Compactor No.3 was efficient because the working time with compactor is smaller than that with truck in general.

**Table 4-29 Main Results of Preliminary Time and Motion Survey for Compactor No.3**

Item	Unit	Results					Average
		2013/11/30	2013/12/2	2013/12/3	2013/12/4	2013/12/5	
Date of survey	Year/Month/Date	2013/11/30	2013/12/2	2013/12/3	2013/12/4	2013/12/5	
Number of collection points	Point	18	12	14	23	26	18.6

Item	Unit	Results					
Average time of collection work at point	Minute	5	7	6	5	3	5.2
Number of trip	Trip	1	1	1	1	1	1.0
Total accumulated distance	Km	48	38	41	59	65	50.2
Total accumulated time	Hour	6	6	6	5	5	5.6



**Figure 4-20 Accumulated Distance and Time by Time and Motion Survey for Compactor No.3**

4) Compactor No.9 (Munuki Payam)

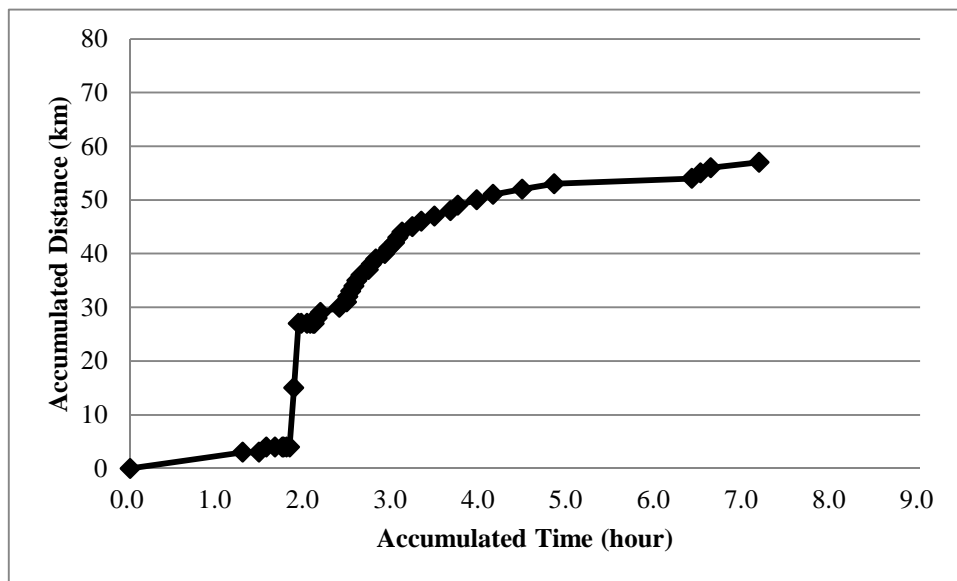
Table 4-30 shows the main results. Figure 4-21 shows the accumulated distance and time. As same as the results of Compactor No.3, the average number of collection point and the average working time are mostly same as the results of Atlabara C. However, it cannot be said that the



collection work with Compactor No.9 was efficient because the working time with compactor is smaller than that with truck in general.

**Table 4-30 Main Results of Preliminary Time and Motion Survey for Compactor No.9**

Item	Unit	Results
Date of survey	Year/Month/Date	2013/12/6
Number of collection points	Point	20
Average time of collection work at point	Minute	6
Number of trip	Trip	1
Total accumulated distance	Km	57
Total accumulated time	Hour	7



**Figure 4-21 Accumulated Distance and Time by Time and Motion Survey for Compactor No.9**

#### 4.1.8 Environmental Monitoring

##### (1) Purposes

In order to grasp the impacts on surrounding environment from the landfill, the groundwater quality and landfill gas were measured. This helped to let the C/Ps understand the importance of environmental monitoring.

##### (2) Monitoring points

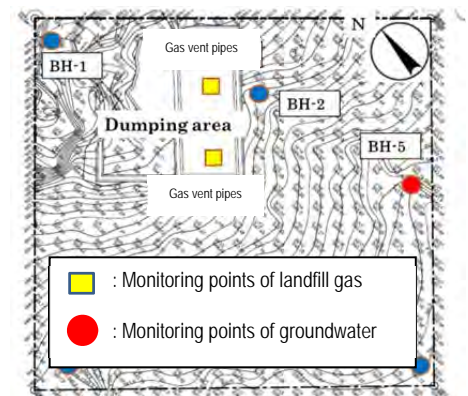
The monitoring points are shown in the right figure.

##### i) Groundwater quality

BH-5 was selected as the groundwater monitoring point among the boring points, where the impacts of the leachate would be significant if the leachate leaks.

##### ii) Landfill gas

The landfill gas was measured at two gas vent pipes where the waste filling had been completed.



**Figure 4-22 Environmental monitoring points**

##### (3) Results of measurement

The results of monitoring are described as follows.

##### i) Groundwater quality

The values of COD,  $\text{NH}_4^+\text{-N}$  and  $\text{NO}_3^-\text{N}$  were low, which meant that the possibility of leachate leakage was low.

**Table 4-31 Results of groundwater measurement**

Measurement date	Color	Groundwater level (GL-m)	pH	EC (ms/cm)	COD (mg/l)	NH <sub>4</sub> <sup>+</sup> -N (mg/l)	NO <sub>3</sub> -N* (mg/l)
2013/8/26	Transparent	—	6.8	2.00	5	0.3	20
2013/10/5	Transparent	—	—	—	13	0.5	20
2013/11/1	Transparent	9.75	6.6	1.22	7	0.0	20

\*Minimum value: 20mg/l

ii) Landfill gas

The temperature inside the landfill was high; the density of CH<sub>4</sub> and CO<sub>2</sub> was high, which meant that waste had been decomposed under the anaerobic circumstances.

**Table 4-32 Results of landfill gas measurement**

Measurement date	Measurement points	Temperature (°C)	CH <sub>4</sub> (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	H <sub>2</sub> S (ppm)	CO (ppm)
2013/11/9	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 4-23 Groundwater monitoring by C/P**

**Figure 4-24 Landfill gas monitoring by C/P**

## 4.2 Capacity Assessment

### 4.2.1 Outline

At the beginning of 2nd Year of the Project, capacity assessment (“CA”) was implemented at the individual level. The C/Ps (15 persons) who answered questionnaires are listed in Table 4-33. The method was self-evaluation-type using a questionnaire, which was also applied in the 1st Year. As is shown in Table 4-34, the questionnaire covers 6 areas (13 questions in total) in the whole solid waste management with 4-level evaluation (1: very low capacity – 4: very high capacity).

**Table 4-33 CA List**

	Organization	Name	Position/Title
1	MoE-RSS	Dorina Keji (*)	Assistant Information Officer
2	Juba City Council	Taban Charles Michael	Assistant CEO
3	Juba City Council	Hilary Dada	Planning Director
4	Juba City Council/ Juba Town Payam	Kalisto Tombe (*)	Public Health Division Director
5	Juba County	Sebit Amosa (*)	Public Health Director
6	Juba Town Payam	Silvestro Peter Mario	Public Health Officer
7	Juba Town Payam	Nasia Hassan	Public Health Officer
8	Kator Payam	Gamardin Mogga (*)	Public Health Officer
9	Munuki Town Payam	Stephen Tako (*)	Public Health Officer
10	Munuki Town Payam	Lubang David Lodu	Public Health Officer
11	Rejaf Payam	Michael Francis	Director
12	Rejaf Payam	Towongo Robert Elizara	Assitant Manager
13	Rejaf Payam	Grace Marcello	Inspector of Public Health
14	Rejaf Payam	Justin Lukudu Elia	Assistant Manager
15	Rejaf Payam	Yousif Pitia	Landfill Manager

(\*) indicates the persons who answered in the 1<sup>st</sup> Year as well.

**Table 4-34 Question Items and Contents of CA**

	Item	Content
A)	Administrative capacity	To grasp whether C/Ps have appropriate knowledge on law and regulations of solid waste management, and whether C/Ps understand their organizational roles etc.
B)	Responsibility and will for the task	To self-evaluate whether C/Ps have sense of mission on solid waste management, and whether C/Ps can work as a team to solve challenges etc.
C)	Technical knowledge and skills for waste management planning	To understand whether C/Ps can analyze the current issues and plan proper countermeasures etc.
D)	Technical knowledge and skills for waste collection system	To self-appraise whether C/Ps can analyze the current issues and propose proper collection system etc.
E)	Technical knowledge and skills for landfill management	To comprehend whether C/Ps can analyze the current issues and operate/manage landfill adequately etc.
F)	Technical knowledge and skills for environmental education/ information dissemination	To understand whether C/Ps can apply environmental education/ public relations into solid waste management etc.

#### 4.2.2 Results/Analysis

This result is based on the self-evaluation by C/Ps on solid waste management, reflect 1st Year's activities. The average values for each item are shown in Table 4-35. Even though these values don't tell definitely how their capacity has been developed, it is clear that in general the average values tend to be improved compared to 1st Year. The average in total from A) to F) is 2.4 in 2nd Year while 2.0 in 1st Year. The results in 1st Year are set as the baseline, which are the indicators to judge the accomplishment in the end of the project.

**Table 4-35 Evaluation Results of C/Ps individual Capacity Assessment at the beginning of 1<sup>st</sup> Year and 2<sup>nd</sup> Year**

	Item	Average Values in 1 <sup>st</sup> Year	Average Values in 2 <sup>nd</sup> Year
A)	Administrative capacity	1.9	2.7
B)	Responsibility and will for the task	2.3	2.8
C)	Technical knowledge and skills for waste management planning	2.1	2.3
D)	Technical knowledge and skills for waste collection system	2.0	2.5
E)	Technical knowledge and skills for landfill management	1.5	2.0
F)	Technical knowledge and skills for environmental education/ information dissemination	2.0	2.4
Average		2.0	2.4

The results and analysis of each item are as follows:

A) Administrative capacity

The average value of administrative capacity for Ministry of Environment and Juba City Council officers is relatively high (average value: 3.4). In 2nd Year, the establishment of preparatory committee for solid waste management company was approved at JCC meeting, and the discussion has been done during this project; the administrative capacity is expected to be improved more, especially Juba City Council officers.

B) Responsibility and will for the task

Among this item, average value on teamwork to solve issues is higher (average value: 3.4). Since April, 2014, JSWVG has been organized and the weekly meetings have been held. This type of continuous activities contributed to the capacity improvement on responsibility and will on solid waste management.

C) Technical knowledge and skills for waste management planning

In the 1st Year, JSWVG was set up, and the group discussed the current challenges and the future strategies, which contributed to the improvement of technical knowledge on waste management planning.

D) Technical knowledge and skills for waste collection system

During the 1st Year, collection pilot project at markets and residential areas have been implemented, which made the progress on the Payam officers' capacity development (average value: 2.7). By the end of these pilot projects, C/Ps were expected to obtain sufficient capacity to sustainably organize solid waste collection by themselves, so that they can sustain the implementation system after the project. In this sense, C/Ps need to be confident in their knowledge and skills on solid waste collection system.

E) Technical knowledge and skills for landfill management

From the 1st Year, the landfill improvement pilot project has been done, which improved the Rejaf Payam officers' capacity. The capacity development of a landfill manager and operators is

essential to properly operate the landfill. On the job training was done to develop their capacity more.

F) Technical knowledge and skills for environmental education/ information dissemination

In the 2nd Year the public relations and recycling activities were incorporated into the project, because the C/Ps' capacity on these areas is lacking so far, which was improved in 2nd Year.

In sum, the C/Ps' understanding about waste collection and landfill operation has been deepened in general.

Regarding waste collection, compared to the 1st Year, C/Ps have clearer visions on solid waste management such as how to organize waste collection. However, the comprehension and readiness on how to manage the breakdown of collection vehicles and how to work with other related entities aren't sufficient. Even though the work for collection has been improved such as leasing private vehicles in case of breakdown, the strong will to implement stable collection is still weak. Therefore, they tend to leave the problems even if their vehicles are broken or not properly allocated. The importance of public services isn't recognized well.

Concerning landfill operation, the systematic work with Juba County and Rejaf Payam has been progressed, and the stable service is expected to continue.

### 4.3 Current Condition of Juba City Council and Payams

#### 4.3.1 Organization and Staff

Table 4-36 shows the organization units and its number of staff of the Juba City Council (hereinafter the City Council), Juba Payam, Kator Payam and Munuki Payam. Two types of staff are deployed in the units totaling up to 377; namely “Classified Staff” and “Unclassified Staff”. The former is the staff seconded from the State Government, and the latter employed directly by the City Council and Payams. 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 4-36 Organization and Number of Staff**

1. Juba City Council				2, Juba Payam			
Unit	C/staff	UC/staff	Total	Unit	C/staff	UC/staff	Total
1. Mayor's Office	5	4	9	1. Payam Administrator	9	5	14
2. D/Mayor's Office	6	4	10	2. Clerical	13	2	15
3. Admin. & Finance	36	120	156	3. Rate	25	2	27
4. Education	7	3	10	4. Accounts	11	2	13
5. Public Health	4	4	8	5. Northern Zone	10	17	27
6. Social Welfare	7	4	11	6. Southern Zone	10	17	27
7. Culture & Information	5	6	11	7. Eastern Zone	10	17	27
8. Veterinary	4	7	11	8. Work-shop	10	106	116
9. Public Work	8	10	18	-	-	-	-
10. Agriculture	3	11	14	-	-	-	-
11. Forestry	5	11	16	-	-	-	-
<b>Total</b>	<b>90</b>	<b>184</b>	<b>274</b>	<b>Total</b>	<b>98</b>	<b>168</b>	<b>266</b>
3. Kator Payam				4. Munuki Payam			
Unit	C/staff	UC/staff	Total	Unit	C/staff	UC/staff	Total
1. Admin. & Finance	24	22	46	1. Admin. & Finance	31	17	48
2. Social Welfare	5	1	6	2. Social Welfare	8	1	9
3. Community Develop.	4	1	5	3. Community Develop.	8	1	9
4. Veterinary	4	4	8	5. Physical Infrast.	7	7	14
5. Physical Infrast	7	5	12	5. Forestry	7	8	15
6. Forestry	6	10	16	6. Veterinary	4	6	10
7. Konyokonyo QC	12	18	30	7. Mauna Jebel Zone	9	4	13
8. Altabara QC	8	8	16	8. Munuki Zone	9	4	13
9. Kator QC	8	7	15	9. Nyokuron Zone	12	4	16
10. Jebel Korok QC	8	13	21	10. Gudele Zone	9	4	13
-	-	-	-	11. Native Admin.	2	0	2
<b>Total</b>	<b>86</b>	<b>89</b>	<b>175</b>	<b>Total</b>	<b>106</b>	<b>56</b>	<b>162</b>
<b>Grand Total of Juba City Council and 3 Payams</b>					<b>C/staff</b>	<b>UC/staff</b>	<b>Total</b>
					<b>380</b>	<b>497</b>	<b>877</b>



Note: C/Staff = Classified Staff : Seconded staff from the State Government, UC/Staff = Unclassified Staff :  
Recruited staff by City Council and Payams

Source: Budget Report of Financial Year 2012/13 of Juba City Council and 3 Payams

### 4.3.2 Year Budget

Table 4-37 shows the financial year 2012/13 budget of the City Council, Juba Payam, Kator Payam and Munuki Payam.

The expenditures totaled up to SSP 33.5million, among which the personnel expenditure was the biggest and its proportion reached at 30%. The capital spending on the construction of new office building was remarkable in this financial year budget.

The revenue composed of the own revenues and the grant from the State Government. The own revenue of the City Council is raised from such income as various permits, business license fee, vehicle license fee and certificate issue fee. On the other hand, the 3 Payams 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 Juba City Council.

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 Juba City Council was approved in the beginning of November 2012. Meanwhile, the 2013/14 budget of the Juba City Council is on the process of finalizing as of end September.

**Table 4-37 Budget of Financial Year 2012/13 (1000 SSP)**

Budget Item			Juba City Council	Juba Payam	Kator Payam	Munuki Payam	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 2012/13 of Juba City Council and 3 Payams

### 4.3.3 Vehicles and Staff for SWM Service

The questionnaire and interview survey on vehicle and staff for SWM service of the City Council and 3 Payams was done by the JICA Expert Team in June 2013. The results of the survey are described below.

#### (1) Collection Vehicle

Table 4-38 and 4-39 presents respectively the list of the compactors and the other vehicles owned by the City Council and 3 Payams. Ten compactors, though being secondhand, were purchased in August of 2012 by the City Council and 3 Payams through their joint financing. Presently, 2 compactors are allocated to the City Council, 2 to Juab Payam, 3 to Kator Payam and 2 to Munuki Payam.

Incidentally, 3 compactors of Kator Payam have been out of order and kept waiting for repairing since August at the workshop garage. However, the date to fix them is unpredictable because of lack of the spare parts.

**Table 4-38 Compactor**

Manufacturer	Chassis No.	Capacity	Year of Manufacture	Year of Purchase	Amount of Purchase
Mercedes	K535044	25m <sup>3</sup>	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 (Juba City Council: 2, Juba Payam 2, Kator Payam 3, Munuki Payam 2)			Total Amount: US\$ 782,630		

Source: Questionnaire survey to Juba City Council and 3 Payams done in June of 2013

Other vehicles are actually operating but aged. Six tractors and twenty containers were granted by USAID in 2007. However, most of containers have been unused and kept at the garage of the City Council workshop.

**Table 4-39 Other Vehicle**

Tipper Truck						
Owned by	Nos.	Manufacturer	Capacity	Year of Manufacture	Year of Purchase	Amount of Purchase
Juba Payam	1	Isuzu	8m <sup>3</sup>	n/a	n/a	n/a
Kator Payam	2	Isuzu				
	1	Fuso				
Munuki Payam	1	Isuzu			2007年	
Total	5 台					
Compressed-Type Compactor						
Juba Payam	1	Nissan Diesel	14m <sup>3</sup>	n/a	2012	n/a
Munuki Payam	1					
Total	2					
Tractor						
Juba Payam	2	Massey Ferguson	-	2007	Granted by USAID in 2007	n/a
Kator Payam	2					
Munuki Payam	2					
Total	6					
Container						
Juba City Council and 3 Payams	20	Stored in the garage of Workshop	5 m <sup>3</sup>	2007	Granted by USAID in 2007	n/a

Source: Questionnaire survey to Juba City Council and 3 Payams done in June of 2013

(2) Staff engaging in SWM Service

Table 4-40 presents number of staff of the City Council and 3 Payams that are engaging in SWM service. Number of the SWM staff totals up to 185 that correspond to 20% of total staff (377) of the City Council and 3 Payams (see Table 4-35). Number of the part-time workers is summed up to 447; this number will increase if includes field supervisor and road cleaner of Munuki Payam. Number of loading-and-unloading worker is 302 that represent the remarkable high percentage, equaling to 70% of total SWM staff.

**Table 4-40 Number of SWM Staff (as of 2012 Year End)**

Classification of Staff		Juba City Council	Juba Payam	Kator Payam	Munuki Payam	Total
Full-time Staff	(Administration and Supervising)	2	5.8 <sup>Note</sup>	4.7 <sup>Note</sup>	4.1 <sup>Note</sup>	16.6 <sup>Note</sup>
Full-time Staff (Field Working)	Driver	2	5	6	6	19
	Assistant Driver	-	5	-	6	11
	Loading & Unloading	-	52	-	40	92
	Road Cleaner	-	-	36	10	46
	Total	2	62	42	62	168
Part-time Worker	Field -supervising	2	2	12	When needed	16

	Loading & Unloading	10	40	150	10	210
	Road Cleaner	12	41	-	Whenneeded	53
	Total	24	83	162	10	279
Grand Total		26	145	204	72	447
(Reference)	Total of Loading & Unloading Workers	10	92	150	50	302
	Total of Road Cleaners	12	41	36	10	99

Note: Full-time staff (8 hours working) is counted 1 staff; otherwise staff working less than 8 hours is divided by 8.

Source: Questionnaire survey to Juba City Council and 3 Payams done in June of 2013

### (3) Expenditures spent on SWM Service

Table 4-41 shows the expenditures on SWM service that the City Council and 3 Payams spent in the financial year of 2011/12. These expenditures are compared with the total recurrent expenditures of the 2012/13 budget of the City Council and 3 Payams respectively because the 2011/12 budgets were un-obtainable. The comparison revealed that 4% for the City Council, 10% for Juba Payam, 50% for Kator Payam and 13% for Munuki Payam. It is obvious that Kator Payam spent the biggest amount on SWM among others.

**Table 4-41 Expenditures on SWM Service (Financial Year of 2011/12, 1000SSP)**

Item of Expenditure	Juba City Council	Juba Payam	Kator Payam	Munuki Payam	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 Juba City Council and 3 Payams done in June of 2013

#### 4.3.4 Workshop of Juba City Council

The workshop is owned by the City Council. It is 3,500m<sup>2</sup> in area where an office, a workplace, a storehouse and garage locate (see Figure 4-25 and 4-26). Incidentally, these facilities have been demolished, and the new facilities are now under the construction there.

	
<p><b>Figure 4-25 Overview of Workshop Area</b></p>	<p><b>Figure 4-26 Garage for 10 compactors</b></p>

Currently 7 staffs are working for the workshop as presented in Table 4-42.

**Table 4-42 Staff of Workshop**

Administration	2 staff: Manager 1 and Store Keeper 1
Mechanic	4 staff: Technician 1, Supervisor 1, Mechanic 1 and Assistant. Mechanic 1
Security	Security Guard 1

Source: Juba City Council

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 as presented in Figure 4-27 and 4-28. Accordingly, the breakdown vehicles cannot be repaired promptly. As of end September, 3 compactors of Kator Payma are not in operation because of breakdown (springs, hydraulic pressure and gear) and parking at the garage. The procurement date for the spare-parts has not been scheduled at present because of the internal procedure of the City Council. Accordingly, Kator Payam has been forced to hire the vehicles and come up against an increasing financial burden.



**Figure 4-27 Manager and Storehouse**



**Figure 4-28 Air-filter for Compactor**

#### 4.3.5 Working Situation

It was informed that the delay to repair the breakdown of compactors was due to the lack of spare parts; however, a mechanic hired by Juba City Council since November, 2012, has never repaired the breakdown. The system and capacity to repair the breakdown are necessary to be improved.

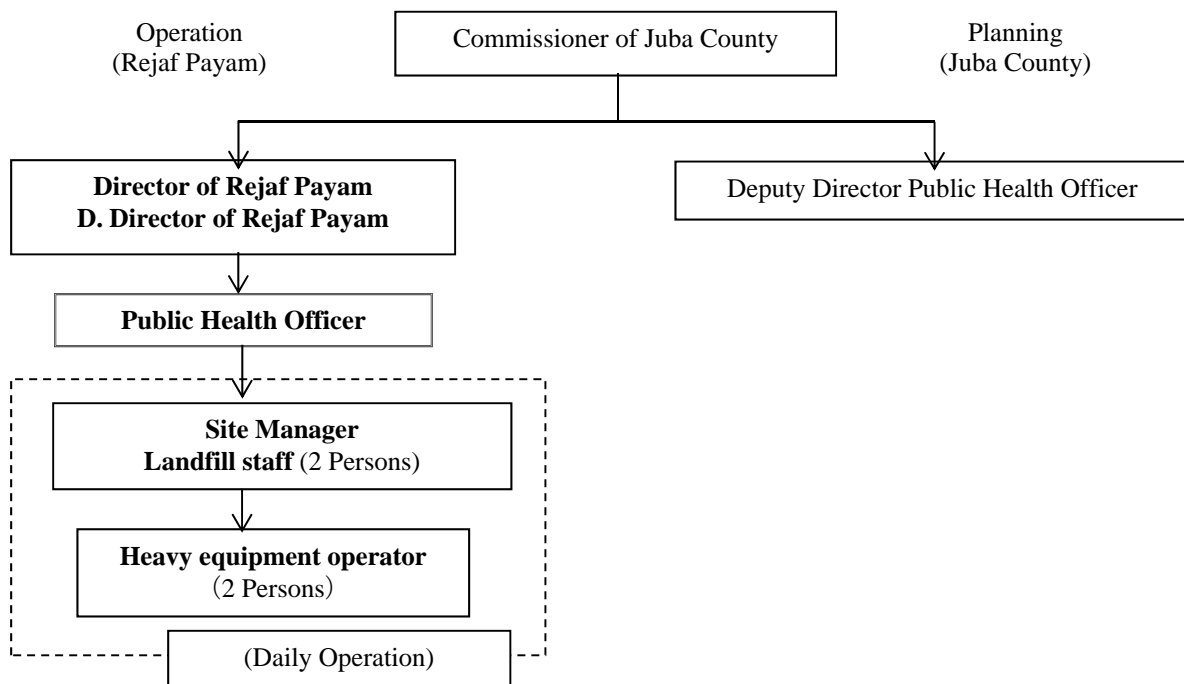
#### 4.4 Pilot Projects

##### 4.4.1 Improvement of Existing Dumping Site

###### (1) Operation and maintenance of dumping site

###### a) Organization

The organization for operation and maintenance (hereinafter referred to as “O&M”) of 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 (Figure 4-29).



**Figure 4-29 Organization for operation and maintenance of Juba County Controlled Dumping Site**

b) Fee Collection for O&M

1) Fee Collection from Users

Rejaf Payam has collects fee for O&M in order to secure the O&M cost. Large vehicles should pay 50 SSP and small vehicles should pay 25 SSP.

The average amount of disposal fee was 20,000SSP per month, and the average number of incoming vehicles was 45 vehicles per month, according to the data from July, 2012 to December, 2013; the average amount of disposal fee was 20,000SSP per month, and the average number of incoming vehicles was 22 vehicles per month, according to the data from January, 2014 to July, 2014. After the political conflicts in December, 2013, the number of incoming vehicles was reduced, but the amount of disposal fee was not changed. This is because the system to clearly identify the disposal fee and the toll fee to transport the materials was established. It is assumed that 40,000SSP (20,000SSP x 2) were collected before the political conflicts.

**Table 4-43 Average amount of monthly disposal fee and the number of incoming vehicles**

Item	July, 2012- December, 2013	January, 2014- June, 2014
Disposal fee	20,000	20,000
Incoming vehicles	45	22

2) O&M Cost

In order to operate the bulldozer newly procured by JICA from August 2013, the calculation of O&M cost had been started since August 2013.

The operation cost was 38,240SSP per month according to the data from August, 2013 to December, 2013; the operation cost was 22,820SSP per month according to the data from January, 2014 to June, 2014. The collected amount of disposal fee was reduced after the political conflicts, because of the reduced number of incoming vehicles. Therefore, the fuel cost for a bulldozer and the hiring cost of heavy machinery for soil cover were controlled to be low.



**Table 4-44 Monthly operation cost**

Item	August, 2013- December, 2013	January, 2014- June, 2014
Fuel cost for a bulldozer	18,000 SSP	10,000 SSP
Salary for the staff	5,120 SSP	5,120 SSP
Hiring cost for heavy machinery for soil cover	15,120 SSP	7,000 SSP
Maintenance of a bulldozer	0 SSP	700 SSP
Total	38,240 SSP	22,820 SSP

3) Comparison between Collected Fee and O&M Cost

The proper operation and maintenance was possible, if the number of incoming vehicles is the same as before the political conflicts in December, 2013. However, with the current number of incoming vehicles, it is difficult to operate and maintenance the dumpsite in a proper way: the frequency of soil cover should be changed from twice to once a month; the frequency of fuel supply from every day to every two days.

c) Situation of O&M

Operation Manual was prepared with landfill staff in August 2013 (see attachment). From now on, O&M of Juba County Controlled Dumping Site will be implemented with this manual. By March 2014, this manual will be used and improved according to the actual works, and then finalized. The present O&M situation is shown in the following table.

**Table 4-45 Present O&M Situation at Juba County Controlled Dumping Site**

Work Item	Situation
1) Overall management <ul style="list-style-type: none"> <li>• Operation record</li> <li>• Weekly meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Site manager makes the operation record every day.</li> <li>• Weekly meeting is held on every Monday. The chairperson reports issues to Director of Rejaf Payam.</li> </ul>
2) Incoming vehicle management <ul style="list-style-type: none"> <li>• Guidance for incoming vehicles to the dumping place</li> <li>• Record of incoming vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• Guidance is mostly done every day. Sometimes staff guides vehicles into muddy places and vehicles get stuck in the mud.</li> <li>• Site manager makes the incoming vehicle record every day.</li> </ul>
3) Landfilling management <ul style="list-style-type: none"> <li>• Landfilling</li> <li>• Soil Covering</li> <li>• Management of waste pickers</li> </ul>	<ul style="list-style-type: none"> <li>• Landfilling is mostly done every day. Compaction is not enough at some areas. The present height of the site is 7.5 m = 2.5 m/layer x 3 layers. It is almost same as the final landfilling height.</li> <li>• 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.</li> <li>• There are not any fires and accidents (injury) at present. Waste pickers cleaned the site once per 2 weeks.</li> </ul>
4) Facility management <ul style="list-style-type: none"> <li>• Facility management</li> <li>• Management of heavy equipment</li> <li>• Extension of gas vent pipes</li> </ul>	<ul style="list-style-type: none"> <li>• Using the Operation Manual, management of each facility will start from September 2013.</li> <li>• Operation started in August 2013. Management will start with the Operation Manual from September 2013.</li> <li>• 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.</li> </ul>
5) Environmental management <ul style="list-style-type: none"> <li>• Groundwater</li> <li>• Gas</li> </ul>	<ul style="list-style-type: none"> <li>• From September 2013, COD, Nitrate nitrogen and Ammonia nitrogen will be measured with simple water analysis tools at the monitoring wells which were set by the geological and groundwater survey.</li> <li>• In October 2013, O<sub>2</sub>, CO<sub>2</sub> and Methane and Hydrogen sulfide water will be measured with simple gas analysis tools at the gas vent pipes.</li> </ul>

(2) Construction of landfill expansion areas

a) Purposes of landfill expansion

Landfill area (Phase-1) was started to be filled in July, 2012, and the waste filling space was getting smaller. Hence, the southern part of Phase 1 area was expanded in October, 2013, which made it possible to secure the landfilling space for more four years, and through which C/Ps learned how to expand landfill area, so that they can implement landfill expansion by themselves in the future.

b) Guidance of landfill expansion

1) Targets of guidance

Targets of guidance were a site manager and landfill staff.

2) Contents of guidance

i) Management of construction procedure (only for site manager)

ii) Construction method of embankment and supervision of construction work (for site manager and landfill staff)

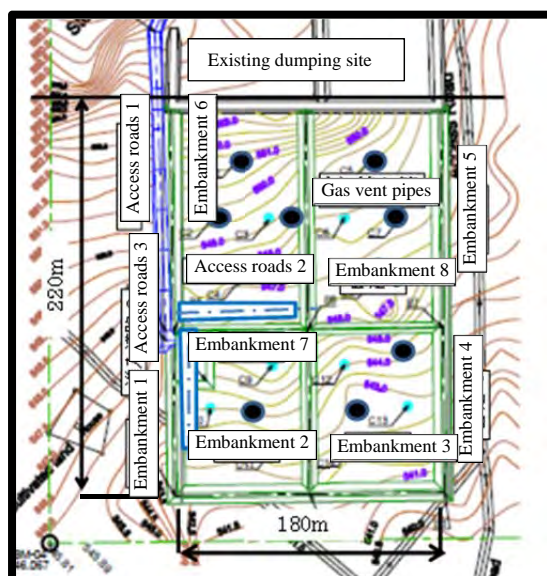
- Management of height and location of embankment
- How to use heavy equipment (bulldozer, back hoe, dump truck)
- Construction and compaction of embankment

c) Contents of construction work

4ha of controlled dumping site was constructed, after the expansion to the southern part of existing dumping site. The detail of construction is shown as follows.

**Table 4-46 Contents of construction work**

Name of facility	Size
Embankment	Top width: 3.5m Height: 3.5m Length: 800m
Access roads	Width: 7m Length: 400m
Gas vent pipes	Structure: $\phi$ 150mm Perforated pipes + crushed stone Number of pipes: 14 pipes



**Figure 4-30 Plan of landfill expansion area**

d) Collaboration among JICA, Japan Self Defense Force and Rejaf Payam

This construction work was done with direct operation by JICA, Japan Self Defense Force and Rejaf Payam. The construction work done by each organization was as follows. It is noteworthy that a bulldozer of Rejaf payam also joined the construction work while doing the waste filling work.

**Table 4-47 Collaboration work among JICA, Japan Self Defense Force and Rejaf Payam**

	Equipment and materials provided	Construction work
JICA	Bulldozer, excavator, dump truck, gas vent pipes, marking poles, shaking roller	Site cleaning, Installation of marking poles, construction of embankment and access roads, Installation of gas vent pipes
Japan Self Defense Force	Bulldozer	Construction of embankment
Rejaf Payam	Bulldozer	Site cleaning, Installation of poles, Construction of embankment and access roads

e) Construction period and procedure

The construction period is one month from October 16, 2013 to November 15, 2013. The construction procedure is shown as follows. The pictures of construction work are shown in Figure 4-31-33.



	
<p><b>1. Explanation of construction outline and schedule (October 16, 2013)/ Installation of marking poles October 19, 2013)</b></p> <p>The construction outline and schedule was explained before the construction started. Landfill staff members set up the marking poles for embankment construction on October 19.</p>	
	
<p><b>2. Levelling work (October 16- 19, 2013)</b></p> <p>The levelling work at expansion area was begun on October 16. A bulldozer procured by JICA laso helped the levelling work while doing waste filling work.</p>	
	
<p><b>3. Excavation and soil transportation work (October 21-17, 2013)</b></p> <p>Excavation and soil transportation work was started with an excavator and two hired dump trucks.</p>	

**Figure 4-31 Expansion of dumping site (1/3)**

	
<p><b>4. Construction of embankment (October 24, 2013- November 15, 2013)</b></p> <p>The construction of embankment was started with a bulldozer on October 24. The construction was delayed because the excavation work took longer than planned; landfill staff worked on Sundays, October 27 and November 3.</p>	
	
<p><b>5. Installation of gas vent pipes (November 7 &amp; 13, 2013)</b></p> <p>The gas vent pipes were installed on November 7 and 13. Total number of pipes was 14.</p>	
	
<p><b>6. Japan Self Defense Force (November 11-15, 2013) and Media tour (November 13, 2013)</b></p> <p>Japan Self Defense Force started the work on November 11, and was in charge of some parts of embankment. The media tour was organized on November 13.</p>	

**Figure 4-32 Expansion of dumping site (2/3)**



**7. Construction of access road 1 (November 9, 2013)**

The access road was constructed on November 9 with a backhoe and roller.



**8. Levelling of dumping site and playing space for waste pickers**

Levelling was done with a bulldozer so that the vehicles could enter the site. After the levelling, waste pickers also use it as a playing space.



**9. Photo of expansion area (taken from the side of existing dumping site) (November 3, 2013)**

**Figure 4-33 Expansion of dumping site (3/3)**



#### 4.4.2 Waste Collection Improvement in Markets

##### (1) Collection Schedule of Target Markets

Table 4-49 shows the collection schedule of target markets. Regarding the collection in Juba Town Market by Juba Town Payam, they used one vehicle for two collection points originally, but they changed to use one vehicle for each collection point. For others, the collection schedule was same as that of October 2013.

**Table 4-49 Collection Schedule of Target Markets**

		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	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

##### (2) Collection in Jebel Market

###### a) Point 1 (the front of the market)

The Compactor No. 8, which was originally allocated for Juba City Council, was allocated for Kator Payam because the compactor, which was originally allocated for Kator Payam, was broken down. As shown in Table 4-50, Kator Payam became to recover the collection schedule by their own efforts although they could not provide the periodical collection service.

**Table 4-50 Situation of Point 1 of Jebel Market (the front of the market)**

2013/11/21	Kator Payam provided the periodical collection service.	
2013/11/22	Kator Payam provided the periodical collection service.	
2013/11/25	Kator Payam could not provide the collection service because of the lack of money for fuel.	
2013/11/26	Kator Payam became to recover the collection schedule by their own efforts although they could not provide the collection service for a day.	
2013/11/28	Kator Payam provided the periodical collection service.	

b) Point 2 (the front of the market)

As shown in Table 4-51, Kator Payam provided the periodical collection service better than the collection at Point 1. It may be because the amount of waste at Point 2 was usually smaller than that at Point 1.

**Table 4-51 Situation of Point 2 of Jebel Market (the front of the market)**

2013/11/21	
2013/11/22	
2013/11/26	
2013/11/28	

c) Point 3 (the back of the market)

Point 3 was clean, but the large amount of wastes was discharged around the Point 3. These wastes could not be collected manually, so JICA Expert Team hired a wheel loader once for cleaning up (on 25th November, 2013). As a result of discussion with the leader of Market Union, it was decided that the leader would remind shop owners and primary collectors to utilize Point 3 appropriately. For primary collectors, C/Ps, JICA Expert Team and Market Union decided to hold a meeting. After this

meeting, shop owners and primary collectors discharged wastes at Point 3 appropriately. Table 4-52 shows the details.

**Table 4-52 Situation of Point 3 of Jebel Market (the back of the market)**

2013/11/22	Around Point 3, people discharged wastes freely, and Payam did not come to collect these wastes. Therefore, workers of JICA Expert Team also could not collect them manually.	
2013/11/25	JICA Expert Team hired a wheel loader for clean up. At the same time, C/Ps, JICA Expert Team and Market Union decided to implement public awareness activity.	
2013/11/26	After the clean up by a wheel loader, the collection system was recovered.	
2013/11/28	Ditto.	

#### d) The Second Meeting with Primary Collectors

The leader of Market Union, members of JICA Expert Team and seven primary collectors attended the meeting and discussed not only the collection at Point 3, but also the overall collection in Jebel Market. Finally, primary collectors promised 4 items; (1) to keep the time to discharge, (2) to keep the place to discharge, (3) to keep the collection points small and not to scatter the wastes, and (4) to cooperate with collection workers. The following points are other discussion results.

- The number of primary collector was 18 persons and they cleaned the market and worked as primary collectors. Market Union managed them.
- Primary collectors insisted that they could not keep the time to discharge (9:00 and 12:00) because they collected wastes after the cleaning (at alleys in the market). The leader of Market Union replied that he would hire 6 persons as primary collectors.
- Primary collectors insisted that the police sometimes caught them although they just cleaned or collected wastes. The leader of Market Union replied that he would submit a list of primary collectors, and prepare ID cards for them.



**Figure 4-34 The Second Meeting with Primary Collectors**

e) Personnel Change of C/P

One of the main C/P, who had been in charge of Jebel Market (Mr. Gamardin), transferred to Konyokonyo Market from 2nd December, 2013. Instead of him, another Public Health Inspector, who had been in charge of another market, transferred to Jebel Market. Mr. Gamardin was the original member of our C/P and had an experience of training in Japan. Especially from the end of the first year, his attitude had been very positive. JICA Expert Team agreed with him to take part in the activities of the Project continuously in order to prevent the negative impacts by the change of C/P.

(3) Collection in Juba Town Market

a) Vehicle Allocation

Juba Town Payam had not allocated vehicles for Juba Town Market following the collection schedule. Therefore, JICA Expert Team had several meetings with Juba City Council, the supervisor of the workshop of Juba City Council and Deputy Director of Juba Town Payam in order to allocate vehicles periodically. As a result, Juba Town Payam decided to appoint the vehicles for the pilot project in Juba Town Market; open truck (blue) for Point 1 and Compactor No.1 for Point 2.




b) Remove of Point 3




Public Health Inspector of Juba Town Payam did not have a meeting with residents around Point 3. Therefore, JICA Expert Team removed Point 3. JICA Expert Team had an idea that Point 3 should not be set until Juba Town Payam became to collect wastes at Point 1 and 2 periodically. Public Health Inspector understood this idea.

c) Improvement of Point 2

Some people of the market had used Point 2 as public toilet because Juba Town Market had only one public toilet. This situation was a serious negative impact for collection workers, so JICA Expert Team suggested Juba Town Payam and the leader of the market to transfer Point 2 to somewhere else. However, the leader of the market insisted to keep the present place for Point 2. After discussion, Juba Town Payam decided to make a fence around Point 2. Table 4-53 shows the details. After the fence was made, Juba Town Payam and JICA Expert Team were able to collect wastes at Point 2 without serious problems.

**Table 4-53 Improvement of Point 2 in Juba Town Market**

	<p>Juba Town Market had only one public toilet, so some people of the market had used Point 2 as public toilet. It was a serious negative impact for collection workers. After discussion, Juba Town Payam decided to make a fence around Point 2.</p>	
<p>2013/11/26</p>	<p>Juba Town Payam made a fence.</p>	
<p>2013/11/27</p>	<p>Juba Town Payam put tapes for keep out.</p>	

2013/11/28	Juba Town Payam put signborads showing not to use as toilet.	
2013/11/29	Juba Town Payam added tapes for keep out, and put drawings of students (originally used for calendars) in order to raise awareness.	  

#### (4) Fee Collection from Markets and Shops

##### a) Outline

Juba City Council sets the fee for waste collection and reviews every year. The implementation agency of waste collection collects the fee. So Juba City Council collects fee from the business entities which contracted with Juba City Council, and Payams collect from others. Payams collect fee mainly from markets and shops because the number of official receipt is limited.

##### b) Fee collection in Jebel Market

Kator Payam collects the fee for public health and for waste collection separately. The fee collectors are Public Health Inspectors. They collect fees every month and recorded on their cashbooks. Juba City Council sets the fee for general shops as 300 SSP/month/shop; however, Public Health Inspectors in Jebel Market collect fees as 200 SSP/month/shop. The price of fee is varied according to the type of shop. They collect 50 SSP/month/shop from street stores, 100 SSP/month/shop from temporal shops, and 500 to 1000 SSP/month/shop from restaurants. Juba Town Payam issues the official receipt with stamps of Ministry of Finance, Juba City Council and Payam for shop owners. Payam should issue this receipt even though the price is 1 SSP. However, Payam has a limit to issue the official receipt. Director of Kator Payam told that it was difficult to collect small amount of money from large amount of people because Payam could not issue such a large amount of receipts. Also he told that Ministry of Finance and Juba City Council did not allow Payam to issue the original receipt.

c) Amount of Fee Collection in Each Payam

As a result of hearing survey, it was found that Kator Payam collects about 290,000 SSP/month, Munuki Payam collects about 60,000 SSP/month and Juba Town Payam collects about 40,000 SSP/month in average. So the total amount of fee collection in three Payams is about 390,000 SSP/month.



#### 4.4.3 Waste Collection Improvement in Residential Areas

##### (1) Collection Schedule of Target Residential Areas

Table 4-54 shows the collection schedule of target residential areas. This schedule is same as that of October 2013.

**Table 4-54 Collection Schedule of Target Residential Areas**

Payam	Target Area	Allocation	Mon	Tue	Wed	Thu	Fri	Sat
Kator Payam	Atlabara B	By Payam						Compactor: 1 unit
		By JICA		Open Truck: 1 unit				
	Atlabara 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) Situation of Compactors Procured by Juba City Council

Table 4-55 shows the situation of compactors procured by Juba City Council. The original allocation plan of Juba City Council is 2 units for Juba City Council to collect wastes from the business entities discharging a large amount of wastes; 3 units for Kator Payam; 3 units for Juba Town Payam; and 2 units for Kator Payam to collect waste from others. However, these compactors were very old vehicles which were manufactured more than 10 years ago. As of November 2013, 4 units had already been broken down; 5 units had worked only for a half day because of the damages: only 1 unit had worked for a full day. Juba City Council manages these compactors and has a right how to allocate them.

**Table 4-55 Situation of Compactors Procured by Juba City Council**

Compactor No.	Capacity	Driver	Operator	Area (Original)	Area (as of 2nd Dec)	Vehicle No.	Condition	Production Year	Working Period [year]
1	25m3	Scander Angalle Ladu	Christopher Awang	Juba Town	Juba Town	NO plate number	NOT WORKING (To allocate for Juba Town Market)	2002	11
2	25m3	Sebit Justine Soraba	Francis Scander	Juba Town	Juba Town	CEG 431 A		2002	11
3	25m3	Richard	Mark Bona Bungu	Juba Town	Juba Town	CEG 430 A	Working for a half day (mechanic troubles)	2000	13
4	25m3	Abdala Marke	Jalal Wani	Kator		CEG 421	NOT working	2001	12
5	25m3	Simon Lagu Wani	John Majok	Kator		CEG 423A	NOT working	1997	16
6	25m3		Nuel Jackson Kamilo	Kator		CEG 429A	NOT working	2001	12
7	25m3	Simon Lagu Wani	Daniel Oliver	Munuki	Munuki	CEG 420A	Working for a half day (mechanic troubles)	2001	12
8	25m3	Alex Latiu Arkifu	Musa David	Juba City Council	Kator	CE 435 A	Working for a half day (To allocate in Kator from 13th Nov, 2013)	2002	11
9	25m3	George Alfeo	Charles Victor	Munuki	Munuki	CE 428 A	Working for a half day (mechanic troubles)	1999	14

Compactor No.	Capacity	Driver	Operator	Area (Original)	Area (as of 2nd Dec)	Vehicle No.	Condition	Production Year	Working Period [year]
10	25m <sup>3</sup>	Ladu		Juba City Council	JCC	CE 427 A	Working for a half day (mechanic troubles)	1999	14

In the workshop of Juba City Council, drivers and assistant drivers inspect these compactors daily, and mechanic workers repair them. If the damage is very heavy and mechanic workers cannot repair, Juba City Council order private workshops. Payams order the workshop of Juba City Council or private workshops to maintain and repair open dump truck and compactors owned by Payams. For example, a private workshop in Kator Payam (owned by Mr. Sebit) received the order from UN and other agencies. Another private workshop is in Munuki Payam, and Munuki Payam uses this private workshop. For general dump trucks and small compactors, spare parts can be procured in Juba City. Actually Juba City Council has experiences to procure them.

### (3) Community Meeting in Hai Thoura

On 22nd November, 2013, Hai Thoura QC held the community meeting for youth. JICA Expert Team attended this meeting and called the cooperation for the pilot project. JICA Expert Team confirmed the collection points and time with leaflets and other items.

### (4) Waste Collection by Private Company in Munuki Payam

Munuki Payam contracted with a private company, which the former Mayor of Juba City Council introduced, to collect wastes in markets and residential areas in Nyokuron QC. However, this company did not collect appropriately. Therefore Munuki Payam tried to cancel the contact with this company.

### (5) Possibility of Collection Vehicle Procurement

As mentioned above, it is highly possible that all compactors of Juba City Council are out of use. However, these compactors collect most of all wastes in Juba City. It could be prevention against a future disaster to procure only one collection vehicle. Therefore, JICA Expert Team examined the possibility of collection vehicle procurement.

As a type of vehicle, JICA Expert Team recommended open dump trucks or small compactors (12m<sup>3</sup> or less). It was because Juba City Council could buy spare parts easily, and had experiences to maintain and repair. Maintenance of open dump trucks was easier than that of compactors although collection with compactors were efficient. Therefore, JICA Expert Team set the first priority for open

dump trucks and the second priority for small compactors. The Director of solid waste management department in Juba City Council had a same idea.

As a method of procurement, JICA Expert Team examined 4 cases; (1) Support by JICA South Sudan Office (same method as a bulldozer for Juba County), (2) Grass-roots grant aid scheme, (3) Grass-roots grant aid scheme special for recycled items and (4) Support by other donors.

Regarding to the method (3), JICA Expert Team had a meeting with the Society for Promotion of Japanese Diplomacy (hereinafter referred to as “SPJD”), and found that SPJD had 4 units of compactors and 1 unit of truck as their stock. The all vehicles were second-hand, but in good condition. SPJD told that they could provide these vehicles if Grass-roots grant aid scheme special for recycled items covered the transportation cost.

Regarding to the method (4), JICA Expert Team asked UNOPS and they answered that the budget of cooperation project with UNEP was not established. JICA Expert Team asked World Bank, but they did not give any good answers.

It is inevitable that wastes would be scattered around the city because of the lack of vehicles. The possibility of vehicle procurement should be examined continuously.

#### 4.4.4 Waste Reduction Activity

Necessity of waste reduction and recycling is often discussed in South Sudan. However, most of the ideas do not reflect the aspect of business feasibility. As mentioned in section 3.3, recycling activity (especially PET bottles which has 30% of share by volume in waste generation) is questionable in terms of sustainability and profitability. Therefore, office waste reduction pilot project is proposed in order to conduct waste reduction by segregation and raising awareness for recycling instead of focusing recycling itself.

Necessity of waste reduction and recycling is often discussed in South Sudan however, most of the ideas do not reflect the aspect of business feasibility. As mentioned in section 3.3, recycling activity (especially PET bottles which has 30% of share by volume in waste generation) is questionable in terms of sustainability and profitability. Therefore, office waste reduction pilot project is proposed in order to conduct waste reduction by segregation and raising awareness for recycling instead of focusing recycling itself.

The steps of activity are; Explain the basic of waste management and importance of waste segregation, install designated basket for each materials and start segregation (Figure 4-35). Segregated materials are filled in the sacks, transported together with other waste by waste collection trucks to designated spot in dumping site. Materials are sold to recycling firms when enough amounts are accumulated. In order to secure the storage space in the dumping site, temporary office which was broken during the storm is renovated (Figure 4-36). Contents of pilot project was discussed in JSWVG meeting, approved by Kator Payam and Juba City Council and started in October 2013.



**Figure 4-35 Explanation of segregation**



**Figure 4-36 Renovated storage**

#### 4.4.5 Public Relations and Environmental Education

##### (1) Lobulet Bridge cleanup campaign and waste collection

Joint cleanup campaign of Lobulet Bridge (the bridge close to Nile River) was conducted in February 2013 together with Juba City Council (Kator Payam), Ministry of Physical Infrastructure responsible for road construction and maintenance which is under the support of JICA Road Project (Figure 4-37).

Cleanup was conducted by using heavy machinery and trucks with collaboration from the volunteers of Kator Center Quarter Council to collect waste in the water and riverbank. As additional activity, signboard addresses prohibition of dumping waste in the river was installed on the riverbank in April (Figure 4-38). One waste collection point is also installed near the bridge and started waste collection once a week. By the effort of Kator Payam collecting waste along this particular street including the collection point and clamping down illegal dumping helped reducing waste dump into the river.

##### (2) Cleanup campaign along Nabari Road

Cleanup campaigns along Nabari Road in Tonping, were conducted 3 times (20 May, 1 June, 29 June 2013) together with Japanese Contingent Engineers under United Nations Mission in South Sudan which is implementing Nabari road improvement and Juba City Council (Juba Town



Figure 4-37 Before and after the cleanup



Figure 4-38 Signboard installed on the riverbank



Figure 4-39 Cleanup activities at Nabari Roads



Figure 4-40 Speech by Juba City staff

Payam). The campaign aimed at helping road construction work and raising awareness of residents in the area. Involvement of volunteers was promoted through consultation with 2 Quarter Councils in the area and other volunteers were joined from Japanese Contingent, JICA, and Embassy of Japan etc. Juba City assigned collection vehicle and call for cooperation by using loudspeaker and banner (Figure 4-39). There were speeches by Juba City, Juba Town Payam and JICA before and after cleanup and volunteer of residents were provided project T-shirt to advertise the activity (Figure 4-40).

### (3) Solid Waste Management Bus Tour

Solid Waste Management Bus Tours were conducted in order for government staffs and residents to understand whole process of solid waste management from collection to disposal. The tour was designed through discussion with National Ministry of Environment which is responsible for environmental policy in South Sudan. Number of participants was maximum 25 and the tour is already implemented 4 times out of 10 times (Table 4-56). Base program is for half day starting from the lecture at the Ministry of Environment, visiting residential areas and markets for waste collection before coming to dumping site to observe waste disposal. Responsible staff of the area explained to the participants regarding their activities (Figure 4-41, 42). From the fourth time, residents and the staff of pilot project area were participated, and some of the media participated and covered the program for fifth time.



**Figure 4-41 Visiting market collection**



**Figure 4-42 Visiting dumping site**

**Table 4-56 Bus tour date and participants**

No	Date	Participants
1	5 June, 2013	Representative students participated the event of environmental day
2	10 August, 2013	Staff of the Ministry of Environment (National, State), Ministry of Health (State)
3	3 September, 2013	Staff of Juba City Council, Juba County and its respective Payams
4	10 October, 2013	Residents of pilot project residential area (Atlabara B, C)
5	13 November, 2013	Residents of pilot areas (Hai Thoura, Gudele Block 8), Media
6	11 December, 2013	Staff of pilot market (Jebel, Konyokonyo, Libya)

**(4) Installation of information board for SWM**

Information sharing has been conducted through activities such as publishing newsletters or conducting regular JSWGMG meetings however, the information was not disseminated within each C/P agencies. Therefore, SWM information board was installed in the Ministry of Environment, JCC and 3 Payams, JC and Rejef Payam in order not only for the staff but also residents to access latest SWM information. First information which introduces latest activities was posted in December 2013 (Figure 4-43).



**Figure 4-43 SWM information board**

**(5) Other public relation activities**

Press releases were delivered to the media for above mentioned cleanup campaigns, bus tour, handover ceremony of bulldozer, opening ceremony for extension area of dumping site and some of them were informed by press release and covered by the media (Figure 4-44). The photo booklet of the project was prepared for publicity. In addition, the activities were presented in The International Development Journal, oral and poster presentation is done in Japan Society of Material Cycles and Waste Management, and article is contributed to Japan



**Figure 4-44 Article of bulldozer handover  
(31 July 2013, Juba Monitor)**



Association on the Environmental Studies as a part of PR in Japan.

**Table 4-57 Coverage of SWM activities by the media**

Date	Media	Contents
31 July, 2013	Juba Monitor (Newspaper)	Handover of bulldozer
14 November 2013	Eye Radio (Radio)	Bus tour 5
14 November 2013	Radio Milaya (Radio)	Bus tour 5
18 November 2013	South Sudan TV (TV)	Opening ceremony for extension of dumping site
18 November 2013	Radio Milaya (Radio)	Opening ceremony for extension of dumping site
19 November 2013	Radio Milaya (Radio)	Interview for commissioner in dumping site

#### 4.5 Preparation of New Organization for SWM

##### 4.5.1 Establishment of SWM Company by Juba City Council

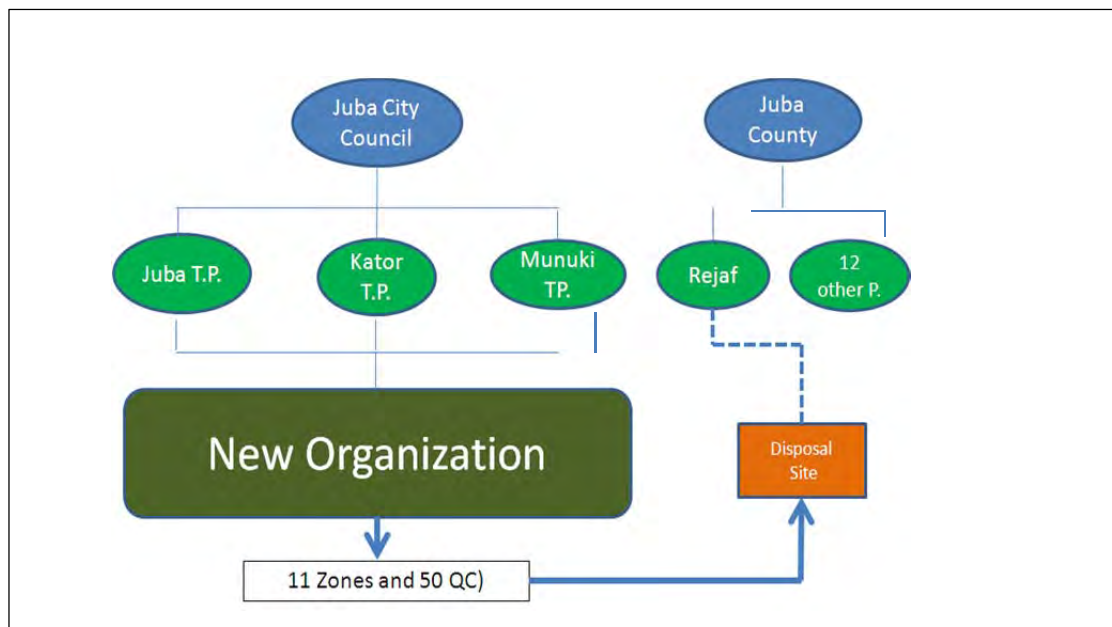
###### (1) Background

At present, the City Council and 3 Payams collect and transport individually the garbage generated within their boundary areas. The City council has aimed to unify these SWM service done separately by the City Council and 3 Payams. To attain this, the City council has envisaged establishing newly a SWM company.

The objectives of the SWM Company envisaged by the Juba Council are below.

1. To deliver the more efficient collection and transport service by the expansion of service area
2. To reduce the overall SWM cost by joint utilization of the vehicles and human resources
3. To implement the improved SWM service by the formation of new organization

Figure 4-45 shows the concept of the SWM Company.



**Figure 4-45 Concept of New SWM Organization by Juba City**



#### 4.5.2 Overview of SWM Company

The contents of the memorandum of association and the service of the SWM Company are presented in Table 4-59, 4-60 and 4-61 respectively. The Preparatory Committee will continue further the discussion and envisages establishing the SWM Company as early as possible.

**Table 4-59 Documents for Company Establishment (Preliminary)**

Documents	Description	Contents
1. Memorandum of Association	1. Company Name	Juba City SWM Co., Ltd. (JCSWMC)
	2. Objectives	<ul style="list-style-type: none"> <li>• To deliver the improved SWM service to citizens</li> <li>• To implement the participatory SWM service together with the community</li> <li>• To promote recycling</li> </ul>
	3. Share Capital	SSP 10,000,000
	4. Promoters and Contribution	<ul style="list-style-type: none"> <li>• Juba City Council: 40%</li> <li>• Juba Payam : 20%</li> <li>• Kator Payam: 20%</li> <li>• Munuki Payam: 20%</li> </ul>
2. Articles of Association	Regulations of such as general meeting, board meeting, execution of management to be completed by the City Council	

Source: JICA Expert Team based on the conclusion done by the Preparatory Committee

**Table 4-60 Solid Waste to be collected by SWM Company**

Solid Waste		Current Condition				SWM Company
		Juba City Council	Juba Payam	Kator Payam	Munuki Payam	
1. Domestic		-	Collecting	Collecting	Collecting	To be collected
2. Commercial	Shop/Restaurant	-	Collecting	Collecting	Collecting	To be collected
	Hotel (Big)	Collecting	-	-	-	To be collected
	(Small)	-	Collecting	Collecting	Collecting	To be collected
	Market	-	Collecting	Collecting	Collecting	To be collected
3. Institutional		-	Collecting	Collecting	Collecting	To be collected
4. Industry	General Waste	Collecting	Collecting	Collecting	Collecting	To be collected
	Hazardous Waste	-	-	-	-	-
	Construction	-	Collecting	Collecting	Collecting	To be

	Waste					collected
5. Hospital	General Waste	-	Collecting	Collecting	Collecting	To be collected
	Hazardous Waste	-	-	-	-	-

Source: JICA Expert Team based on the conclusion done by the Preparatory Committee

**Table 4-61 Type of Service by SWM Company**

SWM Service	Current Condition			Future Condition (After Operation Start-up of SWM Company)			
	Juba Payam	Kator Payam	Munuki Payam	Juba Payam	Kator Payam	Munuki Payam	SWM Company
Primary Collection	-	-	-	-	-	-	-
Secondary Collection	Serving	Serving	Serving	-	-	-	To serve
Transport	Serving	Serving	Serving	-	-	-	To serve
Road Cleaning	Serving	Serving	Serving	To serve	To serve	To serve	-

Note: primary collection = collection from house to house, secondary collection = collection from waste gathering points

Source: JICA Expert Team based on the conclusion done by the Preparatory Committee

**(Reference 1 for preliminary discussion material: Organization Structure and Staff Deployment of the SWM Company)**

For preliminary discussion material, Figure 4-46 was prepared by JICA Expert Team based on the information and data obtained until end September, and presented at the #2 meeting.

**(Reference 2 for preliminary estimate: Financial Aspect of the SWM Company)**

The initial capital and the operation and maintenance cost were tentatively estimated by JICA Expert Team and presented also at the #2 meeting (see Table 4-62 and 4-63). This operation and maintenance cost will be a base concept for determining SWM charges.

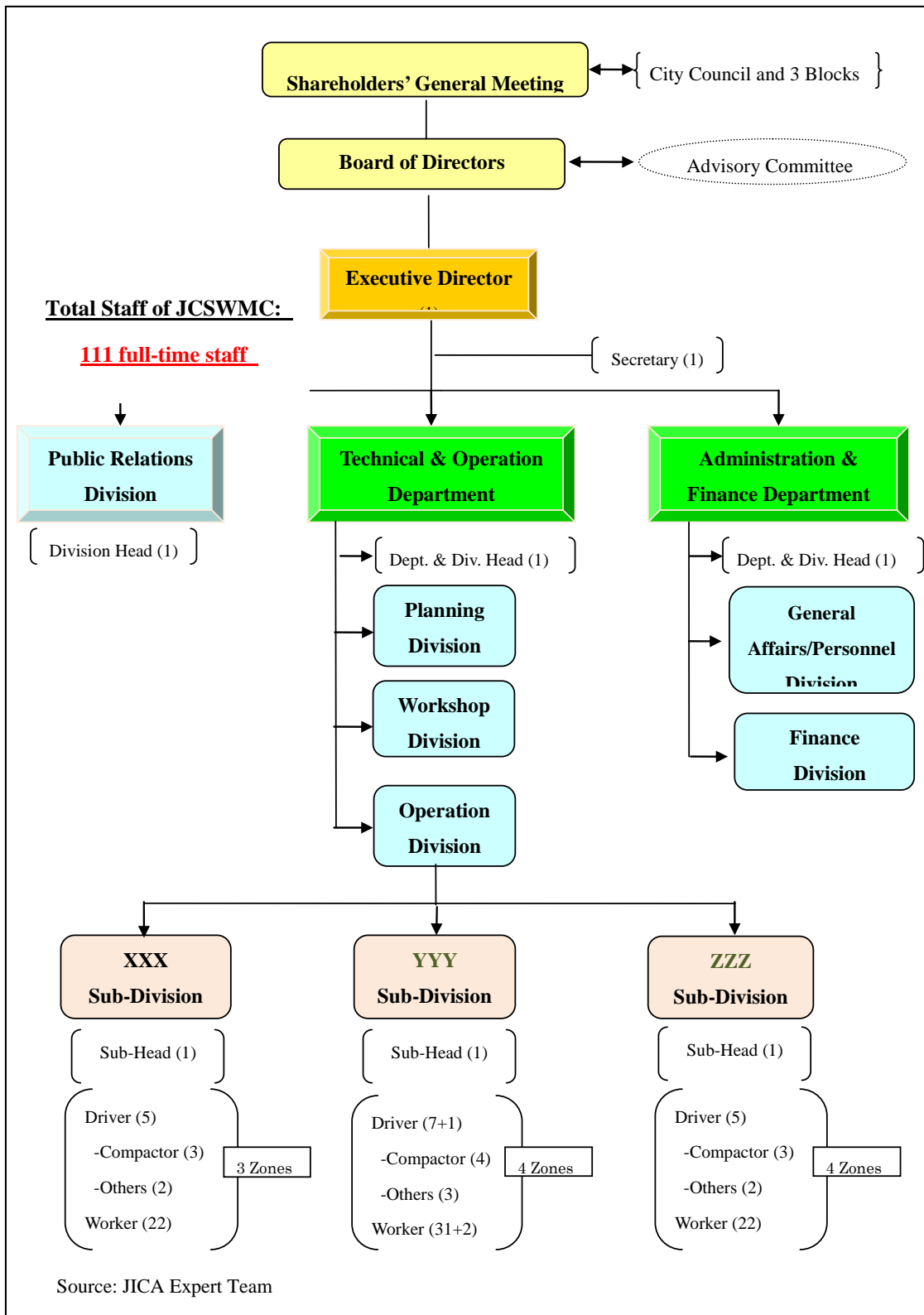


Figure 4-46 Organization Structure and Staff of SWM Company (for preliminary discussion material)

**Table 4-62 Capital of SWM Company necessary for start-up of operation (Preliminary Estimate)**

Vehicles and Fund		Current Owner	Contribution	SSP	Unit Price
1. Vehicle	Existing Compactor: 10	City Council and 3 Payam	With vehicles	3,300,000	7US\$8,000/compactor (year 2012 purchase price)
	Tipper 1, and Compressed Compactor 1	Juba Payam		80,000	30,000SSP/tipper,
	Tipper: 3	Kator Payam		90,000	50,000SSP/compressed compactor (Estimate of market price)
	Tipper: 1 and Compressed Compactor: 1	Munuki Payam		80,000	
	Total			3,550,000	
2. Office Furniture and Equipment			With	110,000	Estimate of market price
3. Working Capital: 6 months of operation expenditure			cash	1,600,000	Table 7-5 x 6 months
Grand Total				5,260,000	

Note: Working capital excludes the depreciation cost of Table 7-5.

Source: Estimate by JICA Expert Team

**Table 4-63 Monthly Operation and Maintenance Expenditure of SWM (Preliminary Estimate)**

Expenditure	SSP	Remarks
1. Personnel	70,000	111 staff
2. Fuel	129,000	17 vehicles x 2 trips x 25 days/month x distance 43 km / mileage 1.7 km/litre x diesel price 6 SSP
4. Repair	29,000	Total value of contributed vehicles x 10%
5. Disposal fee	30,000	Actual cost of August 2013 surveyed by JICA Expert Team and depreciation cost of the new bulldozer. The waste amount transported to dumping site from the City Council and 3 Payams is estimated at 60% of total transported amount/.
6. PRs	1,000	Prints, media and activity expenses
7. Miscellaneous	13,000	5% of above 1 to 5
8. Depreciation	29,000	10 years' depreciation on the contributed vehicles
Total	300,000	(Rounded)

Source: Estimate by JICA Expert Team

#### 4.6 Solid Waste Management Plan in Juba

For Solid Waste Management in Juba, there are no sufficient human resources, equipment and budget, and no waste management organizations. “Solid Waste Management Plan in Juba” shows how to establish the waste management system as implementing the daily duties for waste management under the circumstance that Juba has almost nothing for realization.

The waste collection pilot project in the market has been implemented since July 2012, so that more than 1 year has been passed. In July 2013, another new target market was added. And the waste collection pilot project in the four residential areas has been implemented for more than 1 year. The dumping site in Juba Town was improved, and its operation and maintenance have been implemented appropriately. The minimum experiences and techniques are being accumulated. Of course, the collection and final disposal are only parts of the technology for waste management. It is necessary to establish the practical system for waste management utilizing these minimum experiences and techniques. In order to this, “Solid Waste Management Plan in Juba” indicates the concept to establish the new implementation agency for solid waste management and how to secure the budget sources. The table of contents for Solid Waste Management Plan in Juba is show in the table below.

This consists of short-term and long-term plan. The short-term plan has a target year of 2015, and was made to explain the preparation of sustainable solid waste management. Primary actions to be taken towards the long-term plan and actions to solve urgent issues were described. The long-term plan was drafted to establish the system of sustainable solid waste management in 2023, or 10 years after the base year (2013).

JSWVG discussed the contents of plans chapter by chapter, based on the draft plan prepared by JICA expert team. The plan was finalized at the preparatory meeting of JCC held in October, 2014, and confirmed at the JCC. Later the plan was submitted and approved to the Mayor of Juba City Council.



**Table 4-64 Table of Contents for Solid Waste Management Plan in Juba**

Items	Contents
Chapter 1	Principles for Juba Waste Management Plan a) Background and purposes, b) Target ear, c) Target collection rate, d) Target areas, e) Target wastes
Chapter 2	Present Situation and Issues on Waste Management in Juba
2.1	Outline of target areas a) Basic information of Juab and South Sudan, b) Administrative agencies in Juba, c) Administrative divisions and number of markets in Juba City, d) Waste quantity, e) Waste quality
2.2	Legal and Organizational System a) Legal system, b) Responsibility demarcation, c) Waste management flow in Juba City, d) Waste collection in markets and residential areas in Juba City, e) O&M organization for final disposal site in Juba County
2.3	Financial system a) Budget and cost for waste management in Juba City, b) Unit cost for waste collection in Juba City, c) Unit O&M cost per collection vehicles in Juba City, d) Fee for waste collection service in Juba City, e) O&M cost for Juba County Controlled Dumping Site
2.4	Waste collection in markets and residential areas a) New collection system introduced by the project, b) Collection vehicles, c) Collection capacity
2.5	Final disposal a) Record of improvement activities at Juba County Controlled Dumping Site, b) Outline of Juba County Controlled Dumping Site, c) Incoming vehicles and wastes at Juba County Controlled Dumping Site, d) Heavy equipment for waste disposal, e) O&M situation of Juba County Controlled Dumping Site
2.6	Other activities of the Project a) Public relations, b) Recycling activity
2.7	Urgent issues for waste management in Juba a) Waste collection, b) Final disposal, c) Other activities
Chapter 3	Estimation of Future Population and Waste Amounts
3.1	Estimation of future population
3.2	Estimation of future waste amounts a) Waste generation amount, b) Waste collection ratio, c) Waste collection amount
Chapter 4	Long-term Plan
4.1.	Purpose of long-term plan
4.2.	Organization and legal system a) Organization specialized for waste management, b) Organization specialized for waste management, c) Legal system
4.3.	Financial administration a) Budgetary management of Juab City Council, b) Account management for waste collection and O&M of disposal site, c) Fee collection (Securement of financial

Items	Contents
	resource)
4.4.	Waste collection in markets and residential areas a) Waste collection in markets and residential area, b) Vehicle procurement plan (draft), c) Other necessary plan
4.5.	Final disposal site a) Final disposal site, b) Remaining landfill volume. c) Remaining life span of disposal site, d) Future plan of O&M and expansion of final disposal site, e) Future plan for heavy equipment for waste disposal
Chapter 5	Short-Term Plan
5.1.	Purpose of short-term plan
5.2.	Urgent issues and actions a) Waste collection in markets and residential areas, b) Final disposal site, c) Financial plan

## 4.7 Juba Solid Waste Management Group Activities

Juba Solid Waste Management Group (hereinafter referred to as “JSWMG”) was established in April 2012, and members of JSWMG were selected at the first JCC in the first year of the Project. The main roles of JSWMG are to train officers and workers who would lead the future waste management and to be an activity center for these people. The main activity of JSWMG is to discuss various issues on waste management every Wednesday in order to train each other.

Based on the discussion on JSWMG meetings, the waste collection pilot project in the market has been implemented since July 2012; the dumping site in Juba Town was improved, and its operation and maintenance have been implemented appropriately. Therefore, the members of JSWMG could learn a lot of things from pilot projects if they have the capacity to learn. JICA Expert Team evaluated that the capacity of members was greatly developed after the Project started, however it is not sufficient to lead the future waste management yet.

### 4.7.1 Activities and purposes of JSWMG

JSWMG was considered as the key of capacity development on the C/Ps, and the purposes of regular meetings are to give the opportunities to learn the way of thinking as a future human resource of solid waste management, in addition to the improvement of the daily operation and recovery work of waste collection and the improvement of landfill operation. JSWMG aimed at the following goals: 1) To learn the attitude of grasping the whole solid waste management, 2) To understand the way of thinking towards the future solid waste management, 3) To recognize the level of solid waste management in Juba, 4) To train the C/Ps to tackle together for solving solid waste management issues.

**Table 4-65 Purposes of JSWMG**

	Functions of JSWMG	Purposes
1	To give the opportunities to think about solid waste management in a comprehensive way	It is important to consider solid waste management as comprehensive work, instead of regarding it as individual work such as collection and landfill. In order to let the C/Ps to learn how to tackle with solid waste management, the discussion to think about the whole system of solid waste management was repeated

	Functions of JSWVG	Purposes
		during JSWVG meetings This is an essential way of thinking to be a future leader of solid waste management.
2	To let the C/Ps think about the future solid waste management	Future policies, technologies and necessary work were explained and discussed, to imagine the future solid waste management,
3	To recognize the level of solid waste management in Juba	In order to recognize how is the level of solid waste management in Juba, examples in other countries were taken for explanation and discussion, which led to the discussion on the way forwards, or how to direct the solid waste management in Juba.
4	To train the C/Ps to tackle together to solve solid waste management issues	At first, many officers just complained about their problems, but they got accustomed to raise the issues and solve together among JSWVG members, which was the original intention of establishing JSWVG.

The records of JSWVG meetings from September, 2013 to February, 2014 were described in Table 4-66. This project aimed at learning through the experiences, instead of education or off-site trainings. The records implied that the JSWVG accomplished the purposes.

JSWVG continued to have regular meetings, even after JICA withdrew from South Sudan. The main activities of JSWVG were as follows after the political conflicts in December, 2014.

- JSWVG discussed the draft of solid waste management plan in Juba. The population of Juba was set as 1.5 million, even though the exact statistic was not available. The target collection rate was 20 %, based on the previous experiences of JICA expert team. Annual activity report and activity plan on solid waste management were also discussed among the JSWVG. These three documents were approved later by the C/Ps.
- C/Ps started waste collection system in Konyokonyo Market by themselves in June, 2014, based on the experiences of Jebel Market.

- JSWVG members and Juba City Mayor discussed the future solid waste management on June 4, 2014.
- JSWVG members discussed with the QC leaders to expand waste collection system and had community meetings to explain about waste collection in June, 2014.
- JSWVG members held community meetings at Atlabara B & C, Hai Thoura and Gudele Block 8 in July, 2014, to restart waste collection.

**Table 4-66 Records of JSWVG meetings**

Date	Meetings	Activities and discussion points
2013/9/25	53rd JSWVG meeting	Preparatory committee to establish a solid waste management organization Project booklet
2013/10/9	54th JSWVG meeting	Progress of cleanup activities in Juba Bus tour
2013/10/24	55th JSWVG meeting	Intensive cleanup activities areas in Juba and the impacts Review of waste collection pilot project
2013/10/30	56th JSWVG meeting	Report on centralization of solid waste management in Juba Bus tour plan
2013/11/7	57th JSWVG meeting	Countermeasures against the unavailability of collection vehicles by Payam Methods to repair collection vehicles
2013/11/19	58th JSWVG meeting	Preparation of opening ceremony for landfill expansion areas Analysis and solutions to recover collection system in Juba Town Market
2013/11/27	59th JSWVG meeting	Explanation on centralization plan of solid waste management in Juba
2013/12/4	60th JSWVG meeting	Bus tour plan Future waste minimization policies
2013/2/28	61st JSWVG meeting	Sustainable way of collection vehicles maintenance

## 4.8 Joint Coordination Committee (JCC)

### 4.8.1 1st JCC meeting (2012)

1st Joint Coordination Committee (“JCC”) meeting was held on May 3, 2012. There were 23 participants (including 5 observers) from Ministry of Environment, Ministry of Housing and Physical Planning and Juba City Council, etc.

#### (1) Agenda

10:00 Opening remarks:

Prof. Scopas Jibi Dima, Undersecretary, Ministry of Environment

Mr. Yasuhiko Wada, Deputy Representative, JICA South Sudan Office

10:20 Confirmation on the role and members of Joint Coordinating Committee

Mr. Kazuya Yao, JICA Expert

10:40 Presentation “Work Plan of JICA SWM Project”

Mr. Akio Ishii, JICA Expert

11:00 Discussion and agreement on PDM and Work Plan

#### (2) Summary of discussion at 1st JCC meeting

Work plan and PDM were approved, and Juba Solid Waste Management Group was officially approved.

**Table 4-67 Project implementation members**

Implementation Organization	Area	Juba solid waste management group		
		South Sudan Side		JICA Expert Team
		Chief	Members	
Output 1	Collection improvement in residential area	Mr. Kalisto Tombe (Juba Town Payam/ acting Juba City Council) Subchief: Mr. Alphones Pitia (Kator Payam)	Collection: Mr. Gamardin Mogga (Kator Town Payam) Mr. James Daudi Dada (Munuki Town Payam)	Mr. Ishii  Ms. Matsubara  Mr. Osada
Output 2	Collection improvement in market area		Community Activity: Mr. Stephen Tako (Munuki 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)	Accountant:	Mr. Yao
		Mr. Paul Gore (Ministry of Environment, CES)	Mr. Hallary Jada Woderif (Juba City Council)	Mr. Ishii

#### 4.8.2 2nd JCC meeting (2012)

2nd JCC meeting (2012) was held on November 12.

##### (1) Agenda

10:00 Welcome by Chair

Mr. David Batali Oliver, Acting Undersecretary, Ministry of Environment

10:05 Opening remarks and overview of JICA's support in South Sudan

Mr. Atsushi Hanatani, Chief Representative, JICA South Sudan Office

10:15 Activity Report

1) Market Waste Collection Pilot Project (Kator Payam)

- 2) Residential Waste Collection Pilot Project (Kator Payam)
- 3) Landfill Site Improvement Pilot Project (Juba County)
- 4) Waste collection expansion
- 5) Waste Collection Pilot Project expansion & Pubic Company in Palestine started in 2007. (JICA expert team)

11:00 Waste collection public company

11:20 Discussions

- 1) Demarcation of waste management
- 2) Future development of landfill site

11:40 Report of drawing design contest prize winner

11:50 Closing Remarks

Mr. Col David Lokonga Moses, Deputy Mayor, Juba City Council

#### (2) Summary of discussion at 2nd JCC meeting

Project progress, Environmental impact assessment, demarcation of roles between Juba City Council and Juba County were discussed.

#### 4.8.3 1st JCC meeting (2013)

1st JCC meeting (2013) was held on June 4 at Juba City Council. The main point was the suggestion and approval of the work plan of the second year. JICA Expert Team suggested setting up Preparatory Committee for Solid Waste Management Public Company, and it was approved. Members of JCC showed their opinions, but most of them were not practical. It would be one of the reasons how to expedite the proceedings, but it would be another reason that the awareness of the attendants is still low.

#### (1) Agenda

10:00 Opening remarks

Mr. Dimo, Chief Executive Officer (CEO), Juba City Council



Mr.Sapana Ginaba Jadiya, Representative of H.E Commissioner, Juba County

Mr. Tomoki KOBAYASHI, Senior Representative, JICA South Sudan Office

10:20 Presentation: JICA Activity

Mr. Shimpei TAGUCHI, Representative, JICA South Sudan Office

10:40 Presentation “2nd year Work Plan of JICA SWM Project”

Mr. Akio ISHII, JICA Expert

11:10 Discussion: To establish “Preparatory Committee for Solid Waste Management Public Company”

11:40 Closing remarks

Mr. Charles Taban, Deputy Chief Executive Officer, Juba City Council

(2) Summary of discussion at 1st JCC (2013)

After Mr. Ishii from JICA expert team explained about the work plan, South Sudan side agreed on the following points.

- a) Contents of work plan
- b) Modification of indicators

	Indicator	Annual Indicator
Project Purpose: Basic structure of solid waste management in Juba is formulated.	<ul style="list-style-type: none"> <li>• Result of capacity assessment for C/P staff is improved.</li> <li>• <b>Periodic cleaning service is continuously implemented.</b></li> </ul>	<ul style="list-style-type: none"> <li>• C/Ps were surveyed by questionnaire.</li> <li>• Evaluation is made by the expert team and counterparts.</li> <li>• <b>Record of cleaning service is evaluated by the expert team and counterparts.</b></li> </ul>

c) Modification and approval of counterparts organization

C/P	Ministry of Environment (RSS: Republic of South Sudan), Juba City Council <b>and Juba County</b>
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, <b>Juba County</b> Juba Citizens (Approximately 240,000 persons)

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

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

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

(3) Discussion points

The main discussion points are as follows.

Acting Director/Ministry of Environment

- He mentioned lack of regulations for solid waste management was hindering the full progress

of the project.

- He stressed that Juba City Council should take a leading role to supervise the project e.g. in raising awareness which was still low.
- He welcomed the idea of the formation of a Public Company to run Solid Waste management in Juba City.

Representative of H.E Commissioner/Juba County

- He requested for the expansion of the collection pilot project to the other Payams which were not under Juba City Council.
- He requested to make another new landfill site.

(Mr. Ishii, JICA Expert, answered both was difficult to do under the present condition.)

Deputy CEO/Juba City Council

- There was lack of clear policies on waste management in South Sudan.
- He requested the Ministry of Environment to pressurize the government of the Republic of South Sudan in passing the Draft Environmental Bill of 2012 by Ministry of Environment.
- He went further assuring the participants that there was nothing to prevent the formation of the Public Company.
- Raising awareness in Solid Waste Management was not enough.
- Local orders from Juba City Council at times were not obeyed. Fining of perpetrators was on a routine recurrence. War trauma was a likely contributing factor.
- Creation of a new dumping site in Juba County was advisable because the one at Yei road might get filled up. With the rapid expansion of Juba City, some of the Payams (Rejaf and Northern Bari) might be incorporated into Juba City Council.
- Regarding the formation of the Preparatory Committee for the Public Company, he stressed that it was of paramount importance and urgently needed.
- Ministry of Environment, Rejaf Payam and a Facilitator from JICA would be better to be included in the Preparatory Committee.
- The Directors of the Payams would be better to be included in the Board of Directors of the Public Company.
- He assured the participants that at the moment Juba City Council had enough collection

vehicles and skilled staff, labourers etc. Sooner to formulate the Public Company would be better.

The meeting concluded at 12:00.

#### 4.8.4 1st JCC meeting (2014)

1st JCC meeting (2014) was held in Uganda in April 25. There were five C/Ps from Juba City Council, Juba County and Rejaf Payam etc. one participant from JICA headquarters and two staff members from JICA South Sudan Office. Prior to the JCC meeting, pre-JCC meeting was held in Uganda on April 24, 2014.

##### (1) Agenda

The agenda of 1st JCC meeting (2014) is shown below.

Time	Agenda	Person in charge Presenter/Facilitator
9:00 – 9:10	Opening remarks	Mr. Atsushi Hanatani, Chief Representative, JICA South Sudan Hon. Stephen Wani Michael, Commissioner Juba County
9:10 – 9:30	Introduction of Project DVD	JICA Project Team
9:30 – 10:20	Presentation: Summary of Pre-JCC discussion	Mr. Hillary Dada, Juba City Council
10:20 – 11:20	Discussion: Exchange of opinions	
11:20 – 11:30	Closing remarks	H.W Hakim Deng Majuc, Deputy Mayor, Juba City Council

##### (2) Discussion points

The main discussion points of 1st JCC meeting (2014) were shown below.

- JICA will hire a collection vehicle with the condition that Juba City Mayor submits an official supporting letter and Juba City Council hire enough cleaners (This suggestion was dismissed, because Juba City Council did not respond timely).
- The monitoring of waste collection and landfill improvement pilot projects will be continued until October, 2014.
- Solid waste management plan (draft), annual activity report and annual activity plan will be prepared and Juba City Council will organize necessary discussion.

#### 4.8.5 2nd JCC meeting (2014)

2nd JCC meeting was held by telephone conference system between Japan and South Sudan on October 16. There were 16 C/Ps from Ministry of Environment, Juba City Council, Juba County and Rejaf Payam etc., 2 participants from JICA headquarters and 2 staff members from JICA South Sudan office. Prior to the JCC meeting, the preparatory meeting was held in Uganda from October 6 to October 8; project outputs were shared and solid waste management plan was finalized.

##### (1) Agenda

The agenda of 2nd JCC (2014) is shown below.

Juba	Tokyo	Activity
10:00-10:05	16:00-16:05	Opening remarks - Undersecretary, Ministry of Environment
10:05-10:10	16:05-16:10	Significance of Juba solid waste management project - JICA South Sudan Office
10:10-10:15	16:10-16:15	Summary of Juba solid waste management project - Commissioner, Juba County
10:15-10:35	16:15-16:35	Report on preparatory meeting for JCC - Solid waste management plan - Dorina, Ministry of Environment
10:35-10:55	16:35-16:55	Report on preparatory meeting for JCC - Annual report, Annual

Juba	Tokyo	Activity
10:55-11:20	16:55-17:20	Q&A/ Discussion
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 - Gamardin, Kator Payam
12:05-12:20	18:05-18:20	Outputs of Juba solid waste management project – Landfill - Deputy Director, Rejaf Payam
12:20-12:30	18:20-18:30	Summary, Way forward - JICA Headquarters, Juba City Council, Juba County
12:30-12:55	18:30-18:55	Q&A
12:55-13:00	18:55-19:00	Closing remarks

## (2) Discussion points

The main discussion points of 2nd JCC meeting (2014) are as follows.

- The project outputs of waste collection and landfill improvement were shared and confirmed.
- C/Ps prepared short-term and long-term plans, which were confirmed during the JCC meeting.
- The solid waste management plan (draft), annual activity report and plan on solid waste management were approved after the circulation of minutes of meeting.

## Chapter 5 Actual Inputs

### 5.1 Actual Inputs of JICA Expert Team

The inputs planned as of March, 2012 are shown in Figure 5-1. The inputs such as JICA experts team members were changed at the beginning of 2nd Year, or April, 2013. The detail is explained in Table 5-1. The actual assignment of JICA expert team is shown in Figure 5-2.

	Title	Name		FY 2011	FY2012												Year 1 (Man/Month)						
				2012						2013						SS	JP						
				3	4	5	6	7	8	9	10	11	12	1	2			3					
S o u t h  S u d a n	Chief expert/solid waste collection	Akio ISHII	Plan		(40)				(45)				(30)							4.50			
	Deputy chief expert/Landfill operation and management	Masahiro SAITO	Plan		(30)					(45)				(45)							4.00		
	Market solid waste management	Hiroimi MATSUBARA	Plan						(30)				(30)				(30)				3.00		
	Solid waste collection assistant/project coordination	Akihiro OSADA	Plan		(40)																1.33		
			Plan																		12.83		
J a p a n	Chief expert/solid waste collection	Akio ISHII	Plan	(5)																(5)	0.33		
	Deputy chief expert/Landfill operation and management	Masahiro SAITO	Plan																		0.00		
			Plan																		0.33		
Grand Total																						13.16	

Figure 5-1 Initial plan of inputs (as of March, 2012)

Table 5-1 Modification of JICA expert team members

Role	Name	Assignment (April, 2013- March, 2014)		Reasons and contents of modification
		Before modification	After modification	
Chief expert/solid waste collection	Akio Ishii	4.67	5.00	<Increase of assignment> 0.33 M/M was increased, because the role of Akihiro Osada, who was in charge of “Solid waste collection assistant/ project coordination”, was changed into “Recycling/ Public relations 2/ Landfill operation and management assistant”.
Deputy chief expert/Landfill operation and management	Masahiro Saito	3.67	4.00	<Increase of assignment> 0.33 M/M was increased, because of more support for the landfill was necessary such as the operation of bulldozer procured by JICA, landfill

Role	Name	Assignment (April, 2013- March, 2014)		Reasons and contents of modification
		Before modification	After modification	
				design and supervision, and geological and ground water survey.
Market solid waste management	Hiromi Matsubara	3.00	3.50	<Increase of assignment>  0.50 M/M was increased, because the role of Akihiro Osada, who was in charge of “Solid waste collection assistant/ project coordination”, was changed into “Recycling/ Public relations 2/ Landfill operation and management assistant”.
Organization System Analysis / Finance 1	Noboru Osakabe	0.00	3.00	<Addition of a new expert>  A new expert was added, because it was necessary to strengthen the analysis of waste collection, the collection of financial information on waste collection and landfill operation (Juba County).
Landfill design and construction supervision	Takeshi Yoshioka	0.00	1.00	<Addition of a new expert>  A new expert on landfill design was added, because it was urgent to plan the next landfill site, because waste disposal amount was increased owing to the improvement of waste collection.
Geological and ground water survey	Hisashi Furuichi	0.00	1.00	<Addition of a new expert>  A new expert on landfill design was added, because it was essential to grasp the impacts of leachate on groundwater, and to conduct a survey on the geology of the landfill bottom and groundwater level.
Recycling/ Public relations 2/ Landfill operation and	Akihiro Osada	1.00	3.00	<Modification of roles>  Before the modification: Solid waste collection assistant/ project coordination



Role	Name	Assignment (April, 2013- March, 2014)		Reasons and contents of modification
		Before modification	After modification	
management assistant				<p>After the modification: Recycling/ Public relations 2/ Landfill operation and management assistant</p> <p>&lt;Increase of assignment&gt;</p> <p>The role was changed and 2.00 M/M was increased, because the activities on recycling/ public relations was lacking and it was necessary to support the activities of Deputy chief expert/Landfill operation and management</p>

In addition to the above mentioned consultant experts, Mr. Kazuya Yao participated as an expert of “Recycling/ Public relations 1” (by the direct contract with JICA).

PROJECT FOR CAPACITY DEVELOPMENT ON SOLID WASTE MANAGEMENT IN JUBA  
PROJECT COMPLETION REPORT

1. Assignment in South Sudan

Role	Rank	Number of trips	2013												2014										Days in Total	M/M in Total
			4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10					
Akio Ishii Chief expert/solid waste collection	2	Plan			(17)		(43)					(15)							(9)					93	3.10	
		Actual	4	5/24	6/9	7/7	8/18					11/7	11/21			4/20	4/28								93	3.10
Masahiro Saito Deputy chief expert/Landfill operation and management	3	Plan			(25)		(30)				(33)				(9)									106	3.53	
		Actual	4	5/27	6/20	7/7	8/10	9/8			10/14	11/15			4/20	4/28									106	3.53
Hiromi Matsubara Market solid waste management	4	Plan		(17)		(24)					(32)													73	2.43	
		Actual	3	5/24	6/9	7/7	7/30				11/7	12/8													73	2.43
Noboru Osakabe Organization System Analysis / Finance 1	3	Plan		(13)					(31)															44	1.47	
		Actual	2	5/1	6/5				9/5	10/5															44	1.47
Hiashi Furuichi Geological and ground water survey	3	Plan					(30)																	30	1.00	
		Actual	1				8/10	9/8																	30	1.00
Takeshi Yoshioka Landfill design and construction supervision	5	Plan					(23)																	23	0.77	
		Actual	1				8/10	9/1																	23	0.77
Akihiro Osada Landfill operation and management assistant/Market solid waste management	5	Plan					(18)			(27)					(9)							(9)		63	2.10	
		Actual	3				8/22	9/8		10/25	11/19				4/20	4/28									62	2.07
<b>Assignment in South Sudan Sub-total</b>																							<b>Plan</b>	<b>432</b>	<b>14.40</b>	
																							<b>Actual</b>	<b>431</b>	<b>14.37</b>	

2. Assignment in Japan

Akio Ishii Chief expert/solid waste collection	2	Plan		(4)								(11)	(12)	(11)		(14)			(14)			(5)	71	3.55	
		Actual		(4)									(11)	(12)	(11)		(14)					(14)	(5)	71	3.55
Masahiro Saito Deputy chief expert/Landfill operation and management	3	Plan										(12)		(12)				(14)		(14)		(5)	57	2.85	
		Actual											(12)		(12)			(7)	(7)	(14)		(5)	57	2.85	
Hiromi Matsubara Market solid waste management	4	Plan										(8)	(8)	(8)									24	1.20	
		Actual										(8)	(8)	(8)									24	1.20	
Noboru Osakabe Organization System Analysis / Finance 1	3	Plan										(14)											14	0.70	
		Actual											(14)										14	0.70	
Takeshi Yoshioka Landfill design and construction supervision	5	Plan					(4)																4	0.20	
		Actual					(4)																4	0.20	
Akihiro Osada Landfill operation and management assistant/Market solid waste management	5	Plan										(12)										(5)	17	0.85	
		Actual										(12)										(5)	17	0.85	
<b>Assignment in Japan</b>																							<b>Plan</b>	<b>187</b>	<b>9.35</b>
																							<b>Actual</b>	<b>187</b>	<b>9.35</b>
<b>Grand Total</b>		<b>Plan</b>	<b>23.75</b>																						
		<b>Actual</b>	<b>23.72</b>																						

Figure 5-2 Inputs of JICA expert team

## 5.2 Counterpart Training

### 5.2.1 Counterpart Training in Japan

#### (1) Purpose

The purpose of the counterpart training in Japan was to learn the planning and operation of solid waste management in national and local government in Japan as the future target, through the lectures and site visits.

#### (2) Trainees

The list of trainees is as follows.

**Table 5-2 List of Trainees**

NAME	ORGANIZATION AND POSITION	
Mr. Stephen Wani Michael	JUBA COUNTY	COMMISSIONER
Mr. Hilary Dada	JUBA CITY COUNCIL	SENIOR OFFICER
Mr. Micheal Francis Khabash Lubang	REJAF PAYAM	DIRECTOR
Mr. Taban Francis Henry	KATOR PAYAM	DIRECTOR

#### (3) Schedule

The training schedule is shown in the following table

**Table 5-3 Schedule of CP Training in Japan**

Date	Time	Type	Contents	Lecturer or Person in Charge	
				Name	Title and Organization
20-Jan-13			Arrival in Japan		
21-Jan-13	-		Briefing by JICA		JICA Tokyo
	12:00 - 12:30	Lecture	Program orientation	Mr. Kazuya Yao	JICA Expert
	14:00 - 16:00	Lecture	Policy making, Actual situation of waste management in Tokyo	Mr. Toru Kaneko	Section Manager, Tokyo Metropolitan Government
22-Jan-13	10:00 - 12:00	Lecture	Waste treatment facility shared with several cities, System of regional waste management	Ms. Toshiko Fujiwara	Deputy Section Manager, Tokyo Metropolitan Government
	14:00 - 15:30	Lecture	History and present activity for waste management of Tokyo Environmental Public Service Corporation	Mr. Nobuhiro Yokota	Section Manager, Tokyo Environmental Public Service Corporation
23-Jan-13	09:30 - 11:30	Site visit	History and activity of Clean Association of Tokyo 23 Cities, Operation of intermediate treatment plant	Mr. Tadashi Sasaki	Section Manager, Clean Association of Tokyo 23 Cities
	14:00 - 16:00	Lecture	Municipal policy for waste management		Katsushika City
24-Jan-13	09:00 - 11:00	Site visit	Transfer station	Mr. Morita	Shinjuku Transfer Station
	14:00 - 16:00	Site visit	Operation and maintenance of regional landfill site		Futatsuzuka Landfill Site
25-Jan-13	9:30 - 11:30	Lecture	History of waste management policies in Japan	Mr. Shoichi Hayami	Chief Executive Engineer, Japan Environmental

Date	Time	Type	Contents	Lecturer or Person in Charge	
				Name	Title and Organization
					Sanitation Center
	14:30 - 16:30	Site visit	Intermediate treatment plant (incinerators)		Resources and Waste Recycling Bureau, City of Yokohama
26-Jan-13	-		Off (Preparation of presentation)		
	-				
27-Jan-13	-		Off (Preparation of presentation)		
	-				
28-Jan-13	09:00 - 11:00		Preparation of presentation	Mr. Osada	JICA Expert
	13:00 - 15:00	Site visit	Role of city office for waste management, and community recycling activity	Ms. Takahashi	Toshima City
29-Jan-13	-		Preparation of presentation		
	13:00 -	Presentation	Presentation by each trainee and courtesy call at JICA Headquarters		
30-Jan-13	-		Departure from Japan		

#### (4) Results

As the outputs of this training, the trainees prepared the draft plans on how to improve future solid waste management in South Sudan on the basis of knowledge and experience gained through training. These outputs were shared and utilized as follows:

- a) Some of trainees presented their knowledge, experience and plans to share with other Counter Parts at the JSWMG meeting.
- b) The knowledge and experiences were shared among the C/Ps.
- c) The knowledge and experiences were integrated into the daily activities and the future planning in South Sudan to conduct a better planning and operation.

### 5.2.2 Third Country Training

#### (1) Purpose and schedule of the training

In order for South Sudanese counterparts to understand proper waste management system, third country training was conducted in Dhaka, Bangladesh, a city which has been supported by Japan in the SWM sector for many years. Concept of the training was “Observation of solid waste management method in mega-city with a 12 million population” and key points were as below;

- a) Establishment of Solid Waste Department and human resource management
- b) Enhancing solid waste management in a mega-city by Ward based approach: Establish offices in each ward, decentralize authority to encourage and motivate officers in charge in the area for ward based solid waste management; Awareness raising of waste cleaners (5000 out of 8000) through education and training to promote field centered cleaning operation; Community participatory solid waste collection approach; Efficient, sanitary, realistic waste collection improvement and new waste collection using compactors; Improvement of disposal site to sanitary landfill level.
- c) Assistance by Japan : Dispatch of experts (Waste Management Planning, Landfill Planning), Development study and formulation of master plan of solid waste management, Following up of master plan implementation, Technical Cooperation Project (5 years), Involvement of Japan Overseas Cooperation Volunteers, Environmental program grant aid (Provision of collection vehicle, construction of vehicle workshop), Improvement of landfill site (by Japan Debt Cancellation Fund).

**Table 5-4 Schedule of Third Country Training**

Date	Pick-up time	AM	Comment	PM	Comment
Dec. 2 (Sun)				12:10 Pick up at airport	South Sudan 9W276
Dec. 3 (Mon)	8:50	09:00 DNCC CWMO  11:00 DSCC Project office  11:30 DSCC CWMO	Courtesy call to CWMO. Explanation of project history (project products materials)	14:00 Matuail landfill site,  16:00 Garage & Workshop	To improve Sanitary landfill, workshop by EGAP
Dec. 4 (Tues)	8:30	9:30 Collection vehicles inspection(DNCC)  11:00 Zone office activity		14:00 JICA Office	Courtesy call
Dec. 5 (Wed)	8:15	9:30~10:30 Ward office (W36/13)  11:00~12:00 Ward office (W33/10)	Ward office activity  WBA1-4 activity	14:00 Collection system (W36/13)  16:00 Karawan Bazar (Karu Palli)	Compacter collection type1 (WBA)
Dec. 6 (Thu)	8:45	10:00 Community participatory solid waste management (W2) DNCC	WBA activity with JOCV,  WBA3 process	14:00 Community participatory solid waste management (W40/27)  16:00 Ward office (W40/27)	WBA activity with JOCV
Dec. 7 (Fri)	8:00	9:30 Ward office (W84/48)  10:00 Community participatory solid waste management(W84/48 )	WBA activity	1:30 Collection system (W53) (Officers Colony)  15:00 Private Company (Clean Tech)	Compacter collection type2 (WBA)
Dec. 8 (Sat)	9:00	Amin Bazar Landfill		18:00 pick up at Hotel	South Sudan EK585

(2) Progress of Training and Report

Trainees included 1 member from Ministry of Environment, 4 from Juba City Council, and 2 from Juba County. It should be noted that the training was jointly conducted with the members from Dhaka. Site visits included various places such as waste collection site, landfill site, however the main targets were the ward offices where actual planning and implementation on the ground takes place. After the training, results of the training were reported at JICA South Sudan Office. Trainees were divided into two groups (waste collection and landfill) and following recommendations were presented based on the experience.

- Demarcation and responsible person was clear in Dhaka City and it was indispensable to clarify organization structure (chain of command) and authority in Juba
- Securement of human resources and budget for maintaining machineries and capacity development for realization of waste management implementation was necessary



**Figure 5-3 Photos of Third Country Training**



### 5.3 Inputs of Equipment Procured by the Project

The following equipment was procured by JICA to South Sudan side.

Type	Capacity	Date of Procurement
Bulldozer	CAT, W=21t class	August, 2013

### 5.4 Inputs of Local Expenses

The rough amount of local expenses during this project is shown below; this amount does not include expenses from Mr. Kazuya Yao, JICA expert (direct contract) and JICA South Sudan office.

**Table 5-1 Inputs of local expenses**

Item	Amount of expenses (Unit:1000yen)
Employment of local staff	5,493
Rent of vehicles	5,470
Renting of meeting spaces	17,480
Maintenance of equipment	1,361
Consumables	600
Travel fare	2,050
Communication	140
Document preparation	20
Miscellaneous expenditure	110
<b>Total (Japanese Yen)</b>	<b>¥32,724</b>

### 5.5 Inputs from South Sudan side

The inputs from South Sudan side are described below.

#### 5.5.1 Assignment of C/Ps

The assignment periods of C/Ps from each organization are shown in the table below.

	Organization	Name	Role/Position	Assignment periods
1	MoE-RSS	Dorina Keji (*)	Assistant Information Officer	2012/4-2014/10
2	Juba City Council	Taban Charles Michael	Assistant CEO	2012/4-2014/10

	Organization	Name	Role/Position	Assignment periods
3	Juba City Council	Hilary Dada	Planning Director	2012/4-2014/10
4	Juba City Council	Kalisto Tombe (*)	Public Health Division Director	2012/4-2014/10
5	Juba County	Sebit Amosa (*)	Public Health Director	2012/4-2014/10
6	Juba Town Payam	Silvestro Peter Mario	Public Health Officer	2012/4-2014/10
7	Juba Town Payam	Nasia Hassan	Public Health Officer	2012/4-2014/10
8	Kator Payam	Gamardin Mogga (*)	Public Health Officer	2012/4-2014/10
9	Munuki Town Payam	Stephen Tako (*)	Public Health Officer	2012/4-2013/12
10	Munuki Town Payam	Lubang David Lodu	Public Health Officer	2012/4-2014/10
11	Rejaf Payam	Michael Francis	Director	2012/4-2014/10
12	Rejaf Payam	Towongo Robert Elizara	Assistant Manager	2013/6-2014/10
13	Rejaf Payam	Grace Marcello	Inspector of Public Health	2013/6-2014/10
14	Rejaf Payam	Justin Lukudu Elia	Assistant Manager	2013/6-2014/10
15	Rejaf Payam	Yousif Pitia	Landfill Manager	2013/6-2014/10

### 5.5.2 Facilities and Equipment for Project Implementation

The provision of equipment from South Sudan side is shown in the table below.

Equipment	Specifications	Sources	Note
Compactors	Loading capacity: 25m <sup>3</sup>	Juba City Council	10 compactors
Tipper trucks	Loading capacity : 8m <sup>3</sup>	Payam	5 trucks
Tractors	-----	Payam	6 tractors

### 5.5.3 Meeting Spaces

The provision of meeting spaces is shown in the table below.

Meeting	Source	Period
1st JCC meeting	Ministry of Environment	May 3, 2012/ November 12, 2012/ June 4, 2013/ October 16, 2014
JSWGMG meeting	Kator payam	April, 2013 – September, 2014

#### 5.5.4 Office Space for JICA Expert Team

Ministry of Environment was supposed to provide office space for JICA expert team, but the provision was delayed; Kator Payam offered office space. JICA expert team accepted the offer, because it is easier to have an office space close to the Payam office. The office space was used from April, 2013- December, 2013. The project had paid for office space before April, 2013.

#### 5.5.5 Other necessary expenses

- (1) Salary of governmental officers and other expenses (from April, 2012- October, 2014)
- (2) Electricity at the office space (Kator Payam, April, 2013- December, 2013)

## **Chapter 6 Issues, Ideas and Lessons Leant for Project Operations**

### **6.1 Summary of Project Activities**

In April, 2014, at the beginning of this project, the public waste collection service was not conducted in Juba. C/Ps told that there was collection service on site, and the JICA expert team has visited it for three weeks; however, waste collection vehicles never came. After the survey on waste collection, it was found that there were no collection vehicles available, no persons in charge of collection, no organizations and no budget.

During this project, several approaches were taken to commence waste collection services. C/Ps leaned how to conduct collection services by the collaborative collection work between C/Ps and JICA, so that C/Ps can independently operate collection work by themselves later.

The fixed-time and fixed- point collection methods were applied, where residents bring waste to fixed collection points at fixed collection points. One of the advantages of this method was the residents were mainly involved in the collection work, which let them think about the collection service in a daily life. Another point is that no equipment is necessary. If the operation is done properly, the residents only need to bring waste at the fixed time, and the town is kept always clean.

The waste collection system at a market (Jebel market) and residential areas (Atlabara B & C) was introduced in July, 2012. Two collection areas at residential areas (Hai Thoura, Gudele Block 8) were added into the pilot project in November, 2012. The market waste collection at Juba Town Market was also started in July, 2013.

Juba City Council produced ten compactors in August, 2012.

The project was temporally suspended in December, 2013, because of political conflicts. However, C/Ps secured their own budget and continued their collection work without collection vehicles supported JICA,

## 6.2 Basic Policies and Process of Capacity Development to Implement Solid Waste Management

The following directions were considered as basic policies to implement project activities.

- To take into consideration the culture and the way of thinking of South Sudan side.
- To seek the efficiently integrated solutions among the several components, like the solid waste management does usually.
- To learn through the experiences for human resource development
- To pass the significance, attractive points, proud and hopes of solid waste management, not only technical transfer
- To consider how the outputs can be more sustainable

It was necessary to develop individual and institutional capacity through the project activities in Juba, and the following four factors were integrated.

- a) Basic educational organization: JSWGM was established as an educational organization, consisting of Ministry of Environment, Payam and landfill officers (around 12 members). Weekly meetings were held to discuss solid waste management from different perspectives and to learn solid waste management work.
- b) Learning through experiences by practice: The model pilot projects were introduced at two markets and four residential areas with fixed-time and fixed –point collection system. The collaborative operation between JICA and South Sudan side made it possible for C/Ps to learn technics and knowledge on solid waste management. It was targeted that C/Ps would conduct solid waste management by themselves in the future.
- c) Recognizing the significance of their activities by external evaluation: Community meetings were held many times at markets and residential areas, which provided the opportunities to contact with residents, and to listen to the voice of residents. By these meetings, C/Ps learned the viewpoints of waste dischargers and recognized the importance of their own work.
- d) Deepening the understanding by teaching experiences and knowledge acquired by the project: C/Ps intended to disseminate the experiences and knowledge learnt through the

project, which deepened their own understanding.

### 6.3 Issues, Ideas and Lessons Leant for Project Operations (Project Implementation Methods, Operational System etc.)

Main issues on solid waste management in Juba were analyzed from the viewpoints of solid waste management in general, and the summary was described as follows. The ideas and lessons learnt were examined based on the local common sense and social customs.

Main issues	Issues, Ideas and Lessons Leant for Project Operations (Project Implementation Methods, Operational System etc.)
1) No plans and organizations on solid waste management	<p>There were no organizations, no institutions and no human resources in Juba for the implementation of collection services. Therefore, Juba City Council and each Payam allocated collection vehicles and work on collection services together, which gave them the opportunities to learn more about solid waste management.</p> <p>Fix-time and fixed-point collection system was introduced; C/Ps worked with residents and got direct feedback from the residents.</p> <p>By doing this, the invisible outputs could be observed: the persons in charge could learn waste collection system, and the waste collection organization was prepared.</p> <p>Based on these experiences, the proper planning is expected to be done in the future.</p>
2) No financial sources on solid waste management	<p>Collaborative waste collection work between JICA and C/Ps helped to establish waste collection system in Juba. Juba City Council and Payam put more priority on solid waste management, and got stronger voice among the stakeholders.</p> <p>JICA expert team had discussion with Payam directors: in Kator Payam, the meetings with collection workers were held, and JICA expert team was invited as lectures.</p> <p>Gradually, the budget of solid waste management was secured. Juba City Council started fee collection from large-volume waste dischargers such as hotels, and Payam also actively began fee collection at markets by Payam. It is necessary to establish taxation system in the future, such as fee collection system to secure financial sources.</p>
3) No data on solid waste management	<p>At the beginning of this project, it was not clear how much of waste was discharged in Juba, which made it difficult to plan solid waste management in Juba. The data on waste quality was also not available. Then, JICA expert</p>

Main issues	Issues, Ideas and Lessons Leant for Project Operations (Project Implementation Methods, Operational System etc.)
collection, transportation and treatment	<p>team conducted the survey on waste quantity and quality.</p> <p>The waste collection routes were determined by the survey on collection points and waste amount at each collection points.</p>
4) Lack of human resources and capacity for waste collection, transportation and treatment	<p>The system to develop human resources was prepared in order to let the C/Ps understand the significance and possibilities of waste management. The pilot project sites were selected for their experiences (2 markets –Jebel Market and Juba Town Market, and 4 residential areas- Atlabara B &amp; C, Gudele Block 8, Hai Thoura). During these pilot projects, C/Ps could observe waste collection on site and learned how to organize waste collection system; Juba City Council and each Payam dispatched collection vehicles together with JICA.</p> <p>For the introduction of waste collection system, the cooperation with residents is essential. Hence, the fixed-time and fixed-point collection system with residential participant was introduced, and the residents involvement was encouraged.</p> <p>These methods were applied to learn solid waste management on site under the limited conditions such as the lack of organizations, human sources. As a result, these methods found to be effective: collection workers could learn the system on site, and the organization was prepared.</p>
5) Low understanding of waste management by large-scale volume dischargers and residents	<p>The fixed-time and fixed –point collection system was introduced with residential participation. The explanation to the residents was done repeatedly through community meetings as a model project. In July, 2012, JICA and Juba City Council dispatched the collection vehicles and the support from JICA was gradually reduced. This method enabled the C/Ps to learn collection system by experiences. Two markets (900 shops and 300 shops) and 4 residential areas (25-30 collection points per area) were targeted for the model areas.</p>
6) Lack of proper collection system for Large-scale volume dischargers (mainly markets)	<p>It was necessary to grasp the local culture in order to implement pilot projects. Jebel Markets has 900 shops and mixed type of tribes from South Sudan and other neighbor countries. Since the market has strong leaders, the project intended to work with them.</p> <p>JICA dispatched collection vehicles twice a week for three collection points at Jebel Market. The waste collection points got much cleaner after the pilot project. Some visitor also came to Jebel Market, which stimulated the waste collection work there.</p> <p>In July, 2013, the waste collection at Juba Town Market was introduced, with the initiatives of Juba Town Market, and they conducted regular waste</p>

Main issues	Issues, Ideas and Lessons Leant for Project Operations (Project Implementation Methods, Operational System etc.)
	<p>collection.</p> <p>In June, 2014, C/Ps started waste collection at Konyokonyo Market by themselves, with the same system as Jebel Market: fixed-time and fixed-point collection system.</p>
7) No appropriate collection system at household level	<p>In the introduction of waste collection at residential areas, the perspectives from residents were considered, and fixed-time and fixed-point collection system was initiated. Residents brought waste, following the date and time of waste discharge. With this method and collection vehicles supported by JICA, the residents relatively quickly understood the system. As a result, the target areas were kept cleaner, which was successful; especially at Atlabara B &amp; C all the residents followed the discharge rules. However, in regard to waste collection at residential areas, the waste collection got weaker after the political conflicts in December, 2013, even though they tried to dispatch collection vehicles as often as possible.</p>
8) Improper operation and maintenance of landfill site	<p>Before this project, there were no on-site managers, no facilities, no heavy equipment and no operation budget in Juba, which were the key to proper landfill operation.</p> <p>First, the structure of landfill management was improved. Since it seemed difficult to establish ideal organizations at once, Rejaf Payam was requested to allocate one landfill staff. Secondly, it was important to motivate the landfill staff and Rejaf Payam director to encourage better landfill operation: landfill staff worked for the improvement on site under the support of JICA, which let him feel the importance of landfill operation; it is also necessary to show visible change for Rejaf Payam director. The method to upgrade the existing open dumping site into a controlled dumping site was applied, which was easier to see the outputs. After the improvement work, the landfill conditions was improved such as the bad odor, fire, scattering waste, and the landfill staff got more cooperative to the work.</p> <p>In parallel with this improvement work, the discussion on how to cover operation and maintenance cost was done. Since it was difficult for Rejaf Payam to secure the budget at that moment, the disposal fee collection was introduced.</p> <p>Heavy equipment was procured by JICA, and the number of landfill staff was increased into 6 staff, including two heavy equipment operators. The disposal fee also collected, which contributed to establishing operation and maintenance system under Rejaf Payam.</p>



Main issues	Issues, Ideas and Lessons Leant for Project Operations (Project Implementation Methods, Operational System etc.)
	Through the pilot project of landfill improvement, the significant outputs were observed, even though the period was short approximately 2 years): the open dumping site was upgraded to the controlled dumping site; the operation and maintenance organization was also established; the disposal fee collection was started, which was utilized for landfill operation and maintenance. This project could motivate and attract the initiatives of Juba County and Rejaf Payam for the better landfill operation and maintenance.
9) Lack of organizations, institutions and human resources	<p>The head of environmental and sanitation department was allocated at the beginning of 2013, after Juba City Council recognized the importance of the position. Later the position of sub-head of the department was also established.</p> <p>Payam used to be in charge of waste collection; however, Juba City Council intended to centralize waste collection under Juba City Council, to improve the institutional system.</p> <p>There was a proposal to establish public solid waste management company and the preparatory meetings were held twice, even though this idea is still under preparation.</p> <p>The head of environmental and sanitation department has initiatives to improve solid waste management in Juba.</p>

The comparison between the intentions for the monitoring (after the political conflicts in December, 2013) and the actual activities (from April to October, 2014) is described as follows.

As of April, 2014, it was expected to continue the pilot project of waste collection improvement. However, the collection activities at residential areas were stopped, while the collection at markets and for large-volume dischargers was only continued. It should be also noted that the C/Ps intended to continue the collection activities with the limited number of collection vehicles.

Regarding of landfill operation, the organization had been already established and the landfill operational capacity of on-site staff was improved, before the political conflicts in December, 2013. Hence, the scheduled activities were properly done by remote operation by JICA expert team.

Item	Planned activities (as of April 2014)	Actual activities (done from April to October, 2014)
Collection at markets	The collection activities would be continued.	The collection at Jebel Market was continued; one of two collection points at Juba Market was continued; waste collection at Konyokonyo market was newly introduced.
Collection at residential areas	The collection at 4 target areas and for large-volume dischargers would be continued.	The collection was temporally suspended, but there was a movement to restart the collection.
Landfill	The operation would be continued.	The operation was continued, even though the financial status worsened.
JSWMG	The meetings would be held to solve the issues.	Two meetings were held, and the head of environmental and sanitation department was transferred to another department. Later, JSWMG was started to be organized again, and discussed solid waste management topic by topic.
General	The organization would be stronger, whose structure was prepared before December, 2013.	The activities were slowed down, because of the lack of collection vehicles. Juba City Council started the centralization of waste management.

## **Chapter 7 Recommendations to Achieve Overall Goal**

The direct support to hire collection vehicles, to construct landfill site and to provide environmental monitoring equipment had been conducted until December, 2013. The guidance on waste collection, landfill operation, organizational and financial improvement and public relations were also done by JICA expert team and local project staff. However, because of the sudden security deterioration in December, 2013, the on-site activities were suspended, and the monitoring activities were decided to start, with two hired project staff.

According to the monitoring report in March, 2014, the waste collection was continued with the efforts of C/Ps, even though the direct support by JICA was stopped. This implied the capacity to implement collection activities was improved. The number of trips was reduced, but the collection itself was still continued, while 5 of 10 compactors of Juba City Council were broken. As a result, since each Payam also commenced waste collection using their vehicles, Juba City Council intended to centralize the waste collection work. The waste collection at residential areas got instable, so it was once stopped. Juba City Council has been trying to restart the collection with fee collection. Outsourcing to private collection companies is also under discussion.

The notable point is that the officers from Juba City Council Payam had JSWGM meetings, and JSWGM members discussed how to recover waste collection system, after the collection work got instable.

Landfill operation and maintenance was almost perfectly done, so it is necessary to make the way forwards clearer, based on the short-term (2 years later) and long-term plan (10 years later) in the solid waste management in Juba. The topic to be urgently discussed with C/Ps, especially Ministry of Environment, is to prepare a plan and budget for a new landfill site, because the existing landfill will be full in a couple of years. Also the landfill operation and maintenance has been done properly, but it is necessary to recruit a new engineer to prepare a plan of waste filling and landfill construction.

**Table 7-1 Recommendations to achieve overall goal**

Main Tasks	Recommendations to achieve overall goal
(1) Strengthening of planning, organization, institutions on solid waste management	<ul style="list-style-type: none"> <li>• The collection system was introduced with the collaboration among Juba City Council, Payam and JICA, and the support by JICA was gradually reduced. This was an effective method so the organizations which have enough vehicles should be encouraged to dispatch collection vehicles.</li> <li>• The size of landfill activities was not only within the pilot project level, but also for the practical level, which made it possible to continue the actual operation and maintenance.</li> <li>• It is desirable that a practical collection organization will be formed, which is expected to be a centralized organization.</li> </ul>
(2) Securing financial sources on solid waste management	<ul style="list-style-type: none"> <li>• The regular and stable service was recognized among the waste dischargers, and the higher-level officers also recognized the importance of solid waste management. It is a good chance to introduce fee collection system.</li> <li>• Juba City Council started fee collection system with large-volume dischargers.  The fee collection system should be stable such as disposal fee and waste collection fee.</li> <li>• It is expected to secure the budget according to the annual activity plan.</li> <li>• It is necessary to cover solid waste management service cost among the taxation system.</li> </ul>
(3) Data collection on waste collection, transport and treatment	<ul style="list-style-type: none"> <li>• The basic data was collected by the survey done during this project.</li> <li>• It is expected to add and update the data under the initiative of C/Ps.</li> </ul>
(4) Improvement of human resource capacity on waste collection, transport and treatment	<ul style="list-style-type: none"> <li>• The capacity was developed at the on-site level, by the practical project activities.</li> <li>• The capacity of higher level such as planning, budgeting, forming organizations and facility construction should be improved.</li> </ul>
(5) Improvement of awareness and understanding of	<ul style="list-style-type: none"> <li>• It was found out that fix-time and fixed-point collection system with community participation was suitable in Juba.</li> </ul>

Main Tasks	Recommendations to achieve overall goal
large-volume dischargers and residents on solid waste management	<p>This system should be expanded in Juba.</p> <ul style="list-style-type: none"> <li>Community meetings and bus tours were organized by JICA expert team at first and C/P gradually got more initiatives.</li> </ul>
(6) Urgent improvement of collection system for large-volume dischargers (mainly markets)	<ul style="list-style-type: none"> <li>Market unions were involved at the pilot project at Jebel Market and the collaborative operation between JICA and Payam was done. It is recommended to involve leaders such as market unions.</li> <li>Main markets were targeted as pilot project areas, which was effective for Public Relations. Some visitors also came to the market, which had good effect inside and outside the market.</li> <li>In June, 2014, C/P introduced fixed-time and fixed-point collection system at Kokyokonyo market by themselves.</li> <li>C/Ps who accumulated experiences should help to expand the collection activities.</li> </ul>
(7) Necessity to establish household waste collection	<ul style="list-style-type: none"> <li>It was found out that fix-time and fixed-point collection system with community participation was suitable in Juba. This system should be expanded in Juba. This method was relatively quickly understood by the residents.</li> <li>The residents followed the fixed date and the target areas got cleaner. However, it is essential for Juba City Council to dispatch the collection vehicles, so that they can build the confidential relations with the residents.</li> <li>After December, 2013, the collection at residential areas got weaker, because Juba City Council and Payam could not allocate collection vehicles.</li> <li>The importance of solid waste management was recognized. However, the priority of collection at residential areas was still low.</li> </ul>
(8) Necessity for improvement of enough landfill capacity and proper operation	<ul style="list-style-type: none"> <li>In order to make the operation stable, it is necessary to reduce the hiring cost of heavy machinery for soil cover, which cost the most of maintenance expenditure.</li> <li>The construction for a new landfill should be examined, because the Phase 2 of the current existing dumping site becomes full in a couple of years. The subsidy from national governments is realistic, so the discussion should be done with Ministry of Environment.</li> <li>It is necessary to recruit a staff member who can design a</li> </ul>

Main Tasks	Recommendations to achieve overall goal
	<p>landfill (Phase 3) and make a waste filling plan.</p> <ul style="list-style-type: none"> <li>• Site manager should be sent for the training in Japan, and share the knowledge with other staff members, because the on-site staff members have not received the training in Japan.</li> </ul>
(9) Organizations, Institutions, Human resources	<ul style="list-style-type: none"> <li>• The department of environmental sanitation was established, and the staff members were allocated.</li> <li>• Public solid waste management company was considered, but the consensus has not been reached, because there are no enough human resources.</li> <li>• Legislations on solid waste management are required in the near future.</li> </ul>